



FLORA OF AUSTRALIA

Volume 26 *Meliaceae, Rutaceae, Zygophyllaceae*



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FLORA OF AUSTRALIA

Volume 26 describes three families of plants, Meliaceae, Rutaceae and Zygophyllaceae, with 61 genera and 588 species.

Meliaceae is a largely tropical family and includes the well-known *Toona ciliata*, Red Cedar, as well as *Melia azedarach*, White Cedar, widely planted as an ornamental and shade tree.

The largest family, Rutaceae, has 43 genera and 486 species in Australia. Some are rain forest plants, but the majority are sclerophyllous shrubs in temperate Australia, with the largest of the genera, *Boronia*, having 148 species. The family also includes the economically important citrus group, which includes some endemic species used in the bush food industry.

Zygophyllaceae are herbs or subshrubs of mainly inland parts of Australia, and some species are very widespread. A few are declared noxious weeds, others are reputed to be poisonous to stock.

Thirty-three authors, illustrators and photographers have contributed to this volume.

Cover:

Philotheca spicata (A.Rich.) Paul G. Wilson
Painting by Margaret Wilson.

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arranged according to the system of A.Cronquist (1981)**

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FLORA OF AUSTRALIA



Philotheca spicata (A.Rich.) Paul G.Wilson.
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Meliaceae, Rutaceae, Zygophyllaceae



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Back: *Flora of Australia*: Index to families of flowering plants.

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INTRODUCTION

Volume 26 of the *Flora of Australia* contains 3 families—Meliaceae, Rutaceae and Zygophyllaceae. In all 61 genera and 588 species are described.

Meliaceae is a largely tropical family, with some important timber species as well as ornamentals and fruit trees. In Australia there are 13 genera and 44 species. Most taxa are found in rain forest, but *Xylocarpus* spp. are mangroves, and the Australian endemic genus *Owenia* is unusual in having some species confined to arid regions. The best-known of the native Australian timber species is undoubtedly *Toona ciliata*, the Red Cedar. *Melia azedarach*, White Cedar or Cape Lilac, is native to northern Australia as well as Asia, and is extensively planted as an ornamental and shade tree, with a range of cultivated forms of extra-Australian origin.

Rutaceae is a cosmopolitan family, with its greatest diversity in Australasia. In Australia there are 43 genera and 486 species. In this treatment four informal groups are recognised, of which group 3 is represented only by a single introduced species from South Africa. Group 1 contains mostly rain forest genera and includes some useful timber species in Queensland. Group 2 is by far the largest, of mostly sclerophyllous shrubs, including the largest of the Australian genera, *Boronia*, with 148 species. Economically, the most important group is Group 4, containing *Citrus* and related genera. In addition to extensive plantations of oranges, lemons and other citrus crops, Australia has several endemic *Citrus* species which are becoming important for the Bush Food industry.

Zygophyllaceae in this treatment comprises 5 genera and 58 species in Australia, following Cronquist (1981), however, recent research suggests that two of the genera, *Nitraria* and *Peganum* should be treated in their own families, Nitrariaceae and Peganaceae, and that Zygophyllaceae *s. str.* is not closely related to other families included in the Sapindales. Zygophyllaceae are herbs or subshrubs of mainly inland parts of Australia, and some species are very widespread. A few species are declared noxious weeds, others are reputed to be poisonous to stock.

Scope and Presentation of the *Flora*

The geographical area covered by the *Flora* includes the six Australian States, the Northern Territory, the Australian Capital Territory and immediate offshore islands. Other Australian and State-administered territories such as Christmas Is. and Lord Howe Is. are excluded, but the occurrence in those territories of species included in the *Flora* is added to the notes on distribution. Complete Floras of the oceanic islands are in Volumes 49 and 50.

Descriptions and discussion in the *Flora* are concise and supplemented by important references, synonymy, and information on type collections, chromosome numbers, distribution, habitat, and published illustrations. Descriptions are based on Australian material except for some taxa not confined to Australia for which the collections in Australian herbaria are inadequate. Synonymy is restricted to names based on Australian types or used in Australian literature. Misapplied names are given in square brackets together with an example of the misapplication. Alien taxa established in one or more localities, other than under cultivation, are considered naturalised and are included and asterisked (*).

Where a taxon is listed under the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) this is indicated in a note. State and Territory listings of taxa of conservation concern are not indicated, but may be found through the relevant herbarium.

INTRODUCTION

Families are arranged in the system of A.Cronquist, *An Integrated System of Classification of Flowering Plants* (Columbia University Press, New York, 1981). Within families, genera and species are arranged to show natural relationships as interpreted by contributors. Although relationships cannot be shown adequately in a linear sequence, such an arrangement in a *Flora* assists comparison of related taxa. Intraspecific taxa are keyed out under relevant species. Up to seven collections are cited for each species and infraspecific taxon.

Maps showing distribution in Australia are included on the same page as each taxon. The term 'Malesia' is sometimes used in the notes on geographical distribution for species which occur widely in the region covered by *Flora Malesiana*, i.e. Malaysia, Singapore, Indonesia, the Philippines, New Guinea and adjacent islands.

Type citations under taxa in the main body of the text reflect the authors' belief in their current status (holotype, isotype, syntype, etc) and where they are held. In cases where the type specimen has not been examined, this is indicated by *n.v.* These type statements are not to be interpreted as lectotypifications. Where lectotypifications have been made previously, these are cited with *fide*, followed by a reference to the author and place of publication (or, sometimes, to a secondary reference). Any formal lectotypifications required for this volume, as in previous parts of the *Flora*, are confined to the Appendix.

New taxa and lectotypifications are included in an Appendix where they are formally published in accordance with the *International Code of Botanical Nomenclature* (Koeltz Scientific Books, Königstein, 2006). Abbreviations, contractions and notes on format are listed after the Appendix.

A key to families of flowering plants and a glossary of technical terms are provided in Volume 1 of the *Flora*. Supplementary glossaries are included in each volume as necessary.

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There are 11 authors, 14 illustrators and 10 photographers who have contributed to Volume 26. Their co-operation is gratefully acknowledged.

The Australian National Botanic Gardens slide collection provided a number of the colour photographs used in this volume.

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The Australian Botanical Liaison Officers at Kew also assisted in locating botanic literature unavailable in Australia, and type specimens in a variety of British and European herbaria.

The co-operation of referees, usually working to tight deadlines, is also acknowledged.

The production of this volume would not have been possible without the substantial assistance of the Australian Commonwealth, State and University Herbaria. Their willingness to provide staff time and resources for this project of national importance is an outstanding example of co-operation between the States and the Commonwealth. Overseas institutions have also assisted preparation of the Volume with loans of specimens and by making facilities available to contributors and illustrators.

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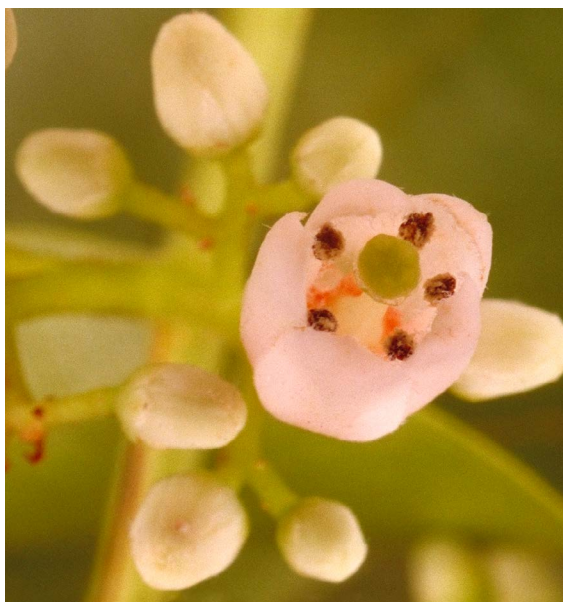


Plate 1. *Toona ciliata*.
 Photograph — B.Jago.



Plate 2. *Azadirachta indica*.
 Photograph — R.Barrett.

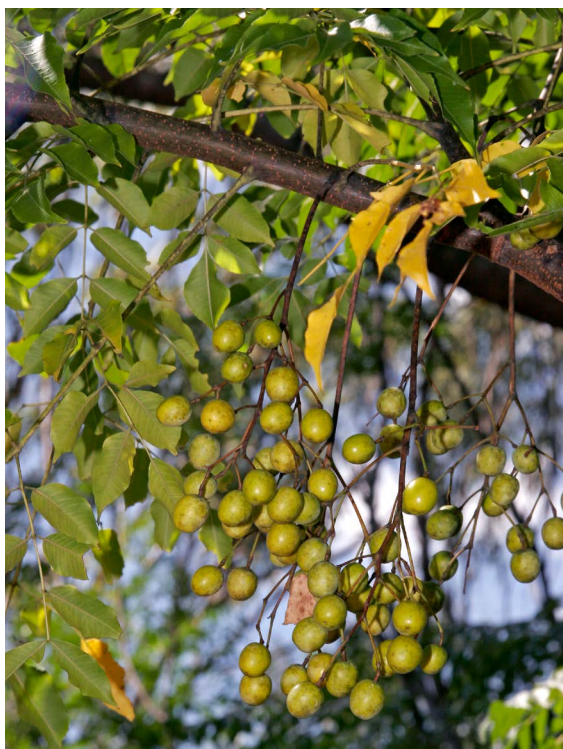


Plate 3. *Melia azedarach*.
 Photograph — R.Barrett.



Plate 4. *Xylocarpus granatum*.
 Photograph — F.Zich.

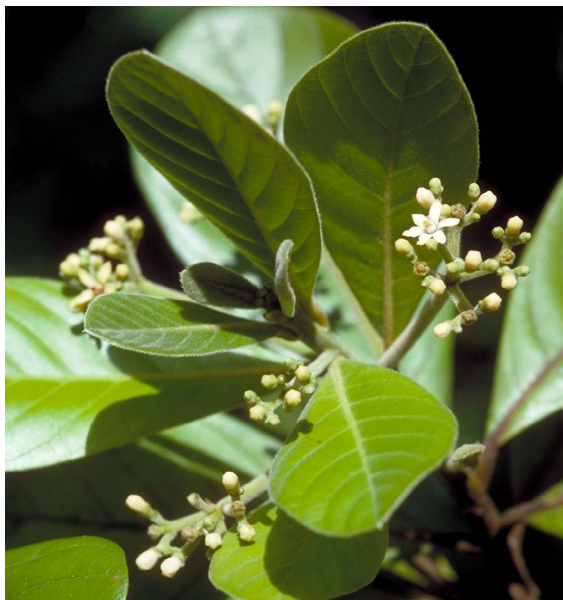


Plate 5. *Vavaea amicorum*.
 Photograph — B.Gray © CSIRO.



Plate 6. *Owenia vernicosa*.
 Photograph — R.Barrett.



Plate 7. *Anthocarapa nitidula*.
 Photograph — B.Gray © CSIRO.



Plate 8. *Turraea pubescens*.
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Plate 9. *Chisocheton longistipitatus*.
 Photograph — B.Jago.

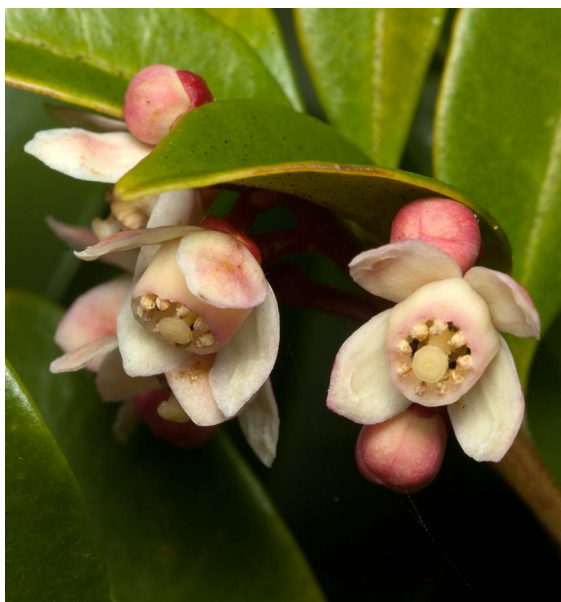


Plate 10. *Synoum glandulosum* subsp. *glandulosum*.
 Photograph — M.Fagg.



Plate 11. *Aglaia argentea*.
 Photograph — B.Gray © CSIRO.



Plate 12. *Dysoxylum gaudichaudianum*.
 Photograph — B.Gray © CSIRO.



Plate 13. *Bosistoa medicinalis*.
Photograph — B.Gray © CSIRO.



Plate 15. *Lunasia amara* var. *armara*.
Photograph — G.Sankowsky.

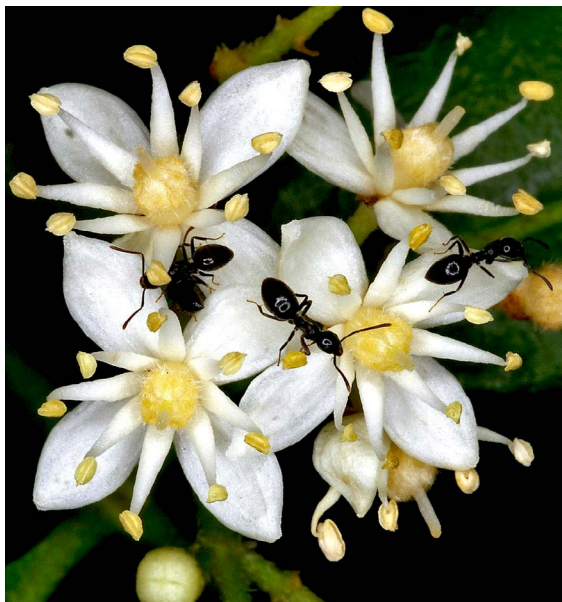


Plate 14. *Bouchardatia neurococca*.
Photograph — G.Sankowsky.



Plate 16. *Dinospasma erythrococtum*.
Photograph — B.Gray © CSIRO.

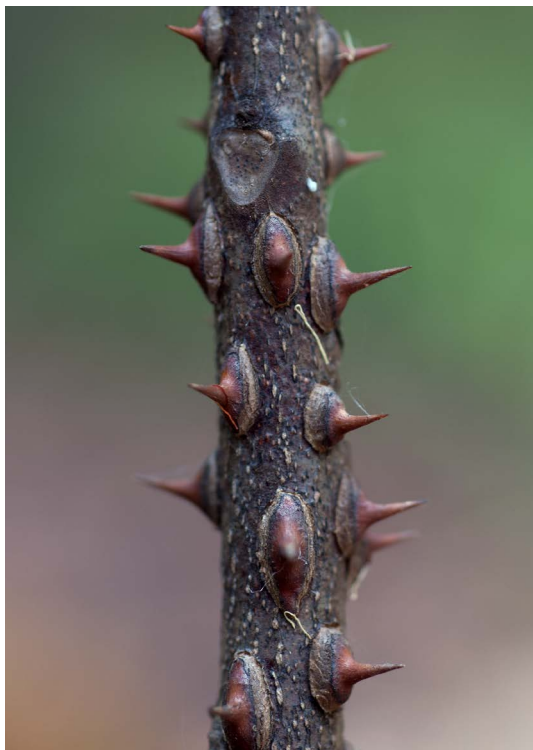


Plate 17. *Zanthoxylum brachyacanthum*.
 Photograph — M.Fagg.



Plate 18. *Acradenia frankliniae*.
 Photograph — M.Fagg.



Plate 19. *Flindersia pimenteliana*.
 Photograph — M.Fagg.



Plate 20. *Flindersia maculosa*.
 Photograph — M.Fagg.

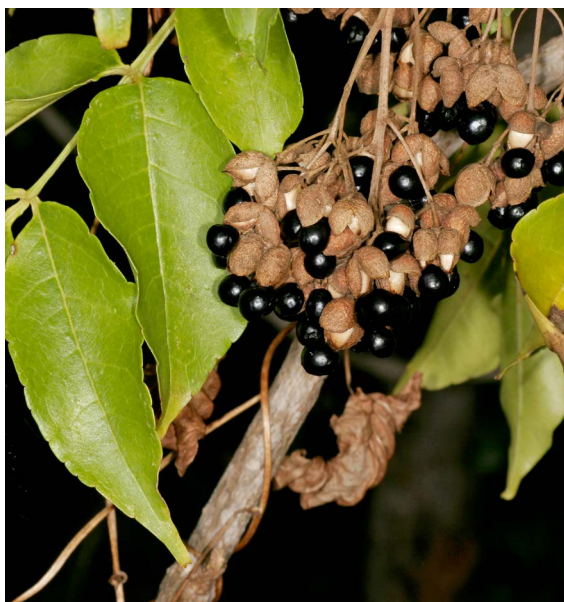


Plate 21. *Zanthoxylum rhetsa*.
 Photograph — R.Barrett.



Plate 22. *Pentaceras australe*.
 Photograph — M.Fagg.



Plate 23. *Halfordia kendack*.
 Photograph — M.Bayly.



Plate 24. *Geijera linearifolia*.
 Photograph — M.Fagg.



Plate 25. *Melicope rubra*.
 Photograph — B.Gray © CSIRO.



Plate 27. *Brombya platynema*.
 Photograph — G.Sankowsky.



Plate 26. *Euodia pubifolia*.
 Photograph — G.Sankowsky.



Plate 28. *Medicosma fareana*.
 Photograph — B.Jago.



Plate 29. *Acronychia peninsularis*.
 Photograph — B.Gray © CSIRO.



Plate 31. *Pitaviaster haplophyllus*.
 Photograph — B.Jago.

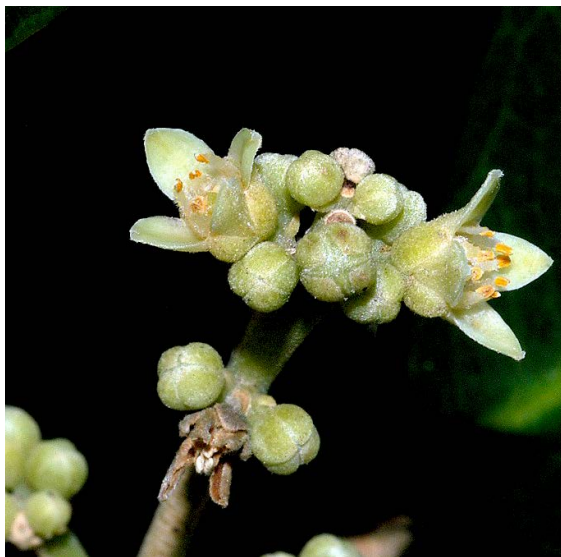


Plate 30. *Sarcomelicope simplicifolia* subsp. *simplicifolia*.
 Photograph — G.Sankowsky.

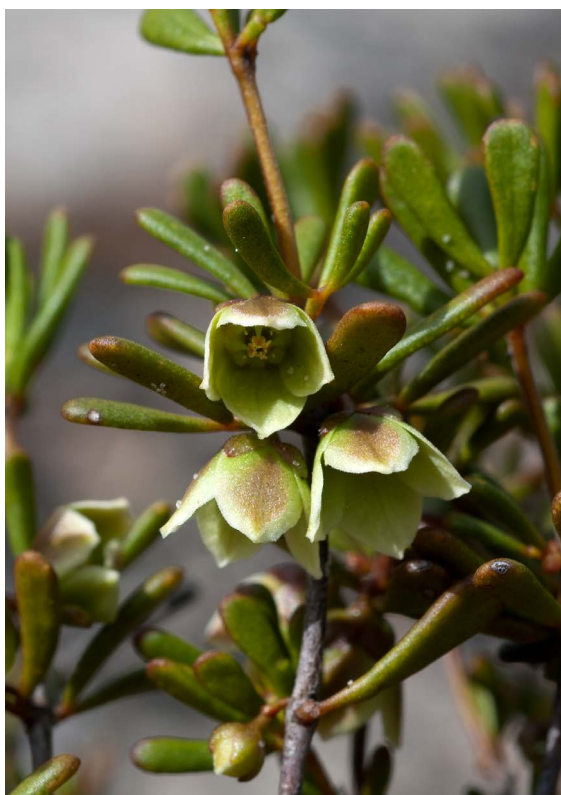


Plate 32. *Boronia octandra*.
 Photograph — M.Fagg.



Plate 33. *Boronia ternata* var. *ternata*.
 Photograph — M.Bayly.



Plate 34. *Boronia kalumburuensis*.
 Photograph — R.Barrett.



Plate 35. *Zieria cytisoides*.
 Photograph — M.Fagg.



Plate 36. *Zieria arborescens* subsp. *arborescens*.
 Photograph — M.Fagg.

MELIACEAE

D.J.Mabberley (family treatment and all genera except *Aglaia*)

C.M.Pannell (*Aglaia*)

Trees, treelets or rarely shrubs, dioecious, polygamous, monoecious or all flowers hermaphrodite. Indumentum of simple or stellate hairs, stellate or peltate scales, sometimes mixed. Vegetative buds naked or with scale-leaves (in Australia only in subfam. Cedreloideae). Leaves exstipulate, spirally arranged, rarely decussate, pinnate (sometimes with a terminal 'bud', i.e. pseudogemma) to simple or bipinnate; leaflets usually entire. Inflorescences thyrsoid to spicate, fascicled or of simple flowers, axillary to cauliflorous or epiphyllous (not in Australia). Calyx of discrete sepals, sometimes transitional to bracteoles, or a tube, sometimes atop an elongate pseudopedicel. Petals usually in 1 whorl of 3–7. Stamens free or usually anthers borne on or in a tube; anthers usually 3–10 in 1 whorl. Disc (probably nectary) around ovary or absent. Ovary usually 2–6-locular, each locule with 1–many ovules. Fruit a capsule, berry or drupe. Seed with fleshy aril or sarcotesta or combination of these, or winged or corky or none of these; endosperm usually absent.

A family of 50 genera and about 650 species throughout the tropics and subtropics with very few in temperate regions; in Australia 13 genera (2 endemic, 2 naturalised) and 44 species (14 endemic). A number of exotic species are grown for timber, fruit and ornament, and 2 are known to be naturalised.

The family is divisible into two pantropical subfamilies, Melioideae and Cedreloideae (Swietenioideae), both being represented in Australia. The family is chemically marked by the presence of extremely characteristic tetranortriterpenoids called limonoids, of which over 250 were identified before 1984. Those of Australian Meliaceae are discussed by Mulholland and Taylor (1992). They have also been found in Cneoraceae (now included in Rutaceae), some Rutaceae and *Harrisonia* R.Br. ex A.Juss. (generally put in Simaroubaceae but now accommodated in Rutaceae). Several limonoids constitute the principal toxins of the plants and are of considerable commercial interest (see *Azadirachta* and *Melia* below). The structure of limonoids in different genera gives general support to the morphological classification but draws attention to the debated position of tribe Xylocarpeae (Cedreloideae) and the finely drawn distinctions between certain tribes of Melioideae. DNA sequencing (Muellner *et al.*, 2006) places Xylocarpeae in a clade with most Cedreloideae and does not reflect the Pennington and Styles (1975) classification in so far as the two unigeneric subfamilies from Madagascar they propose are deeply embedded in the two subfamilies recognised here, while their concept of tribes such as Trichilieae and Turraeeae is not reflected in the molecular classification. Muellner *et al.* conclude that the family had a west Gondwanan origin.

At the generic level, the family demonstrates some remarkable transpacific affinities: Old World *Toona* with neotropical *Cedrela* and Old World *Dysoxylum* and *Chisocheton* with neotropical *Guarea* L. Fossils with features which would put them in modern Meliaceae if they existed today are known from the Upper Cretaceous, some of the earliest being referred to *Guarea*, while, of the Cedreloideae, '*Cedrela*' is recorded from the Palaeocene and '*Toona*' from the Eocene of Britain (London Clay).

Many Meliaceae are very common trees of the canopy and understorey of lowland primary forest throughout Indomalesia and the western Pacific; they are represented by species of *Xylocarpus* on rocky shores and in mangrove swamps but are poorly represented at high altitudes; some species of *Owenia*, a genus restricted to Australia, are notable for occupying arid regions. Many are early successional species surviving into the mature canopy of rain forest and are frequent in regrowth. Most species appear to be insect-pollinated and the seeds of Melioideae animal-dispersed. In Australia, birds are important dispersal agents of seeds from capsular fruits, berries and drupes, those of *Owenia* probably being dispersed by emus. Of Cedreloideae, the winged seeds are wind-dispersed and the corky seeds of *Xylocarpus* are dispersed by ocean currents.

MELIACEAE

The timbers of certain Meliaceae are some of the most sought after in the world, such that natural stands have been much depleted. The original ‘mahogany’ of 18th Century English furniture-makers Hepplewhite and Chippendale was *Swietenia mahagoni* (L.) Jacq. of the neotropics, which allowed the manufacture of more graceful and woodworm-proof furniture than could the oak and walnut previously utilised in Europe: this species has suffered severe genetic erosion and most ‘mahogany’ seen today (if meliaceous at all) is derived from *S. macrophylla* King, introduced to the Old World in 1876 and described from cultivated material in India. *Toona ciliata* M.Roem., Red Cedar, has suffered similarly (see below). The other important meliaceous timbers are generally Cedreloideae, notably the neotropical *Cedrela odorata* L. and species of the African genera *Entandrophragma* (Sapele, Utile), *Khaya* (African Mahogany) and *Lovoa* (Nigerian Golden Walnut). In Australia, where the timbers of Melioideae are generally known as Rosewood, the most important are in the genus *Dysoxylum*, which includes fine timber species in Indonesia and New Zealand as well. Although a number of species have been tried in plantations in Australia and elsewhere, there are very serious problems due to the depredations of *Hypsipyla* moths, the larvae of which are pernicious shoot-borers.

A number of Malesian Meliaceae are valuable fruit trees, notably the Langsat and Duku, cultivars of *Lansium domesticum* Corrêa, and the Sentul, *Sandoricum koetjape* (Burm.f.) Merr., a species grown in Qld. More important on a world scale are *Azadirachta indica* A.Juss. as a soil ameliorant and source of innumerable by-products (see below) and *Melia azedarach* L. as a source of insecticides and second quality timber (see below). The bitterness of the barks of many Meliaceae has long been known and they are of considerable importance in local medicine in Indomalesia, where European settlers eagerly sought them as possible antimalarials: they are now receiving renewed interest. Besides aboriginal use as fish-poisons (*Melia*) and for food (fruits of *Owenia* species), Australian Meliaceae are otherwise only utilised as shade-trees for stock and for ornament.

Flindersia R.Br., included in this family by Bentham, is now referred to Rutaceae.

Exotic species grown in plantation include the neotropical *Cedrela odorata* L., cultivated in Qld and N.S.W. for timber and as a street-tree; it is becoming naturalised in the Old World, as, for example, in New Caledonia, and may be expected to do so in Qld. It yields one of the most important tropical hardwoods. The neotropical true mahoganies are in plantation in the Old World, including Qld: *Swietenia macrophylla* King is the principal source of present-day mahogany, considered one of the most valuable timbers for cabinetwork. Others exotics, particularly African species of *Turraea* and *Khaya*, are grown in private and botanic gardens. *Khaya senegalensis* is recorded from two Aboriginal communities in the Kimberley region of W.A. One record describes the species as abundant in a disturbed area in and around houses, forming a woodland of this species. It could easily become naturalised from this population.

G.Bentham, Meliaceae, *Fl. Austral.* 1: 378–390 (1863) *p.p.*, excl. *Flindersia*; A.C.P.de Candolle, Meliaceae, in A.L.P.P.de Candolle & A.C.P.de Candolle, *Monogr. Phan.* 1: 419–758 (1878); H.A.T.Harms, Meliaceae, in H.G.A.Engler & K.A.E.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19b1: 1–172 (1940); P.K.Khosla & B.T.Styles, Karyological Studies and Chromosomal Evolution in Meliaceae, *Silvae Genet.* 24: 73–84 (1975); T.D.Pennington & B.T.Styles, A Generic Monograph of the Meliaceae, *Blumea* 22: 419–540 (1975); T.D.Pennington & B.T.Styles, *Fl. Neotrop. Monogr.* 28 (1981); M.F.das G.F.da Silva *et al.*, Evolution of Limonoids in the Meliaceae, *Biochem. Syst. & Ecol.* 12: 229–310 (1984); A.C.Smith, Meliaceae, *Fl. Vit. Nova* 3: 527–578 (1985); D.J.Mabberley, Meliaceae, in P.Morat & H.S.MacKee, *Fl. Nouv.-Caléd.* 15: 17–89 (1988); M.R.Cheek, *The Systematic Seed Anatomy of the Meliaceae with Particular Reference to the Seedcoat of the Melioideae*, D. Phil. Thesis, Bodleian Library, Oxford (1989); D.A.Mulholland & J.A.H.Taylor, Limonoids from Australian Members of the Meliaceae, *Phytochemistry* 31: 4163–4166 (1992); D.J.Du Puy, Meliaceae, *Fl. Australia* 50: 295–98 (1993); P.S.Green, Meliaceae, *Fl. Australia* 49: 245–48 (1994); D.J.Mabberley, C.M.Pannell & A.M.Sing, Meliaceae, *Fl. Males.* ser. 1, 12: 1–407 (1995); A.N.Muellner *et al.*, The mahogany family “out-of-Africa”: divergence time estimation, global biogeographic patterns inferred from plastid *rbcl* DNA sequences, extant, and fossil distribution of diversity, *Mol. Phylog. & Evol.* 40: 236–250 (2006); D.J.Mabberley, Meliaceae, in K.Kubitzki (ed.), *Fam. Gen. Vasc. Pl.* 10: 185–211 (2011).

MELIACEAE

KEY TO SUBFAMILIES

Vegetative buds with scale leaves; fruits woody septifragal capsules with central columella; seeds corky or winged

Subfam. **1. CEDRELOIDEAE**

Vegetative buds naked; fruits capsules, berries or drupes; seeds neither corky nor winged

Subfam. **2. MELIOIDEAE**

KEY TO GENERA

- 1** Leaves simple
 - 2** Fruit a berry **6. VAVAEA**
 - 2:** Fruit a dehiscent capsule **8. TURRAEA**
- 1:** Leaves compound
 - 3** Leaves 2–3-pinnate **5. MELIA**
 - 3:** Leaves pinnate
 - 4** Leaves (in Australian species) with apical pseudogemmula **11. CHISOCHETON**
 - 4:** Leaves paripinnate or imparipinnate
 - 5** Leaflets serrate **4. AZADIRACHTA**
 - 5:** Leaflets entire
 - 6** Disc usually tubular, surrounding or obscuring ovary **12. DYSOXYLUM**
 - 6:** Disc absent or, at least, not surrounding and obscuring ovary
 - 7** Seeds winged or corky
 - 8** Seeds winged
 - 9** Seeds winged at both ends **1. TOONA**
 - 9:** Seeds with terminal wing **2. CHUKRASIA**
 - 8:** Seeds corky **3. XYLOCARPUS**
 - 7:** Seeds neither winged nor corky
 - 10** Indumentum of stellate hairs and/or stellate or peltate scales (sometimes sparse); anthers 3–6 **13. AGLAIA**
 - 10:** Indumentum of simple hairs; anthers 8 or 10
 - 11** Leaves imparipinnate **10. SYNOUM**
 - 11:** Leaves paripinnate
 - 12** Anthers on margin of staminal tube, or on distally free filaments **7. OWENIA**
 - 12:** Anthers inserted within staminal tube **9. ANTHOCARAPA**

MELIACEAE

Subfam. 1. CEDRELOIDEAE

Meliaceae subfam. *Cedreloideae* (R.Br.) Arn., *Botany* 103 (1832), as *Cedreleae*

Cedrelaceae R.Br. in M.Flinders, *Voy. Terra Austral.* 2: 595, 596 (1814). T: *Cedrela* P.Browne

Swietenioideae Harms in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 3, 4: 267, 270 (1896). T: *Swietenia* Jacq.

Vegetative buds with scale leaves. Plants monoecious. Locules multiovulate. Fruit a woody or leathery septifragal capsule with a central columella. Seeds winged or corky; endosperm absent.

A subfamily of 14 genera; 3 genera in Australia of which one is introduced.

1. TOONA

Toona (Endl.) M.Roem., *Fam. Nat. Syn. Monogr.* 1: 131, 139 (1846); from toon, an Indian vernacular name for *T. ciliata*.

Cedrela b. *Toona* Endl., *Gen. Pl.* 2: 1055 (1840); *Surenus* Kuntze, *Rev. Gen. Pl.* 1: 110 (1891), *nom. superfl. pro Toona*. T: *T. ciliata* M.Roem.

Trees with simple hairs. Leaves usually paripinnate. Inflorescence a thyrse. Flowers unisexual but with vestiges of opposite sex, rarely hermaphrodite. Calyx lobed or of free sepals. Petals 5, free, basally adnate to a short androgynophore (disc which does not surround or obscure the ovary). Stamens 5, free, sometimes with 1–5 staminodes. Ovary 5-locular, each locule with 6–10 ovules; stylehead discoid. Capsule 5-merous, ±woody; columella 5-angled, reaching capsule apex. Seeds numerous, winged at one or both ends. $n = 26, 28, 39$; $2n = 46, 52, 56$, T.D.Pennington & B.T.Styles, *Blumea* 22: 513 (1975).

A genus of about 4 or possibly 5 species from E Pakistan and S China through Malesia to E Australia. It is closely allied to the neotropical *Cedrela* P.Browne, which differs in its long androgynophore and entire (as opposed to lobed) seedling leaves. All species produce valuable red-coloured timber and medicinal barks in local use.

J.Vader, *Red Cedar* (1987); K.N.Bahadur, *Monograph on the Genus Toona (Meliaceae)* (1988); J.McPhee (ed.), *Red cedar in Australia* (2004).

Toona ciliata M.Roem., *Fam. Nat. Syn. Monogr.* 1: 139 (1846)

Cedrela toona Roxb. ex Rottler in C.L.von Willdenow, *Ges. Naturf. Freunde Berlin Neue Schriften* 4: 198 (1803); *C. australis* Mudie, *Picture of Australia* 147 (1829), *nom. superfl. pro C. toona*; *Surenus toona* (Rottler) Kuntze, *Rev. Gen. Pl.* 1: 111 (1891). T: Madras, India, 1799, *J.T.Klein s.n. in herb. Willd.* 4828; holo: B-WILLD; ?iso: BM.

Cedrela australis F.Muell., *Fragm.* 1: 4 (1858), *nom. illeg. non* Mudie (1829); *Surenus australis* Kuntze, *Rev. Gen. Pl.* 1: 111 (1891); *Toona australis* (Kuntze) Harms in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 3, 4: 270 (1896); *C. toona* var. *australis* (Kuntze) C.DC., *Rec. Bot. Surv. India* 3: 368 (1908); *T. ciliata* var. *australis* (Kuntze) Bahadur, *Monogr. Toona* 78 (1988). T: not designated.

Cedrela toona var. *parviflora* Benth., *Fl. Austral.* 1: 387 (1863); *Toona ciliata* var. *parviflora* (Benth.) Bahadur, *op. cit.* 94. T: Clarence R., N.S.W., Oct., *J.Wilcox s.n.*; holo: K; iso: MEL.

Cedrela toona var. *grandiflora* C.DC. in A.L.P.P.de Candolle & A.C.P.de Candolle, *Monogr. Phan.* 1: 745 (1878). T: 'Nova Hollandia', Anon.; holo: G n.v.

Cedrela toona var. *vestita* C.T.White, *Queensland Agric. J.* n.s. 13: 66 (1920); *Toona ciliata* var. *vestita* (C.T.White) Bahadur, *op. cit.* 106. T: Warwick Dist., parishes of Dundas and Byron, Qld, 16 Jan. 1919, *W.E.Moore s.n.*; holo: BRI.

Illustrations: K.A.W.Williams, *Native Pl. Queensland*, 3rd edn, 1: 270 (1984), as *T. australis*; J.Vader, *Red Cedar*, var. pages (1987), as *T. australis*; G.J.Harden (ed.), *Fl. New South Wales* 2: pl. 19 (1991).



Figure 1. *Toona ciliata*. A, habit; B, male flower L.S.; C, female flower L.S.; D, opened capsules; E, seed (A–E, ‘Volk tree no 3’, FHO). Scale bars: A, D = 3 cm; B, C = 3 mm; E = 10 mm. Drawn by R. Wise.

Deciduous tree to 40 m tall with bole to 3 m diam. and buttresses to 3.5 m tall; bark flaking irregularly. Leaves usually 15–50 cm long, usually 4–10-jugate, usually glabrescent with hairy domatia in axils of veins of leaflet abaxial surface, red when young; petiole 4–11 cm long; leaflets usually 4–10 cm long, 1.5–5 cm wide, ovate to lanceolate or even subfalcate, asymmetric at base, acuminate at apex; petiolules usually 4–10 mm long. Thyrses to 50 cm long. Sepals spatulate; margins ciliate. Petals usually 4–5 mm long, white; margins ciliate. Stamens usually 5; filaments pilose; staminodes absent. Style glabrous. Capsule to 26 mm long, 8 mm wide, ellipsoid, opening by lenticellate valves. Seeds 4–7 per locule, winged at both ends.

$2n = 56$, P.K.Khosla & B.T.Styles, *Silvae Genet.* 24: 78 (1975). *Red Cedar*. Plate 1; Fig. 1.

Coastal rain forests from Claudie R, NE Qld, S to Ulladulla, SE N.S.W., formerly very plentiful on basalt-derived alluvial flats of the larger rivers. Also in Indomalaysia from Pakistan to New Guinea and New Britain. Flowers Sept.–Nov.; fruits Sept.–Jan., May.

Qld: SFR 191, Atherton, *T.Hartley & B.Hyland 14168* (BRI, CANB, K). N.S.W.: Paterson's [Hunter] R., 22 Oct. 1804, *R.Brown* (BM, BRI, CANB, K, MEL, NSW).

Toona ciliata is a wide-ranging species, of which the type and other Indian plants seem to differ from the Australian plants in their glabrous filaments, such that it may be appropriate to recognise populations from the eastern part of the species' range infra-specifically. Moreover in New Guinea and parts of Qld there are some particularly hairy forms, e.g. SFR 452, *K.Sanderson* (CNS); Brown's Falls, Darling Downs, *I.R.Telford 426* (CBG), which seem to correspond with *Cedrela toona* var. *vestita* C.T.White. Recognition of infraspecific taxa requires further analysis.



Because the tree is deciduous, its tree-rings have potential in reconstructing early season temperatures and late-season rainfall patterns of the past (see I.Heinrich & J.C.G.Banks, *Austral. J. Bot.* 53: 21–32 (2005)). Possibly the most prized of all Australian native timbers, red cedar has been logged so effectively that good specimens are now rare. Trees over 60 m tall have been recorded and some idea of their value and exploitation for furniture, coach-building, doors and other joinery can be gained from the Post-War daily press (see, e.g. P.J.Hurley, *Sydney Morning Herald* 1 Nov. 1947), recording the disappearance of these gigantic trees, of which even the roots were valued (for a popular illustrated account see Vader, *loc. cit.*). Flowering in spring, red cedar is sometimes cultivated for ornament but it is difficult to grow in plantation because, like other Meliaceae, it is prone to devastating attacks by shoot borers (*Hypsipyla robusta*). In the neotropics, these moths are attracted by a chemical allied to substances which, in species from other parts of the world, are toxic to the local moths. Thus, *T. ciliata* is resistant to attack in Costa Rica and it is alleged that this resistance may be transferred to the susceptible local *Cedrela odorata* L. if a scion of it is grafted on to a stock of *Toona*. There have been many attempts at biological control of the moths, for externally applied insecticides have little effect and systemic ones are expensive.

2. CHUKRASIA

Chukrasia A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 239 (1830); from chickrassy, an Indian vernacular name for *C. tabularis*.

Type: *C. tabularis* A.Juss.

Trees with simple hairs. Leaves paripinnate with terminal leaflet represented by a spike, imparipinnate and bipinnate in juvenile plants. Inflorescence a thyrs, axillary but subterminal so as to appear terminal. Calyx 4- or 5-lobed. Petals 4 or 5, free. Staminal tube margin entire or crenulate; anthers 8–10, attached to margin. Ovary 3–5-locular, each locule with numerous ovules; stylehead capitate. Capsule 3–5-merous, woody; columella reaching

capsule apex. Seeds numerous, with a terminal wing. $2n = 26$, P.K.Khosla & B.T.Styles, *Silvae Genet.* 24: 77 (1975).

A genus with a single, variable species, native in India and Nepal, E and SE from southern China, Sri Lanka and Andaman Is. to Sarawak; introduced in Australia.

***Chukrasia tabularis** A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 241 (1830)

T: India, *W.Roxburgh s.n.*; holo P *n.v.*; iso: BM.

Illustration: D.J.Mabberley, *Fl. Males.* ser. 1, 12: 356, fig. 53 (1995).

Deciduous tree to 40 m tall and fluted bole to 1.2 m diam., with buttresses to 1.5 m high. Leaves 30–50 cm long; leaflets in 6–21 pairs, ovate to oblong or subfalcate, asymmetric at base, subglabrous to velutinous abaxially. Thyrses 10–30 cm long. Flowers sweetly scented. Petals 12–16 mm long, creamy or pinkish. Capsule 2.5–4 cm long, opening by 3–5 valves. Seeds 60–100 per locule, c. 1.2 cm long.

Tried in plantation in Qld and now aggressive, naturalised in parts of the Atherton Tableland at 650–750 m alt. Flowers Nov.–Dec.

Qld: SFR 310, Tardent LA, *B.Hyland 25228RFK* (CANB, CNS); SFR 185 Danbulla Severin LA, *R.Jensen 735* (CNS).

The timber is the Chickrassy, Yinma or Chittagong wood of commerce and is favoured for carving as well as construction. The bark is astringent and the flowers are the source of a dye. For further discussion, see D.J.Mabberley, *Chukrasia*, *Fl. Males.* ser. 1, 12: 354–358 (1995).



3. XYLOCARPUS

Xylocarpus J.König, *Naturforscher (Halle)* 20: 2 (1784); from the Greek *xylon*, wood, and *carpon*, fruit.

Type: *X. granatum* J.König

Semi-evergreen trees of coasts. Leaves paripinnate, usually 2- or 3-jugate; leaflets entire, glabrous. Inflorescence a short axillary thyse. Calyx 4-lobed to about middle, valvate. Petals 4, contorted. Staminal tube margin 8-lobed; anthers 8, included. Disc cushion-shaped, red, not surrounding or obscuring ovary. Ovary usually 4-locular, each locule with usually 3 or 4 ovules; stylehead discoid. Capsule large, subspherical, pendulous, with 4 tardily dehiscent leathery valves. Seeds 5–20, irregularly tetrahedral or pyramidal, with outermost surface convex, attached to central columella; seed-coat corky, aerenchymatous (? sarcotestal). $2n = 52$, T.D.Pennington & B.T.Styles, *Blumea* 22: 526 (1975).

A genus of 3 species throughout the coastal regions of the Old World tropics from E Africa to the W Pacific, in mangrove swamps, coastal woodlands and on rocky headlands. The seeds float just below the water surface and are widely dispersed in sea currents.

The species are most readily distinguished in the field but are often confused in herbaria; indeed, in the absence of ecological information, details of the bark, ripe fruit, buttresses and pneumatophores, the herbarium worker may well be at a loss to pigeonhole specimens, particularly sterile material, and that from young plants may be almost impossible to determine. Moreover, the most frequently confused species, the mangroves *X. granatum* and *X. moluccensis*, often grow near one another so that there is the possibility of mixed field notes or even gatherings.

The wood of all three species is rich red-brown and hard. It has been used for boat-building and furniture. The bark is used in tanning, imparting a firm texture and tan colour to the

leather, and with *Ceriops* bark and coal tar it is a most efficacious preservative for fishing-nets in the Philippines. The trees are also of considerable local medical use in Malesia (see L.M.Perry, *Medicinal Plants of East and South-East Asia*, 263 (1980)).

The genus is closely allied to *Carapa* Aubl. of tropical America and west and central Africa.

B.Rollet, *Bibliography of Mangrove Research 1600–1975* (1980); D.J.Mabberley, *Xylocarpeae*, in D.J.Mabberley, Notes on Malesian Meliaceae for ‘The Tree Flora of Malaya’, *Malaysian Forester* 45: 448–450 (1982); P.B.Tomlinson, *Xylocarpus*, in P.B.Tomlinson, *The Botany of Mangroves* 274–282 (1986).

- 1 Leaflets in 2–4 pairs, ovate to cordate, sometimes subfalcate; fruit 6–8 cm diam.; tree of rocky coasts and sand, not mangrove, with neither conspicuous buttresses nor pneumatophores

1. *X. rumphii*

- 1: Leaflets in usually 1–3 pairs, obovate to elliptic or lanceolate, with apex acute or rounded to obtuse; fruit 6–25 cm diam.; tree of mangrove with either conspicuous buttresses or pneumatophores

- 2 Leaflets elliptic-oblong or lanceolate to oblanceolate, acute to obtuse; thyrses usually 3–8 cm long, usually with distinct main axis; fruit 6–11 cm diam.; buttresses not ribbon-like; pneumatophores erect, pointed

2. *X. moluccensis*

- 2: Leaflets obovate or elliptic, in mature plants obtuse to emarginate, coriaceous; thyrses (1–) 3–6 cm long, often without distinct main axis; fruit 12–25 cm diam.; buttresses flattened, ribbon-like, spreading across mud; pneumatophores absent

3. *X. granatum*

1. *Xylocarpus rumphii* (Kostel.) Mabb., *Malaysian Forester* 45: 450 (1982)

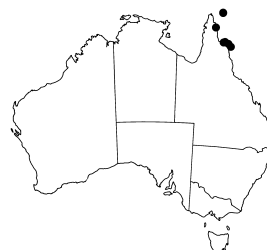
Carapa rumphii Kostel., *Allg. Med.-Pharm. Fl.* 5: 1988 (1836). T: illustration ‘*Granatum litoreum latifolium*’ in G.Rumphius, *Herb. Amboin.* 3: t. 62 (1743).

Illustrations: D.J.Mabberley, *Fl. Nouv.-Caléd.* 15: t. 15, figs 1 & 2 (1988); D.J.Mabberley, *Fl. Males.* ser. 1, 12: 374, fig. 56a–c; 375 fig. 57 (1995).

Tree usually 4–12 m tall with usually solitary bole to 80 cm diam. and neither buttresses nor pneumatophores; bark lenticellate to finely fissured, greyish. Leaf rachis and petiole to 22 cm long with terminal spike 1 mm long. Leaflets 2–4 pairs, ovate to cordate, sometimes subfalcate, usually 5–10 cm long, 3–5 cm wide, broadly cuneate to cordate and asymmetric at base, acute to acuminate at apex; venation conspicuous; petiolules usually 1–3 mm long. Thyrses usually 10–18 cm long, lax, pendent; main axis distinct; lateral branches to 8 cm long; bracts and bracteoles persistent. Pseudopedicels 3–8 mm long, not conspicuously swollen beneath calyx lobes. Calyx lobes 1–1.5 mm long. Petals elliptic-oblong, 3.5–6 mm long, 2–2.5 mm wide, creamy white. Staminal tube 2–2.5 mm diam.; marginal lobes apiculate or bifid to retuse. Capsule globose, 6–8 cm diam. Seeds 6–16, 3.6–7 cm long; first leaves compound.

Torres Strait islands S to Lizard Is. near Cooktown, NE Qld, on islands and rocky headlands; very rarely collected. Also in the Old World tropics from E Africa to Tonga, growing on cliffs and rocks near surf or on sandy substrates above high watermark. Flowers June–Oct.; fruits Oct.

Qld: Torres Strait, Murray Is., *H.Heatwole & E.Cameron* 658 (CNS); Cape Melville, *B.Hyland* 4821 (BRI, CNS, K); Fisher Is., *D.R.Stoddart* 5100 (BRI).



2. *Xylocarpus moluccensis* (Lam.) M.Roem., *Fam. Nat. Syn. Monogr.* 1: 124 (1846)

Carapa moluccensis Lam., *Encycl.* 1: 621 (1785). T: illustration of ‘*Granatum litoreum parvifolium*’ in G.Rumphius, *Herb. Amboin.* 3: t. 61 (1743); lecto: *vide* D.J.Mabberley, *Malaysian Forester* 45: 449 (1982).

X. australasicus Ridl., *Kew Bull.* 1938: 291 (1938). T: Cairn Cross Is., Qld, *F.Mueller*; holo: K.

Illustrations: P.B.Tomlinson, *The Botany of Mangroves* t. B40 (1986), as *X. mekongensis*; D.J.Mabberley, *Fl. Males.* ser. 1, 12: 374, fig. 56d, e; 377 fig. 58 (1995).

Tree usually 6–18 m tall with usually solitary bole to 70 cm diam., small buttresses and many erect, pointed pneumatophores; bark rough with longitudinal fissures, falling in oblong flakes, whitish to yellow-brown mottled. Leaf rachis and petiole to 10 cm long, sometimes with persistent apical spike to 1 mm long. Leaflets usually 2 or 3 pairs, elliptic-oblong or lanceolate to oblanceolate, usually 4–10 cm long, 2.5–6.5 cm wide, cuneate and \pm asymmetric at base, acute to obtuse at apex; venation prominent only when dried; petiolules usually 2–5 mm long. Thyrses usually 3–8 cm long, often produced with the new leaves, \pm lax; main axis usually distinct; lateral branches to 4 cm long; bracts and bracteoles \pm persistent. Pseudopedicels 3–8 mm long, not conspicuously swollen beneath calyx lobes. Calyx lobes 1–1.7 mm long. Petals oblong to obovate, 3.5–4 mm long, 2–3 mm wide, creamy white. Staminal tube 2–3 mm diam.; marginal lobes acute to apiculate or bifid to retuse. Capsule flattened-globose, 6–11 cm diam. Seeds 5–10, 4–6.5 cm long; first leaves simple.

Northern Australian coasts in mangrove swamps, from Derby, W.A., to Curtis Is. near Rockhampton, Qld, most commonly in the upper reaches, sometimes in only slightly brackish water. Also in tropical Asia from India (Sundarbans), Thailand and Indochina to New Guinea. Flowers Sept.–Oct.; fruits Dec.–Feb.

W.A.: Stokes Bay, 20 km NE of Derby, 3 Feb. 1980, *V.Semeniuk* (PERTH). N.T.: Mugg's Mistake, McArthur R., *L.A.Craven 4002* (CANB); Appletree Point, Kapalga, *G.Wightman 1485* (BRI, CANB, K, MEL, PERTH). Qld: McCready's Ck, Pioneer Shire, *E.R.Anderson & D.Champion 1061* (BRI); Bauer Inlet, Weary Bay, *G.Stocker 1003* (BRI, CNS).



This species has been widely confused with *X. granatum*, another mangrove species, though they are distinct enough to local people in Malaysia who have different vernacular names for them. Nevertheless, *X. moluccensis* seems to be rather variable and some Australian populations have particularly small leaflets: whether such require formal recognition can only be ascertained from population studies in the field.

3. *Xylocarpus granatum* J.König, *Naturforscher (Halle)* 20: 2 (1784)

T: from India, not traced.

Carapa obovata Blume, *Bijdr.* 179 (1825). T: Indonesia (not designated).

Illustrations: P.B.Tomlinson, *op. cit.* t. B39; D.J.Mabberley, *Fl. Nouv.-Caléd.* 15: t. 15, figs 3–5 (1988); D.J.Mabberley, *Fl. Males.* ser. 1, 12: 380 fig. 59, 381 fig. 60 (1995).

Tree usually 6–15 m tall, with (sometimes multiple) boles to 90 cm diam., and narrow flattened, ribbon-like extended and branched buttress-roots; pneumatophores absent; bark thin, smooth, irregularly scaling, whitish to yellow-brown mottled. Leaf rachis and petiole to 9 cm long, usually much less; terminal/apical spike usually absent. Leaflets usually 1 or 2 pairs, obovate or elliptic, usually 5–12 cm long, 3–6 cm wide, cuneate at base, obtuse, rounded or even emarginate at apex, coriaceous; venation prominent only when dried; petiolules usually 5–6 mm long, swollen. Inflorescence usually (1–) 3–6 cm long, borne on old and young twigs, often without distinct axis and unbranched; bracts and bracteoles caducous. Pseudopedicels 3–9 mm long, somewhat swollen beneath calyx lobes. Calyx lobes 1–1.3 mm long. Petals oblong, 3.5–5.5 mm long, 2–3 mm wide, cream or pinkish. Staminal tube 2–3.5 mm diam.; marginal lobes apiculate or bifid to retuse. Capsule flattened-globose, 12–25 cm diam. Seeds usually 8–16, 4–6 cm long; first leaves simple. Plate 4.

Northern Australian coasts in mangrove swamps, from the Kimberley region, W.A., N.T., and in Qld S to Curtis Is. near Rockhampton, most commonly near the outer seaward edges. Also in the Old World tropics from E Africa to Tonga. Flowers Oct.–Jan.; fruits Jan.–Sept.

W.A.: NW Kimberleys, King Cascade, Cascade Ck, *K.F.Kenneally 8948* (PERTH). N.T.: Yirrkala, *R.L.Specht 808* (AD, BRI, CANB); Melville Is., Maxwell Ck, *G.Wightman 210* (DNA, CANB, MEL). Qld: Cannonvale, Jan. 1962, *W.T.Jones* (BRI); ½ mile [0.8 km] N of Somerset in Albany Pass, Cape York Penin., *S.Powell 2* (CBG).



MELIACEAE

Subfam. 2. MELIOIDEAE

Meliaceae subfam. *Melioideae* Arn., *Botany* 103 (1832), as *Melieae*.

Type: *Melia* L.

Vegetative buds naked. Plants dioecious, polygamous or all flowers hermaphrodite. Locules 1- or 2-ovulate, very rarely multiovulate; ovules collateral or superposed. Fruit a fleshy or leathery capsule, berry or drupe. Seed unwinged, usually with a sarcotesta or aril or combination of these; endosperm occasionally present.

A subfamily with 35 genera; 10 genera in Australia of which 2 are endemic and one is introduced.

4. AZADIRACHTA

Azadirachta A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 236 (1830); from the Persian name, *azadiraxt*, for the species *A. indica*.

Type: *A. indica* A.Juss.

Trees with simple hairs; buds resinous. Leaves pinnate. Thyrses axillary; flowers hermaphrodite and male on same tree. Calyx 5-lobed to lower half. Petals 5, free, imbricate. Staminal tube cylindrical, ribbed, with (8–) 10 rounded to bifid lobes; anthers (8–) 10, inserted at base of lobes. Disc annular. Ovary 3-locular, each locule with 2 collateral ovules; stylehead a swollen torus with 3 acute stigmatic lobes. Drupe with thin cartilaginous endocarp. Seed 1 (or 2), ovoid, with membranous seed coat.

A genus of 2 species in Indomalaysia; one species, *A. indica*, is widely cultivated in tropical areas and naturalised in Australia and elsewhere.

****Azadirachta indica*** A.Juss., *Mém. Mus. Hist. Nat.* 19: 221, t. 13, fig. 5 (1832)

T: Sri Lanka, near Colombo, *P.Hermann* '161' in herb. Hermann 2 f. 56; lecto: BM-HERM, *vide* R.Howard, *Fl. Lesser Antilles* 4: 582 (1988).

Tree to 16 m tall; bole to 60 cm diam. Leaves imparipinnate or paripinnate with terminal projection, 4–7-jugate, garlic-scented when damaged; petiole 3–7 cm long, slightly swollen at base; leaflets opposite to subopposite, lanceolate to falcate, 5–9 cm long, 1.5–3.5 cm wide, acute and very asymmetric at base, serrate, long-acuminate; petiolules c. 1–2 mm long. Thyrses to 30 cm long. Calyx c. 1 mm long; lobes rounded, pubescent, ciliate. Petals linear-spathulate, 4–6 mm long, white. Drupe ellipsoid, 1–2 cm long, yellow. $2n = 28$, P.K.Khosla & B.T.Styles, *Silvae Genet.* 24: 80 (1975). *Neem*. Plate 2.

Cultivated and naturalised in northern W.A., N.T. and Qld. Probably native in Burma but long and widely cultivated in Asia and tropical Africa, where, dispersed by bats and baboons, the tree is widely naturalised. Flowers in the dry season (winter–spring); fruits Feb.–Mar.

W.A.: Broome, *G.J.Keighery* 17092 (CANB, PERTH). Qld: Coen, *B.M.Waterhouse* 5462 (BRI, CANB).



Like *Melia azedarach* (see below), *A. indica* has proved very adaptable and able to withstand arid conditions. The wood is as durable as teak and resists decay; it is a fast-growing source of fuelwood. In Malaysia, the young leaves and flowers are boiled and eaten and the tree extracts have been ingredients of soaps, toothpastes and lotions in commerce for decades (S.A.Radwanski & G.E.Wickens, *Econ. Bot.* 35: 398–414 (1981)). The pressed leaves have long been put in books to ward off insects, the repellent being a limonoid called azadirachtin, which is absorbed by plants and acts as a systemic insecticide so efficient that Japanese beetles and other insects, even including the desert locust, will starve rather than eat plants treated with it. Neem seed

powder with carbofuran greatly reduces green leaf-hopper and rice tungro virus in rice (A.Kareem *et al.*, *Int. Rice Res. Newslett.* 13: 35 (1988)). Neem is alleged to contain anticulicid factors and may be effective in controlling the spread of malaria. The leaves, bark and seed-oil have medicinal properties summarised by L.M.Perry, *Medicinal Plants of East and Southeast Asia* 260 (1980) and have been used in the treatment of a wide range of ailments, including malaria, but also eczema, dysentery and ulcers, but it is particularly effective as a parasiticide for skin diseases such as scabies. Neem oil also has significant post-coital contraceptive action (K.C.Sinha *et al.*, *Indian J. Med. Res.* 79: 131–136 (1984)). For further discussion, see D.J.Mabberley, *Azadirachta*, *Fl. Males.* ser. 1, 12: 337–343 (1995).

5. MELIA

Melia L., *Sp. Pl.* 1: 384 (1753); from the Greek *melia*, referring to manna ash (*Fraxinus ornus* L., Oleaceae), which has leaves similar to those of *Azadirachta indica* A.Juss. (= *Melia azadirachta* L.)

Type: *M. azedarach* L.

Azedarach Mill., *Gard. Dict. abr. ed.* 4: [170] (1754). T: not indicated.

Trees with simple and stellate-tufted hairs. Leaves 2–3-pinnate. Thyrses axillary; flowers hermaphrodite and male on same tree. Calyx usually 5-lobed to near base. Petals usually 5, free, imbricate. Staminal tube narrowly cylindrical, usually 10-ribbed with 10 bifid or 4-fid filiform lobes; anthers usually 10, inserted at margin of or just within tube. Disc small. Ovary 4–8-locular, each locule with 2 superposed ovules; stylehead capitate to coroniform with 4–8 short stigmatic lobes. Drupe with thick bony endocarp dimpled at both ends. Seeds 1–5, oblong, with leathery seed-coat. $2n = 28$, T.D.Pennington & B.T.Styles, *Blumea* 22: 463 (1975).

A genus of 3 species in the tropical Old World, the following and 2 closely allied ones in S and E tropical Africa.

D.J.Mabberley, A Monograph of *Melia* in Asia and the Pacific, *Gard. Bull. Singapore* 37: 49–64 (1984), *q.v.* for extra-Australian synonymy.

#*Melia azedarach* L., *Sp. Pl.* 1: 384 (1753)

T: Sri Lanka, ?near Colombo, *P.Hermann s.n.*, Herb. Hermann 1: 10, n. 162; lecto: BM, *fide* P.Abdulla, in E.Nasir & S.I.Ali, *Fl. W. Pakistan* 17: 8 (1972).

M. dubia Cav., *Diss.* 7: 364 (1789), ?*nom. provis.* T: (?)Java, *P.Sonnerat s.n.*; holo: P-LAM.

M. composita Willd., *Sp. Pl.* 2: 559 (1799). T: India, 1785, *J.G.Klein in Herb. Willd.* 8086; holo: B-WILLD.

M. australasica A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 239 (1830); *M. azedarach* var. *australasica* (A.Juss.) C.DC. in A.L.P.P.de Candolle & A.C.P.de Candolle, *Monogr. Phan.* 1: 452 (1878); *Azedarach sempervirens* (L.) Kuntze var. *australasica* (A.Juss.) Kuntze, *Rev. Gen. Pl.* 1: 110 (1891). T: Port Jackson, N.S.W., *Anon. s.n.*; syn: P-JU; isosyn: P; d'Entrecasteaux Is., New Guinea, *Anon. s.n.*; syn: P-JU; isosyn: P.

M. australis Sweet, *Hort. Brit.*, 2nd edn, 85 (1830), *nom. nud.*

M. australis Sweet ex G.Don, *Gen. Hist.* 1: 680 (1831). T: Cultivated in England from Australian material; holo: not preserved?

Illustrations: W.D.Francis, *Austral. Rain-Forest Trees* 3rd edn, tt. 119, 120 (1970), as var. *australasica*; G.J.Harden (ed.), *Fl. New South Wales* 2: t. 19 (1991); D.J.Mabberley, *Fl. Males.* ser. 1, 12: 333, t. 49 (1995).

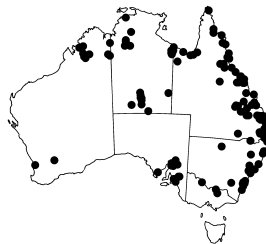
Deciduous tree to 40 m tall; bole to at least 60 cm diam.; bark fissured and scaling with age; leafy twigs ± clothed with fulvous stellate hairs. Leaves 15–80 cm long with 3–7 pairs of pinnae, each with 3–7 leaflets, the most basal sometimes replaced by short pinnae with a few pairs of leaflets, usually subglabrous; petiole 8–30 cm long; leaflets ovate or oblong-lanceolate to elliptic, usually 3–6 cm long, 1–2.5 cm wide, entire to serrate. Thyrses 10–22 cm long, twice-branched with fascicles of scented flowers. Calyx c. 2 mm diam.; lobes c. 2 mm long. Petals narrowly oblong, 6–10 mm long, 2 mm wide, white to lilac or bluish. Drupe plum-shaped,



Figure 2. *Melia azedarach*. A, habit; B, indumentum detail; C, seedling; D, flower L.S.; E, top of staminal tube; F, fruits (A, B, J.MacWhirter 20–22, FHO; C, B.T.Styles s.n., FHO; D, E, J.MacWhirter 20, FHO; F, J.MacWhirter 3, FHO). Scale bars: A, C, F = 3 cm; B = 10 mm; D = 5 mm; E = 2.5 mm. Drawn by R.Wise.

2–4 cm long, 1–2 cm wide, yellow-brown. Seed smooth, brown. $2n = 28$, P.K.Khosla & B.T.Styles, *Silvae Genet.* 24: 75 (1975). *White Cedar, Persian Lilac, Cape Lilac.* Plate 3; Fig. 2.

Northern and eastern Australia from the Kimberley region, W.A., through the N.T. and Qld S to Milton, N.S.W., growing in subtropical and dry rain forest and in *Eucalyptus* or *Acacia* forest where smaller, often in regrowth, but original distribution completely obscured by cultivated and naturalised forms (see below). Certainly naturalised in SW W.A., S.A., Vic. and possibly Tas. Also in drier Indomalaysia from India and Nepal, Sri Lanka and tropical China to Solomon Is. Flowers mostly Aug–Dec.; fruits mostly Mar.–June.



W.A.: 3.7 km SW of Mt Daglish, *G.J.Keighery & J.J.Alford 1382* (PERTH). N.T.: Lonely Spring Ck, *T.S.Henshall 1090* (CANB). Qld: Broad Sound, near Upper Head, 15 Sept. 1802, *R.Brown* (BM, E, K, MEL). N.S.W.: Sandy Ck, Kootingal, 5 miles [8 km] NE of Tamworth, *E.F.Constable 6672* (K, NSW).

This species is a complex of wild and cultivated forms, discussed by D.J.Mabberley, *Gard. Bull. Singapore* 37: 49–64 (1984). The wild plants in Australia often have more distinctly pink or even mauve flowers than those further west and those from Java eastwards including Australia are often less stellate-hairy than those to the west. The leaflets of apparently truly wild plants in Australia are entire and drupes are up to 4 cm long. Selected precocious forms have been grown for over 2500 years and may be grouped as Indian and Chinese cultivars, the former of which have been introduced throughout the warmer parts of the world, where they are widely naturalised and can become a nuisance. This is the Persian or Cape Lilac which is widely cultivated in Australia as an ornamental and as a street tree. Also cultivated are Australian strains, which prove remarkably adaptable to the dry conditions of inland stations. Hybrids between different cultivars occur in cultivation and, in Australia, both exotic and native plants have become naturalised within and beyond the putative natural distribution of the species. Around Perth and Adelaide the weedy forms appear to be Persian Lilac, whereas elsewhere it is often difficult to pigeon hole the naturalised plants. Distinctive named cultivars include 'Floribunda', which flowers when less than 50 cm tall, and 'Umbraculifera', the 'Texas Umbrella Tree', a mutant form with a flattened crown of branches, first selected in Texas in the nineteenth century. Fastgrowing cultivars have been selected for plantation work, particularly in S America. Timber is used for furniture and light construction such as ceilings, boats, tea chests, also as fibre board and in paper making. It is grown as coffee shade but the fruit is toxic to pigs and humans (6–8 a fatal dose in children) and cows fed on the leaves yield tainted milk. The toxic principles are limonoids - meliatoxins A₁, A₂, B₁, B₂ (P.B.Oelrichs *et al.*, *Phytochemistry* 22: 531–534 (1983)).

The insecticidal qualities of the leaves have long been recognised in China and India and are now being appreciated elsewhere. A steroid ester, azedarachol, isolated from root-bark has been found efficacious in Japan (M.Nakatani *et al.*, *Phytochemistry* 24: 1945–1948 (1985)). In China the seed-oil has been found to be quite effective as an antifeedant to yellow rice-borers, but not striped or pink ones, and similarly effective against white-backed and brown planthoppers but not leafhoppers or rice thrips (J.Hu *et al.*, *J. Agric. Assoc. China (Nanking)* 1983: 63–69 (1983)). The oil is also effective in control of certain citrus pests, while powdered ripe seeds or leaves are mixed with stored wheat to preserve it from insect attack (W. & H.Olkowski, *IPM Practitioner* 10: 1–6 (1988)).

A glycopeptide, meliacin, isolated from the leaves and roots, is responsible for inhibition of in-vitro replication of various DNA and RNA animal viruses (G.M.Andrei *et al.*, *Antiviral Res.* 9: 221–231 (1988)). It also triggers an antiviral state in cells prior to infection and, although the mechanism is not like that in interferon, it is otherwise not understood. Further medical uses are discussed by Mabberley (1995).

6. VAVAEA

Vavaea Benth., *London J. Bot.* 2: 212 (1843); after Vava'u, Tonga, where the type specimen of the type species was collected.

Type: *V. amicorum* Benth.

Trees with sympodial branching and simple hairs. Leaves simple. Flowers usually bisexual, in pedunculate cymules. Calyx usually 4- or 5-lobed. Petals usually 4–6, free, usually imbricate. Staminal tube cylindrical or cyathiform with partly free filaments; anthers 9–23 at filament-tips. Disc obscure or absent. Ovary 2–6-locular, each locule with 1 or 2 collateral ovules or 4–10 in 2 rows; stylehead subdiscoid to capitate. Berry with fleshy to woody pericarp. Seeds usually 1–3, ovoid or plano-convex, with thin sarcotesta.

A genus of 4 species from (?)Sumatra and Java, eastwards through Malesia to tropical Australia, Micronesia, Melanesia and Polynesia; one widespread including in Australia, two restricted to New Guinea and one to Fiji.

T.D.Pennington, A Revision of the Genus *Vavaea*, *Blumea* 17: 351–366 (1969).

***Vavaea amicorum* Benth., *London J. Bot.* 2: 212 (1843)**

T: Vava'u, Tonga, May 1840, *G.Barclay s.n.*; holotype: K.

V. australiana S.T.Blake, *Austral. J. Bot.* 2: 122, t. 4 (1954). T: Between Gerowie Ck and Mary R., N.T., 4 Oct. 1946, *S.T.Blake 17168*; holotype: BRI; isotype: CANB, CNS, L.

Illustrations: S.T.Blake, *loc. cit.*, as *V. australiana*; T.D.Pennington, *Blumea* 17: 360, fig. 1a–e (1969).

Tree to 30 m tall but often much less. Leaves in terminal rosettes, oblanceolate to obovate, rarely orbicular, 3–22 cm long, 5–9 cm wide, subglabrous to densely hispid; major veins usually 6–11 on each side; petiole 3–22.5 mm long. Inflorescences 2–13 cm long with linear-lanceolate bracts usually 1–4 mm long. Flowers sweetly scented. Calyx 1–3.5 mm long. Petals oblong to oblanceolate, 4–9.5 mm long, white or pinkish. Staminal tube with filaments free and up to ¼ its length, hairy outside distally; anthers 9–17. Disc 0.5–2 mm long. Ovary 2–4-locular, locules with 1 or 2 ovules. Berry to 2 cm diam., purplish black when ripe; pericarp usually thin and fleshy. Seeds 1–4. Plate 5.

Northern Australia from the Kimberleys in W.A., N.T. and Qld S to near Mackay. Also in Central Sumatra (recorded once), W Java and Philippines to Caroline Is., Fiji and Tonga. Grows in primary and secondary rain forest, on limestone in some of its range. Flowers Oct.–Jan.; fruits Sept.–Feb.

W.A.: 10 km NW of September Point, *K.F.Kenneally & B.Hyland 10860* (BRI, CANB). N.T.: Kakadu Natl Park, *L.A.Craven 6583* (AD, BRI, CANB, DNA, E, MEL). Qld: Claudie R. (tidal reaches), *B.Hyland 6206* (CANB, CNS, K, NSW).



Although first collected in Australia by Robert Brown in Feb. 1803, the species was not recorded from N.T. until 1945. The variability of the species throughout its range has been discussed by Pennington (*Blumea* 17: 355 (1969)), who shows that there are four main centres of variation in this complex species: Philippines, New Guinea, Solomon Is. and Fiji, in each of which the variation is similar and principally involves leaf shape, leaf indumentum, petiole and inflorescence lengths. Locally distinct entities may be recognised (and have often been described as species - for an example of this traditional view, see A.C.Smith (*Fl. Vit. Nova* 3: 530–536 (1985))) but these distinctions break down elsewhere. According to Pennington (*op. cit.* 352), building on the earlier observations of Asa Gray, some flowers are functionally female, having narrow shrunk anthers without good pollen and, indeed, some trees appear to be effectively female, with few-flowered inflorescences, and the flowers with fewer (10–12) non-functional anthers. Some trees have flowers with fertile anthers and have young fruits on the same shoot and he concludes that the flowers are probably bisexual. The other species in the genus appear to have bisexual flowers only. In Fiji and the Carolines, the timber is considered a substitute for Sandalwood.

MELIACEAE

7. OWENIA

Owenia F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 303 (1857); commemorating Richard Owen (1804–1892), British zoologist, opponent of Charles Darwin and first Director of the British Museum (Natural History).

Type: *O. acidula* F.Muell.

Trees dioecious, with resinous buds and often milky sap; hairs simple. Leaves paripinnate. Flowers white to yellowish, in axillary thyrses. Sepals 5, free, imbricate. Petals 5, free, imbricate. Staminal tube irregularly lobed with anthers on margin of tube, or with distally free filaments with 2 apical appendages; anthers 10, glabrous. Disc obscure, annular. Ovary 2–4-locular; locules 1-ovulate; stylehead conical. Drupe 2–4-locular; mesocarp fleshy to leathery; endocarp woody, hard. Seed ovoid to orange-segment-shaped, with thin sarcotesta. $2n = 28$, T.D.Pennington & B.T.Styles, *Blumea* 22: 478 (1975).

A genus of 5 species restricted to Australia, particularly in drier regions. At least some species are believed to be dispersed by emus; the seeds are notoriously difficult to germinate. The fruits are edible, fresh or roasted. The distributions of the species scarcely overlap and autecological investigation of such closely related species would be rewarding.

1 Leaves 6–17-jugate

- | | |
|--|-------------------------------|
| 2 Leafy shoots 4–7 mm diam.; leaflets 10–50 mm long, 3–8 mm wide | 5. <i>O. acidula</i> |
| 2: Leafy shoots 8–20 mm diam.; leaflets 70–150 mm long, 10–35 mm wide | |
| 3 Leafy shoots 8–10 mm diam.; leaves 6–9-jugate, garlic-scented when young; petals 3–4 mm long; drupe 1.5–2 cm diam., red | 1. <i>O. cepiodora</i> |
| 3: Leafy shoots 10–20 mm diam.; leaves 7–15-jugate, not garlic-scented when young; petals c. 2 mm long; drupe 3–4 cm diam., purple | 2. <i>O. vernicosa</i> |

1: Leaves 2–4-jugate

- | | |
|---|--------------------------------|
| 4 Leaflets 10–20 cm long, 4–10 cm wide, ovate or broadly ovate-lanceolate | 3. <i>O. reticulata</i> |
| 4: Leaflets 2.5–9 cm long, 1.2–3 cm wide, obovate to elliptic-oblong | 4. <i>O. venosa</i> |

1. *Owenia cepiodora* F.Muell., *Fragm.* 11: 81 (1880)

T: Richmond R., N.S.W., *H.C.Fawcett s.n.*; ? holo (Anon.): MEL; ? iso: K.

Illustration: A.G.Floyd, *New South Wales Rain Forest Trees* VIII: t. 57 (1979).

Tree to 30 m tall with bole to 60 cm diam.; bark brown, vertically fissured with gum from slash turning red on exposure; inner bark onion-scented; leafy shoots 8–10 mm diam., older ones cicatrose. Leaves 30–40 cm long, 6–9-jugate, with terminal process; petiole 5–10 cm. Leaflets opposite to alternate, narrowly elliptic or ovate, 7–15 cm long, 1.5–3.5 cm wide, asymmetric at base, acuminate at apex, glabrous, shining adaxially, garlic-scented when young; venation prominent abaxially. Thyrses 10–22 cm long. Sepals orbicular, c. 2 mm long. Petals oblong-lanceolate, c. 3–4 mm long, white. Drupe 15–20 mm diam., red. *Bog Onion*.

Endemic. Restricted to dry hoop-pine forests of the Qld–N.S.W. border area. Flowers Nov.

N.S.W.: Roseberry S.F., Sawpit Ck, *A.G.Floyd 1187* (BRI, NSW); Murwillumbah, Nov. 1904, *Forester Pope s.n.* (BM, BRI, NSW).

This tree has been collected on only a handful of occasions; formerly occurring from Lamington Natl Park, Qld, S to Clarence R., N.S.W., it is now rare. It was much exploited as a substitute for red cedar, the wood (Onion Cedar) being soaked to remove the tell-tale smell of onions. It is now probably restricted to Roseberry and Mebbin S.F. in N.S.W. and Lamington Natl Park in Qld; growing in dry rain forest with *Araucaria cunninghamii*. According to J.Leigh *et al.*, *Extinct & Endangered Pl. Australia* 244–5 (1984), there were only 30 trees left by 1984.



2. *Owenia vernicosa* F.Muell., *Fragm.* 3: 15 (1862)

T: not indicated.

O. vernicosa var. *pubescens* Benth., *Fl. Austral.* 1: 386 (1863). T: Mouth of the Victoria R. [N.T.], *F.Mueller*; holo: MEL; iso: BM, K.

O. capitis-yorkii Domin, *Biblioth. Bot.* 22 (89): 854 (1927). T: Qld, Cape York, *W.Hann Cape York Peninsula Expedition 115*; holo (?): K.

Illustration: R.J.Petheram & B.Kok, *Pl. Kimberley Region* t. 224 (1983).

Tree to 7 m or more tall with bole to 35 cm diam. and spreading limbs; bark pale grey to brown, flaking; heartwood pale brown; leafy shoots 1–2 cm diam., older ones strongly cicatrose. Leaves in dense terminal spirals, 25–35 cm long, 7–15-jugate with terminal process; petiole 8–15 cm long. Leaflets usually opposite, lanceolate, 7–10 cm long, 1–2 cm wide, asymmetric at base, acuminate to emarginate at apex, glabrous usually, shining adaxially; midrib and venation prominent. Thyrses 8–25 cm long with subsquarrose branches. Sepals c. orbicular, 1 mm long. Petals elliptic, c. 2 mm long, cream. Drupe 3–4 cm diam., purplish; infructescence axis often with gall-like swellings.

Emu Apple. Plate 6.

Endemic. Throughout most of the Kimberley region from Mitchell Plateau to St George Ranges in W.A., across northern N.T., and to 15°S in N Qld. In *Eucalyptus-Acacia* communities and grasslands on various substrates, where common and often locally dominant. Flowers Oct.–Nov.; fruits Feb.–Oct.

W.A.: Between Kalumburu Mission and Longini landing, *D.E.Symon 7121* (AD, CANB, FHO, K, PERTH). N.T.: Oenpelli, *R.L.Specht 1219* (AD, CANB, K, LAE, MEL, PERTH). Qld: 2.5 km S of Koolburra, *J.R.Clarkson 3688* (CNS).

**3. *Owenia reticulata* F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 305 (1857)**

T: Islands of Gulf of Carpentaria [N.T.], *F.Mueller*; holo: MEL; iso: BM, K.

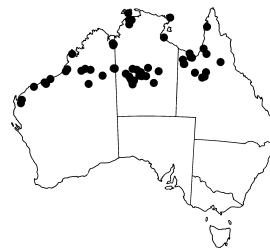
O. xerocarpa F.Muell., *Fragm.* 3: 13 (1862). T: Nickol Bay [N.T.], *P.Walcott*; syn: MEL *n.v.*; isosyn: K; Sweers Is. [N.T.], *D.Henne*; syn: MEL; isosyn: K; Yule R. [N.T.], *F.Gregory*; syn: MEL.

Illustration: R.J.Petheram & B.Kok, *Pl. Kimberley Region* t. 223 (1983).

Tree to 10 m or more tall with bole to 25 cm diam. and very dense crown; bark grey, corky to deeply fissured; leafy shoots 1.5–2 cm diam., older ones ruggedly cicatrose. Leaves in dense terminal spirals, 20–35 cm long, usually 2–4-jugate with terminal process; petiole 6–10 cm long. Leaflets usually opposite, ovate or broadly ovate-lanceolate, 10–20 cm long, 4–10 cm wide, asymmetric at base, obtuse to emarginate and mucronate at apex, coriaceous, glabrous, adaxially smooth; venation reticulate, prominent abaxially. Thyrses 10–20 cm long, branching divaricate. Sepals orbicular, c. 2 mm long. Petals oblong-lanceolate, 4 mm long, white. Staminal tube often bearing free filaments as long as tube. Drupe 3–4 cm diam., red or purplish. *Desert Walnut*.

Endemic. From near Exmouth Gulf to the Kimberley region of W.A., extending into the Great Sandy Desert and as far S as the Tanami Desert in N.T. and to N Qld. Usually on spinifex sandy plains, sometimes with *Acacia* spp. or even in *Eucalyptus* woodland. Flowers Oct.–Nov.; fruits May–Oct.

W.A.: 21 miles [34 km] SE of Wyndham Township, *R.A.Perry 2546* (AD, CANB, K, MEL, NSW). N.T.: 23 km S of Wauchope. *P.K.Latz 1815* (AD, CANB). Qld: 19.9 km W of Doomadgee, *C.F.Puttock & S.J.St.George UNSW 14402* (CNS, FHO).



The foliage is palatable to stock and the dense crown provides welcome shade. The fruit is baked and eaten. The seed-oil is used to rub into sores.

4. *Owenia venosa* F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 304 (1857)

T: Dawson R. [Qld], *F.Mueller*; syn: MEL; Burnett R. [Qld], Dec. 1856, *F.Mueller*; syn: MEL.

Illustrations: W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, tt. 127, 128 (1970); A.G.Floyd, *New South Wales Rain-forest Trees* VIII: t. 58 (1979).

Tree to 20 m tall with bole to 45 cm diam.; bark brown or greyish, scaling; leafy shoots glabrous. Leaves 6–20 cm long, 3- or 4-jugate, often with terminal process, those of suckers and saplings imparipinnate and with markedly winged rachis; petiole 3–8 cm long. Leaflets opposite to alternate, obovate to elliptic-oblong, 2.5–9 cm long, 1.2–3 cm wide, usually asymmetric at base, obtuse to emarginate at apex, glossy adaxially; venation conspicuously reticulate abaxially. Thyrses 6–16 cm long. Sepals orbicular, c. 2 mm long. Petals oblong-lanceolate, c. 4–5 mm long, white to greenish yellow. Drupe 2–4 cm diam., red. *Crow's Apple*.

Endemic. Rockhampton to the Warwick area, SE Qld; also in NE N.S.W.? but not seen for this treatment. Growing in dry rain forest, especially surviving in disturbed conditions and persisting in farmland. Flowers and fruits Nov.–Jan.

Qld: Barney View, Mt Barney, *E.F.Constable* NSW22246 (K, NSW); S.F.R. 289 Yarraman, *V.K.Moriarty* 1501 (CANB, E, NSW); Biloela Experimental Farm, *L.S.Smith* 3476 (BRI, LAE).

Wood used for tool-handles and flooring.

The specimen *L.S.Smith* 3476, which is rather like *O. acidula* in a number of features, has been referred to *O. × reliqua* P.I.Forst. (T: Qld, 4 km NW "Toondahra", *P.I.Forster* 4829; holo: BRI *n.v.*; iso: K, L), i.e. *O. venosa* × *O. acidula*, by Forster, *Austrobaileya* 3: 304 (1990).



5. *Owenia acidula* F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 304 (1857)

T: Between Burdekin and upper Brisbane Rivers [Qld], *F.Mueller*; holo: MEL; iso: K.

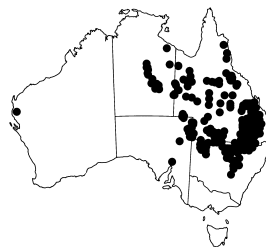
Illustrations: J.Jessop, *Fl. Central Australia*: t. 227 (1981); G.M.Cunningham *et al.*, *Pl. W New South Wales* 451 (1992).

Twiggy shrub or tree 1.5–10 m tall, sometimes suckering, with bole to 20 cm diam. and wide crown; bark deeply cracked; leafy shoots 4–7 mm diam., covered with resin. Leaves c. 12–20 cm long, usually 7–17-jugate; petiole 1–3 cm long; rachis often winged. Leaflets opposite, narrowly elliptic to linear-lanceolate, 10–50 mm long, 3–8 (–14) mm wide, asymmetric and cuneate at base, acute to obtuse and mucronate at apex, glabrous, with scattered resin-dots; veins raised abaxially. Thyrses c. 6–12 cm long. Sepals suborbicular, c. 2 mm long. Petals oblong-lanceolate, 4 mm long, creamy to brownish. Drupe 2–3.5 cm diam., maroon, sometimes mottled. $2n = 28$, T.D.Pennington & B.T.Styles, *Blumea* 22: 478 (1975). *Emu Apple*, *Colane*, *Gruie*, *Gouyia*.

Endemic. Semi-arid to subhumid regions of south tropical and subtropical eastern Australia, from central N.T., through Qld except northern Cape York, and S to eastern S.A. and Moree area, N.S.W., with an isolated record from Mardie Stn, W.A., usually in 200–550 mm rainfall areas on the plains, in grasslands of various types on various substrates, or thin woodlands. Flowers mainly Oct.–Nov.; fruits mainly July.

W.A.: Mardie Stn, 10 Dec. 1949, *B.H.Sharpe* (PERTH). N.T.: near Garnett's Camp, Murray Downs Stn, c. 270 km NNE Alice Springs, *T.R.N.Lothian* 436 (AD, NSW). S.A.: Chillimookoo Waterhole, *L.Alexander* 2178 (AD). Qld: 25 miles [40 km] SW of Mora Township, *M.Lazarides* 6919 (AD, BRI, K, PERTH). N.S.W.: Bilambil, 10 miles [16 km] W of Baradine, *E.F.Constable* 19187 (K).

Foliage fed to stock; a good shade tree. Fruit edible, rather acid.



Excluded species

Owenia cerasifera F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 305 (1857).

T: Burdekin R., Qld, *F.Mueller*; holotype: MEL *n.v.*

This is *Pleiogynium timoriense* (DC.) Leenh. in the Anacardiaceae (see L.W.Jessup, *Fl. Australia* 25: 178 (1985)).

8. TURRAEA

Turraea L., *Mant. Pl.* 2nd edn, 150 (1771); probably commemorating one of the Italian botanists, possibly Georgio à Turre (fl. 1680s) or, more likely, Antonio Turra (1730–1796).

Type: *T. virens* L.

Trees or shrubs with simple hairs. Leaves (in Australia) simple, entire. Flowers bisexual, in cymes or fascicles or solitary-axillary. Calyx usually 4- or 5-toothed or -lobed. Petals usually 4 or 5, free, imbricate or contorted. Staminal tube entire or tipped with free filaments to $\frac{1}{2}$ its length; margin often with simple or bilobed appendages; anthers usually 8–10, apical. Disc small or absent. Ovary usually 4–10-locular; locules biovulate; style usually expanded near apex, forming a pollen receptacle surmounted by discoid stigmatic region. Capsule loculicidally dehiscent, usually with 4–10 valves and 1- or 2-seeded locules. Seeds plano-convex with raphe-funicular arils. $2n = 36, 50$, T.D.Pennington & B.T.Styles, *Blumea* 22: 457 (1975).

A genus of about 30 species in Africa, perhaps 35 in Madagascar and the Mascarenes with one in Indomalaysia, reaching tropical Australia. The African species are found in a variety of forest types and bush vegetation, often markedly seasonal; a number of them are cultivated in Australia.

F.White, *The Taxonomy, Chorology and Reproductive Biology of Southern African Meliaceae and Ptaeroxylaceae*, *Bothalia* 16: 148–154 (1986); D.J.Mabberley & M.R.Cheek, *The Typification of Turraea* (Meliaceae), *Taxon* 41: 541–545 (1992).

***Turraea pubescens* Hell., *Kon. Vet. Acad. Nya Handl. Stockh.* 9: 308, t. 10, fig. 3 (1788)**

T: Hainan, China, *J.T.Fagraeus s.n.* (lost, but basis of fig. above).

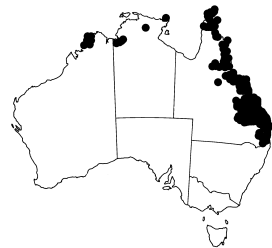
T. brownii C.DC. in A.L.P.P.de Candolle & A.C.P.de Candolle, *Monogr. Phan.* 1: 442 (1878). T: Goods Is. [Qld], 2 Nov. 1802, *R.Brown*; holotype: BM, iso: CANB.

Illustrations: D.J.Mabberley, *Jupiter Botanicus* t. 19 (1985), as *T. virens*; G.J.Harden (ed.), *Fl. New South Wales* 2: 282 (1991); D.J.Mabberley, *Fl. Males.* ser. 1, 12: 26, fig. 1 (1995).

Deciduous straggling shrub or tree to 6 m tall. Leaves ovate to oblong, 1.5–10 cm long, 1–6 cm wide, rounded to cuneate at base, obtuse to acuminate at apex, subglabrous to subvelutinous abaxially; major veins c. 5 or 6 on each side; petiole 5–9 mm long. Flowers in condensed cymes, sweetly scented; pedicels 15–30 mm long. Calyx cupular, 3–4 mm long, pubescent, 5-lobed to $\frac{1}{2}$ way. Petals linear-spathulate, 30–45 mm long, 2.5–4 mm wide at widest, white. Staminal tube cylindrical to weakly obconical, white, usually with 10 appendages, sometimes lobed; anthers 10. Ovary 5-locular; style long, exserted. Capsule globose, to 18 mm long, vermilion; valves 5, reflexed starwise in dehiscence. Seeds c. 6 mm long with shiny black testa. Plate 8.

Occurs on Bonaparte Archipelago and at Pt Warrender in northern W.A., extending through the northern N.T., northern and eastern Qld, just reaching NE N.S.W. Also in Indo-malesia from India and southern China to New Guinea. Grows in semi-evergreen and deciduous forest, behind mangroves, on dunes and rocks of various origins, as well as in secondary vegetation at forest edge and savanna. Flowers Sept.–Dec.; fruits Apr.–Nov.

W.A.: Augustus Is., Bonaparte Archipelago, *P.G.Wilson 10768* (PERTH). N.T.: Mt Kukpalli, *G.J.Leach & C.R.Dunlop 2420* (BRI). Qld: Iron Ra.,



Cape York, *L.J.Brass 19236* (BRI, CANB, K, L). N.S.W.: White Swamp road 1 km S of Qld border, *K.A.W.Williams 78032* (BRI, NSW).

As Bentham (*Fl. Austral.* 1: 379–380 (1863)) noted, the staminal tube appendages, on which character several ‘species’ have been recognised throughout this species’ range, vary greatly, even on one flowering shoot. The degree of pubescence also varies and may be associated with the level of exposure, while immature fruits dehisce on drying so that ‘ripe’ fruit size varies greatly in herbarium material. The range of variation in Australian populations of *T. pubescens* embraces the type of *T. brownii* and, indeed, all *Turraea* plants wild in Indomalesia.

The plant in flower may be leafless, the scented white flowers suggesting moth-pollination, which is recorded from closely-related species in Africa. Seeds have been examined by E.J.H.Cornier, *Seeds Dicots* 192, t. 392 (1976), who regards them as very similar to those of Celastraceae, to which family many collectors have assigned fruiting material of this species in the field. In India, the plant is of some medicinal value and the pickled fruits are used in dyeing.

9. ANTHOCARAPA

Anthocarapa Pierre, *Fl. Forest. Cochinch.* 5: sub t. 343 (1896); from the Greek *anthos*, flower, and *Carapa*, referring to the similar flowers in that genus.

Type: *A. balansaeana* (C.DC.) Pierre

Evergreen trees with simple hairs. Leaves paripinnate. Flowers unisexual, white or cream in axillary thyrses. Calyx 4- or 5-lobed. Petals 4 or 5, free, imbricate. Staminal tube cyathiform; margin 10–12-lobed; anthers inserted within tube. Disc in male flowers thick, fleshy, annular to patelliform; in female flowers small, annular and confined to base of ovary. Ovary 2- or 3-locular; locules uniovulate; stylehead discoid. Capsule loculicidal, 2- or 3-valved; pericarp thick, somewhat woody. Seeds 1–3, ellipsoid with non-vascularised sarcotesta.

A genus of 1 or perhaps 2 species in eastern Malesia and the western Pacific. One species in eastern Australia.

***Anthocarapa nitidula* (Benth.) T.D.Penn. ex Mabb., *Blumea* 31: 133 (1985)**

Amoora nitidula Benth., *Fl. Austral.* 1: 383 (1863); *Pseudocarapa nitidula* (Benth.) Merr. & L.M.Perry, *J. Arnold Arbor.* 21: 315 (1940). T: Moreton Bay, Qld, *W.Hill s.n.*; lecto: K, *fide* D.J.Mabberley, *loc. cit.*; isolecto: MEL.

Illustrations: D.J.Mabberley, *Fl. Nouv.-Caléd.* 15: t. 13 (1988); G.J.Harden (ed.), *Fl. New South Wales* 2: 282 (1991); D.J.Mabberley, *Fl. Males.* ser. 1, 12: 134, fig. 21 (1995).

Tree to 30 m tall; bole to 65 cm diam., sometimes with buttresses to 1 m tall. Leaves 15–37 cm long, usually 2- or 3-jugate, subglabrous, coriaceous, often smelling of onions; petiole 3.5–4.5 cm long; leaflets 7–20 long, 3–8.5 cm wide, oblong-elliptic to obovate with bases narrowed to resemble petiolules 10–15 mm long. Thyrses to 15 cm long; pseudopedicels 2.5 mm long. Calyx 3 mm diam., irregularly 5-lobed. Petals 5, 2–3 mm long, white. Staminal tube glabrous; anthers 10. Capsule globular-pyriform, often asymmetric when 1-seeded, 2–5 cm diam., somewhat woody, brown. Seeds 1–3, planoconvex, 3 cm long, 1.5 cm wide; sarcotesta red; cotyledons green. *Bog Onion*, *Incense Cedar*. Plate 7.

From Cape York S to Rockingham Bay, NE Qld, and disjunctly in SE Qld S to Richmond R., NE N.S.W., in rain forests, where it can be very common. Also in the Philippines (? possibly a distinct species with 4-merous flowers), Lesser Sunda Is., New Caledonia and Fiji (Rotuma). Flowers Dec.–June; fruits Dec.–Feb.

Qld: Mt Glorious, Jan. 1945, *M.S.Clemens s.n.* (AD, BM, BRI, E, L, MEL); Clump Point, *L.S.Smith 5014* (K, L, LAE). N.S.W.: Toonumbar S.F. c. 29 km NW of Kyogle, *R.Coveny & P.Hind 10558* (BRI, CNS, K, NSW).



Trees can be male or monoecious, though male flowers fall rapidly making the trees appear female and the species dioecious. The fruit is eaten by a wide range of birds. The timber is exploited in New Caledonia (*Lilas de Forêt*) and in Australia (*Bog Onion*, *Incense Wood*).

10. SYNOUM

Synoum A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 237 (1830); from the Greek *syn-*, together, and *oon*, egg, referring to the seeds being linked together by arillate tissue.

Type: *S. glandulosum* (Sm.) A.Juss.

Tree with simple hairs. Leaves imparipinnate. Flowers unisexual, creamy-white in axillary thyrses. Calyx deeply 4- or 5-lobed, extended into pseudopedicel. Petals 4 or 5, free, imbricate. Staminal tube cyathiform; margin irregularly and shallowly lobed; anthers 8 or 10, partly exerted. Disc obscure. Ovary with 3 locules, each with 2 ovules; style short with discoid head. Capsule loculicidal, 2- or 3-valved, locules usually 2-seeded. Seeds collateral, pendulous, epitropous, united by joint raphe-arils partly enveloping them. $2n = 84$, T.D.Pennington & B.T.Styles, *Blumea* 22: 499 (1975).

A monospecific genus known so far only from eastern Australia though it might be expected from New Guinea.

***Synoum glandulosum* (Sm.) A.Juss., *Mém. Mus. Hist. Nat.* 19: 227, t. 15 (1832)**

Trichilia glandulosa Sm. in A.Rees, *Cycl.* 36 (1) *Trichilia* n. 10 (1817). T: Botany Bay [N.S.W.], Apr.–May, 1770, *J.Banks & D.Solander s.n.*; holotype: LINN-SM; isotype: E, MEL, NSW.

Tree 4–20 m or more tall, sometimes with small buttresses and often suckering; timber red; bark rough, irregularly scaling. Leaves 15–20 cm long, 3- or 4-jugate; petiole 2–5 cm long; leaflets subobovate to elliptic, 5–9 cm long, 2.5–4.5 cm wide, the distal the largest, acute at base, obtuse to subcuspidate at apex, glabrous save for domatia in axils of major veins abaxially; veins conspicuously looped together, c. 5–7 on each side. Thyrses of pedicellate sweetly scented flowers. Calyx c. 3 mm across. Petals elliptic, c. 4 mm long, white to pinkish. Capsule c. 2 cm diam., usually 2- or 3-lobed; pericarp sometimes with white latex. Seeds 1–4; aril red, partly enveloping seeds and filling space between them so that pairs detach together.

Endemic in NE Qld S to Bega, N.S.W. There are 2 subspecies.

Thyrses much shorter than leaves; flowers usually 4-merous

a. subsp. ***glandulosum***

Thyrses almost as long as leaves; flowers 5-merous

b. subsp. ***paniculosum***

a. *Synoum glandulosum* (Sm.) A.Juss. subsp. *glandulosum*

S. lardneri C.Moore, *Cat. Nat. Int. Prod. New South Wales* 29 (1862), *nom. subnud.*

Illustrations: W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, tt. 125, 126 (1970); B.D.Morley & H.R.Toelken, *Fl. Pl. Australia* t. 115 a, b (1983); G.J.Harden (ed.), *Fl. New South Wales* 2: pl. 19 (1991).

Thyrses much shorter than leaves. Flowers usually 4-merous. *Bastard Rosewood*, *Scentless Rosewood*. Plate 10.

Southern part of the species' range, from Bega, N.S.W., northwards to range of subsp. *paniculosum*. Common small tree in most kinds of rain forests, especially at margins and near the sea, to 1000 m alt. Flowers Jan.–July, fruits Sept.–Feb.

Qld: Mt Tamborine, March 1947, *M.S.Clemens s.n.* (AD, BM, BRI, K, L, MEL). N.S.W.: Kioloa State Forest, c. 10 km N of Batemans Bay, *R.Schodde 5101* (AD, BRI, CANB, K, L, NSW); Port Jackson, 1792, *J.White s.n.* (LINN-SM).



The wood is suitable for cabinetwork but, as the trees are often of poor form with hollow trunks, available pieces are small.

b. Synonym glandulosum subsp. paniculosum (F.Muell.) Mabb., *Telopea* 8(1): 48 (1998)

S. glandulosum var. *paniculosum* F.Muell., *Fragm.* 5: 145 (1866), as *Synoon*. T: Rockingham Bay, Qld, 1865, *J.Dallachy s.n.*; holo: MEL; iso: BM, BRI, L.

S. muelleri C.DC. in A.L.P.de Candolle & A.C.P.de Candolle, *Monogr. Phan.* 1: 593, t. 7, fig. 10 (1878). T: Rockingham Bay, Qld, *F.Mueller*; holo: B, lost; iso? (*J.Dallachy s.n.*): BM, BRI, L, MEL.

Thyrse almost as long as leaves; flowers 5-merous.

Northern part of species' range, from Windsor Tableland to Eungella, Qld; growing in rain forest to 1300 m alt. Flowers Apr.–Aug.; fruits Nov.–Jan.

Qld: Sea View Ra., 8 July 1864, *J.Dallachy s.n.* (MEL); Mt Koolmoon F.R., 7 miles [11.3 km] SE of Ravenshoe, Atherton Tableland, *R.Schodde* 3294 (B, BRI, CANB, CNS, L).



11. CHISOCHETON

Chisocheton Blume, *Bijdr.* 168 (1825); from the Greek *schizo*-, split or torn, and *chiton*, tunic, referring to the shape of the staminal tube.

Type: *C. patens* Blume

Rhetinosperma Radlk. in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam. Nachtr.* 3, Erg. 2³: 204 (1907). T: *R. longistipitata* (F.M.Bailey) Radlk.

Trees, dioecious or polygamous, with simple or 4-stellate hairs. Leaves pinnate and terminated by a pseudogemmula (not in some non-Australian species). Flowers sometimes with elongated receptacle (pseudopedicel), in thyrses or congested racemes on long peduncles, in axils or on branches or bole or even leaves (New Guinea). Calyx usually obscurely 3–6-lobed. Petals usually 4–6 in 1, rarely 2, whorls, usually free. Staminal tube usually cylindrical with entire or lobed margin; anthers usually 4–10, usually locellate. Disc usually absent. Ovary 2–8-locular, each locule with 1 or 2 ovules; stylehead clavate or discoid. Capsule loculicidal, usually 2–5-valved and leathery. Seeds obovoid-spheroid to scutelliform or orange-segment-shaped, orthotropous, arillate or sarcotestal. $2n = 46, 92$, D.J.Mabberley, *Bull. Brit. Mus. (Nat. Hist.), Bot.* 6: 312 (1979).

A genus of c. 53 species from Assam and tropical China throughout Malesia to tropical Australia (one species) and Vanuatu.

The pseudogemmulate leaves with indeterminate growth have attracted considerable morphological attention as have the epiphyllous inflorescences of some New Guinea species. Season by season, the terminal meristem of the leaf differentiates new pairs of leaflets as the proximal ones are shed, while the petiole has annual increments of growth in vascular tissue supplying them, thereby breaking down the academic distinction between stems and leaves. In the epiphyllous species, the inflorescences are produced in similar seasonal flushes on the rachis and are not associated with leaflet axils.

D.J.Mabberley, The species of *Chisocheton* (Meliaceae), *Bull. Brit. Mus. (Nat. Hist.), Bot.* 6: 301–386 (1979), *q.v.* for extra-Australian synonymy.

Chisocheton longistipitatus (F.M.Bailey) L.S.Sm., *Proc. Roy. Soc. Queensland* 70: 29 (1959)

Castanospora longistipitata F.M.Bailey, *Queensland Fl.* 1: 288 (1899); *Rhetinosperma longistipitata* (F.M.Bailey) Radlk. in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* Nachtr. 3, Erg. 23: 204 (1907). T: Qld, Barron R., E.Cowley 8D; holo: BRI.

Illustration: D.J.Mabberley, *Fl. Males.* ser. 1, 12: 186, fig. 28 (1995).

Evergreen tree to 39 m tall; bole to 75 cm diam. with buttresses to 1.5 m tall; bark dark brown, lenticellate; sapwood white; leafy shoots 4–8 mm diam. Leaves to 1 m long, paripinnate, and 18-jugate with short claw-like pseudogemmula; leaflets elliptic-oblong, 9–32 cm long, 4.2–13 cm wide, sparsely stellate-hairy; petiolules 4–8 mm long. Thyrses to 45 cm long, 3- or 4-times branched, fragrant. Calyx 1.5–3 mm long, irregularly lobed. Petals 4 or 5, 6–7 mm long, 0.4–0.7 mm wide, white to pinkish. Staminal tube pubescent except at ends; margin usually 5-lobed; anthers usually 5, scarcely locellate. Disc small, cupular. Ovary usually 2-locular; style stellate-hairy; stylehead cylindrical. Capsule subspherical, 3–3.5 cm long, reddish; stipe 1–2 cm; pericarp spongy. Seeds usually 2, to 11 mm diam., sarcotestal. Plate 9.

From Iron Ra. area to Cardwell, N Qld; growing in rain forest to 300 m alt. Also in New Guinea and Solomon Is. to 1065 m alt. Flowers Nov.–Feb.; fruits Nov.–Jan.

Qld: Mission Beach, L.S.Smith & L.J.Webb 4920 (BRI, CANB, K); Whitfield Ra., E.Volck & B.Hyland 2122 (BRI, CANB, L).

Originally described from fruiting material and assigned to Sapindaceae, *C. longistipitatus* is one of the 4 species comprising sect. *Rhetinosperma* (Radlk.) Mabb., characterised by the stellate indumentum unknown elsewhere in the genus, pseudogemmulae approaching the tardy apical development of some *Dysoxylum* species, and a disc developed as in that genus. The section is found from NE Borneo to Vanuatu, two species being restricted to Malesia with the fourth, *C. rex* Mabb., known only (from the type collection) from Vanuatu.

**12. DYSOXYLUM**

Dysoxylum Blume, *Bijdr.* 172 (1825); from the Greek *dys-*, bad (*osmo-*, smelling) and *xylon*, wood.

Type: *D. alliaceum* (Blume) Blume

Epicharis Blume, *Bijdr.* 166 (1825). T: not indicated.

Goniocheton Blume, *Bijdr.* 176 (1825). T: *G. arborescens* Blume

Didymocheton Blume, *Bijdr.* 177 (1825). T: *D. nutans* Blume

Hartighsea A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemain, *Bull. Sci. Nat. Géol.* 23: 237 (1830). T: not indicated.

Cambania Comm. ex M.Roem., *Fam. Nat. Syn. Monogr.* 1: 83, 102 (1846). T: *C. fraseriana* (A.Juss.) M.Roem.

Macrocheton (Blume) M.Roem., *op. cit.* 84, 104, as *Macrochiton*. T: not indicated.

Alliaria Kuntze, *Rev. Gen. Pl.* 1: 108 (1891), *nom. illeg. non* Fabricius (1759). T: not indicated.

Trees dioecious, more rarely with bisexual flowers, with simple, sometimes also stellate, hairs. Leaves pinnate, usually in spirals. Flowers usually unisexual, rarely bisexual, in axillary to cauliflorous thyrses to racemes. Calyx of free sepals or a usually 3–5-lobed tube. Petals 3–6, free or adnate to staminal tube, valvate to imbricate. Staminal tube cylindrical to urceolate; margin entire to lobed; anthers 6–16, within tube. Disc usually tubular, surrounding or obscuring ovary. Ovary 2–5-locular, each locule with 1 or 2 anatropous ovules; stylehead discoid to subcapitate. Capsule 2–5-valved. Seeds 1 or 2 in each valve, usually fleshy. $2n = 80, 84$; $n = 10, 40$, T.D.Pennington & B.T.Styles, *Blumea* 22: 505 (1975).

A genus of about 80 species from India, Sri Lanka (3) and tropical China to Samoa, Niue (1) and New Zealand (1). Usually rain forest trees, sometimes very tall, often with valuable timbers. There are 15 Australian species making it the largest of the family in Australia. Of

these, only 4 are endemic, with 3 being closely allied to Malesian species and the fourth to the sole species from Norfolk Is. (*D. bijugum*). Further, the low rate of Australian endemism contrasts with the high rates observed for the nearby island floras where the one species from Lord Howe Is., the one from New Zealand and 8 of the 9 from New Caledonia and the Loyalties are endemic. In both New Caledonia and Australia, there are species (e.g. *D. setosum*) which share characters previously considered significant for the generic delineation of *Didymocheton* and *Epicharis* from *Dysoxylum* s. str. *Dysoxylum* differs from the allied *Chisocheton* most clearly in the anatropous as opposed to orthotropous ovules and is very close morphologically to the neotropical genus *Guarea* L. ($2n = 32$), which differs in not having a tubular disc and in most species having a pseudogemmula as seen in *Chisocheton*.

The fruits are often characteristic but are rarely well represented in herbaria.

D.J.Mabberley, A key to *Dysoxylum* (Meliaceae) in Australia, with a description of a new species from Far North Queensland, *Telopea* 10: 725–29 (2004).

- 1 Leaves decussate
 - 2 Leaflets with conspicuous lateral veins; capsule c. 2 cm diam., finely hairy **12. *D. oppositifolium***
 - 2: Leaflets with scarcely discernible lateral veins; capsule 5–8 cm diam., glabrous **15. *D. acutangulum***
- 1: Leaves in spirals
 - 3 Leaves in bud stiletto-like
 - 4 Leaves 3- or 4-jugate; capsule c. 5 cm long, pyriform, usually strongly veined when dried, lacking rostrum **13. *D. latifolium***
 - 4: Leaves usually 2-jugate; capsule c. 3.5–4 cm long, subspherical, ±veined when dried, distinctly rostrate **14. *D. pumilum***
 - 3: Leaves in bud fist-shaped
 - 5 Leaves paripinnate, sometimes with a terminal spike
 - 6 Domatia present **7. *D. fraserianum***
 - 6: Domatia absent
 - 7 Petals less than 2 mm long **8. *D. papuanum***
 - 7: Petals more than 5 mm long
 - 8 Bracts and bracteoles 1–1.5 mm long; petals 6–15 mm long; capsule to 2.5 cm diam.; foliage not garlic- scented **10. *D. klanderi***
 - 8: Bracts and bracteoles minute; petals 5–8 mm long; capsule to 7.7 cm diam.; foliage garlic-scented **11. *D. alliaceum***
 - 5: Leaves imparipinnate
 - 9 Calyx of free sepals
 - 10 Calyx glabrous or subglabrous **1. *D. gaudichaudianum***
 - 10: Calyx densely hairy **2. *D. rufum***
 - 9: Calyx cupular to tubular
 - 11 Fruit densely hairy **3. *D. setosum***
 - 11: Fruit glabrous
 - 12 Flowers on bole and branches, rarely in axils too
 - 13 Petals 15–20 mm long **4. *D. parasiticum***
 - 13: Petals 8–9 mm long **5. *D. pettigrewianum***
 - 12: Flowers in axils
 - 14 Flowers 4-merous **6. *D. mollissimum***
 - 14: Flowers 5-merous **9. *D. arborescens***

1. *Dysoxylum gaudichaudianum* (A.Juss.) Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 15 (1868)

Didymocheton gaudichaudianum A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 239 ('238') (1830). T: Pulo Lawak ('Rawak'), Waigeo, Irian Jaya, Jan. 1819, *C.Gaudichaud-Beaupré s.n.*; holotype: P-JUSS; iso: G-DC, P.

Turraea decandra Blanco, *Fl. Filip.* 347 (1837). T: Manila, Philippines, *E.D.Merrill, Sp. Blancoanae* 218; neo: L; isoneo: A, BM, BO, G, K, P, *fide* D.J.Mabberley, *Telopea* 8: 47 (1998).

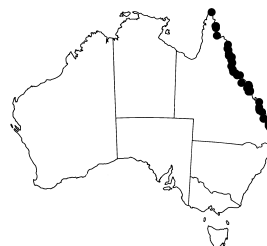
Dysoxylum rufum (A.Rich.) Benth. var. *glabrescens* Benth., *Fl. Austral.* 1: 382 (1863), as *Dysoxylon*. T: Rockhampton, Qld, *A.Thozet s.n.*; holotype: K; iso: P.

Dysoxylum amorooides Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 16 (1868). T: [SW Irian Jaya,] *A.Zippelius s.n.*; lectotype: U; isotype: L, *fide* D.J.Mabberley, *Telopea* 8: 47 (1998).

Tree to 36 m tall; bole to 80 cm diam.; buttresses to 2.5 m tall, 3.5 m out; bark scaling or smooth. Leaves in spirals, fist-shaped in bud, 30–125 cm long, imparipinnate, to 14-jugate, with distal leaflets tardily expanding; petiole 3–8 cm long; leaflets oblong-ovate, 8–30 cm long, 1.5–10 cm wide (subterminal), strongly asymmetric at base, acuminate at apex, glabrous adaxially, glabrescent to softly hairy abaxially. Thyrses to 70 cm long, 1- or 2-branched, axillary to supra-axillary; flowers sessile, somewhat foetid; bracteoles c. 2 mm long. Sepals 5, free, 2 mm long, glabrous to weakly adpressed-pubescent. Petals usually 5, linear-lanceolate, c. 12–14 mm long, cream to yellowish green, adnate to staminal tube in proximal $\frac{1}{3}$, adpressed-hairy outside. Staminal tube usually sericeous; margin with 10 bifid lobes; anthers usually 10. Disc c. 2.5 mm long. Ovary 5-locular; locules 2-ovulate. Capsule 5-lobed, flattened-globose, c. 3 cm diam., densely yellow-brown tomentose, foetid when ripe. Seeds up to 10, planoconvex, 1 cm long, orange-red (raphe-aril cum sarcotesta). *Ivory Mahogany*. Plate 12.

Eastern Qld, Cape York S to Maryborough area; primary and secondary rain forest to 700 m alt. Also on Christmas Is. and Java, Philippines to Vanuatu and Samoa. Flowers Sept.–Jan.; fruits Oct.–Feb.

Qld: 6 miles [9.7 km] NW of Daintree, *D.E.Boyland 514* (A, BRI, CNS, K, L); Burdekin [R.] crossing near Glendon, *L.S.Smith 4628X* (A, BRI, K, L); Claudie R. between Portland Roads and Iron Ra., *L.Webb & J.G.Tracey 8538* (BRI, CNS).



The seeds are taken by pigeons and other birds, which may help to explain the wide distribution of this tree, which, with the naturalised *Melia azedarach*, is the only Meliaceae found on Christmas Is. (D.J.Du Puy, *Fl. Australia* 50: 297 (1993)). Maturing fruits develop a fishy aroma attractive to insects, hastening the decay process. The tree has medicinal qualities, first recorded by westerners in the seventeenth century, and has been widely used as a (dangerous) emetic.

2. *Dysoxylum rufum* (A.Rich.) Benth., *Fl. Austral.* 1: 382 (1863), as *Dysoxylon*

Hartighsea rufa A.Rich. in J.S.C.Dumont d'Urville, *Voy. Astrolabe* 2: 29 (1834); *Alliaria rufa* (A.Rich.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891); *Didymocheton rufum* (A.Rich.) Harms in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 2nd edn, 19b1: 157 (1940). T: Moreton Bay [Qld], 1828, *C.Fraser s.n.*; holotype: P; iso?: BM.

Illustration: B.D.Morley & H.R.Toelken, *Fl. Pl. Australia* 119, t. 115c, d (1983).

Tree to 20 m tall; fluted bole to 60 cm diam.; bark finely cracked, grey; shoots with soft rusty pubescence. Leaves in spirals, fist-shaped in bud, 35–100 cm long, imparipinnate, to 9-jugate; petiole 3–10 cm long; leaflets narrowly oblong-ovate, 5–20 cm long, 1.5–4 cm wide, asymmetric at base, acuminate at apex, rusty-pubescent abaxially. Thyrses to 30 cm long, pubescent; flowers sessile, extremely fragrant; bracteoles c. 1.5 mm long. Sepals 5, free, 1.5 mm long, densely rusty-hairy. Petals 5, linear-lanceolate, 12–14 mm long, creamy white, adnate to staminal tube in proximal $\frac{1}{3}$, adpressed-hairy outside. Staminal tube hairy on both sides; margin with 10 lobes; anthers 10. Disc c. 2.5 mm long. Ovary 5-locular; locules 2-ovulate. Capsule flattened-globose, c. 2.5 cm diam., orange, densely tomentose with golden irritant hairs. Seeds up to 10, planoconvex, c. 8 mm long, orange-red. *Hairy Rosewood*, *Rusty Mahogany*.

Endemic, from Atherton Tableland, Qld, S to Williams R., N.S.W. Subtropical and dry rain forest to 1250 m alt. Flowers June–Feb.; fruits Aug.–Dec.

Qld: Brisbane R., *A. Cunningham* 168 (BM, K, NSW); Tolga Scrub, *B. Hyland* 1853 (BRI, CANB, K, L, MEL, NSW). N.S.W.: Lismore, *R.T. Baker* 1156 (G, K, MEL,); Coff's Harbour, Boundary Ck, *A.G. Floyd* 261 (CANB); Hastings R., *G. Caley* s.n. (G).

Dysoxylum rufum is very closely allied to *D. gaudichaudianum*, of which it might be considered a southern derivative. The timber, Rusty Mahogany or Bastard Cedar Pencil-Wood, is still of value for cabinetwork and was formerly used in joinery.



3. *Dysoxylum setosum* (Span.) Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 13 (1868)

Epicharis ? *setosa* Span., *Linnaea* 15: 182 (1841). T: Namsei, Kupang, Timor, *J.B. Spanoghe* s.n.; holo: L; iso: BO.

D. cerebriforme F.M. Bailey, *Bot. Bull. Dept. Agric., Queensland* 14: 7, tt. 1, 2 (1896). T: Fresh-water Ck, Cairns, Qld, *L.J. Nugent* II; holo: BRI.

D. sericiflorum C.T. White, *N. Queensland Nat.* 3: 35 (1935). T: Atherton, Qld, May 1914, *H.W. Mocatta* s.n.; holo: BRI; iso: K.

Illustration: W. Cooper & W.T. Cooper, *Fr. Austral. Tropical Rainforest* 291 (2004).

Tree to 30 m tall; bole to 50 cm diam., with small buttresses; bark grey, vertically fissured; leafy shoots usually yellow-brown velutinous. Leaves in spirals, fist-shaped in bud, 20–75 cm long, usually imparipinnate, to 6-jugate; petiole 8–20 cm long; leaflets elliptic-ovate, to 10–28 cm long, 2.5–10 cm wide (subterminal largest), weakly asymmetric at base, acuminate at apex, subglabrous to softly fulvous hairy abaxially. Thyrses to c. 25 cm long; flowers sweetly scented; pedicels 5–8 mm long; bracteoles 1–4 mm long. Calyx tubular, c. 5–8 mm long, splitting into usually 5 irregular lobes. Petals usually 5, 7–10 mm long, creamy white, adnate to tube in lower 1/3, sericeous outside. Staminal tube glabrous to ±pilose; margin with usually 10 rather irregular lobes; anthers 10. Disc c. 5 mm long. Ovary 5-locular; locules 2-ovulate. Capsule to 3 cm long, often rostrate, yellow-brown with dense tawny tomentum usually with paler deciduous irritant hairs. Seeds up to 10, trigonal, orange. *Miva Mahogany*.

Rarely collected and so far known in Australia only from the Cairns area and Iron Ra. in NE Qld, occurring in rain forest. Also in Timor and New Guinea in evergreen, semi-deciduous and secondary forests to 2580 m alt. including those on coral and other limestones. Flowers Dec.–Feb.; fruits Dec.–Jan.

Qld: S.F.R. 191 Wongabel, *A.K. Irvine* 200 (CANB, CNS, L, LAE); Coen to Iron Ra. road, 8 km W of Gordon's Hut, *K.A.W. Williams* 85250 (BRI).

Dysoxylum setosum has the calyx of '*Epicharis*' and the fruit of '*Didymocheton*'. In its hairy and subglabrous forms fruiting material is readily confused with *Dysoxylum rufum* and *D. gaudichaudianum* respectively.



4. *Dysoxylum parasiticum* (Osbeck) Kosterm., *Reinwardtia* 7: 247 (1966)

Melia parasitica Osbeck, *Dagb. Ostind. Resa.* 278 (1757). T: Pulo Peutjang, Java, 20 Jan. 1752, *P. Osbeck* s.n.; holo: S n.v. (photos FHO, K); iso: LINN.

D. schiffneri F. Muell., *Melbourne Chem. Druggist* 1881: 53 (1881); *Epicharis schiffneri* (F. Muell.) Harms in H.G.A. Engler & K.A.E. Prantl, *Nat. Pflanzenfam.* 2nd edn, 19b1: 169 (1940). T: Bellenden-Ker Ra., Qld, 1881, *G. Karsten* s.n.; holo: MEL.

D. densevestitum C.T. White & W.D. Francis, *Bot. Bull. Dept. Agric., Queensland* 22: 6 cum tab. (1920); *Epicharis densevestita* (C.T. White & W.D. Francis) Harms, *loc. cit.* T: Harvey's Ck S of Cairns, Qld, *F.M. Bailey* s.n.; holo: BRI; iso: K.

Illustrations: N.C.W. Beadle, *Veg. Australia*, fig. 7. 23 (1981); D.J. Mabberley, *Fl. Males.* ser. 1, 6: 79, fig. 11 (1995).

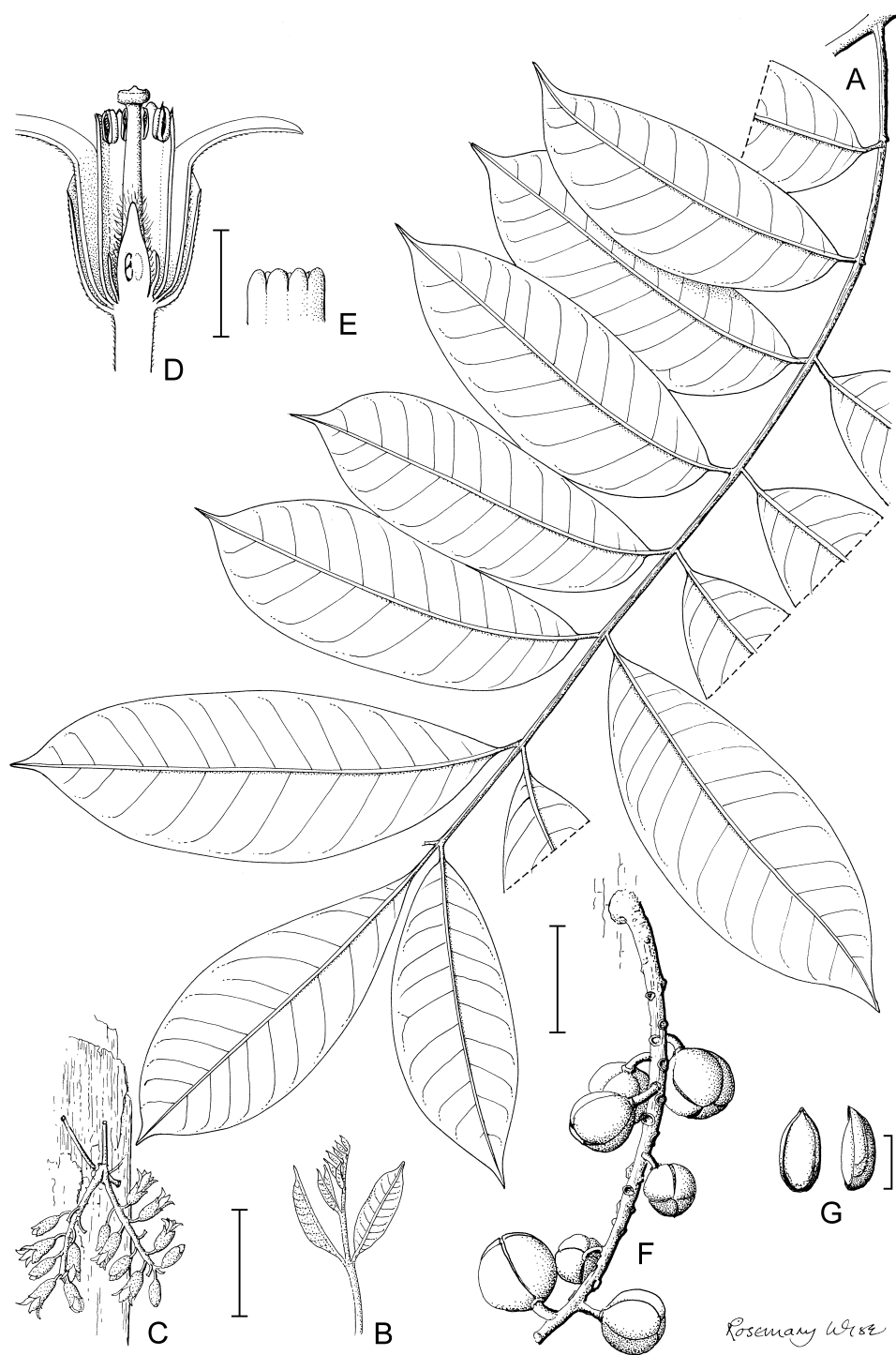


Figure 3. *Dysoxylum parasiticum*. A, leaf; B, unfolding leaf apex; C, inflorescence habit; D, flower L.S.; E, top of staminal tube; F, fruits; G, seeds (A–E, J. MacWhirter 13, FHO; F, G, T.D. Pennington 8082, FHO). Scale bars: A–C, F = 3 cm; D = 5 mm; E = 2.5 mm; G = 10 mm. Drawn by R. Wise.

Tree to 27 m tall; bole to 45 cm diam.; buttresses to 1.5 m tall and out; bark yellowish, smooth to flaking, with large inflorescence bosses. Leaves in spirals, fist-shaped in bud, 1–1.5 m long, imparipinnate, to 17-jugate, the apical leaflets expanding tardily; petiole 8–12 cm long; leaflets narrowly elliptic to oblong, 7–19 cm long, 1.5–6 cm wide, usually asymmetric at base, acuminate at apex, subglabrous to densely fulvous-tomentose abaxially and on veins abaxially. Racemes to 30 cm long in fascicles on bole, branches or twigs or even axillary (when flowers sometimes solitary); flowers sweetly scented; bracteoles c. 1 mm long, rarely subfoliaceous and longer. Calyx tubular, 7–15 mm long; margin irregularly 3–5-lobed. Petals usually 4, linear-lanceolate, 15–20 mm long, creamy-white, usually adpressed-hairy outside. Staminal tube usually glabrous with usually 8 lobes and anthers. Disc 4–5 mm long. Ovary 4-locular; locules 1- or 2-ovulate. Capsule globose, to 4 cm diam., 4-ribbed, red-brown, glabrous. Seeds 2–5, c. 2 cm long; ‘aril’ basal, orange-red. Fig. 3.

From Cape York to W of Ingham in NE Qld; rain forest, including that on limestone. Also from Sumatra, Java, Taiwan and Philippines to Solomon Is. Flowers Sept.–Dec.; fruits Nov.–Feb.

Qld: W of Ingham, *S.T.Blake 18826* (BRI, CANB); Daintree R., *S.F.Kajewski 1427* (A, B, BRI, K, NY); Wongabel Forest Res., c. 7 miles [11 km] S of Atherton, *R.Schodde 3262* (CANB, L).

The specific epithet refers to Linnaeus’s pupil’s preconceptions of plant form, Pehr Osbeck (1723–1805) interpreting the cauliflorous inflorescences as parasitic plants. The flowers are visited by butterflies, apparently important pollinators for many rain forest Meliaceae.



5. *Dysoxylum pettigrewianum* F.M.Bailey, *Bot. Bull. Dept. Agric., Queensland* 5: 9 (1892), as *Dysoxylon*

T: Base of Bellenden Ker Ra., Qld, n.d. [1889], *E.Cowley*; holo: BRI; iso: BM, MEL.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 291 (2004).

Tree to 35 m tall; bole to 1.2 m diam.; buttresses to 2.5 m tall and 2 m out; bark smooth to scaly, brown. Leaves in spirals, fist-shaped in bud, 20–80 cm long, imparipinnate, 3–6-jugate; petiole 6–10 cm long; leaflets oblong (most proximal elliptic-ovate), 5–20 cm long, 1.5–5.5 cm wide (terminal largest), asymmetric at base, acute at apex, glabrous (to sparsely sericeous abaxially). Racemes to 19 cm long, on twigs and young branches when in fascicles, rarely in axils also; flowers sessile, sweetly scented. Calyx 2.5–4 mm long, cupular, irregularly 4-dentate, pubescent outside. Petals 4, linear-spathulate, 8–9 mm long, white to cream, usually glabrous. Staminal tube glabrous with 8 emarginate to bifid lobes; anthers 8. Disc c. 3 mm long. Ovary 4-locular. Capsule stipitate, subspherical, to 8 cm long, 4 cm wide, brown-lenticellate, glabrous, 4-angled when mature, orange-brown with white latex in pericarp. Seeds 1–4, ovoid, 2–2.4 cm long; sarcotesta orange. *Spurwood*, *Cairns Satinwood*, *Spur Mahogany*.

From McIvor R. near Cooktown to Paluma Ra. in NE Qld; in rain forests. Also in the Moluccas, New Guinea, New Britain and Solomon Is. growing in rain forest to 1000 m alt. Flowers May–Oct; fruits Oct.–Mar.

Qld: Gadgarra Res., Atherton Tableland, *S.F.Kajewski 1014* (A, B, BRI, K, NY); Clump Point, *L.S.Smith 5011* (A, BRI, L).

The fruits are eaten by Cassowaries, the seeds by Metallic Starlings. The timber is used in cabinetwork.



6. *Dysoxylum mollissimum* Blume, *Bijdr.* 175 (1825)subsp. **molle** (Miq.) Mabb., *Blumea* 38: 309 (1994)*D. molle* Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 18 (1868). T: South-west Irian Jaya, 1828, *A. Zippelius s.n.*; holotype: U; isotype: L.*D. muelleri* Benth., *Fl. Austral.* 1: 381 (1863), as *Dysoxylon*; *Alliaria muelleri* (Benth.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Moreton Bay, Qld, *W. Hill s.n.*; lectotype: K; isotype: MEL, *fide* D.J. Mabberley, *Blumea* 38: 309 (1994).Illustrations: W.D. Francis, *Austral. Rain-forest Trees* 3rd edn, t. 124 (1970), as *D. muelleri*; G.J. Harden (ed.), *Fl. New South Wales* 2: pl. 19 (left) (1991).

Tree to 35 m tall; fluted bole to 1.5 m diam.; buttresses to 2 m tall and 1 m out; bark scaling or vertically cracking; slash often with strong smell of garlic or turnips. Leaves in spirals, fist-shaped in bud, 25–95 cm long, imparipinnate, to 14-jugate, distal leaflets expanding tardily; petiole 5–10 cm long; leaflets oblong to ovate, 5–16 cm long, 2–6 cm wide, (subapical the largest), often asymmetric at base, acute at apex, glabrous to sparsely pubescent (on veins) adaxially, subglabrous to densely soft-pubescent abaxially, often with domatia in vein axils. Thyrses axillary, to 60 cm long, 1- or 2-branched; flowers subsessile, sweetly scented. Calyx shallowly cupular, c. 1 mm long, irregularly 4-lobed. Petals 4, linear, c. 8–12 mm long, cream, adnate to staminal tube in proximal half, sparsely pubescent outside. Staminal tube hairy; anthers 8. Disc c. 2–4 mm long. Ovary 4-locular; locules 1-ovulate. Capsule flattened-globose, 1.5–2.5 cm diam., pustular-lenticellate, reddish brown, glabrous; pericarp with white latex. Seeds 1–4 (–5), planoconvex, c. 12 mm long; ‘aril’ red-brown. *Red Bean, Kedgy-kedgy, Pencil Cedar.*

Eastern seaboard from Mt Webb near Cooktown, Qld to Bellinger R., N.S.W. Also in Malesia, E of Wallace's Line and the western Pacific. Subtropical to tropical and littoral rain forest. Flowers July–Oct.; fruits Oct.–Mar.

Qld: S.F.R. 191 (Wongabel), *G. Stocker 666* (BRI, CANB, CNS, K, L, LAE). N.S.W.: Fullerton Cove, Nov. 1804, *R. Brown* (BM); Victoria Park 5 miles [8 km] S of Alstonville, *J. O'Hara & R. Coveny 3488* (A, BRI, CNS, K, NSW).



In its retarded leaflet development and petals adnate to the tube *D. mollissimum* resembles *D. gaudichaudianum*, but the calyx and 1-ovulate locules are completely different. The typical subsp. *mollissimum* is native from Sikkim and Assam and southern China to Malesia west of Wallace's Line. It differs most obviously in its smooth fruit. The timber of subsp. *molle* is used in cabinetwork, that of subsp. *mollissimum* is important as lumber for planking and other construction. Subsp. *molle* can be cultivated as far south as Melbourne, Vic.

7. *Dysoxylum fraserianum* (A.Juss.) Benth., *Fl. Austral.* 1: 381 (1863), as *Dysoxylon*

Hartighsea fraseriana A.Juss. in C.F.B. de Mirbel & A.H.G. de Cassini *apud* J.B.A. Guillemin, *Bull. Sci. Nat. Géol.* 23: 239 [‘238’] (1830); *Cambania fraseriana* (A.Juss.) M. Roem., *Fam. Nat. Syn. Monogr.* 1: 102 (1846); *Alliaria fraseriana* (A.Juss.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Hastings R., N.S.W., *C. Fraser*; holotype: P; (?): isotype: BM, E, G, K, NSW, OXF.

Hartighsea lessertiana A.Juss., *loc. cit.*; *Macrocheton lessertianum* (A.Juss.) M. Roem., *op. cit.* 104; *D. lessertianum* (A.Juss.) Benth., *op. cit.* 382, as *Dysoxylon*; *Alliaria lessertiana* (A.Juss.) Kuntze, *loc. cit.* T: N.S.W., (?): *C. Fraser in herb. Ventenat*; holotype: G; (?): isotype: E, K, NSW, OXF, P.

D. lessertianum var. *pubescens* Benth., *op. cit.* 382, as *Dysoxylon*; *D. beckerianum* C.DC. in A.L.P. de Candolle & A.C.P. de Candolle, *Monogr. Phan.* 1: 509 (1878); *A. pubescens* (Benth.) Kuntze, *op. cit.* 108, *nom. illeg.* T: Clarence R., N.S.W., *H. Beckler s.n.*; holotype: K; isotype: MEL, NSW.

Illustrations: W.D. Francis, *Austral. Rain-forest Trees* 3rd edn, tt. 121–3 (1970); D.J. Boland *et al.*, *Forest Trees of Australia* 4th edn, 141 (1984).

Tree to 30 m tall; bole to 1.2 m diam.; buttresses to 1 m tall; bark scaly, grey-brown. Leaves in spirals, fist-shaped in bud, 12–25 cm long, paripinnate, 3–6-jugate, petiole 2–8 cm long; leaflets elliptic to obovate, 5–11 cm long, 2–4 cm wide, asymmetric at base, acuminate at apex, usually glabrous save for domatia in axils of veins on abaxial surface of leaflets. Thyrses

to 12 cm long, weakly branched; flowers subsessile, sweetly scented. Calyx cupular, c. 3 mm diam., puberulous outside; margin 4- or 5-lobed. Petals usually 4, oblong-ovate, 5–7 mm long, white to pinkish, adnate basally to staminal tube, glabrous. Staminal tube hairy with 8–10 lobes and anthers. Disc c. 1 mm long. Ovary usually 4-locular; locules usually 2-ovulate. Capsule 4-lobed, ovoid, to 25 mm long, 20 mm diam., pink, glabrous. Seeds c. 4, with basal 'aril'. *Rosewood*.

Endemic. From Bundaberg, Qld, S to Wyong, N.S.W. Subtropical and dry rain forest, to 900 m alt. Flowers Apr.–Aug.; fruits Aug.–Mar.

Qld: near Imbil, *L.S.Smith & L.Webb 3147* (A, BRI, CANB, L, NY). N.S.W.: 10 miles [16 km] WSW Dungog, *D.F.Blaxell & R.Coveny 335a* (NSW); 'Williams R.', Nov. 1804, *R.Brown* (BM, CANB, K, NSW).

Dysoxylum fraserianum is allied to *D. bijugum* (Labill.) Seem. of Norfolk Is. (see P.S.Green, *Fl. Australia* 49: 247–48 (1994)), New Caledonia, Loyalty Is and Vanuatu. The timber is rose-scented and durable, used for furniture and carving, being very resistant to termites. The largest tree harvested for timber in N.S.W. was recorded as 56.9 m high with a bole 3.55 m diam. Surviving trees are all smaller.



8. *Dysoxylum papuanum* (Merr. & L.M.Perry) Mabb., *Blumea* 31: 131 (1985)

Pseudocarapa papuana Merr. & L.M.Perry, *J. Arnold Arbor.* 21: 315 (1940). T: Papua New Guinea, Sattelberg, Morobe Dist., *M.S.Clemens 3073*; holo: A; iso: G, L, Z.

D. micranthum Merr. & L.M.Perry, *J. Arnold Arbor.* 22: 257 (1941). T: Solomon Is., Star Harbour, San Cristobal, *L.J.Brass 3114*; holo: A; iso: BISH.

[*Aglaia sapindina* auct. non Harms: C.T.White & W.D.Francis, *Proc. Roy. Soc. Queensland* 38: 237 (1927)]

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 290 (2004).

Tree to 40 m tall; bole to 1.3 m diam., often with buttresses to 3 m tall and extending out 3 m; bark smooth to flaking. Leaves in spirals, fist-shaped in bud, 25–40 cm long, paripinnate, 4–6-jugate; petiole 3–6 cm long; leaflets narrowly oblong to elliptic, 9–14.5 cm long, 2.5–5 cm wide, often asymmetric at base, usually acuminate at apex, often glabrous. Thyrses 4–15 cm long, often branched from base, usually axillary; bracteoles c. 1 mm long, caducous. Calyx campanulate, 0.5–0.8 mm long, 4-lobed. Petals 4, broadly ovate, 1.5–2 mm long, white, adnate basally to staminal tube. Staminal tube cylindrical with 8 lobes and anthers opposite them. Disc c. 0.5 mm long. Ovary 2- or 3-locular. Capsule flattened-globose, c. 2.5 cm diam., glabrous, white, drying 3-angled. Seeds usually 2, ellipsoid, c. 15 mm long, red-brown. *Cream Mahogany*, *Spice Mahogany*.

From the Iron Ra. to Paluma, NE Qld; rain forest. Also occurring in New Guinea and Solomon Is., in primary and secondary forests to 800 m alt. Flowers Mar.–July; fruits Aug.–Feb.

Qld: Paluma Ra., Dotswood Holding, *B.Hyland 7263* (CANB, CNS, L, LAE); T.R. 176 Monkhouse, *B.Hyland 12261* (CNS).

At first sight, the minute flowers (the smallest in the genus), recall *Aglaia*, but the paripinnate leaves distinguish it at once. The timber is used for house-building in New Guinea.



9. *Dysoxylum arborescens* (Blume) Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 24 (1868)

Goniocheton arborescens Blume, *Bijdr.* 177 (1825). T: Java, base of mts 'Salak et Seribu', 1824, *C.L.Blume s.n.*; holo: L; iso: L.

D. nernstii F.Muell., *Fragm.* 5: 176 (1866); *Alliaria nernstii* (F.Muell.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Rockingham Bay, Qld, *J.Dallachy s.n.*; holo: MEL (? MEL 118556 or 119106); iso: BRI (fragment).

Illustration: D.J.Mabberley, *Fl. Males.* ser. 1, 12: 104, fig. 16 (1995).

Tree to 20 m tall but often much less; bole to 45 cm diam.; bark smooth to weakly cracked. Leaves in spirals, fist-shaped in bud, 12–45 cm long, imparipinnate, 4-jugate; petiole to 7 cm long; leaflets (narrowly) elliptic to obovate, 8.5–18 cm long, 3–7 cm wide, cuneate at base, acuminate at apex with acumen to 12 mm long, glabrous. Thyrses 2–8 cm long, axillary; branches often congested, to c. 5 cm long, of long-pseudopedicellate, sweetly scented flowers; bracteoles to 1.5 mm long. Calyx shallowly cupular, 2.5–4 mm diam., irregularly 5-lobed, ±adpressed fawn-pubescent. Petals 5, oblong-ovate, c. 7–10 mm long, off-white, adhering basally to tube, usually glabrous. Staminal tube with usually truncate margin and 10 anthers near it. Disc c. 1–1.5 mm long. Ovary 4- or 5-locular; locules 2-ovulate. Capsule flattened-globose, to 3 cm diam., usually 5-valved, bright pink-red, glabrous. Seeds 1–6, planoconvex, 18 mm long, bright orange.

North-eastern Qld, from Cape York S to Rockingham Bay; rain forest. Also occurring in Andaman Is and Taiwan (S) and throughout Malesia to Vanuatu. A very common tree of primary and secondary rain forest to 1500 m alt. Flowers Oct.–Jan.; fruits Feb.–Mar.

Qld: Claudie R., *B.Hyland* 6982 (BRI, CNS, L); Daintree R., *S.F.Kajewski* 1434 (A, BRI, DS, K, NSW, NY, SING).



10. *Dysoxylum klanderi* F.Muell., *Fragm.* 5: 176 (1866)

Alliaria klanderi (F.Muell.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Rockingham Bay, Qld, *J.Dallachy s.n.*; holo: MEL; (?) iso: BM, K, L, NSW.

Schleichera ptychocarpa F.Muell., *Fragm.* 9: 97 (1875); *D. ptychocarpum* (F.Muell.) Radlk., *Abh. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss.* 9: 593 (1879). T: Rockingham Bay, Qld, *J.Dallachy s.n.*; holo: MEL; (?) iso: BO, G, K, M.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 288 (2004).

Tree to 35 m tall; bole to 60 cm diam.; buttresses to 3 m tall and 2.5 m out; bark smooth to slightly cracking. Leaves in spirals, fist-shaped in bud, 25–90 cm long, paripinnate with terminal scar, 2–4-jugate; petiole 5–10 cm long; leaflets ovate-elliptic to lanceolate, 10–25 cm long, 4–10 cm wide, acute at base, obtuse to acuminate at apex, glabrous adaxially, glabrous to weakly hairy abaxially. Thyrses 15–30 (–100) cm long, axillary with cymules of sweetly scented subsessile flowers; bracteoles 1–1.5 mm long. Calyx shallowly cupular, 4–5 mm diam., irregularly 4-toothed. Petals 4, narrowly oblong, 6–15 mm long, white to pinkish, free of staminal tube, minutely sericeous outside. Staminal tube glabrous or weakly puberulent; anthers 8. Disc half as long as tube. Ovary 3- or 4-locular; locules 1- or 2-ovulate. Capsule globose, usually weakly rostrate, to 2.5 cm diam., veined, glabrous, pink to reddish brown. Seeds usually 4, subreniform, c. 2 cm long, 1.5 cm wide, red. *Cape York Cedar*.

Endemic. Rain forests between Cooktown and Rockingham Bay, NE Qld, with reported collections also from Lockhart R. and the Proserpine area. Flowers Jan.–Sept.; fruits Oct.–Feb.

Qld: Gadgarra, Peeramon, *S.F.Kajewski* 1020 (A, B, BRI, K, NSW); Smithfield, *L.S.Smith* 5313 (A, BRI, K, L, LAE).

Dysoxylum klanderi is very closely allied to *D. excelsum* Blume, which, in the wide sense, is found from continental Asia to the Solomon Is., in rain forests to 1800 m alt. Usually the fruit of *D. klanderi* is much larger and the inflorescence axes tend to be more robust with the flowers being less frequently opposite one another. There is room for the view that *D. klanderi* could be included in *D. excelsum*. Whatever its status, it would appear to be a peripheral isolate of that complex. The seeds are eaten by Tooth-billed Bowerbirds.



11. *Dysoxylum alliaceum* (Blume) Blume, *Bijdr.* 172 (1825)

Guarea alliacea Blume *apud* Nees, *Flora* 7: 290 (1824). T: Java, Mt Salak, *C.L.Blume '196'*; holo: L; iso: L.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 288 (2004).

Tree to 38 m tall; bole to 80 cm diam., sometimes fluted and with buttresses to 60 cm tall and 1 m out; bark smooth to finely fissured; slash usually onion-scented. Leaves in spirals, fist-shaped in bud, 20–60 cm long, paripinnate, 3–6-jugate, garlic-scented when bruised; petiole 5–15 cm long; leaflets elliptic to ovate or subfalcate, 7.5–25 cm long, 2.5–7.5 cm wide, asymmetric at base, acuminate at apex, subglabrous. Thyrses to 40 cm long, axillary, pyramidal, of cymules of subsessile sweetly scented flowers; bracteoles to 1 mm long, caducous. Calyx shallowly cupular or salveriform, 2.5–3 mm diam., 4-toothed, glabrous to subpuberulous outside. Petals 4 or 5, linear, 5–8 mm long, white to pinkish, free of staminal tube. Staminal tube glabrous or puberulous outside, ±hairy inside; margin subtruncate to 8- or 10-denticulate; anthers 8 or 10. Disc c. 1 mm long. Ovary 3-locular; locules usually 2-ovulate. Capsule subglobose, often asymmetric and beaked when young, to 7.7 cm diam., cream to pink or brown, glabrous. Seeds 1–4, ellipsoid, c. 2.0–2.2 cm long, red.

North-eastern Qld, from Cape York to S to Mackay; growing in rain forests to 800 m alt. Also in Andaman Is and peninsular Thailand throughout Malesia to Solomon Is.; in rain forest to 1800 m alt. Flowers Nov.; fruits Apr.–June.

Qld: Clump Point, *L.S.Smith 5013* (BRI, CANB, E, K, L); Gap Ck SE of Cooktown, *L.S.Smith 11230* (BRI, CANB, K, L, NSW).

A polymorphic species closely allied to the *D. excelsum* complex (see *D. klanderii*), sterile material of the two being difficult to distinguish, though the latter never has an onion smell and bears larger bracts and bracteoles with generally smaller infructescences.

**12. *Dysoxylum oppositifolium* F.Muell., *Fragm.* 5: 177 (1866)**

Alliaria oppositifolia (F.Muell.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Qld, Rockingham Bay, *J.Dallachy s.n.*; holo: MEL, iso (?): BRI, E, K, NSW.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 290 (2004).

Tree to 30 m tall; bole to 40 cm diam., sometimes with buttresses to 1.5 m tall; bark flaking. Leaves decussate, stiletto-like in bud, 15–45 cm long, paripinnate, 2–6-jugate with minute apical spike or its scar; petiole 7–10 cm long; leaflets opposite to alternate, oblong-elliptic, (4–) 8–17 cm long, (2–) 3.5–5.5 cm wide, usually acute at base, usually acuminate at apex, subglabrous to pilose on adaxial midrib and abaxial surface, usually with domatia in axils of very prominent abaxial lateral veins. Thyrses 5–9 cm long, axillary or in axils of cicatrices, subracemose bearing fascicles of subsessile flowers; bracteoles minute or 0. Calyx cupuliform, c. 2–3 mm diam., puberulous outside; margin 4-toothed. Petals 4, oblong, c. 7–10 mm long, cream to yellowish, free of staminal tube. Staminal tube cylindrical, glabrous or very sparsely pubescent outside; margin crenate; anthers 8. Disc c. 1–2 mm long. Ovary 4-locular; locules 1- or 2-ovulate. Capsule subglobose, c. 2–3 cm long, 2.5–3 cm wide, 4-valved, finely hairy, orange. Seeds 4, ellipsoid, c. 2 cm long, black. *Pink Mahogany*.

From Torres Strait islands S to Paluma, NE Qld; growing in rain forest 0–1160 m alt. Also in the Philippines, Borneo and New Guinea. Flowers Aug.–Dec.; fruits Oct.–Mar.

Qld: Upper Parrot Ck, Annan R., *L.J.Brass 20291* (A, BRI, CANB, K, L); Whitfield Ra., Cairns, *B.Jago 13* (BRI).



13. *Dysoxylum latifolium* Benth., *Fl. Austral.* 1: 381 (1863), as *Dysoxylon*

Alliaria latifolia (Benth.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Frankland Is. off Cairns [Qld], June 1848, R.J.MacGillivray, *Voyage of Rattlesnake Bot.* 300; holotype: K.

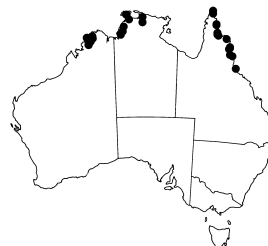
Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 289 (2004).

Tree to 30 m tall; bole to 50 cm diam., fluted; bark smooth to finely fissured and scaling, grey. Leaves in spirals to subopposite, stiletto-like in bud, 20–30 cm long, 3- or 4-jugate with terminal spike or its scar; petiole 6–10 cm long; leaflets ovate to oblong, 8–15 cm long, 5–9 cm wide, asymmetric at base, obtuse to shortly acuminate at apex, usually glabrous or veins puberulent. Thyrses 3–11 cm long, spiciform, axillary to supra-axillary, with cymes of 1–3 weakly scented flowers; bracteoles c. 0.5 mm long, caducous. Calyx shallowly cupular, 3–4 mm diam., 4-toothed, hairy outside. Petals 4, oblong, 5–6 mm long, puberulous outside, white, free of staminal tube. Staminal tube hairy outside; margin crenulate; anthers 8. Disc 0.5–1 mm long. Ovary 4-locular; locules 1-ovulate. Capsule pyriform, c. 5 cm long, 4 cm diam., veined, orange-brown, glabrous. Seeds 1–3, flattened-ellipsoid, c. 2–3 cm long, red.

Northernmost W.A. and N.T., and in Qld from Cape York S to North Brook Is. near Cardwell, 0–600 m alt.; growing in rain forests, semi-deciduous thicket and forested creeks, where often a common canopy tree. Also in New Guinea, Solomon Is., Vanuatu and possibly Indonesia, to 1200 m alt. Flowers June.

W.A.: Osborne Is., *P.G.Wilson 11042* (FHO, PERTH). N.T.: Darwin, Koolpinyah Jungle, *W.Bateman 13693* (CANB). Qld: Rocky R., *B.Hyland 2336* (BRI, L).

Dysoxylum latifolium is closely allied to *D. cyrtobotryum* Miq. of western Malasia.

**14. *Dysoxylum pumilum* Mabb., *Telopea* 10: 727, fig. 1 (2004)**

T: Qld, SFR 755, Gosschalk L.A., 18 May 1976, *B.Hyland 8792*; holotype: CNS; isotype: NSW.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 290 (2004).

Tree to 8 m high; bole to 8 cm diam.; bark smooth. Leaves \pm alternate, stiletto-like in bud, 14–25 cm long, 2 (or 3)-jugate, with terminal spike or its scar; petiole 7.5–10 cm long; leaflets ovate to oblong, 12–34 cm long, 5–12 cm wide, weakly asymmetric at base, acute at apex or with acuminate to 8 mm long, glabrous. Thyrses axillary, sometimes in axils of undeveloped leaves, subspiciform, 8–35 cm long; axis \pm subglabrous, bearing cymes of 1–3 flowers; bracts c. 0.5 mm long, caducous; pedicels 3–4 mm long, pubescent, articulated with short pseudopedicels. Calyx shallowly cupular, 3–4 mm diam. Petals 4, oblong, 5–6 mm long, cream. Staminal tube narrowed towards apex, subglabrous, cream; margin shallowly crenulate to \pm dentate; anthers 8. Disc c. 1 mm long. Ovary 4-locular. Capsule subspherical, abruptly rostrate. Seeds 2 or 3, flattened ellipsoid to hemispherical, c. 2.5–3 cm long; sarcotesta glossy, orange-brown.

Endemic. Restricted to Russell R. catchment between Boonjee and eastern base of Mt Bartle Frere, Qld, growing in rain forest, 380–590 m alt. Flowers May–June.

Qld: Russell R. at junction with Chuck Lunga Ck, *W.Cooper 1624* (CNS); SFR 755, Gosschalk L.A., *B.Gray 786* (CNS, NSW).

**15. *Dysoxylum acutangulum* Miq., *Fl. Ned. Ind., Eerste Bijv.* 196, 503 (1861)**

subsp. *foveolatum* (Radlk.) Mabb., *Blumea* 38: 303 (1994)

D. foveolatum Radlk., *Sitzb. Akad. Muench. Math.-Phys.* 9: 598 (1879). T: Timor, Tanini, *J.E.Teijsmann 10579* [‘10799’ in text]; holotype: M; isotype: BO, K.

D. schultzei C.DC., *Monogr. Phan.* 1: 502 (1878), as *schultzei*; *Alliaria schultzei* (C.DC.) Kuntze, *Rev. Gen. Pl.* 1: 109 (1891). T: Darwin, N.T., *F.Schultz 573*; holotype: K.

Tree to 37 m tall; bole to 1.4 m diam.; buttresses to 3 m tall, 2 m out; bark smooth to scaling, yellowish. Leaves decussate, stiletto-like in bud, 15–30 cm long, paripinnate, 4–6-jugate with minute apical spike or its scar; petiole 8–11 cm long; leaflets elliptic, 9–15 cm long, 5–6.5 cm wide (distal largest), often asymmetric at base, acute to acuminate at apex, coriaceous, usually with domatia in axils of scarcely discernible lateral veins abaxially. Thyrses 3–8 cm long, axillary to subramiflorous, bearing fascicles of sweetly scented subsessile flowers; bracteoles c. 0.5 mm long. Calyx very shallowly crateriform, c. 2.5 mm diam., 4-lobed, sparsely short-pubescent outside. Petals 4, oblong, c. 10–13 mm long, creamy yellow, free of staminal tube, ±puberulous on both sides. Staminal tube sometimes sparsely pubescent outside, glabrous inside; margin crenulate; anthers usually 8. Disc c. 1.5 mm long. Ovary usually 4-locular; locules 2-ovulate. Capsule subglobose to pyriform, 5–8 cm diam., 4-valved, glabrous to minutely hairy, orange, with white latex. Seeds 4, ellipsoid, c. 2 cm long, black; ‘aril’ small, orange.

From Bonaparte Archipelago, W.A., N.T. “Top End” and Cape York, Qld, to 16° S in rain forests and forested creeks and gullies, 30–600 m alt. Also occurring in S Sumatra, through S Malesia to Solomon Is. in rain forests to 950 m alt. Flowers Sept.–Dec.; fruits Jan.–Feb.

W.A.: South Maret Is., Bonaparte Archipelago, *A.A.Mitchell 5412* (BRI, BRO, PERTH). N.T.: Darwin, *F.A.W.Bleeser 543* (MEL, NSW); Headwaters of Liverpool R., *G.Wightman & L.Craven 1407* (CANB). Qld: Thursday Is., *G.C.Stocker 1310* (BRI, CNS, L).

As with many other Meliaceae, this tree flowers as a treelet a few metres tall in open habitats. Subsp. *acutangulum* from N Malesia is the membalo of commerce, probably the most important meliaceous timber in the region and largely used for furniture but also coffins and cartwheels. It differs in its broader leaflets without domatia. Seeds eaten by Pied Imperial Pigeons.



Excluded name

Dysoxylum sessile Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 15 (1868)

T: “Superioribus tribus speciebus accedit *D. rufum* (Hartighsea A.RICH in Voy. Astrolabe II p. 29, tab. 11) e Nova Hollandia.”

This species is restricted to the N & C Moluccas, Indonesia, and the record may be a confusion with one of *D. rufum*.

13. AGLAIA

C.M.Pannell

Aglaia Lour., *Fl. Cochinch.* 173 (1790), *nom. cons.*; from the Greek *Aglaia*, one of the Graces who presided over the Olympic Games; beauty, lustre.

Type: *A. odorata* Lour.

Amoora Roxb., *Pl. Coromandel* 3: 54, t. 258 (1820). T: *A. cucullata* Roxb.

Nemedra A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemin, *Bull. Sci. Nat. Géol.* 23: 239 (1830). T: *N. elaeagnoidea* A.Juss.

Hearnia F.Muell., *Fragm.* 5: 55 (1865). T: *H. sapindina* F.Muell.

Trees, dioecious; indumentum of stellate hairs and or stellate or peltate scales. Leaves usually (always in Australia) imparipinnate. Inflorescences axillary panicles, male larger than female. Flowers unisexual, male smaller than female, similar in structure but male lacks viable ovules and female lacks pollen. Petals usually 3 or 5, rarely 2, 4 or 6, free; aestivation imbricate or quincuncial; staminal tube cup-shaped, subglobose or obovoid, with margin entire or lobed, usually without hairs or scales, rarely with stellate hairs on inside of tube (*A. cooperae*,

A. euryanthera); anthers 3, 5 or 6, inserted inside staminal tube, sessile, rarely with simple hairs on margins (*A. euryanthera*), included or protruding through aperture of staminal tube. Disc absent. Ovary with (1–) 2 or 3 locules, each with 1 or 2 ovules; style absent; stigma sessile, either ovoid with 2 or 3 apical lobes or depressed-globose. Fruit either a dehiscent loculicidal capsule with 3 locules or indehiscent with 1 or 2 locules; pericarp fibrous. Seeds plano-convex, 0 or 1 per locule; aril usually almost or completely surrounding seed, rarely vestigial.

A genus of 120 species in Indomalesia, Australasia and the Western Pacific. 12 species occur predominantly near the coast in N and NE tropical Australia, mainly in Cape York, where 4 or 5 species are endemic, but also in northern W.A., N.T. and Qld as far S as Gympie.

Amoora is now included in *Aglaia*. Dehiscence of the fruit is the only constant distinguishing feature between the two genera (dehiscent in *Amoora* and indehiscent in *Aglaia*), but since this is not consistently correlated with any other more frequently available character, identification of the separate genera, if they were maintained, would often not be possible. However, molecular investigation of the genus thus circumscribed suggests that it is paraphyletic and that it encompasses 3 monophyletic lineages, sect. *Amoora*, sect. *Neoaglaia* and sect. *Aglaia* (A.N.Muellner *et al.*, 2005). The small or tiny flowers are complex in structure and highly perfumed, especially in the male. All species have a fleshy aril. This usually completely surrounds the seed, but in *A. elaeagnoidea* in Australia it is vestigial and the pericarp is fleshy. The fruits or arillate seeds are eaten, and the cleaned seeds dispersed, by birds such as Cassowaries, Pied Imperial Pigeons, Victoria's Riflebirds, Spotted Catbirds, and Wompoo Fruit-doves. King Parrots feed on fruits of *A. ferruginea*, but they are likely to destroy the seeds.

The genus *Aglaia* is the source of a unique group of natural products featuring a cyclopenta[b]-tetrahydrobenzofuran skeleton. Most of these compounds have potent insecticidal properties, antifungal, antiviral, antibacterial or antihelmintic bioactivity. Several of them exhibit pronounced cytotoxic activity against a range of human cancers (see S.S.Ebada *et al.*, in A.D.Kinghorn *et al.* (eds), *Progress in the Chemistry of Organic Natural Products* 94 (2011).

C.M.Pannell, A Taxonomic Monograph of the Genus *Aglaia* Lour. (Meliaceae), *Kew Bull., Addit. Ser.* 16 (1992), *q.v.* for extra-Australian synonymy; A.N.Muellner, R.Samuel, M.W.Chase, C.M.Pannell & H.Greger, *Aglaia* (Meliaceae): an evaluation of taxonomic concepts based on DNA data and secondary metabolites, *Amer. J. Bot.* 92: 534–543 (2005); C.M.Pannell, A key to *Aglaia* (Meliaceae) in Australia, with a description of a new species, *A. cooperae*, from Cape York Peninsula, Queensland, *J. Adelaide Bot. Gard.* 22: 67–71 (2008); A.N.Muellner, H.Greger & C.M.Pannell, Genetic diversity and geographic structure in *Aglaia elaeagnoidea* (Meliaceae, Sapindales), a morphologically complex tree species near the two extremes of its distribution, *Blumea* 54: 207–216 (2009).

- 1 Indumentum solely or partly of peltate scales, visible with a hand lens
- 2 Scales white or pale brown, numerous or densely covering lower leaflet surface
- 3 Scales thickly coating lower leaflet surface, completely concealing lamina 4. *A. argentea*
- 3: Scales few to numerous but rarely overlapping on lower leaflet surface
- 4 Leaflets (1) 3–7; scales large, numerous on lower leaflet surface 5. *A. elaeagnoidea*
- 4: Leaflets c. 15; scales scattered on midrib and occasional elsewhere on lower leaflet surface 6. *A. silvestris*
- 2: Scales dark reddish- or purplish-brown, mainly on midrib and scattered elsewhere on lower leaflet surface
- 5 Flowers with 2 or 3 petals; fruits 3-locular, dehiscent 1. *A. australiensis*
- 5: Flowers with 4, 5 or 6 petals; fruits 2-locular, indehiscent
- 6 Undersurface of midrib with stellate scales absent or sparse amongst the peltate scales; staminal tube deeply 5-lobed, with margins densely hairy and anthers inserted on inside 10. *A. euryanthera*

- 6: Undersurface of midrib with numerous stellate scales amongst the peltate scales; staminal tube and anthers not hairy
- 7 Pits absent or few on leaflet surfaces; staminal tube obovoid with a pin-prick aperture; anthers 5, included 7. *A. brassii*
- 7: Pits numerous on one or both leaflet surfaces
- 8 Indumentum of peltate scales only; leaflet margins recurved; staminal tube subglobose; anthers 3 8. *A. cooperae*
- 8: Indumentum of peltate scales and stellate hairs; leaflet margins not recurved; staminal tube shallowly cup-shaped; anthers 5 9. *A. sapindina*
- 1: Indumentum of stellate scales or hairs, visible with a hand lens
- 9 Flowers with 3 petals; fruits 3-locular, dehiscent
- 10 Leaflets with reticulation subprominent or visible on lower surface; hairs and scales inconspicuous, pale brown; fruits large, to 8 cm diam. 2. *A. spectabilis*
- 10: Leaflets with reticulation not subprominent and barely or not visible; hairs and scales conspicuous, dark reddish brown; fruits small, not more than 2.5 cm diam. 3. *A. meridionalis*
- 9: Flowers with 4 or 5 petals; fruits 1- or 2-locular, indehiscent
- 11 Indumentum of mainly stellate hairs, numerous on lower leaflet surface, sometimes with fewer stellate scales interspersed
- 12 Hairs with arms all of similar lengths; reticulation usually white or pale brown on lower leaflet surface when dry 11. *A. brownii*
- 12: Hairs with some arms much longer than the rest; reticulation brown on lower leaflet surface when dry 12. *A. ferruginea*
- 11: Indumentum mainly of stellate scales, sparse to numerous on lower leaflet surface, sometimes with stellate hairs interspersed
- 13 Scales numerous on lower leaflet surface 11. *A. brownii*
- 13: Scales sparse to densely covering midrib and scattered on rest of lower leaflet surface
- 14 Pits absent or few on lower leaflet surface; staminal tube obovoid with pin-prick aperture 7. *A. brassii*
- 14: Pits numerous on lower leaflet surface; staminal tube shallowly cup-shaped with a wide aperture 9. *A. sapindina*

1. *Aglaia australiensis* Pannell, *Kew Bull., Addit. Ser.* 16: 63 (1992)

T: Boonjie, near Malanda, Qld, 12 Aug. 1947, *L.S.Smith 3274*; holo: BRI; iso: CANB, K, L.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 284 (2004).

Tree to 10 m tall. Indumentum of dark reddish- or purplish-brown peltate scales which have a fimbriate margin, sparse to densely covering twigs, petioles, rachis and petiolules, midrib of lower leaflet surfaces, inflorescences and infructescences, calyces and fruits and scattered on lower leaflet surface. Leaves (18–) 42–72 cm long. Leaflets (7–) 9–11, 7–29 cm long, 3.5–9.5 cm wide; veins 6–14 pairs; reticulation barely or not visible. Inflorescence 7–19 cm long. Flowers 2–4 mm long, 2–4 mm wide. Petals 2 or 3, white or yellow. Staminal tube subglobose, 2 mm long, 2 mm wide; anthers 6, just protruding beyond aperture. Infructescence c. 6 cm long. Fruit dehiscent, ovoid, 3–5.5 cm long, 2.3–4 cm wide, longitudinally ribbed, brown or orange-brown; inner pericarp white or pinkish white. Locules 3, each with 0 or 1 seed. Seeds 2–4.2 cm long, partly enclosed by a thin orange aril.



Endemic, from Atherton to Tully, NE Qld. Grows on basalt-derived soils. In rain forest, coastal rain forest and complex mesophyll forest, 0–930 m alt. Flowers Aug.–Oct.; fruits Sept.–Feb.

Qld: S.F.R. 755, Barong Logging Area, *D.Fitzsimon* 279 (CNS).

Aglaia australiensis differs from *A. meridionalis* in having a peltate rather than stellate indumentum. The distribution of *A. meridionalis* overlaps with *A. australiensis* but extends further north on the east coast of Cape York.

2. *Aglaia spectabilis* (Miq.) Jain & Bennet, *Indian J. Forest.* 9: 271 (1986)

Amoora spectabilis Miq., *Ann. Mus. Bot. Lugd.-Bat.* 4: 37 (1868). T: India, Calcutta Botanic Garden, *Anon.* in Herb. EIC ['Wall. Cat.'] 1278; lecto: K, *vide* C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 79 (1992).

Illustrations: C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 82, t. 13 (1992); W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 286 (2004).

Tree to 40 m tall, with large plank buttresses; bark greyish white or brown, flaking in large squarish scales; latex white. Indumentum of reddish brown or pale brown stellate hairs or scales, densely covering twigs, petioles, rachis and petiolules, inflorescences and infructescences, calyces, outside of petals and fruits, with few to many on lower leaflet surface. Leaves 50–135 cm long. Leaflets (3–) 9–21, 8–40 cm long, 3–17 cm wide, coriaceous; veins 9–19 pairs; secondary veins subprominent on lower surface. Inflorescence to 40 cm long. Flowers 2–7 mm long, 2–6 mm wide. Petals 3, pinkish yellow. Staminal tube cup-shaped, c. 3 mm long and 2.5 mm wide; anthers 6, protruding beyond aperture. Infructescence 9–13 cm long. Fruit dehiscent, subglobose or obovoid, 6–9 cm long, 5.5–8 cm wide; pericarp to 1 cm thick with white latex. Locules 3, each with 0 or 1 seed. Seeds 5–6 mm long, with a complete red aril.

Occurs in Cape York Penin., Qld, from Lockerbie Scrub S to the Rocky R. E of Coen. Also in India, through Indomalesia and Melanesia to Santa Cruz Is. Grows on red soils derived from a mixture of basic rocks and ferruginous sandstone, in rain forest, gallery rain forest, coastal riverine forest and deciduous mesophyll vine forest. Flowers Feb.; fruits Nov.–Feb.

Qld: Claudie R., *B.Hyland* 6641 (BRI, CNS); near Lockerbie, *B.Hyland* 10231 (FHO).

Aglaia spectabilis is a widespread species with large dehiscent fruits and in Australia is found only in the northern part of Cape York; in some parts of its range, it is believed to be dispersed by fruit pigeons (see C.M.Pannell & M.J.Kozioł, *Phil. Trans. Ser. B* 316: 303–333 (1987)).



3. *Aglaia meridionalis* Pannell, *Kew Bull. Addit. Ser.* 16: 88 (1992)

Amoora ferruginea C.T.White, *Proc. Roy. Soc. Queensland* 53: 210 (1942). T: Thornton Peak, Mt Alexander, Qld, 20 Sept. 1937, *L.J.Brass* & *C.T.White* 262; holo: BRI n.v. (photo FHO); iso: K.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 285 (2004).

Tree 1.5–10 m tall, often unbranched. Indumentum of dark reddish brown stellate scales or hairs, densely covering twigs, petioles, rachis, petiolules, midrib of leaflets below, inflorescences and infructescences and calyces and fruits, sometimes numerous on lower leaflet surface. Leaves 46–84 cm long. Leaflets 11–15, 5–28 cm long, 2–8 cm wide; veins 11–23; reticulation barely or not visible. Inflorescences to 13 cm long. Flowers 3.5–5 mm long, 3 mm wide. Petals (2 or) 3, white or pale yellow. Staminal tube obovoid, c. 2 mm long and 2 mm wide; aperture c. 0.8 mm across; anthers 6, protruding through aperture. Infructescence 6–12 cm long. Fruit dehiscent, obovoid, 2.5–3.5 cm long, 2.5–3 cm wide. Locules 3, each with 0 or 1 seed. Seeds brown or blackish brown, 1.5–3 cm long, completely enclosed in an orange aril. Fig. 4.

Endemic to the E side of Cape York Penin., Qld, from Big Tableland near Cooktown to Tully. Grows on sand, sandy clay, sand with pumice layers, soil derived from granite or granodiorite or basaltic krasnozems, red loamy clay in montane, hillside and ridge-top rain forest, simple, complex or mixed meso-notophyll vine forest, 40–1100 m alt. Flowers July–Oct.; fruits Nov.–Feb.

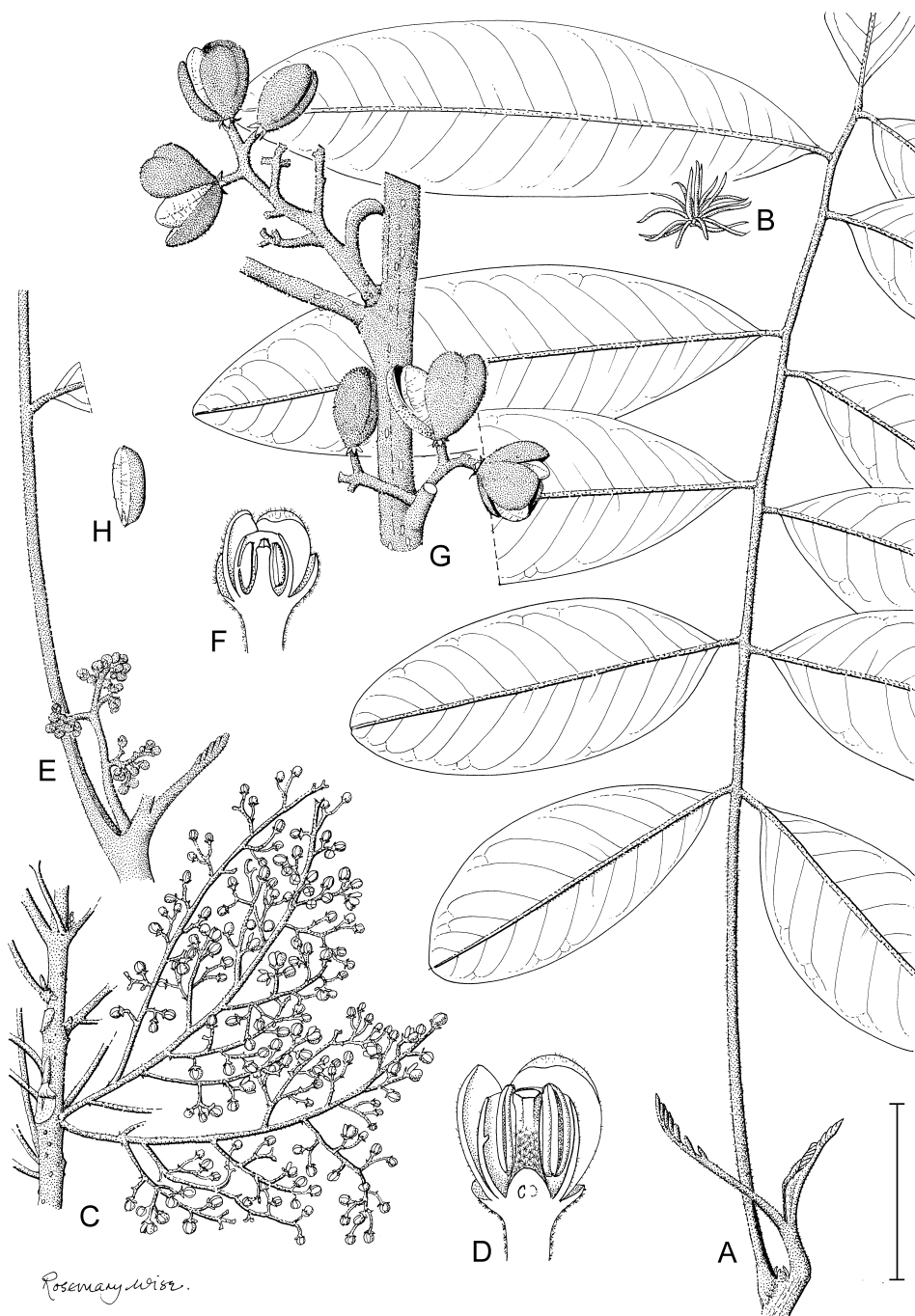


Figure 4. *Aglaia meridionalis*. A, leaf; B, stellate hair; C, male inflorescence; D, male flower; E, young female inflorescence; F, young female flower L.S.; G, fruits; H, seed (A, C, D, R.Schodde 4147, K; B, B.Gray 1035, CNS; E, F, L.S.Smith 3943, CNS; G, B.Gray 2929, CNS; H, B.Hyland 10977, CNS). Scale bars: A, C, E, G, H = 5 cm; B = 0.3 mm; D, F = 3 mm. Drawn by R.Wise.

Qld: 24 km NWW of Daintree, *D.E.Boyland* (& *J.G.Gilleatt*) 472 (BRI, CANB); Tully Falls, *H.Flecker* 6341 (CNS); S.F.R. 251, Tableland L.A., *B.Gray* 1035 (CNS); S.F.R. 143, North Mary L.A., *B.Hyland* 10977 (CNS); Main ridge, 1.6 km S of Mt Lewis Ra., *R.Schodde* 4147 (CANB, L).

Aglaia meridionalis resembles *A. lepidopetala* from New Guinea in the size of the tree and the size and form of the fruit, but it is distinguished from *A. lepidopetala* by the structure and distribution of its indumentum. Fruits eaten by Cassowaries.



4. *Aglaia argentea* Blume, *Bijdr.* 170 (1825)

T. Indonesia. Java, Mt Salak, *C.L.Blume s.n.*; lecto: L., *fide* C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 125 (1992).

Illustrations: F.S.P.Ng, *Tree Fl. Malaya* 4: 212, t. 1A (1989); C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 123, t. 27 (1992); W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 284 (2004).

Tree to 30 m tall, sometimes with buttresses, sometimes with white latex. Indumentum of pale brown or white peltate scales which have a darker centre, densely covering twigs, petioles, rachis, petiolules, inflorescences and infructescences, lower leaflet surfaces, calyces and fruits. Leaves 60–112 cm long. Leaflets 9–19, 11–30 cm long, 1.5–11 cm wide; veins 11–20 pairs. Inflorescence 16–60 cm long. Flowers 2–4 mm long, 1–3 mm wide. Petals 5, pale yellow. Staminal tube obovoid, c. 1.8 mm long and 1.3 mm wide; aperture c. 0.5 mm across; anthers 5, included. Infructescence 20–50 cm long. Fruits indehiscent, pear-shaped, 1–3.5 cm long, 2–2.5 cm wide; pericarp white or yellow. Locules 2 (or 3), each with 0 or 1 seed. Seeds with a complete, thin, yellowish white sweet-sour aril. Plate 11.

Occurs on Cape York Penin., Qld, between Gordon Ck and Dead Horse Ck, Table Ra. Also in Indomalesia, from Thailand to Solomon Is. Grows on alluvial soil, in semi-evergreen riverine vine forest, coastal riverine rain forest, ridge-top rain forest to 150 m alt. and rarely in floodplain rain forest. Flowers Mar.; fruits Dec.–June.

Qld: Iron Ra., *L.J.Brass* 19302 (BRI, CANB, K); Table Ra., Dead Horse Ck, *A.W.Dockrill* 778 (CNS); 'Steelwire bridge', East Claudie R., *R.Tucker* 278 (CNS); Claudie R., *L.J.Webb* & *J.G.Tracey* 8311 (BRI, CANB, K).

The fruits are eaten by Cassowaries.



5. *Aglaia elaeagnoidea* (A.Juss.) Benth., *Fl. Austral.* 1: 383 (1863)

Nemeda elaeagnoidea A.Juss. in C.F.B.de Mirbel & A.H.G.de Cassini *apud* J.B.A.Guillemain, *Bull. Sci. Nat. Géol.* 23: 239 (1830). T: Australia, *J.-B.L.C.T.Leschenault de la Tour* in *N.Baudin s.n.*, lecto: P, *fide* D.J.Mabberley, *Fl. Nouv.-Caléd.* 15: 75, t. 14 (1988); isolecto: BM, G, K (fragment).

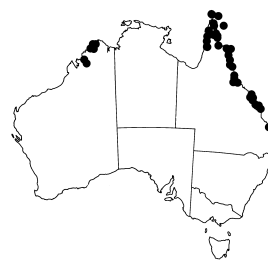
Illustrations: C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 148, t. 34 (1992); K.F.Kenneally & N.L.McKenzie, *Landscape* 4: 52 (1989); W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 285 (2004).

Small tree to 20 m tall, sometimes with buttresses. Indumentum of pale brown or pale orange brown peltate scales, densely covering twigs, petioles, rachis and petiolules, inflorescences and infructescences and calyces, numerous on lower leaflet surfaces and few on fruits. Leaves 4.5–22 cm long. Leaflets (1) 3–7, 2–16 cm long, 1–6 cm wide, subcoriaceous, with numerous faint or conspicuous pits on both surfaces; veins 5–10 pairs. Inflorescence 8–34 cm long. Flowers c. 2 mm long, c. 2 mm wide. Petals usually 5, white or yellow. Staminal tube subglobose, c. 1 mm long, c. 1–1.4 mm wide; aperture 0.3–0.6 mm across; anthers usually 5, just protruding through aperture. Infructescence to 12 cm long. Fruits indehiscent, subglobose, 1–2 cm long, 1.3–1.5 cm diam., red. Locules 2, each with 0 or 1 seed. Seeds partly or completely surrounded by a gelatinous white or yellow aril.

Occurs in W.A. from Walcott Inlet to Cape Bougainville and in Qld from islands in the Torres Strait S to NE of Miriam Vale, near Gladstone. Also in Indomalesia, Australasia and Melanesia, from India to New Caledonia. Grows a variety of soils, in coastal rain forest, monsoon forest, strand forest on dunes, shingle ramparts, rocky hillside, semi-deciduous vine forest, vine scrub or wind swept vine forest, and riverine forest fringing creek. Flowers W.A.: Apr.–Sept., Qld: Nov.–May; fruits W.A.: Jan.–July, Qld: Jan.–May.

W.A.: 13.5 km NE of Crystal Head, SW Osborn Is., *K.F.Kenneally & B.Hyland 10853* (FHO). Qld: Mapoon, S of Port Musgrave, *A.Morton 1006* (BRI); Magnetic Is. in Horseshoe Bay, *C.Sandercoe 662* (BRI); Clump Point, *L.S.Smith 4916* (BRI, CANB, L).

Aglaia elaeagnoidea is a widespread and variable species which occurs throughout most of the range of the genus. Large, almost white peltate scales are conspicuous on the stems and leaves. In the Kimberleys, the aril is vestigial, the pericarp has few scales and the fruit is eaten by birds, especially the Pied Imperial Pigeon (*Ducula bicolor*), which swallows it whole.



6. *Aglaia silvestris* (M.Roem.) Merrill, *Interpr. Rumph. Herb. Amboin.* 210 (1917)

T: [Maluku], Amboina, [Hitoe Lama], July–Nov. 1913 [11 Oct. 1913], in forests alt c. 150 m, *Robinson Plantae Rumphianae Amboinense* 490; neo: PNH lost; iso: BM, BO, K, L, NY, P.

A. sp. Iron Range (Legge 21), C.M.Pannell, *J. Adelaide Bot. Gard.* 22: 68 (2008)

Tree to 30 m tall. Indumentum of pale brown or almost white peltate scales which have a dark grey centre and sometimes a fimbriate margin, densely covering twigs, petioles, rachis and petiolules, inflorescences, infructescences, calyces and fruits, scattered on midrib on lower leaflet surface and occasional on the rest of that surface. Leaves c. 45 cm long. Leaflets c. 15, the laterals alternate, asymmetrically ovate or elliptic, 9.5–11 cm long, 2.5–3.5 cm wide, rounded on one side and cuneate on the other side of the markedly asymmetrical base, with an obtuse acumen 6–9 mm long, brownish green to reddish brown when dry, with numerous faint reddish brown pits on lower surface; lateral veins 13–15 pairs. Flowers not seen. Fruits 28–30 mm long, c. 25 mm wide, yellow or orange, densely covered with scales similar to those on twigs but smaller and darker brown. Locules 2, each containing 0 or 1 seed. Seeds c. 18 mm long, brown, completely covered with a white aril.

Occurs in the Iron Ra. area, NE Qld, in rain forest at c. 50 m alt. Fruits Nov.–Dec.

Qld: Iron Ra., *S.Legge 21* (CNS); Gordon Ck, *W.Cooper & R.Jensen 02041* (CNS).

In Australia known from a single fruiting collection. *Aglaia silvestris* is a wide-spread and variable species, found in the Andaman Is, Nicobar Is, Vietnam, Cambodia, Thailand, Malaysia, Sumatra, Borneo, Philippine Islands, Java, Sulawesi, Maluku, New Guinea, New Britain and the Solomon Is.



7. *Aglaia brassii* Merr. & L.M.Perry, *J. Arnold Arbor.* 1940, 21: 325–326 (1940)

T: Solomon Is., Ysabel, Meringe, 23 Nov. 1932, *L.J.Brass 3189*; lecto: A; isolecto: BO, BRI *n.v.* (photo SING), *vide* C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 249 (1992).

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 284 (2004).

Tree to 20 m tall. Indumentum of dark reddish brown peltate scales and paler stellate scales, dense on twigs, petioles, rachis and petiolules, inflorescences and infructescences, midrib of lower leaflet surface, calyces and fruits. Leaves 8.5–29 cm long. Leaflets (1) 3–7, 4.5–22 cm long, 2–7 cm wide; veins 6–11 pairs. Inflorescence c. 13.5 cm long. Flowers c. 4 mm long, c. 4 mm wide. Petals 4–6, white or yellow. Staminal tube obovoid, 1.2–3 mm long, 1.5–3 mm wide; aperture 0.2–1 mm across; anthers 5, included. Infructescence c. 7 cm long. Fruit indehiscent, sub-globose, 1.5–2.8 cm long, 1.3–2.8 cm wide. Locules 2, each with 0 or 1 seed. Seeds enclosed in a translucent white aril.

Occurs in NE Qld, from Mt Pieter Botte to Mt Lewis. Also in New Guinea and the Solomon Is. Grows in rain forest, 600–1300 m alt. Flowers Oct.–Nov.; fruits Mar.–Apr.



Qld: Main ridge, 1.6 km S of Mt Lewis, *R.Schodde 4148* (CANB); 'Bunja' site, Mt Lewis, *L.J.Webb & J.G.Tracey 13729* (BRI, CANB, CNS).

Aglaia brassii and *A. cooperae* are very similar but the flower of *A. brassii* has 5 petals and 5 anthers, and the staminal tube is obovoid with a small aperture, whereas in *A. cooperae* there are 3 petals, and the staminal tube is cup-shaped with 3 broad anthers which protrude through the aperture and point towards the centre of the flower.

8. *Aglaia cooperae* Pannell, *J. Adelaide Bot. Gard.* 22: 69 (2008)

T: Qld, Cook District: Silver Plains, S of Scrubby Ck and W of Colmer Point, 27 June 1995, *P.I.Forster 17031*; holotype: BRI.

Aglaia sp. Silver Plains, L.W.Jessup, in R.J.F.Henderson (ed.), *Queensland Vasc. Pl.: Names and Distribution* 111 (1997).

Illustrations: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 284 (2004), as *A.* sp. Silver Plains; C.M.Pannell, *op. cit.* 70, figs 2, 3.

Small tree or multi-stemmed shrub 3–6 m high. Indumentum of dark reddish brown peltate scales, densely covering twigs, petioles, rachis and petiolules, inflorescences, infructescences, outer surface of petals, calyces and fruits, numerous to dense on midrib of lower leaflet surface, absent or few on rest of lower surface. Leaves 6.5–20.5 cm long. Leaflets 5–7, 2.5–9 cm long, 1–3 cm wide, recurved at margin, coriaceous, with numerous pits on both surfaces; veins 9–11 pairs. Inflorescence 2.5–3 cm long. Flowers c. 3 mm long, c. 3 mm wide; pedicel c. 2 mm long. Petals 3, with dense scales on exposed surfaces. Staminal tube subglobose, 2.2 mm high, 2.2 mm wide, with numerous pale brown stellate scales on inner surface; aperture triangular, c. 1 mm across; anthers 3, just protruding through aperture. Ovary 1.2 mm long, 1 mm wide; locules 2, each with 2 ovules; stigma sessile with 2 minute apical lobes. Infructescence 4.4–7.5 cm long. Fruit subglobose, 1.7–2.5 cm long, 1–2 cm wide.

Endemic to NE Qld. Occurs on the E side of the MacIlwraith Ra. on Cape York Penin. from Nesbit R. S to Massey Ck. Grows mostly in semi-deciduous or deciduous vine thickets, sometimes in evergreen notophyll thicket or rain forest, at 20–70 m alt. Flowers June; fruits Oct.–Feb.

Qld: 3 km N of Massey Ck Crossing, Silver Plains Stn, *P.I.Forster et al. PIF10578* (CNS); Between Massey Ck and Rocky R., *B.Hyland 10296* (CNS, FHO); 8 km N of crossing on Massey Ck, on road between Silver Plains Stn and Rocky R., *L.J.Webb & J.G.Tracey 9734* (BRI, FHO).



9. *Aglaia sapindina* (F.Muell.) Harms in H.G.A.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 3: 298 (1896)

Hearnia sapindina F.Muell., *Fragm.* 5: 55 (1865). T: Rockingham's Bay, Qld, *J.Dallachy s.n.*, syn: BM, BO, G, K, L, MA, ?MEL *n.v.*, W.

Illustrations: C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 260, t. 74 (1992); W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 285 (2004).

Small tree to 15 m tall, occasionally to 30 m, sometimes with buttresses. Indumentum of pale brown or reddish brown peltate scales which have a fimbriate margin, usually interspersed with very dark purplish brown or blackish brown peltate scales, dense on twigs, petioles, rachis and petiolules, midrib and veins on lower leaflet surface; midrib and veins below sometimes with few stellate hairs interspersed with the scales; inflorescences, calyces and infructescences densely covered with reddish brown stellate scales. Leaves 13–65 cm long. Leaflets (3) 5–9, 7–26 cm long, 3–13.5 cm wide, with numerous shallow reddish brown pits on lower surface; veins 8–14 pairs. Inflorescence 3–28 cm long. Flowers subglobose, to 3 mm diam., smelling of citronella. Petals 5, yellow or white. Staminal tube shallowly cup-shaped, c. 1 mm long, c. 2 mm wide, with a wide aperture; anthers 5, protruding and pointing towards centre of flower. Infructescence 3–15 cm long. Fruit indehiscent, ellipsoid or subglobose, 1.5–2.8 cm long, 1.5–2.1 cm diam., red or orange, with few scales. Locules 2, each with 1 or 2 seeds. Seeds 1.5 cm long, enclosed in a gelatinous orange aril.

Occurs in N.T. from Melville Is. to Arnhem Land and in Qld on the eastern side of Cape York Penin. Also in Moluccas, New Guinea, New Britain, New Ireland and Bougainville. Grows on sand, grey sandy loam and perennially wet sandy organic soil, latosols derived from laterised basalt, basaltic krasnozems, alluvial soils and soils derived from metamorphic rock or granite, brown clay. Found in primary and secondary rain forest, coastal riverine rain forest, on perennial springs at the edge of dense monsoon forest and in semi-evergreen mesophyll vine forest, sometimes with sclerophyll emergents such as *Acacia polystachya* or *A. aulococarpa*. Flowers N.T.: Sept.–Nov., Qld: July–May; fruits N.T.: Sept.–Feb., Qld: Nov.–June.

N.T.: Melville Is., Garden Point, *J.Must 1638* (BRI, CANB, DNA); Arnhem Land, 3 km NE of Port Bradshaw, *G.M.Wightman 4118* (BRI, DNA). Qld: Natl Park Res. 202, L. Eacham, *B.Hyland & E.H.Volk 3010* (BRI, K); Wongabel, S.F.R. 191, Cpt 2a, Exp. LT22, *G.L.Unwin 168* (BRI); Headwaters of Massey Ck, McIlwraith Ra., *L.J.Webb & J.G.Tracey 9135* (BRI).



10. *Aglaia euryanthera* Harms in H.G.A.Engler, *Bot. Jahrb. Syst.* 72: 171 (1942)

T: New Guinea, S.E., Papua, fluss Lala, Wald, 24 July 1935, *C.E.Carr 13989*, lecto: BM, *fide* C.M.Pannell, *Kew Bull., Addit. Ser.* 16: 253 (1992); isolecto: K, L, SING.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 285 (2004).

Tree 6–12 m tall, sometimes with buttresses. Indumentum of dark reddish brown or orange-brown shiny peltate scales which have an irregular or fimbriate margin, dense on twigs, petioles, rachis, petiolules, inflorescences and infructescences, leaflet midrib below, calyces and fruits, and rarely a few stellate scales on undersurface of midrib. Leaves 13–50 cm long. Leaflets 1–5 (–9), 7–26 cm long, 3–10 cm wide; veins 9–25 pairs. Inflorescence 5–18 cm long. Flowers 2–4 mm long, 1.5–4 mm wide. Petals 5 or 6, white or yellow. Staminal tube cup-shaped, deeply 5-lobed, 1.5–2.5 mm long, 1–2 mm wide, with dense short simple yellow hairs along margins of lobes; anthers 5, inserted inside tube. Infructescence 7–11 cm long, with 1 or 2 fruits. Fruits subglobose, 1–3.2 cm long, 1.4–2.2 cm wide. Locules 2, each with 0 or 1 seed. Seeds 1.8–2.5 cm long, partly enclosed in a yellow or orange aril.

Occurs in NE Qld from Torres Straits Is to Silver Plains, E of Coen, with one record from Whitfield Spur, near Cairns. Also in New Guinea. Grows on stony loams and deep alluvial soil derived from a mixture of metamorphic rocks and granite. Found in semi-deciduous mesophyll vine forest, monsoon forest, araucarian semi-evergreen vine forest, riverine gallery forest and occasionally in flood plain rain forest. Flowers Apr.–Oct.; fruits Sept.–Feb.

Qld: Iron Ra., *L.J.Brass 19048* (BRI, CANB, K); Whitfield Spur, *R.L.Jago 83* (BRI); Lockerbie Scrub, *K.A.Williams 85217* (BRI).



The proportion of dark reddish brown peltate scales is usually greater than in *A. sapindina*, from which it is also distinguished by staminal tube structure. *Aglaia sapindina* always has stellate scales on the inflorescence and infructescence whereas *A. euryanthera* has peltate scales.

11. *Aglaia brownii* Pannell, *Kew Bull., Addit. Ser.* 16: 327 (1992)

T: Groote Eylandt [N.T.], 15 Jan. 1803, *R.Brown*; holo: BM.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 285 (2004).

Tree 2–12 m tall. Indumentum of brown stellate scales and hairs, dense on twigs, petioles, rachis and petiolules, inflorescence and infructescence, calyces and fruits; leaflets with numerous pale brown stellate scales on lower surface, sometimes interspersed with usually fewer, darker compact stellate hairs. Leaves 9–45 cm long; leaflets (3) 5–9, 4.5–20 cm long, 1.5–8 cm wide, wilting and margin strongly recurved in dry conditions; veins 9–15 pairs; reticulation often white or pale brown below when dry. Inflorescence 9–17 cm long. Flowers 1–2 mm long, 1–1.5 mm wide, strongly perfumed. Petals 5, white or yellow. Staminal tube cup-shaped, c. 0.5 mm long;

anthers (3) 5 (6), protruding and pointing towards centre of flower. Infructescence 3.5–9 cm long. Fruits indehiscent, subglobose, 1.4–2.1 cm long, 1.5–1.7 cm wide, orange; pericarp thin. Locules 2, each with 0 or 1 seed. Seeds enclosed in yellowish brown aril.

Occurs in N.T. from Melville Is. E to Groote Is., and in Qld at Chester R., Cape York Penin., and from Cape Hillsborough S to Gympie. Also in New Guinea. Grows on dark brown organic soil, aeolian sands, stabilised dune or laterite. Found on rocks and dunes near the sea, monsoon forest on coastal dunes, fringing coastal woods, semi-deciduous notophyll vine forest at edge of beach close to mangroves, *Eucalyptus* forest. Flowers N.T.: Jan.–Mar., Qld: Mar.–July; fruits N.T.: Mar.–July, Qld: Aug.–Dec.

N.T.: Groote Eylandt, Hemple Bay, *R.L.Specht* 368 (AD, BRI, K, L, PERTH); Arnhem Land, Yirrkala, *R.L.Specht* 886 (AD, BRI, K, L); West Alligator R., *L.J.Webb* & *J.G.Tracey* 12434 (BRI, CNS). Qld: Chester R., *B.Hyland* 9481 (FHO); Carlisle Is., *P.R.Sharpe* & *G.Batianoff* 4483 (BRI, CANB).

Following Bentham's inclusion of R.Brown's collections of this plant in *A. elaeagnoidea*, it has frequently been identified as that species. It differs from *A. elaeagnoidea* in having an indumentum of stellate hairs and scales rather than the peltate scales typical of *A. elaeagnoidea*. It belongs to the *A. tomentosa* group, but differs from *A. ferruginea* (the other Australian species belonging to that group) in having numerous pale brown stellate scales on the lower leaflet surface with some stellate hairs interspersed. The stellate hairs of *A. ferruginea* are usually a darker reddish brown with unequal arms up to 1 mm long.



12. *Aglaia ferruginea* C.T.White & W.D.Francis, *Proc. Roy. Soc. Queensland* 35: 66 (1923)

T: Qld, Atherton Tableland, Jan. 1918, *C.T.White s.n.*; holo: BRI *n.v.* (photo FHO); iso: K.

[*A. tomentosa* auct. non Teijsm. & Binn.: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 286 (2004)]

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Tropical Rainforest* 286 (2004), as *A. tomentosa*.

Tree to 15 m tall. Indumentum of reddish brown or orange-brown stellate hairs which have arms of differing lengths, dense on twigs, petioles, rachis and petiolules, inflorescences and infructescences, calyces and fruits, numerous on lower leaflet surface, with arms of adjacent hairs overlapping and with some paler hairs interspersed. Leaves 11–60 cm long. Leaflets 5–11, 2.5–32 cm long, 1.5–11 cm wide; veins 5–25 pairs, at an angle greater than 60° to midrib; reticulation brown on lower leaflet surface when dry. Inflorescence 9–18 cm long. Flowers 1–4 mm long, Petals 5, white or yellow. Staminal tube cup-shaped, 1 mm long, 1.5 mm wide; anthers 5, inserted just inside margin of tube, protruding and pointing towards centre of flower. Infructescence indehiscent, ellipsoid, 5–19 cm long. Fruit 1.6–2.2 cm long, 1.2–1.7 cm diam. Locules 1 or 2, each with 0 or 1 seed. Seeds 1.5–1.8 cm long, completely covered with a shiny translucent gelatinous orange aril.

Occurs on Badu and Banks Is in the Torres Strait S to Glen Allyn, Atherton Tableland, Qld. Also in Indomalesia from India to New Guinea. Grows on clay derived from metamorphic rocks. Found in rain forest, coastal rain forest and complex mesophyll vine forest, to 1000 m alt. Flowers Oct.–Feb.; fruits Apr.–Feb.

Qld: Upper Parrot Ck, Annan R., *L.J.Brass* 20318 (BRI, CANB, K, L); S.F.R. 310, Swipers L.A., *B.Hyland* 6621 (CNS, L); Robson L.A., *A.K.Irvine* 1641 (CANB, CNS); Atherton Tableland, next to Yungaburra, *W.Morowetz et al.* 18–16185 (CNS).



Morphologically, *A. ferruginea* belongs to the *A. tomentosa* group, but the molecular phylogeny of the genus places it, along with some other species from Australia and Fiji, in a separate clade from the rest of *Aglaia* sect. *Aglaia*. The lateral veins on the leaves of this species are at an angle greater than 60° to the midrib; in *A. tomentosa* from western Malesia, this angle is less than 60°. The fruits are eaten by King Parrots and Victoria's Riflebirds.

RUTACEAE

Family description by T.G.Hartley

Other authors listed under individual group and generic treatments

Shrubs or trees or sometimes herbs, sometimes scrambling or scandent, sometimes armed, with pellucid glands containing aromatic, volatile oil visible from surface of at least the leaves, young branchlets, inflorescences, flower parts, pericarp, or cotyledons in seed. Leaves alternate, opposite, or whorled, simple or variously compound, exstipulate or rarely with stipular excrescences. Flowers bisexual and/or unisexual, actinomorphic, hypogynous, usually 3–5-merous. Sepals (rarely lacking) distinct to completely connate. Petals distinct or sometimes coherent or connate for part of length. Disc (sometimes lacking) intrastaminal, nectariferous. Stamens equal to or twice as many as petals or sometimes more numerous; filaments distinct or sometimes coherent or connate for at least part of length; anthers longitudinally dehiscent, introrse or sometimes latrorse. Gynoecium of 1–5 (rarely more) carpels, these distinct (but then joined in a common style), partially connate, or completely connate, each with 1 locule containing 1–many ovules; placentation axile; styles lateral, subapical, or apical, distinct, coherent, or connate. Fruit of 1–5 distinct or proximally connate follicles (called cocci by some authors), drupaceous carpels, or samaras, or \pm syncarpous and capsular, drupaceous, or baccate. Seeds with large embryo; endosperm present and fleshy or lacking.

A family of c. 155 genera and 1600 species; nearly cosmopolitan, but mainly tropical and subtropical; especially abundant in Australia and southern Africa; in Australia there are 43 genera (24 endemic) and 486 species (458 endemic).

Pellucid glands containing aromatic volatile oils distinguish Rutaceae from their morphologically similar allies Simaroubaceae, Cneoraceae, most Meliaceae, and Zygophyllaceae. They are most often present in mature plants and are often best observed with a compound microscope provided with sub-stage light source.

Rutaceae includes the economically important Citrus fruit group, as well as some minor tropical fruit crops, and regionally important timber species.

G.Bentham, Rutaceae, *Fl. Austral.* 1: 301–372 (1863); H.G.A.Engler, Rutaceae, in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III, 4: 95–201 (1896); H.G.A.Engler, Rutaceae, in H.G.A.Engler & K.Prantl (eds), *op. cit.* 2nd edn, 19a: 187–359 (1931); G.K.Brizicky, The genera of Rutaceae in the southeastern United States, *J. Arnold Arbor.* 43: 1–22 (1962); E.M.Ross, Rutaceae, in T.D.Stanley & E.M.Ross, *Fl. SE Queensland* 1: 440–470 (1983); J.A.Armstrong *et al.*, Rutaceae, in J.P.Jessop & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 2: 768–783 (1986); J.R.Wheeler, Rutaceae, in N.G.Marchant *et al.*, *Fl. Perth Region* 1: 476–490 (1987); A.G.Floyd, Rutaceae, *Rainforest Trees Mainland SE Australia* 316–345 (1989); J.R.Wheeler, Rutaceae, in J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 667–675 (1992); B.P.M.Hyland & T.Whiffin, Rutaceae, *Austral. Trop. Rain Forest Trees, An Interactive Identification System* 2: 439–464 (1993); M.G.Corrick & B.A.Fuhrer, Rutaceae, in A.S.George (ed.), *Wildfl. SW Australia* 190–197 (1996); M.F.Duretto, Rutaceae, in N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 153–197 (1999); J.A.Armstrong *et al.*, Rutaceae, in G.J.Harden (ed.), *Fl. New South Wales* Rev. edn, 2: 257–321 (2002); J.R.Wheeler *et al.*, Rutaceae, *Fl. South West* 2: 867–878 (2002); K.Kubitzki *et al.*, Rutaceae, in K.Kubitzki (ed.), *Fam. Gen. Vasc. Pl.* 10: 276–356 (2011).

RUTACEAE

KEY TO GROUPS

- 1 Fruit dehiscent
 - 2 Staminalodes 5, adnate to petals; stamens 5, antiseptalous; shrubs; flowers 5-merous; petals to 5 mm long GROUP 3
 - 2: Staminalodes absent, rarely present and then antiseptalous (*Drummondia*) or antipetalous (*Flindersia*) and free; stamens 3, 4, 5, 8 or 10 (–25); herbs to large trees; flowers 3, 4 or 5(+)-merous; petals to 30 mm long
 - 3 Cotyledons in seed considerably wider than hypocotyl; mostly comparatively large-leaved shrubs or trees of rain forest, if non rain forest then flowers 5-merous with 5 stamens (*Geijera*, *Flindersia*) and staminalodes, if present, antipetalous GROUP 1
 - 3: Cotyledons in seed linear, c. same width as hypocotyl; mostly small-leaved shrubs of sclerophyllous vegetation; if 5-merous then with 10 stamens, or rarely with 5 stamens and 5 antiseptalous staminalodes GROUP 2
- 1: Fruit indehiscent; cotyledons in seed considerably wider than hypocotyl
 - 4 Fruit of 1–5 samaras or drupaceous; endocarp cartilaginous or thinly so or woody; seeds with copious endosperm (except in *Pentaceras*, where tissue is scant); leaves opposite or alternate GROUP 1
 - 4: Fruit baccate, endocarp membranaceous or fleshy; seeds without endosperm; leaves alternate GROUP 4

GROUP 1

T.G.Hartley

Trees or shrubs. Anthers usually without apical gland. Fruit dehiscent or indehiscent. Cotyledons in seed considerably wider than hypocotyl.

In Australia a group of 18 genera, mostly comparatively large-leaved shrubs or trees in rain forest.

The 18 genera of Group 1 are arranged in the sequence proposed by Hartley (2001). Regarding their suprageneric classification, which is discussed briefly in that study, it is my opinion that revision is probably needed. It should, however, be based on the study of specimens of all taxa of the family, worldwide, and is a task far beyond the scope of this treatment.

Following are some notes on morphology and seed dispersal.

Trichomes are simple or compound. When compound, they vary from fasciculate (2 or 3 arms radiating from base) to stellate (several or many radiating arms) to scale-like (as in stellate, but with the arms coalesced). Extremely small trichomes occur in many of the species. These range down to around 0.1 mm in length and magnification of at least 40× is needed to view them adequately.

Leaves with a single lamina may be unifoliate (i.e. reduced compound leaves, as evidenced by their petiole being swollen and/or articulate at apex) or simple (petiole neither swollen nor articulate at apex). Single-bladed leaves in *Coatesia*, *Geijera* and *Halfordia* are exclusively simple, but in *Bosistoa*, *Bouchardatia*, *Dinosperma*, *Lunasia*, *Flindersia*, *Euodia*, *Brombya*, *Medicosma*, *Melicope*, *Acronychia*, *Sarcomelicope* and *Pitaviaster* their expressions of the unifoliate and simple conditions are inconstant, with at least some of the species or specimens appearing to have both unifoliate and simple leaves. Because distinguishing between the two types wherever they occur would serve no very useful purpose and would make some of the keys more difficult to use, all leaves with a single lamina are described as simple.

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The testa, as the product of the outer integument of the ovule, may have an inner layer of dense, usually black sclerenchyma (the sclerotesta) or this tissue may be lacking. The sclerotesta varies from thin and brittle to thick and resistant to breakage. In the latter condition, seen mainly in *Zanthoxylum*, *Geijera* and *Melicope* it clearly represents a specialisation for endozoochory, enabling the seed to retain its viability when it is passed through the gut of an animal.

Seeds that are expelled from dehiscent fruit (these are seen in *Bosistoa*, *Bouchardatia*, *Acradenia*, *Dinosperma* (excepting *D. erythrococcum*), *Lunasia*, *Coatesia*, *Euodia*, *Brombya* and *Medicosma*) invariably appear to lack the testal strength required for endozoochory, either lacking a sclerotesta or having a thin, brittle sclerotesta. However, they tend to retain on their ventral surface a membranaceous to subfleshy piece of endocarp (the ventral endocarp) which evidently serves as an attractant for their dispersal by ants (see Berg, 1975). The remaining endocarp in these plants, the dorsilateral endocarp, which is cartilaginous, separate from the ventral endocarp, and separate from the rest of the pericarp, is hygroscopic, and by these movements usually expels the seed, and itself as well, from the dehiscent fruit.

Some authors call the ventral endocarp a placental endocarp and others (Berg included) call it an elaiosome. Both appear to be misnomers. The placenta is not part of the endocarp and the ventral endocarp, at least as far as known in Australian Rutaceae, does not appear to contain oil, which is a diagnostic feature of an elaiosome. Berg (p. 495) noted that most Australian elaiosomes are relatively dry and hard and admitted that he could say nothing about their chemical content.

Among the other dehiscent-fruited genera, not one has a ventral endocarp and the seeds are not expelled from the fruit. The seeds of *Flindersia*, which are winged and passively released from the dehiscent fruit, are wind-dispersed, and those of *Zanthoxylum*, *Geijera* and *Melicope*, which are not winged and remain attached in the dehiscent fruit (with the drying of herbarium specimens they sometimes become detached), are commonly dispersed by arboreal, seed-eating birds. The testa in the latter three genera is highly specialised for endozoochory, having a thick sclerotesta and an outer layer of spongy-fleshy tissue (the sarcotesta, which is the reward for the vector) bounded externally by a shiny, black or reddish pellicle, which enhances the seed's visibility in the dehiscent fruit. In all four of these genera the endocarp is cartilaginous and in all of the species except *Melicope vitiflora* it is adnate to the outer pericarp.

Of the indehiscent-fruited genera, *Pentaceras* has wind-dispersed samaras and *Halfordia*, *Acronychia*, *Sarcomelicope* and *Pitaviasier* have drupaceous, usually fleshy, often attractively-coloured fruit, the seeds of which are commonly dispersed by arboreal, fruit-eating birds. Protection for the seed in its passage through the gut of the vector is provided by a cartilaginous endocarp, often augmented by a thick sclerotesta and/or a woody mesocarp.

R.Y.Berg, Myrmecochorous plants in Australia and their dispersal by ants, *Austral. J. Bot.* 23: 475–508 (1975); T.G.Hartley, Morphology and biogeography in Australasian-Malesian Rutaceae. *Malayan Nat. J.* 55: 197–219 (2001).

KEY TO GENERA BASED ON FLOWERING MATERIAL

1 Petals usually 5

2 Stamens usually 5

3 Petals valvate, usually hooked adaxially at apex

9. GEIJERA

3: Petals imbricate or narrowly so, not hooked adaxially at apex

4 Flowers mostly bisexual or male; stamens alternating with 5 staminodes, these similar to filaments of functional stamens or reduced to ligules or rarely lacking; functional gynoeceium a 5-loculed syncarpous pistil with 2–6 ovules per locule; leaves alternate to opposite, impari- or paripinnate, trifoliate, or simple; trichomes simple to stellate or scale-like

6. FLINDERSIA

RUTACEAE

- 4: Flowers bisexual; stamens not alternating with staminodes; gynoeceum a 5-carpelled subapocarpous pistil with 2 ovules per locule; leaves alternate, simple; trichomes simple **7. COATESIA**
- 2: Stamens 10
- 5 Leaves opposite
 - 6 Buds with 2 pairs of opposite, imbricate scales enclosing leaf or floral primordia; carpels in ovary without prominent glands; ovules 4–6 per locule **1. BOSISTOA**
 - 6: Buds naked; carpels in ovary each with prominent gland; ovules 2 per locule **3. ACRADENIA**
- 5: Leaves alternate
 - 7 Leaves imparipinnate **10. PENTACERAS**
 - 7: Leaves simple **11. HALFORDIA**
- 1: Petals less than 5
 - 8 Flowers in small capitate clusters; petals 3 **5. LUNASIA**
 - 8: Flowers comparatively lax; petals 4
 - 9 Leaves alternate, mostly pinnate or trifoliolate; plants dioecious, usually armed; stamens 4 **8. ZANTHOXYLUM**
 - 9: Leaves opposite or whorled (or rarely subopposite or alternate in *Dinosperma* and *Medicosma*), compound or simple; plants monoclinal or dioecious, unarmed; stamens 8 or 4
 - 10 Inflorescences terminal or terminal and axillary; stamens 8
 - 11 Leaves with pocket-domatia in axils of secondary veins; ovules 6–8 per locule **2. BOUCHARDATIA**
 - 11: Leaves without domatia; ovules 2 per locule **4. DINOSPERMA**
 - 10: Inflorescences axillary and/or infrafoliar; stamens 8 or 4
 - 12 Stamens 4
 - 13 Inflorescences compoundly or simply racemose **12. EUODIA**
 - 13: Inflorescences paniculate
 - 14 Carpels in ovary joined in apical style, otherwise contiguous **15. MELICOPE**
 - 14: Carpels in ovary joined in apical or subapical style, otherwise connate at base or to full length **18. PITAVIASTER**
- 12: Stamens 8
 - 15 Trichomes mostly fasciculate, stellate, or scalelike; at least the antisealous staminal filaments usually with raised glands towards apex **14. MEDICOSMA**
 - 15: Trichomes simple; staminal filaments eglandular
 - 16 Petals valvate, narrowly elliptic, lanceolate, or linear, usually becoming recurved or reflexed **16. ACRONYCHIA**
 - 16: Petals valvate or narrowly imbricate, ovate-elliptic or elliptic, erect or ascending
 - 17 Gynoeceum syncarpous **17. SARCOMELICOPE**
 - 17: Gynoeceum subapocarpous
 - 18 Leaves simple; staminal filaments flattened and ±petaloid, elliptic or narrowly so or orbicular to obovate or spatulate **13. BROMBYA**
 - 18: Leaves trifoliolate and/or simple; staminal filaments sublinear, gradually tapering from base to subulate apex **15. MELICOPE**

RUTACEAE

KEY TO GENERA BASED ON FRUITING MATERIAL

- 1 Fruit indehiscent (in herbarium specimens of some species of *Acronychia* occasional or rather frequent fruiting carpels may open into the locule; see note under *Acronychia*, p. 61)
 - 2 Leaves alternate
 - 3 Leaves imparipinnate; fruit of 1–5 distinct samaras **10. PENTACERAS**
 - 3: Leaves simple; fruit syncarpous, drupaceous, 3–5-loculed **11. HALFORDIA**
 - 2: Leaves opposite (or rarely whorled in *Sarcomelicope*); fruit drupaceous
 - 4 Leaves trifoliolate or mostly so **16. ACRONYCHIA**
 - 4: Leaves simple or mostly so
 - 5 Fruit 1-loculed **18. PITAVIASTER**
 - 5: Fruit 4-loculed (4–8-loculed in *Acronychia wilcoxiana*)
 - 6 Fruit with septicidal fissures at least at apex **16. ACRONYCHIA**
 - 6: Fruit without septicidal fissures (or rarely with apical septicidal fissures in *Sarcomelicope*)
 - 7 Petals and staminal filaments deciduous in fruit **16. ACRONYCHIA**
 - 7: Petals and filaments of staminodes, or at least proximal portion of antisepalous staminodal filaments (usually ±concealed by persistent sepals), persistent in fruit **17. SARCOMELICOPE**
- 1: Fruit dehiscent (often tardily so in *Geijera*)
 - 8 Testa membranaceous (or coriaceous or subcoriaceous in *Dinosperma*)
 - 9 Fruit an ellipsoid, 5-loculed septicidal capsule that separates (or is easily separable) into 5 distinct valves at maturity; seeds winged **6. FLINDERSIA**
 - 9: Fruit of 1–5 basally connate follicles; seeds not winged
 - 10 Trichomes mostly fasciculate, stellate, or scale-like; leaves alternate, simple **5. LUNASIA**
 - 10: Trichomes simple; leaves opposite or whorled (or rarely subopposite or alternate in *Dinosperma*), compound or simple
 - 11 Cotyledons in seed flattened, convolute and folded **4. DINOSPERMA**
 - 11: Cotyledons in seed plano-convex, neither convolute nor folded
 - 12 Leaves with pocket-domatia in axils of secondary veins **2. BOUCHARDATIA**
 - 12: Leaves without domatia
 - 13 Buds with 2 pairs of opposite, imbricate scales enclosing leaf or floral primordia; fruit of 1 or 2 or rarely 3 follicles 8–30 mm long; leaves mostly imparipinnate, trifoliolate, or simple **1. BOSISTOA**
 - 13: Buds naked; fruit of 1–5 follicles 6–8 mm long; leaves trifoliolate **3. ACRADENIA**
 - 8: Testa with sclerotesta
 - 14 Leaves alternate; fruit of 1–5 basally connate follicles
 - 15 Seeds usually expelled from dehiscent fruit; testa thin and brittle, dull to lustrous; leaves simple **7. COATESIA**
 - 15: Seeds usually persistent in dehiscent fruit; testa with thick sclerotesta, sarcotesta, and shiny black or reddish pellicle; leaves compound or simple
 - 16 Leaves compound or mostly so; plants usually armed **8. ZANTHOXYLUM**
 - 16: Leaves simple; plants unarmed **9. GEIJERA**

RUTACEAE

- 14:** Leaves opposite or whorled (or rarely subopposite or alternate in *Medicosma*); fruit of 1–4 basally connate follicles (or carpels united into a 4-loculed septicidal capsule in *Melicope*)
- 17** Seeds usually persistent in dehiscent fruit (but see description of *M. broadbentiana*); testa with thick sclerotesta, sarcotesta, and shiny black pellicle **15. MELICOPE**
- 17:** Seeds usually expelled from dehiscent fruit; testa thin and brittle, dull to lustrous, with neither sarcotesta nor shiny black pellicle
- 18** Sepals adaxially pubescent or sparsely so; follicles 4.5–6 mm long, usually with short stylar beak; trichomes simple **12. EUODIA**
- 18:** Sepals adaxially glabrous; follicles 4–10 mm long, usually without stylar beak; trichomes simple or compound
- 19** Inflorescences 2.5–17 cm long; leaves simple; petals (deciduous or subsistent in fruit) 1.5–4 mm long; trichomes simple; follicles 4–8 mm long **13. BROMBYA**
- 19:** Inflorescences shorter than above, or, if as long, then leaves compound or petals (which are persistent or subsistent in fruit) at least 7 mm long; trichomes simple to stellate or scale-like; follicles 4–10 mm long **14. MEDICOSMA**

1. BOSISTOA

T.G.Hartley

Bosistoa F.Muell. ex Benth., *Fl. Austral.* 1: 359 (1863); after Joseph Bosisto, 1827–1898, Melbourne pharmacist.

Type: *B. sapindiformis* F.Muell. ex Benth.

Pagetia F.Muell., *Fragm.* 5: 178 (1866). T: *P. medicinalis* F.Muell.

Trees, evergreen, unarmed. Trichomes simple. Buds with 2 pairs of opposite, imbricate scales enclosing leaf or floral primordia. Leaves opposite, imparipinnate, trifoliolate, or simple, (occasional leaves bifoliolate), without domatia. Inflorescences paniculate, terminal or terminal and axillary. Flowers bisexual, 5-merous (rarely occasional flowers 4-merous). Sepals connate at base or to nearly their full length, persistent or deciduous in fruit. Petals distinct, valvate, white, deciduous in fruit. Stamens twice as many as petals, alternately unequal in length. Gynoecium subapocarpous, 5-carpelled (rarely occasional flowers 4-carpelled); carpels in ovary without prominent glands; ovules 4–6 per locule; style lateral; stigma punctiform. Fruit of 1 or 2 (rarely 3) basally connate follicles; exocarp woody; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as an ovate to elliptic, often acuminate piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds solitary, usually expelled from dehiscent fruit; testa brown, smooth, polished, membranaceous, without sclerotesta; endosperm lacking. Embryo straight or nearly so; cotyledons plano-convex, suborbicular or broadly elliptic in outline; hypocotyl terminal or subterminal, considerably narrower than cotyledons.

An endemic Australian genus of 4 species.

Since *Bosistoa* was revised (Hartley, 1977), the number of collections of the genus has more than doubled, mainly through the field work of Queensland botanists. Study of these collections, many of which come from previously unsampled populations, shows that there is considerably more variability among plants of *Bosistoa* than was previously seen, and it is evident that the differences between several of the previously recognised taxa break down. It was therefore found to be necessary to reduce the number of accepted species from 7 to 4 and to dispense with the 5 previously recognised varieties.

T.G.Hartley, A revision of the genus *Bosistoa* (Rutaceae), *J. Arnold Arbor.* 58: 416–436 (1977).

- 1 Scars of inner pair of bud scales remote from those of outer pair; ovary woolly; follicles 10–30 mm long; exocarp densely pubescent
- 2 Leaves imparipinnate and/or trifoliolate, 9–45 cm long; petals glabrous; follicles 18–30 mm long **1. *B. pentacocca***
- 2: Leaves trifoliolate and/or simple (occasional leaves bifoliolate), 5.5–16 cm long; petals pubescent abaxially; follicles 10–14 mm long **2. *B. transversa***
- 1: Scars of inner pair of bud scales directly above those of outer pair (but see description of *B. medicinalis*); ovary glabrous to villous; follicles 8–12 mm long; exocarp glabrous or nearly so or sparsely pubescent
- 3 Leaves imparipinnate, 11–28 cm long; ovary sparsely or densely hispidulous-velutinous; exocarp sparsely pubescent **3. *B. floydii***
- 3: Leaves trifoliolate and/or simple (occasional leaves bifoliolate), 5–19 cm long; ovary glabrous to hispidulous or villous; exocarp glabrous or nearly so **4. *B. medicinalis***

1. *Bosistoa pentacocca* (F.Muell.) Baill., *Hist. Pl.* 4: 470 (1873)

Euodia pentacocca F.Muell., *Fragm.* 3: 41 (1862); *B. sapindiformis* F.Muell. ex Benth., *Fl. Austral.* 1: 359 (1863), *nom. illeg.*; *Acradenia bosistoi* F.Muell., *Pap. & Proc. Roy. Soc. Tasmania* 8: 8 (1868), & *Fragm.* 6: 167 (1868), *nom. illeg.* T: Clarence R., N.S.W., *H. Beckler*; holo: MEL; iso: K.

B. connaricarpa Domin, *Feddes Repert. Spec. Nov. Regni Veg.* 12: 390 (1913); *B. pentacocca* var. *connaricarpa* (Domin) T.G.Hartley, *J. Arnold Arbor.* 58: 424 (1977). T: Rockhampton, Qld, 5 Feb. 1863, *J. Dallachy*; iso: MEL.

B. pentacocca var. *dryanderensis* T.G.Hartley, *J. Arnold Arbor.* 58: 425 (1977). T: Mt Dryander, Qld, 11 Aug. 1972, *V.K. Moriarty* 968; holo: CANB; iso: BRI.

Tree to 18 m high. Buds pubescent; scars of inner pair of bud scales remote from those of outer pair. Leaves imparipinnate and/or trifoliolate, 3–13-foliolate, 9–45 cm long; petiolules of lateral leaflets obsolete or to 8 mm long; terminal leaflet sessile or with petiolule to 40 mm long; laminae narrowly to broadly elliptic, elliptic-oblong, obovate, or oblanceolate, 4.5–27 cm long, 1.5–9 cm wide, entire to crenate or coarsely serrate, acute to acuminate. Inflorescences 5–33 cm long. Sepals connate at base or up to nearly their full length, 0.7–1 mm long, persistent in fruit. Petals 3.5–4.5 mm long, glabrous. Ovary 1–1.5 mm high, woolly; ovules 4 per locule; style glabrous. Follicles 18–30 mm long, 15–30 mm wide, ±compressed, usually with short styler beak; exocarp densely pubescent. Seeds subellipsoid or subreniform, 10–20 mm long.

Native Almond, Union Nut.

Occurs from Bowen, east-central Qld, to the Clarence R., NE N.S.W.; in rain forest (often dry), near sea level to 450 m alt. Flowers Jan.–Feb. (May); fruits recorded most months.

Qld: S.F. 50, 3.5 km S of Mt Urah, *P.I. Forster* 4841 (CANB); Bulburin S.F., upper Granite Ck, *W.J.F. McDonald* 3263 *et al.* (CANB); Beechmont, *C.T. White* 1912 (A, BRI, NSW, P). N.S.W.: Tintenbar, Oct. 1893, *W. Baeuerlen s.n.* (NSW, U); 3.2 km SW of Wiangaree, *H.C. Hayes et al.* 2554 (NSW).



2. *Bosistoa transversa* J.F.Bailey & C.T.White, *Bot. Bull. Dept. Agric., Queensland* 19: 7, t. 2 (1917)

T: Kin Kin, Qld, Mar. 1916, *W.D. Francis & C.T. White*; lecto: BRI, *fide* T.G.Hartley, *J. Arnold Arbor.* 58: 426 (1977).

B. selwynii T.G.Hartley, *J. Arnold Arbor.* 58: 428, fig. 2 (1977). T: Little Derrier L.A., S.F.R. 135, Imbil, Qld, *V.K. Moriarty* 1644; holo: CANB; iso: BRI.

Illustrations: J.F.Bailey & C.T.White, *op. cit.* t. 2; T.G.Hartley, *op. cit.* 427, as *B. selwynii*.

Tree to 22 m high. Buds pubescent; scars of inner pair of bud scales remote from those of outer pair. Leaves trifoliolate and/or simple (occasional leaves bifoliolate). Trifoliolate leaves 8.5–16 cm long; petiolules of lateral leaflets obsolete or to 5 mm long; terminal leaflet with petiolule 8–25 mm long; laminae narrowly to broadly elliptic or obovate, 4–12.5 cm

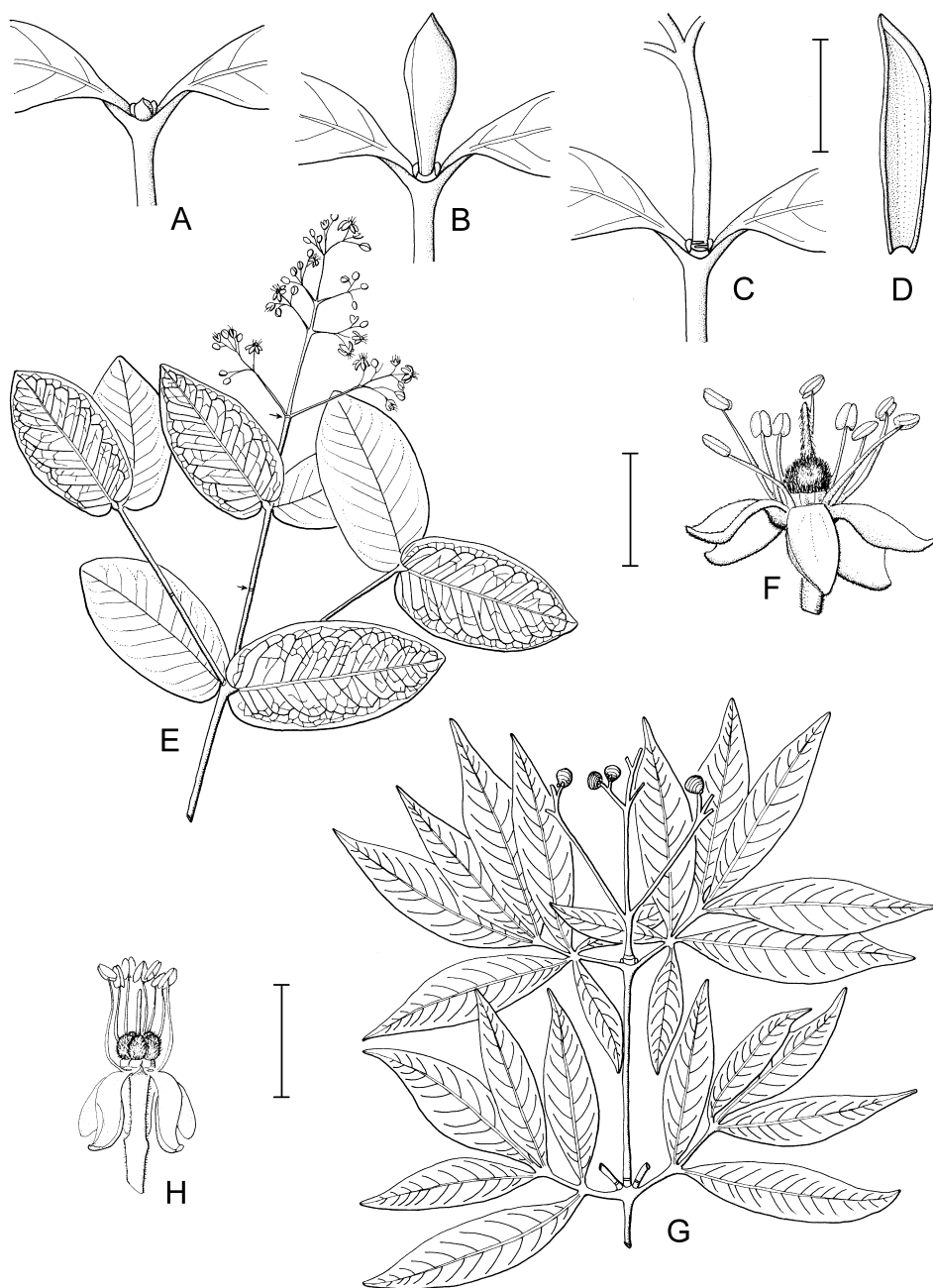


Figure 5. *Bosistoa*. **A–D**, *B. medicinalis*. **A**, branchlet apex showing terminal bud and 2 axillary buds; **B**, branchlet apex shortly after opening of terminal bud (outer bud scales fallen); **C**, stage after further elongation of inflorescence (both pairs of bud scales fallen); **D**, fully enlarged inner bud scale fallen from new shoot. **E**, **F**, *B. transversa*. **E**, flowering branchlet; **F**, flower with 1 stamen removed (**E**, **F**, V.Moriarty 1644, CANB). **G**, **H**, *B. floydii*. **G**, fruiting branchlet; **H**, flower with 3 stamens removed (**G**, A.Floyd s.n., 25 Feb. 1975, CANB; **H**, A.Floyd s.n., 21 Oct. 1974, CANB). Scale bars: **A–D** = 1 cm; **E**, **G** = 5 cm; **F**, **H** = 5 mm. Drawn by T.Hartley, reproduced with permission from *J. Arnold Arbor.* 58: 420, 427, 429 (1977).

long, 1–6 cm wide, entire, obtuse to acuminate. Simple leaves 3.5–16 cm long; petiole obsolete or to 1.2 cm long; lamina suborbicular or ovate to obovate, 3.5–15 cm long, 2–9 cm wide, cordate to rounded or acute at base, entire, rounded to acuminate at apex. Inflorescences 1.5–16 cm long. Sepals basally connate, 0.7–1.5 mm long, persistent in fruit. Petals 3–4.5 mm long, pubescent abaxially. Ovary 0.7–1.5 mm high, woolly; ovules 4 per locule; style pubescent or sparsely so, at least towards base. Follicles obovoid, 10–14 mm long; exocarp densely pubescent. Seeds \pm reniform, c. 10 mm long. *Yellow Satinheart*. Fig. 5E, F.

Occurs from Mt Larcom, east-central Qld, to Mullimbimby, NE N.S.W.; in rain forest (often dry), near sea level to 500 m alt. Flowers Dec.–May; fruits recorded most months.

Qld: Mt Brisbane, Rough L.A., 24 June 1989, *L.H.Bird & D.Orford* (CANB); McIntyres Scrub 6 km W of Woombye, *P.I.Forster 6202 et al.* (CANB); Mt Larcom, 5 Mar. 1989, *M.C.Tucker* (BRI, CBG). N.S.W.: Tongoggin Mtn, Feb. 1895, *W.Baerlen s.n.* (NSW); North Pumpenbil Ck below Cockscomb Point, *A.G.Floyd 386* (CANB).



3. *Bosistoa floydii* T.G.Hartley, *J. Arnold Arbor.* 58: 428, fig. 3 (1977)

T: Miram Ck, upper Orara R., N.S.W., 25 Feb. 1975, *A.G.Floyd s.n.*; holotype: CANB.

Illustration: T.G.Hartley, *op. cit.* 429.

Tree to 15 m high. Buds pubescent; scars of inner pair of bud scales directly above those of outer pair. Leaves imparipinnate, 5–7-foliolate, 11–28 cm long; petiolules of lateral leaflets obsolete or to 8 mm long; terminal leaflet sessile or with petiolule to 20 mm long; laminae elliptic or narrowly so, 4–16 cm long, 0.7–5 cm wide, entire, acuminate. Inflorescences 10–16 cm long. Sepals basally connate, c. 1 mm long, persistent in fruit. Petals glabrous, 4–5 mm long. Ovary c. 1 mm high, sparsely to densely hispidulous-velutinous; ovules 5 per locule; style glabrous. Follicles obliquely obovoid or subglobose, c. 10 mm long; exocarp sparsely pubescent. Seeds broadly ellipsoid, c. 7 mm long. *Five-leaved Bonewood*. Fig. 5G, H.

Occurs in NE N.S.W. in the vicinity of Dorrigo and Coffs Harbour; in rain forest. Flowers Oct.; fruits Feb.

N.S.W.: upper Orara R., 23 Feb. 1974, *A.G.Floyd s.n.* (CFSHB); *loc. id.*, Oct. 1974, *A.G.Floyd s.n.* (CFSHB); Oakes S.F., 17 Jan. 1962, *H.C.Hayes s.n.* (CFSHB); Dorrigo Natl Park, Dec. 1962, *J.B.Williams s.n.* (NSW).



4. *Bosistoa medicinalis* (F.Muell.) T.G.Hartley, *J. Arnold Arbor.* 58: 431 (1977)

Pagetia medicinalis F.Muell., *Fragm.* 5: 178 (1866). T: Rockhampton, Qld, *J.O'Shanesy 247*; lectotype: MEL, *vide* T.G.Hartley, *J. Arnold Arbor.* 58: 431, 432 (1977).

P. monostylis F.M.Bailey, *Bot. Bull. Dept. Agric., Queensland* 13: 7 (1895); *B. monostylis* (F.M.Bailey) T.G.Hartley, *J. Arnold Arbor.* 58: 430 (1977). T: Eumundi, Qld, Nov. 1895, *F.M.Bailey (Field Naturalists' Excursion)*; holotype: BRI; isotype: NSW, W.

P. dietrichiae Domin, *Biblioth. Bot.* 89: 291 (1927). T: "Brisbane River" [probably Rockhampton], Qld, 1863–1865, *A.Dietrich*; 5 syntype coll.: 643 (HBG, PR), 1436 (MEL), 1544 (HBG, MEL, NY, PR), 1768 (HBG, PR), and 2212 (HBG, MEL, PR).

B. brassii T.G.Hartley, *J. Arnold Arbor.* 58: 433, figs. 1 & 4 (1977). T: Iron Ra., Cape York Penin., Qld, 23 July 1948, *L.J.Brass 19653*; holotype: CANB; isotype: L.

B. brassii var. *proserpinensis* T.G.Hartley, *J. Arnold Arbor.* 58: 434 (1977). T: Mt Dryander, Qld, 3 Oct. 1968, *W.T.Jones 3857*; holotype: CANB.

Illustrations: T.G.Hartley, *op. cit.* 420, 434, as *B. brassii* var. *brassii*.

Tree to 20 m high. Buds glabrous to pubescent; scars of inner pair of bud scales directly above (very rarely to c. 5 mm above) those of outer pair. Leaves trifoliolate and/or simple (occasional leaves bifoliolate). Trifoliolate leaves 7–18 cm long; lateral leaflets sessile or subsessile; terminal leaflet with petiolule 3–17 mm long; laminae ovate to obovate, or

narrowly so, 3.5–14 cm long, 1–5.5 cm wide, entire, obtuse to acuminate. Simple leaves 5–19 cm long; petiole 0.1–1.5 cm long; lamina suborbicular or ovate to obovate, 4.5–18.5 cm long, 2–9 cm wide, cordate to acute or attenuate at base, entire, obtuse to acuminate at apex. Inflorescences 5–10 cm long. Sepals basally connate, 0.5–1 mm long, deciduous in fruit. Petals 3–4.5 mm long, puberulous abaxially at least at margin and/or towards apex. Ovary 0.8–1 mm high, glabrous to hispidulous or villous; ovules 4–6 per locule; style glabrous. Follicles ovoid to subglobose, 9–12 mm long; exocarp becoming glabrous. Seeds ovoid or subreniform, c. 8 mm long. Plate 13; Fig. 5A–D.

Occurs from the Pascoe R., NE Qld, to Woombye, SE Qld; in rain forest (often dry), sea level to 600 m alt. Flowers Feb.–Oct.; fruits Oct.–Mar.

Qld: Stony Ck, 4 km E of Didcot, *P.I. Forster 4707* (CANB); 6 km W of Woombye, *P.I. Forster 6150 et al.* (BRI, CANB); Deep Ck, c. 15 km N of Coalstoun Lakes, *G.P. Guymier 1547 & L.W. Jessup* (CANB); Pascoe R., Horse Ck, *B. Hyland 6435* (CANB); Yarrabah, *N. Michael 435* (BRI, GH, NSW).



2. BOUCHARDATIA

T.G. Hartley

Bouchardatia Baill., *Adansonia* 7: 350 (1867); after A. Bouchardat, 1806–1886, French professor of medicine.

Type: *B. australis* Baill.

Shrubs or trees, evergreen, unarmed. Trichomes simple. Buds naked. Leaves opposite, imparipinnate and/or trifoliolate (occasional leaves bifoliolate or simple), with pocket-domatia in axils of secondary veins. Inflorescences paniculate, terminal or terminal and axillary. Flowers bisexual, 4-merous. Sepals basally connate, deciduous in fruit. Petals distinct, narrowly imbricate, deciduous in fruit. Stamens 8, alternately unequal in length. Gynoecium subapocarpous, 4-carpelled; carpels in ovary without prominent glands; ovules 6–8 per locule; style subapical; stigma punctiform or capitate. Fruit of 1–4 basally connate follicles; exocarp woody, nearly glabrous to sparsely hispidulous or minutely pilose; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as an elliptic piece of tissue; dorsilateral endocarp cartilaginous, nearly glabrous to sparsely pubescent, separate and usually expelled from dehiscent fruit. Seeds solitary, expelled from dehiscent fruit; testa brown, smooth, polished, membranaceous, without sclerotesta; endosperm scant or lacking. Embryo straight; cotyledons plano-convex, elliptic in outline; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of one species.

Bouchardatia is apparently unique among Australian plants of the Group 1 genera in possessing domatia. In fresh leaves these were found to be inhabited by oribatid mites, most species of which are herbivorous and live in humus of the forest floor (Murray Wallace, CSIRO Division of Entomology, pers. comm.).

T.G. Hartley, A revision of the genus *Bosistoa* (Rutaceae), *J. Arnold Arbor.* 58: 416–417 (1977).

Bouchardatia neurococca (F. Muell.) Baill., *Adansonia* 9: 110 (1868)

Euodia neurococca F. Muell., *Fragm.* 1: 28 (1858); *Melicope neurococca* (F. Muell.) Benth., *Fl Austral.* 1: 360 (1863). T: Brisbane R. [Qld], *W. Hill* (as *Hill & Mueller* in protologue); holo: MEL.

B. australis Baill., *Adansonia* 7: 351, t. 10 (1867). T: Australia orientali-boreali, *L. Leichhardt*; possible type: P (Bellija R. [Qld], Dec. 1843, *L. Leichhardt 119*).

Shrub, or tree to 8 m high. Leaves 3–5-foliolate, 6–24 cm long; petiolules of lateral leaflets 1.5–3.5 mm long; terminal leaflet with petiolule 5–30 mm long; laminae elliptic or narrowly



Figure 6. A–F, *Bouchardatia neurococca*. A, flowering branchlet; B, domatium; C, flower, 1 petal removed; D, dehiscent fruit; E, dorsilateral endocarp; F, seed, lacking ventral endocarp (A–C, P.Beasley 1140, CBG; D–F, W.McDonald 3808, CBG). G–I, *Flindersia brayleyana*. G, fruiting branchlet; H, flower; I, seed (G, I.Telford 11321 & R.Rudd, CBG; H, R.Booth *et al.* 2827, CANB; I, G.Stocker 807, CANB). J–L, *F. collina*. J, habit; K, flower; L, fruit (J, L, A.Rodd 4217, CANB; K, B.Gray 7562, CANB). Scale bar: A, G, J = 70 mm; B = 0.5 mm; C = 3.5 mm; D = 9 mm; E, F = 6 mm; H = 4 mm; I = 5 mm; K = 3 mm; L = 4 mm. Drawn by J.Miller.

so, in larger leaflets 5–15 cm long, 1.5–5 cm wide, entire, acuminate or rarely acute. Inflorescences 5–10 cm long. Sepals 0.8–1.5 mm long. Petals 4–5 mm long, white, glabrous. Follicles truncately obovoid, 8–10 mm long, usually with short stylar beak. Seeds narrowly ellipsoid, 6–7 mm long. *Union Nut*. Plate 14; Fig. 6A–F.

Occurs from Mackay, east-central Qld, to the Richmond R., NE N.S.W.; in rain forest (usually dry), from near sea level to 630 m alt. Flowers Oct.–July; fruits recorded Apr–Sept.

Qld: Port Mackay, *A.Dietrich 2432* (MEL, NY, PR); Tamborine Mtn, Feb. 1917, *H.A.Longman & C.T.White* (BRI); Boyne Valley c. 60 km SSW of Gladstone, *W.J.McDonald 3808* (BRI, CBG). N.S.W.: Lismore, Rotary Park, *P.Beesley 1140* (CBG); Richmond R., *C.Fawcett 101* (NSW).



Excluded species

Bouchardatia cyanosperma Ridl., *Trans. Linn. Soc. London, Bot.* 9: 25 (1916)

T: Canoe Camp, New Guinea; *n.v.*

This is conspecific with *Melicope novoguineensis* Valetton, a New Guinea endemic.

3. ACRADENIA

T.G.Hartley

Acradenia Kippist, *Proc. Linn. Soc. London* 2: 201 (1853); from the Greek *akros* (tip) and *aden* (gland), referring to the prominent upper-abaxial gland on each carpel of the ovary.

Type: *A. frankliniae* Kippist

Luerssenidendron Domin, *Biblioth. Bot.* 89: 289 (1927). T: *L. monostylis* Domin

Shrubs or trees, evergreen, unarmed. Trichomes simple. Buds naked. Leaves opposite, trifoliolate, without domatia. Inflorescences panicle, terminal and/or axillary. Flowers bisexual, 5-merous (rarely occasional flowers 6-merous). Sepals basally connate, 1–1.5 mm long, persistent in fruit. Petals imbricate, distinct, deciduous in fruit. Stamens twice as many as petals, alternately unequal in length. Gynoecium subapocarpous, 5-carpelled (rarely in occasional flowers 4-carpelled); carpels in ovary each with prominent upper-abaxial gland; ovules 2 per locule; style apical (but inserted below the level of the prominent glands); stigma punctiform. Fruit of 1–5 basally connate follicles, these truncately obovoid, 6–8 mm long; exocarp woody, tomentose; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as a triangular, ovate, or lanceolate piece of tissue; dorsilateral endocarp cartilaginous, separate and usually expelled from dehiscent fruit. Seeds solitary, narrowly to broadly and obliquely pyriform, c. 5 mm long, expelled from dehiscent fruit; testa brown, smooth, polished, membranaceous, without sclerotesta; endosperm scant. Embryo straight; cotyledons plano-convex, ovate in outline; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of 2 species.

T.G.Hartley, A revision of the genus *Acradenia* (Rutaceae), *J. Arnold Arbor.* 58: 171–181 (1977).

Petioles 1–7.5 cm long; leaflet laminae 4–23 cm long; inflorescences axillary or rarely terminal, 6–21 cm long

1. *A. euodiiformis*

Petioles 0.3–0.8 cm long; leaflet laminae 2–6 cm long; inflorescences terminal or terminal and axillary, 2–5 cm long

2. *A. frankliniae*

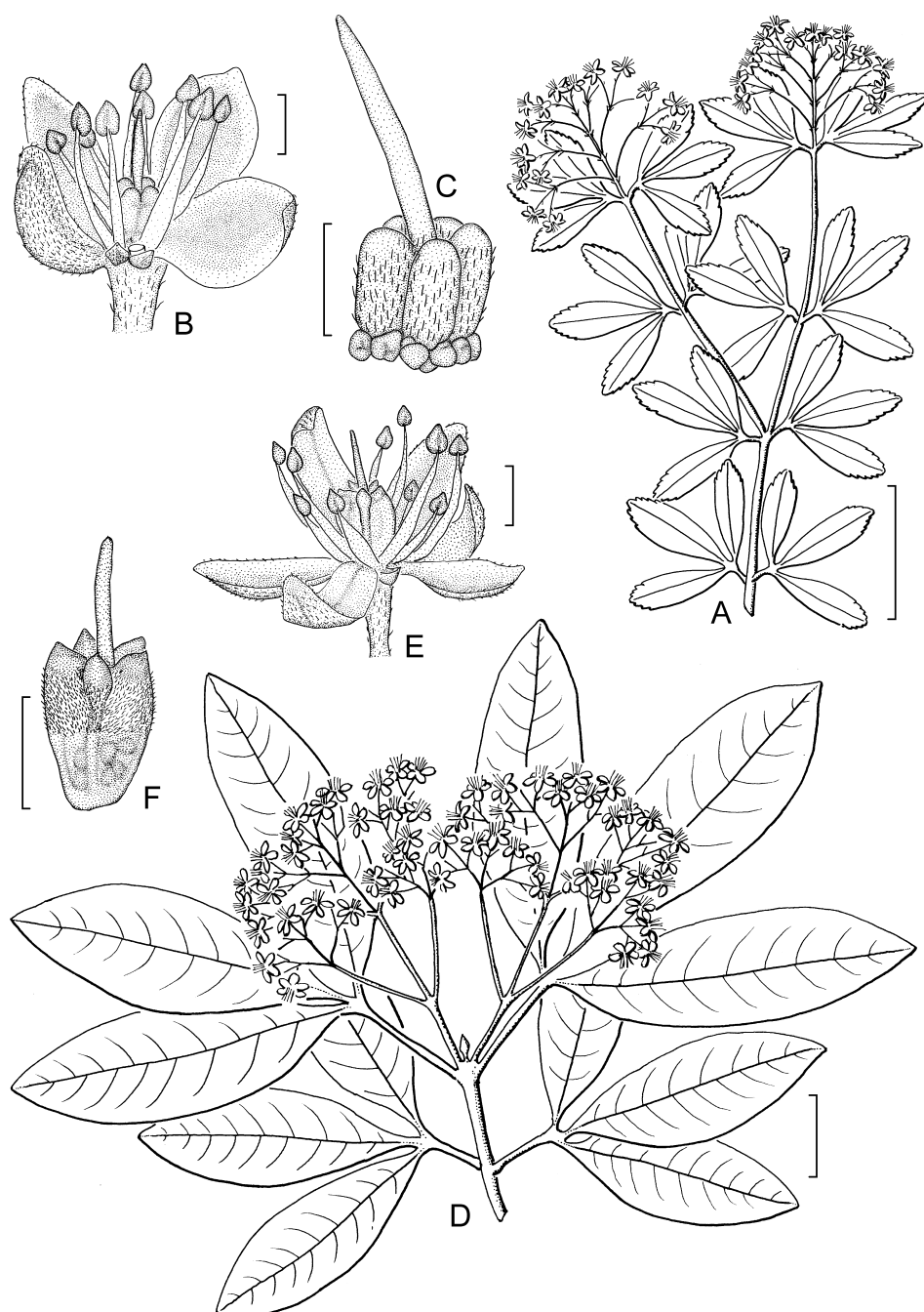


Figure 7. *Acradenia*. A–C, *A. frankliniae*. A, flowering branchlet; B, flower, 1 petal & 1 stamen removed; C, gynoecium (A, J. Milligan 727, GH, NY; B, C, A.M. Gray 413, CANB). D–F, *A. euodiiformis*. D, flowering branchlet; E, flower; F, gynoecium (D, W. Jones 13, BRI; E, F, C. Hayes 2508 *et al.*, CANB). Scale bar: A = 3 cm; B, C, E, F = 2 mm; D = 5 cm. A, D, drawn by T. Hartley, reproduced with permission from *J. Arnold Arbor.* 58: 176, 179 (1977); B, C, E, F drawn by A. Orchard.

1. *Acradenia euodiiformis* (F.Muell.) T.G.Hartley, *J. Arnold Arbor.* 58: 176, fig. 1 (1977)

Bosistoa euodiiformis F.Muell., *Fragm.* 9: 174 (1875), as *euodiformis*. T: upper Clarence R., N.S.W., Nov. 1875, *J.F.Wilcox*; holo: MEL.

Luerssenidendron monostylis Domin, *Biblioth. Bot.* 89: 289, t. 29 (1927). T: head of Hastings R., N.S.W., *C.Moore*; holo: K; iso: GH.

Illustrations: K.Domin, *op. cit.* t. 29, as *L. monostylis*; T.G.Hartley, *loc. cit.*

Tree to 30 m high. Branchlets becoming glabrous, smooth. Leaves: petiole 1–7.5 cm long; laminae sessile or subsessile, narrowly elliptic to oblanceolate, 4–23 cm long, 1.2–6.5 cm wide, cuneate to attenuate at base, entire or sometimes crenate distally, obtuse to acute or occasionally acuminate at apex. Inflorescences axillary or rarely terminal, 6–21 cm long. Petals 5.5–6.5 mm long, white to cream, tomentose abaxially, sparsely pubescent adaxially. Dorsilateral endocarp glabrous. *Bonewood, Yellow Satinheart*. Fig. 7D–F.

Occurs from the McPherson Ra., SE Qld, to the Hunter R., central-eastern N.S.W.; in rain forest, 60–1200 m alt. Flowers Sept.–Jan.; fruits recorded May.

Qld: Lamington Plateau, Morans Ck Paddock, *T.M.Whaite 3032* (NSW); Lamington Natl Park, near Mt Hobwee, *C.T.White 6172* (A, BRI, NY, UC). N.S.W.: Whian Whian S.F., 15 Jan. 1953, *E.F.Constable* (L, NSW, US); Booral, 30 Oct. 1892, *A.Rudder* (NSW); Dingo S.F. 24 km W of Wingham, *R.Schodde 5117* (CANB).



2. *Acradenia frankliniae* Kippist, *Proc. Linn. Soc. London* 2: 201 (1853)

T: Franklin R., western Tas., Apr. 1842, *J.Milligan 1038*; holo: K.

Illustrations: M.Stones & W.M.Curtis, *Endemic Fl. Tasmania* 5: t. 167 (1975); T.G.Hartley, *J. Arnold Arbor.* 58: 179, fig. 2 (1977).

Shrub, or tree to 7 m high. Branchlets sparsely to densely puberulous, pustular-glandular. Leaves: petiole 0.3–0.8 cm long; laminae sessile or subsessile, narrowly elliptic to oblanceolate, 2–6 cm long, 0.5–2 cm wide, cuneate at base, entire proximally, crenate distally, rounded to obtuse at apex. Inflorescences terminal or terminal and axillary, 2–5 cm long. Petals 4.5–6 mm long, white, sparsely pubescent. Dorsilateral endocarp sparsely hairy. *Whity Wood*. Plate 18; Fig. 7A–C.

Occurs in western Tas. from the Pieman R. S to the Gordon R.; in rain forest, near sea level to 200 m alt. Flowers Nov.–Feb.; fruits Feb.–May.

Tas.: Franklin R., Nov. 1932, *M.Atkinson* (HO); King River Gorge road between Mt Huxley and Mt Jukes, *R.Burns 231* (CBG); King River road between Regatta Point and Teepookana, *A.M.Gray 413* (CANB); Gordon R., 13 Dec. 1946, *A.M.Olsen* (HO); Pieman R., *A.Simson 1735* (MEL).



4. DINOSPERMA

T.G.Hartley

Dinosperma T.G.Hartley, *Adansonia*, sér. 3. 19: 190 (1997); from the Greek *dinos* (whirl), and *sperma* (seed), referring to the convolute cotyledons.

Type: *D. melanophloium* (C.T.White) T.G.Hartley

Shrubs or trees, evergreen, unarmed. Trichomes simple. Buds with 2 pairs of caducous, opposite, ±imbricate scales. Leaves opposite or whorled (subopposite or alternate in occasional shoots), simple, or impari- or paripinnate, trifoliolate (bifoliolate in occasional

leaves), without domatia. Inflorescences paniculate, terminal or terminal and axillary. Flowers bisexual, 4-merous. Sepals connate at base or up to c. $\frac{1}{3}$ length, persistent in fruit. Petals narrowly imbricate or valvate, distinct, deciduous in fruit. Stamens 8, distinct, alternately \pm unequal in length. Gynoecium subapocarpous, 4-carpelled; carpels in ovary without prominent glands; ovules (as far as known) 2 per locule; style apical; stigma punctiform or capitellate. Fruit of 1–4 basally connate follicles; exocarp woody or subfleshy, brown or attractively coloured (red or orange); abortive carpels persistent. Seeds (as far as known) solitary or rarely in pairs, ovoid to ellipsoid; testa dull to lustrous, without sclerotesta; endosperm lacking. Embryo (as far as known) straight; cotyledons flattened, convolute and folded in seed; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of 4 species.

- | | |
|---|---|
| <p>1 Leaves compound or mostly so; exocarp orange to red, subfleshy</p> <p>1: Leaves simple; exocarp brown, woody</p> <p>2 Leaves 15–30 cm long; petiole 0.1–0.5 cm long; lamina narrowly cordate at base</p> <p>2: Leaves 5–17.5 cm long; petiole 0.4–3.5 cm long; lamina acute to attenuate at base</p> <p>3 Secondary veins of leaf lamina 8–10 (–14) on each side of midrib; inflorescences 6–12 cm long; follicles 8–10 mm long; dorsilateral endocarp sparsely pubescent</p> <p>3: Secondary veins of leaf lamina 11–17 on each side of midrib; inflorescences 1.5–3 cm long; follicles 10–15 mm long; dorsilateral endocarp glabrous</p> | <p>4. <i>D. erythrococcum</i></p>
<p>3. <i>D. longifolium</i></p>
<p>1. <i>D. melanophloium</i></p>
<p>2. <i>D. stipitatum</i></p> |
|---|---|

1. *Dinosperma melanophloium* (C.T.White) T.G.Hartley, *Adansonia*, sér. 3. 19: 192, fig. 1 (1997), as *melanophloia*

Melicope melanophloia C.T.White, *Bot. Bull. Dept. Agric., Queensland* 20: 8, fig. on p. 9 (1918). T: Kin Kin, Qld, Jan. 1917, *C.T.White s.n.*; holo: BRI; iso: A, MEL, NY.

Illustrations: C.T.White, *op. cit.* 9; T.G.Hartley, *op. cit.* 193.

Tree to 10 m high. Leaves opposite, (alternate in occasional shoots), simple, 7–17.5 cm long; petiole 0.5–3.5 cm long; lamina elliptic, 6.5–16 cm long, 2–7 cm wide, acute to attenuate at base, entire, narrowly obtuse to acuminate at apex, with 8–10 (–14) secondary veins on each side of midrib. Inflorescences 6–12 cm long. Sepals 1–1.2 mm long. Petals narrowly imbricate, 5.5–6.5 mm long, white, short-sericeous abaxially, puberulous adaxially at least in distal $\frac{1}{2}$. Ovary pubescent. Follicles truncately ellipsoid to obovoid, 8–10 mm long; exocarp brown, woody, tomentose; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and \pm persistent on seed as an ovate to lanceolate piece of tissue; dorsilateral endocarp cartilaginous, sparsely pubescent, separate and usually expelled from dehiscent fruit. Seeds 6–8.5 mm long, expelled from dehiscent fruit; testa membranaceous, brown or blackish, lustrous. *Hard Aspen*. Fig. 8.

Occurs from the McIlwraith Ra., NE Qld, to the Blackall Ra., SE Qld; in rain forest (often dry), 60–1000 m alt. Flowers Oct.–May; fruits recorded most months.

Qld: Conway Ra. E of Proserpine, *N.Byrnes & J.Clarkson* 3853 (CANB); Mt Larcom Ra., Targinie, *N.Gibson* 1146 (CBG); S.F.R. 607, Bridle L.A., *B.Hyland* 5948 (BRI, CNS, L, LAE); upper Massey Ck, NE of Coen, *W.T.Jones* 2288 (CANB); Blackall Ra. near Palmwoods, 15 Jan. 1979, *G.Thorpe* (CANB).



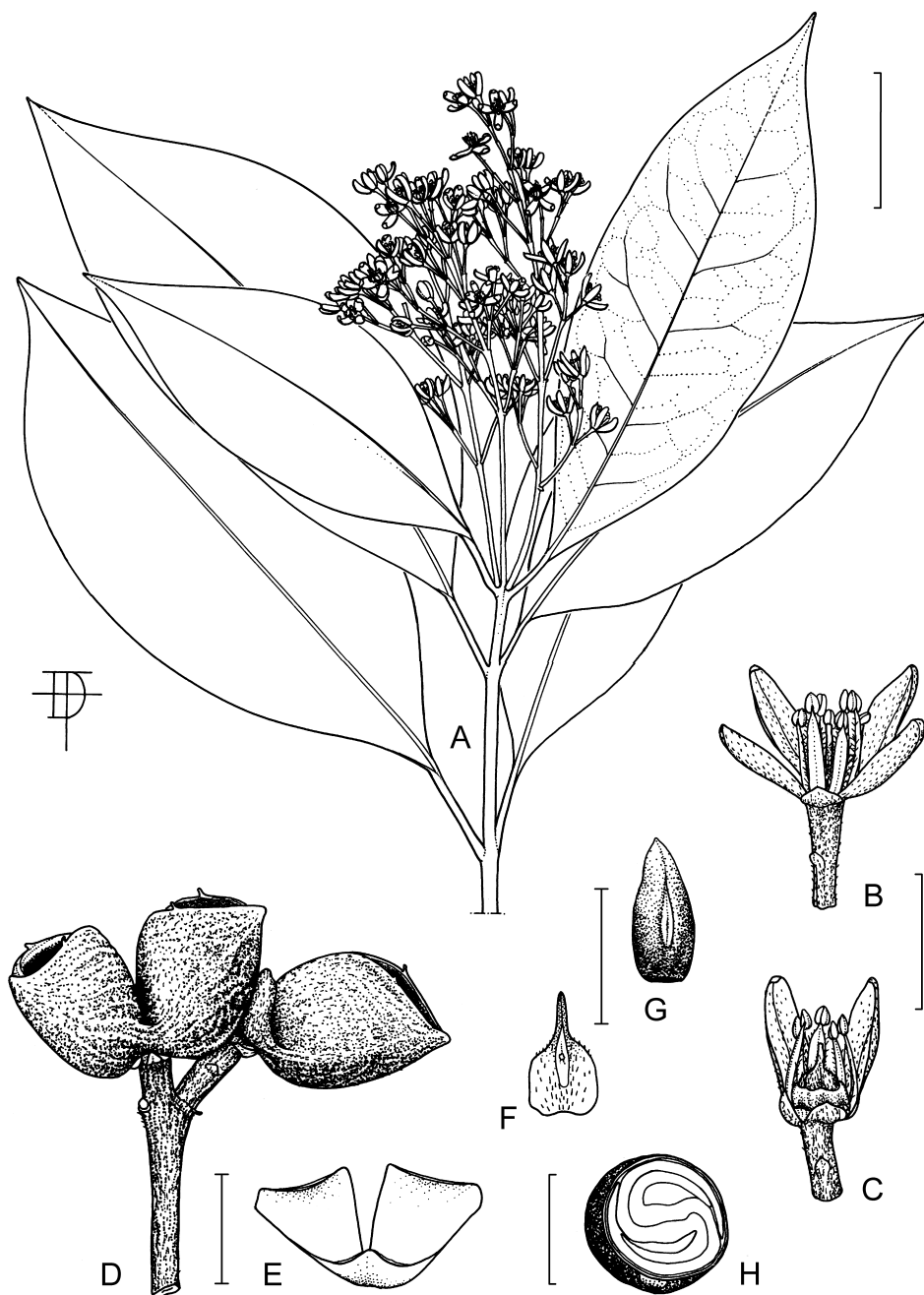


Figure 8. *Dinosperma melanophloium*. A, flowering branchlet; B, C, flowers; D, dehiscent fruits; E, dorsilateral endocarp; F, ventral endocarp; G, seed; H, T.S. of seed (A, B.Hyland 5948, CNS; B, C, B.Hyland RFK2566, CANB; D–H, W.Jones 2288, CANB). Scale bars: A = 3 cm; B, C = 5 mm; D–G = 6 mm; H = 3 mm. Drawn by D.Fortescue. Reproduced with permission from *Adansonia* sér. 3. 19(2): 193 (1997).

2. *Dinosperma stipitatum* (C.T.White & W.D.Francis) T.G.Hartley, *Adansonia*, sér. 3. 19: 192 (1997), as *stipitata*

Melicope stipitata C.T.White & W.D.Francis, *Proc. Roy. Soc. Queensland* 37: 153, t. 2 (1926). T: Glenallyn, Malanda, Qld, *H.C.Hayes*; holo: BRI.

Illustration: C.T.White & W.D.Francis, *op. cit.* t. 2.

Shrub, or tree to 15 m high. Leaves opposite or in whorls of 3 or 4, simple, 5–17 cm long; petiole 0.4–1.2 cm long; lamina elliptic or elliptic-obovate, or narrowly so, 4.5–16 cm long, 1–4.7 cm wide, acute to attenuate at base, entire, narrowly obtuse to acuminate at apex, with 11–17 secondary veins each side of midrib. Inflorescences 1.5–3 cm long. Sepals 0.6–0.8 mm long. Petals valvate, 4–6 mm long, white or cream, densely puberulous at margin, otherwise glabrous to sparsely puberulous abaxially and pubescent adaxially. Ovary pubescent or sparsely so. Follicles broadly ellipsoid to obovoid with rounded to ±obliquely truncate apex, 10–15 mm long; exocarp brown, woody, becoming glabrous, rarely pubescent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as an ovate to lanceolate piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds 8–11 mm long, expelled from dehiscent fruit; testa subcoriaceous, reddish brown or blackish, dull to rather lustrous. *Turkey Bush*.

Occurs in NE Qld from Gap Ck S to Rockingham Bay; in rain forest, 230–800 m alt. Flowers and fruits most months.

Qld: head of Roaring Meg Ck, *M.Godwin* C 2581 (BRI); Davies Ck forestry road, *R.D.Hoogland* 8534 (BRI, CANB); T.R. 1230, Boonjie L.A., *B.Hyland* 6678 (BRI, CNS, L, LAE); Koolmoon Ck, *L.S.Smith* 4734 (BISH, BRI, CANB, LAE); Gap Ck c. 38 km S of Cooktown, *L.S.Smith* 11113 (A, BRI, L).



3. *Dinosperma longifolium* T.G.Hartley, *Adansonia*, sér. 3. 19: 195, fig. 3 (1997), as *longifolia*

T: Freshwater Ck, S.F.R. 607, Qld, 11 Jan. 1966, *D.I.Nicholson* 4018; holo: BRI; iso: CNS.

Illustration: T.G.Hartley, *op. cit.* 197.

Tree 4–7 m high. Leaves opposite or in whorls of 3 or 4, simple, 15–30 cm long; petiole 0.1–0.5 cm long; lamina narrowly elliptic to narrowly obovate, 15–30 cm long, 3.5–7.5 cm wide, narrowly cordate at base, entire, acute or subacuminate at apex, with 18–27 secondary veins on each side of midrib. Inflorescences 6–30 cm long. Flowers only seen in bud. Sepals c. 1 mm long. Petals (colour unknown) narrowly imbricate, c. 2 mm long, glabrous. Ovary glabrous. Follicles asymmetrically obovate with obliquely truncate apex, c. 20 mm long; exocarp brown, woody, glabrous; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Ventral endocarp and ripe seeds not seen.

Known only from Freshwater Ck and the East Mulgrave R., NE Qld; in rain forest, 800–1000 m alt. Flowers recorded Jan., July; fruits recorded July, Sept.

Qld: Freshwater Ck, S.F.R. 607, *S.J.Dansie* 2193 (BRI); E Mulgrave R., Wooroonooran Natl Park, *P.I.Forster* 26440 *et al.* (CANB).

As far as known, this plant is correctly placed in *Dinosperma*, but the seeds at hand are immature and the embryo, which is minute, does not show the convolute cotyledons that are characteristic of the genus.



4. *Dinosperma erythrococcum* (F.Muell.) T.G.Hartley, *Adansonia*, sér. 3. 19: 196 (1997), as *erythrococca*

Euodia erythrococca F.Muell., *Fragm.* 1: 28 (1858); *Melicope erythrococca* (F.Muell.) Benth., *Fl. Austral.* 1: 360 (1863). T: Moreton Bay [Qld], *W.Hill & F.Mueller*; lecto: MEL, *fide* T.G.Hartley, *loc. cit.*

Tree to 23 m high. Leaves opposite (subopposite or alternate in occasional shoots), impari- or paripinnate or trifoliolate (occasional leaves bifoliolate or simple), 3–5-foliolate, 5–20 cm long; petiolules of lateral leaflets obsolete or to 7 mm long; terminal leaflet sessile or with petiolule to 30 mm long; laminae ovate to elliptic or narrowly so, 3–10 (–12) cm long, 1–3 (–5) cm wide, entire or inconspicuously crenulate, obtuse to acute or subacuminate at apex, with 10–17 secondary veins on each side of midrib. Inflorescences 3.5–9 cm long. Sepals 0.8–1 mm long. Petals valvate, 3.5–4 mm long, greenish cream to pale yellow, puberulous abaxially, pubescent adaxially. Ovary glabrous to rather sparsely pubescent. Follicles ellipsoid, 6–8.5 mm long; exocarp orange to red, subfleshy, glabrous or becoming so; ventral and dorsilateral endocarp thinly cartilaginous, glabrous, connate towards base and adnate to base of follicle. Seeds 3.5–4.5 mm long, persistent in dehiscent fruit; testa coriaceous, black or bluish black, glossy. *Tingle Tongue*. Plate 16.

Occurs from Iron Range Natl Park, NE Qld, to Kangaroo River State Forest, NE N.S.W.; in rain forest (often dry), 60–1000 m alt. Flowers and fruit most of year.

Qld: between Iron Ra. and Portland Roads, *A.Dockrill* 553 (BRI, CNS); Bridle Ck c. 19 km SE of Mareeba, *T.G.Hartley & B.Hyland* 14122 (CANB); Barrabas Scrub, *B.Hyland* 6061 (BRI, CNS, L); Balfour (Blackbutt) Ra., Commissioners View, *W.J.McDonald* 4151 (CBG). N.S.W.: Unumgar, *W.T.Jones* 3159 (CANB).



The vernacular name for this species refers to a property of the bark to produce a tingling sensation when placed in the mouth. Also, the bark is reputed to have irritating effects on the eyes of axemen cutting the trees. Bancroft (*Proc. Roy. Soc. Queensland* 8: 35–36 (1891)) tested the plant (presumably a decoction of the bark) on frogs and found that it caused reflex excitability followed by paralysis and death. In a chemical analysis of the bark, Jones & White (*Proc. Roy. Soc. Queensland* 41: 154–157 (1930)) found that the monoterpenoid elemicin was the principal constituent (90%) of the essential oil and that the triterpenoid lupeol was also present, but not in the oil. They believed elemicin to be the substance responsible for the above-mentioned effects on humans.

5. LUNASIA

T.G.Hartley

Lunasia Blanco, *Fl. Filip.* 783 (1837); from the Tagalog word *Lunas* (one of the vernacular names for the type species).

Type: *L. amara* Blanco

Shrubs or trees, dioecious, evergreen, unarmed. Trichomes simple and compound (fasciculate, stellate, or scale-like). Buds naked. Leaves alternate, simple. Inflorescences panicate or racemose, axillary, with flowers in small capitate clusters. Flowers 3-merous. Sepals basally connate, persistent in fruit. Petals distinct, valvate, pubescent abaxially, glabrous adaxially, persistent in fruit. Male flowers: stamens 3; gynoecium rudimentary, pulvinate, with neither functional ovules nor differentiated styles. Female flowers: stamens rudimentary, similar to functional stamens but anthers lacking pollen; gynoecium subapocarpous, 3-carpelled; carpels in ovary without prominent gland; ovules 1 per locule; styles 3, subapical, recurved, each with flattened stigma. Fruit of 1–3 basally connate follicles; exocarp woody, puberulous; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as

an ovate to elliptic piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds solitary, expelled from dehiscent fruit; testa brown, smooth, ±polished, membranaceous, without sclerotesta; endosperm lacking. Embryo straight; cotyledons plano-convex, elliptic in outline; hypocotyl lateral, considerably narrower than cotyledons.

A genus of one species. Distributed from the Philippines S to Java and Australia.

Well known in aboriginal medicine in Malesia, reputedly having a number of uses including treatment of snake bite, skin diseases, swollen limbs, inflamed eyes, and digestive disorders. There are also several reports of a substance from the bark being used for arrow poison. In tests on laboratory animals (Wirth, 1931) it has been established that injections of two alkaloids from the bark, lunasin and lunacrine, indeed have a lethal effect.

E.H.Wirth, *Studiën over Lunasia amara* Blanco var. *costulata* (Miq.) Hochr., Dissertation, Leiden 1931 [Abs. in *J. Amer. Pharm. Assoc.* 20: 1254 (1931)]; T.G.Hartley, A revision of the genus *Lunasia* (Rutaceae), *J. Arnold Arbor.* 48: 460–475 (1967).

***Lunasia amara* Blanco, *Fl. Filip.* 793 (1837)**

var. *amara*

Pilocarpus amara (Blanco) Blanco, *Fl. Filip.*, 2nd edn, 540 (1845). T: Guinayangan, Quezon Province, Luzon, Philippines, Mar./Apr. 1913, *L.Escritor BS 20766* (*E.D.Merrill Species Blancoanae 5*); neo: A, *fide* T.G.Hartley, *op. cit.* 464, 467; isoneo: GH, L, NY, US.

Illustrations: C.Lauterbach, *Bot. Jahrb. Syst.* 55: 248, fig. 4 (1918), as *L. amara* var. *repanda* (Lauterb. & K.Schum.) Lauterb. (A–D) and *L. quercifolia* (Warb.) Lauterb. & K.Schum. (E–L); H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19a: 237, fig. 99 (1931).

Shrub, or tree to 15 m high. Leaves: petiole 1–9 cm long; lamina elliptic to obovate, or narrowly so, 5.5–37 cm long, 3–14 cm wide, cuneate to narrowly rounded or cordate at base, subentire to manifestly sinuate, rounded to acuminate at apex. Inflorescences 3–28 cm long; flowers greenish yellow to white. Male flowers: sepals c. 0.5 mm long; petals c. 1 mm long; stamens c. 1 mm long. Female flowers: sepals 1–1.5 mm long; petals 2–2.3 mm long; staminodes 3, well differentiated but without pollen, c. 1 mm long; gynoecium c. 0.6 mm high and 0.9 mm wide; styles coherent basally, otherwise free, c. 0.3 mm long; stigmas broadly flattened, c. 0.5 mm long, spreading over tops of each of the 3 carpels. Follicles truncately obovoid, somewhat compressed, 6–15 mm long. Seeds ovate to elliptic, c. 5–9 mm long. Plate 15; Fig. 10 I–L.

Ranges from the Philippines S to Java and Australia. In Australia occurs in NE Qld from Kennedy Hill S to the vicinity of Coen; in coastal scrub, gallery forest, and rain forest, to 800 m alt. Flowers Apr.–Oct.; fruits recorded Dec.–Jan., July.

Qld: Iron Ra., *L.J.Brass 19317 & 19655* (A, CANB); upper Chester R., *G.Butler 518* (CBG); 2 km SE of Kennedy Hill, *P.I.Forster 8898* (BRI); Gordon Ck, *J.Nelder 3562 & J.Clarkson* (BRI); upper Massey Ck, c. 24 km ENE of Coen, *L.S.Smith 11722* (CANB).

A widely variable taxon with a host of synonyms in Malesia. The other taxon recognised is *L. amara* var. *babuyanica* (Merr.) T.G.Hartley, which is endemic to the northern Philippines.



RUTACEAE

6. FLINDERSIA

T.G.Hartley

Flindersia R.Br. in M.Flinders, *Voy. Terra Austral.* 2: 595 (1814); after Matthew Flinders (1774–1814), British explorer.

Type: *F. australis* R.Br.

Oxleya A.Cunn. ex Hook., *Bot. Misc.* 1: 246 (1830). T: *O. xanthoxyla* A.Cunn. ex Hook.

Strzeleckya F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 308 (1857). T: *S. dissosperma* F.Muell.

Trees, evergreen, armed (*F. dissosperma* and *F. maculosa*) or unarmed. Trichomes simple or compound (fasciculate, stellate, or scale-like). Leaves alternate to opposite, mostly pinnate, trifoliolate, or simple. Inflorescences paniculate, terminal and/or axillary. Flowers bisexual or bisexual and male (plants monoclinal or andromonoecious) or rarely occasional flowers female or neutral, 5-merous. Sepals distinct or basally connate, usually deciduous in fruit. Petals imbricate or narrowly so, distinct, deciduous in fruit. Stamens 5, alternating with 5 staminodes, these similar to filaments of functional stamens or ligulate or rarely lacking. Gynoecium syncarpous, in bisexual flowers 5-carpelled, 0.7–3 mm high; ovary ±globose and often inconspicuously 5-lobed, usually with 5 apical glands around base of style; placentation axile, with an arm of the placenta protruding into each of the 5 locules and each provided with 1–3 ovules on each side (2–6 per locule); style apical; stigma capitate or peltate, 5-ridged and often 5-angled. Gynoecium in male flowers rudimentary, 0.4–1 mm high, conical, turbinate, or pulvinate; ovules poorly developed or lacking. Fruit an ellipsoid, 5-valved and -loculed septicidal capsule c. 2–15 cm long; exocarp woody, muricate or nearly smooth; ventral endocarp lacking; remaining endocarp cartilaginous, glabrous, adnate. Seeds winged, 2–6 per locule, 1–3 on each side of the flattened, much-enlarged placental arms (sometimes incorrectly called dissepiments), which, like the seeds, become free; testa membranaceous, without sclerotesta; endosperm lacking. Embryo straight; cotyledons flattened, elliptic to oblong; hypocotyl considerably narrower than cotyledons.

A genus of 17 species, known from the Moluccas, New Guinea, Australia, and New Caledonia; 15 species in Australia, 11 of them endemic.

Most of the species are important as commercial timbers, their uses ranging from railway sleepers and fencing to general building and cabinet-making. Crow's Ash (*F. australis*) and Hickory Ash (*F. iffaiiana*) are especially useful for general building. Queensland Maple (*F. brayleyana*) and Rose Silkwood (*F. pimenteliana*) are highly valued cabinet woods.

Although *Flindersia* is typical of the Rutaceae in possessing, among other features, punctate oil glands, its capsule is rather unusual for the family and superficially resembles that of *Cedrela* P.Browne of the Meliaceae. This led Robert Brown, in the original description of the genus, to place it in the "Natural Order" Cedreleae, and several other 19th century botanists, including Bentham (1863), de Candolle (1878) and Bailey (1899), essentially followed Brown, placing it in the Meliaceae subfam. Cedreleae. Engler, however (1896, 1931), placed it in the Rutaceae subfam. Flindersioideae, and this classification was generally accepted until 1965 when Airy-Shaw based the new family Flindersiaceae on Engler's Flindersioideae. Hartley (1969), citing supporting evidence from morphology, palynology, wood anatomy, and chemistry, followed Engler's placement of the genus in the Rutaceae.

Trichome complexity in *Flindersia* can vary from one part of the plant to another, and specimens with inflorescences are required for determining the full range of variability in most species.

Male flowers were seen in about half the species of *Flindersia*, and probably occur in more. In characteristics of the perianth and androecium they are the same as bisexual flowers, but ovule number, which is an important diagnostic character, can be determined only in bisexual flowers.

G.Bentham, *Flindersia* in Meliaceae, *Fl. Austral.* 1: 388–390 (1863); C.de Candolle, *Flindersia* in Meliaceae, *Monogr. Phan.* 1: 728–735 (1878); H.G.A.Engler, *Flindersia* in Rutaceae, in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 170–171 (1896); F.M.Bailey, *Flindersia* in Meliaceae, *Queensland Fl.* 1: 238–243 (1899); H.G.A.Engler,

Flindersia in Rutaceae, in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19a: 294–296 (1931); H.K.Airy-Shaw, Diagnosis of new families, new names, etc. for the seventh edition of Willis’ “Dictionary,” *Flindersia* in Flindersiaceae, *Kew Bull.* 18: 257–258 (1965); T.G.Hartley, A revision of the genus *Flindersia* (Rutaceae), *J. Arnold Arbor.* 50: 481–526 (1969); T.G.Hartley & B.P.M.Hyland, Additional notes on the genus *Flindersia* (Rutaceae), *J. Arnold Arbor.* 56: 243–247 (1975).

- 1 Ovules in bisexual flowers 1 on each side of placental arms (or 2 on each side of placental arms of *F. laevicarpa* var. *laevicarpa*, one of which is smaller and apparently aborts); capsule with exocarp muricate or almost smooth; seeds 1 on each side of much-enlarged placental arms, winged at both ends; embryo with terminal hypocotyl
- 2 Petals 3.5–4 mm long, white or cream, adaxially tomentulose; capsule 7–11 cm long; exocarp muricate, puberulous, the excrescences to 4.5 mm long
2. Petals 2–3.5 mm long, red, white, or cream, adaxially tomentulose in c. proximal half or shortly pubescent; capsule 2.9–10 cm long; exocarp almost smooth at maturity, glabrous
- 3 Petals red or reddish, adaxially shortly pubescent; leaves mostly paripinnate; lateral leaflets with petiolules 3–13 mm long; laminae 6.5–11 cm long, 1.5–4 cm wide, acute to acuminate; capsule 2.9–4 cm long
- 3: Petals white or cream, adaxially tomentulose in c. proximal half; leaves paripinnate; petiolules 10–25 mm long; laminae 8–18.5 cm long, 3–8 cm wide, obtuse to obtusely acuminate; capsule 6–10 cm long
- 1: Ovules in bisexual flowers 2 or 3 on each side of placental arms; capsule with exocarp muricate; seeds 2 or 3 on each side of much-enlarged placental arms, winged at both ends or at apical end only; embryo with lateral hypocotyl
- 4 Ovules in bisexual flowers 3 on each side of placental arms; seeds (2 or) 3 on each side of much-enlarged placental arms, winged at both ends; capsule 6.5–15 cm long; leaves mostly imparipinnate
- 5 Leaves alternate; lateral leaflets with petiolules 4–10 mm long; capsule with exocarp puberulous or becoming glabrous, the excrescences to 5 mm long
- 5: Leaves opposite; lateral leaflets sessile or subsessile or with petiolules to 6 mm long
- 6 Leaves 19–40 cm long; lateral leaflets in (4–) 5–8 pairs, sessile or subsessile; petals adaxially villous in proximal $\frac{1}{3}$ – $\frac{1}{2}$; capsule with exocarp puberulous or becoming glabrous, the excrescences to 5 mm long
- 6: Leaves 9–33 cm long; lateral leaflets in 2–5 pairs, petiolulate or mostly so; petals adaxially glabrous or sparsely papillose
- 7 Petals 5–10 mm long; capsule with exocarp glabrous, the excrescences to 4 mm long
- 7: Petals 3–4.3 mm long; capsule with exocarp puberulous, the excrescences to 4 mm long
- 4: Ovules in bisexual flowers 2 on each side of placental arms; seeds 2 on each side of much-enlarged placental arms, winged at both ends or at apical end only; capsule 2–9 cm long; leaves mostly impari- or paripinnate, trifoliolate, or simple
- 8 Petals red or reddish; trichomes simple; capsule 6–9 cm long; exocarp glabrous; seeds winged at both ends
- 9 Leaves mostly imparipinnate or trifoliolate; capsule with excrescences of exocarp to 4 mm long
- 9: Leaves mostly simple; capsule with excrescences of exocarp to 2.5 mm long

1. *F. brassii*

2. *F. laevicarpa*

3. *F. brayleyana*

6. *F. acuminata*

7. *F. schottiana*

8. *F. bourjotiana*

9. *F. xanthoxyla*

4. *F. pimenteliana*

5. *F. oppositifolia*

- 8: Petals white or cream; trichomes simple and compound; capsule 2–9 cm long; exocarp puberulous, glabrous, or becoming so; seeds winged at both ends or at apical end only
- 10 Trichomes simple, fasciculate, and stellate; capsule 3.2–9 cm long; exocarp puberulous; seeds winged at apical end only
- 11 Leaves opposite, paripinnate; petals 2–2.5 mm long; capsule 3.2–5.5 cm long; excrescences of exocarp to c. 2 mm long, often becoming blunt with age 14. *F. ifflaiana*
- 11: Leaves alternate to opposite, mostly imparipinnate; petals 5–7 mm long; capsule 4.6–9 cm long; excrescences of exocarp to c. 10 mm long, not becoming blunt with age 15. *F. australis*
- 10: Trichomes simple, fasciculate, stellate, and scale-like; capsule 2–7 cm long; exocarp glabrous or becoming so; seeds winged at both ends
- 12 Leaves 8.5–36 (–45) cm long, mostly imparipinnate or trifoliolate; rachis not winged; lateral leaflets usually petiolulate; capsule 4–7 cm long; exocarp glabrous, the excrescences to 4 mm long 10. *F. bennettii*
- 12: Leaves 1–14 cm long, mostly imparipinnate, trifoliolate, or simple, when compound often with winged petiole and/or rachis; lateral leaflets sessile; capsule 2–5 cm long; exocarp glabrous or becoming so, the excrescences 1–2 mm long
- 13 Laminae of leaves 1–5 cm wide; leaves imparipinnate or trifoliolate (occasional leaves, or rarely most of them, simple); capsule 2.8–5 cm long; exocarp glabrous or becoming so 11. *F. collina*
- 13: Laminae of leaves 0.2–1 (–1.5) cm wide; leaves mostly imparipinnate, trifoliolate, or simple; capsule 2–3 cm long; exocarp glabrous
- 14 Leaves mostly imparipinnate or trifoliolate 12. *F. dissosperma*
- 14: Leaves mostly simple 13. *F. maculosa*

1. *Flindersia brassii* T.G.Hartley & B.Hyland, *J. Arnold Arbor.* 56: 243, fig. 1 (1975)

T: Claudie R., Cape York Penin., Qld, 2 Jan. 1973, *B.Hyland RFK 2770*; holo: CANB; iso: CNS.

Illustration: T.G.Hartley & B.Hyland, *op. cit.* 244.

Tree to 30 m high. Trichomes simple and sometimes irregularly fasciculate. Leaves opposite or subopposite, impari- or paripinnate, 4–9-foliolate, 7–18 cm long, neither petiole nor rachis winged; petiolules of lateral leaflets 2–6 mm long; terminal leaflet with petiolule 7–16 mm long; laminae elliptic or narrowly so or elliptic-obovate, \pm equilateral, 4–8 cm long, 1.5–3.7 cm wide, rounded or acute. Inflorescences 12–17 cm long. Flowers apparently exclusively bisexual. Sepals 1–1.5 mm long. Petals 3.5–4 mm long, white or cream, appressed-pubescent abaxially, tomentulose adaxially. Ovules 1 on each side of placental arms. Capsule 7–11 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, puberulous, with excrescences to 4.5 mm long. Seeds 1 on each side of much-enlarged placental arms, 5.5–7 cm long, winged at both ends. Embryo with terminal hypocotyl. *Hard Scented Maple*.

Known only from the type locality and nearby Mt Carter, NE Qld; in dry rain forest, 60–540 m alt. Flowers Jan.; fruits recorded July & Oct.

Qld: Mt Carter, *B.Hyland 3074* (CANB).



2. *Flindersia laevis* C.T.White & W.D.Francis, *Bot. Bull. Dept. Agric., Queensland* 22: 8, fig. on p. 9 (1920)

var. *laevis*

T: Atherton district, Qld, July 1919, *J.M.Fraser*; holo: BRI.

Illustration: C.T.White & W.D.Francis, *op. cit.* 9.

Tree to 21 m high. Trichomes simple. Leaves opposite, paripinnate (occasional leaves bifoliolate), 4–8-foliolate, (10–) 12–30 cm long, neither petiole nor rachis winged; petiolules 3–13 mm long; laminae ovate to elliptic, or narrowly so, usually inequilateral, 6.5–11 cm long, 1.5–4 cm wide, acute to acuminate. Inflorescences 12–30 cm long. Flowers apparently exclusively bisexual. Sepals c. 1 mm long. Petals c. 2.5 mm long, red, appressed-pubescent abaxially, short-pubescent adaxially. Ovules 1 or 2 on each side of placental arms (where 2, one is smaller and apparently aborts). Capsule 2.9–4 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp almost smooth at maturity, glabrous. Seeds 1 on each side of much-enlarged placental arms, 2.5–3.2 cm long, winged at both ends. Embryo with terminal hypocotyl. *Dirran Maple*, *Rose Ash*, *Scented Maple*.

Occurs in NE Qld from the vicinity of Daintree River Natl Park S to Gadgarra; in rain forest, 150–830 m alt. Flowers Jan.–July; fruits recorded Oct. & Jan.

Qld: Gadgarra, 9 Jan. 1934, *R.B.Dreghorn* (BRI); T.R. 55, Whyanbeel, *B.Hyland RFK3032* (CANB); Danbulla, *W.T.Jones 1116* (BRI, CANB); S.F.R. 185, Robson L.A., *T.Risley 39* (CANB); Tinaroo Ra. between Mt Edith and Danbulla, *L.S.Smith & L.J.Webb 3369* (BRI).

Flindersia laevis var. *heterophylla* (Merr. & L.M.Perry) T.G.Hartley, the only other infraspecific taxon recognised, is endemic to New Guinea.



3. *Flindersia brayleyana* F.Muell., *Fragm.* 5: 143 (1866)

T: Herberts R., Qld, *J.Dallachy*; holo: MEL; iso: K.

F. chatawaiana F.M.Bailey, *Queensland Agric. J.* 5: 387, t. 138, fig. 2 (1899). T: Martintown, Qld, June 1899, *J.F.Bailey*; syn: BRI; Middle Tully R., Qld, July 1899, *J.F.Bailey*; syn: BRI.

Illustration: F.M.Bailey, *op. cit.* t. 138, fig. 2, as *F. chatawaiana*.

Tree to 35 m high. Trichomes simple. Leaves opposite or subopposite, paripinnate, 6–10-foliolate, 20–45 (–75) cm long, neither petiole nor rachis winged; petiolules 10–25 mm long; laminae ovate to elliptic, or broadly so, or subfalcate, usually inequilateral, 8–18.5 cm long, 3–8 cm wide, obtuse to obtusely acuminate. Inflorescences 12–23 cm long. Flowers apparently exclusively bisexual. Sepals c. 0.5 mm long. Petals 2.5–3.5 mm long, white or cream, puberulous in proximal $\frac{3}{4}$ abaxially, tomentulose adaxially in c. proximal $\frac{1}{2}$. Ovules 1 on each side of placental arms. Capsule 6–10 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp almost smooth at maturity, glabrous. Seeds 1 on each side of much-enlarged placental arms, 4.5–6 cm long, winged at both ends. Embryo with terminal hypocotyl. *Maple Silkwood*, *Queensland Maple*. Fig. 6G–I.

Occurs in NE Qld from the Daintree R. S to Rockingham Bay; in rain forest, 30–1100 m alt. Flowers Dec.–Jan.; fruits Apr.–Dec.

Qld: Kamerunga, Feb. 1905, *E.Cowley* (BRI); Gadgarra, *R.B.Dreghorn 13* (BRI); S.F.R. 144, Great Divide, *B.Hyland 5677* (CANB); Mission Beach road., *G.Stocker 807* (CANB); Tolga Scrub 2 km N of Atherton, *I.R.Telford 11321 & R.J.Rudd* (CBG).



4. *Flindersia pimenteliana* F.Muell., *Fragm.* 9: 132 (1875)

T: Rockingham Bay, Qld, *J.Dallachy*; lecto: MEL, *fide* T.G.Hartley, *J. Arnold Arbor.* 50: 494, 497 (1969); isolecto: BM, BO, K, NSW.

F. mazlini F.M.Bailey, *Queensland Agric. J.* 5: 388, t. 138, fig. 3 (1899). T: Evelyn, Qld, 8 July 1899, *J.F.Bailey*; holo: BRI; iso: K.

Illustration: F.M.Bailey, *op. cit.* t. 138, fig. 3, as *F. mazlini*.

Tree to 36 m high. Trichomes simple. Leaves opposite or subopposite, imparipinnate or sometimes trifoliolate (occasional or frequent leaves paripinnate or bifoliolate or rarely occasional leaves simple), mostly 3–7-foliolate, 7–25 cm long, neither petiole nor rachis winged; petiolules of lateral leaflets 3–15 mm long; terminal leaflet with petiolule 12–40 mm long; laminae equi- or inequilaterally ovate to elliptic, or narrowly so, or subfalcate, 3.5–12 cm long, 1.3–5 cm wide, acuminate. Inflorescences 9–17 cm long. Flowers bisexual or at least a few male. Sepals 0.8–1.2 mm long. Petals 2.5–4 mm long, red or reddish, glabrous or sparsely puberulous abaxially, glabrous or with scattered papillae adaxially. Ovules in bisexual flowers 2 on each side of placental arms. Capsule 6–9 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous, with excrescences to 4 mm long. Seeds 2 on each side of much-enlarged placental arms, 4–6 cm long, winged at both ends. Embryo with lateral hypocotyl. *Maple Silkwood, Red Beech, Rose Silkwood.* Plate 19.

Occurs in NE Qld from Mt Finnigan S to Mt Fox; in rain forest, 20–1250 m alt. Also in New Guinea. Flowers Nov.–Feb.; fruits May–Dec.

Qld: Mt Finnigan, *L.J.Brass* 20322 (A, CANB); Mt Fox, Sept.–Dec. 1949, *M.S.Clemens* (CANB, GH, MICH); Gadgarra, 9 Jan. 1934, *R.B.Dreghorn* (A, BRI, NY); L. Barrine, *S.F.Kajewski* 1114 (A, BRI, NY, P); c. 10 km S of Mossman, *L.S.Smith* 3953 (BRI).

**5. *Flindersia oppositifolia* (F.Muell.) T.G.Hartley & Jessup, *Brunonia* 5: 109 (1982)**

Hypsophila oppositifolia F.Muell., *Victoria Naturalist* 9: 11 (1892); *F. pimenteliana* f. *oppositifolia* (F.Muell.) K.D.Scott, W.K.Harris & J.Playford, *Austrobaileya* 5(4): 668 (2000). T: Mt Bartle Frere, Qld, 1892, *S.Johnson*; lecto: MEL, *fide* T.G.Hartley & L.W.Jessup, *loc. cit.*

F. unifoliolata T.G.Hartley, *J. Arnold Arbor.* 50: 498 (1969). T: Mt Bellenden Ker, Qld, *W.A.Sayer* 136; holo: MEL.

Tree to 30 m high. Trichomes simple. Leaves opposite or subopposite, simple (rare leaves bifoliolate or trifoliolate), 3–12 cm long; petiole 0.5–2.5 cm long, not winged; lamina ovate to elliptic, or narrowly so, 2.5–10 cm long, 1.4–3.5 cm wide, obtuse to acuminate. Inflorescences 3–9 cm long. Flowers apparently exclusively bisexual. Sepals 1–1.5 mm long. Petals 5–9 mm long, dark reddish, strigillose abaxially, glabrous or with scattered papillae adaxially. Ovules 2 on each side of placental arms. Capsule 7.5–8 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous, with excrescences to 2.5 mm long. Seeds 2 on each side of much-enlarged placental arms, winged at both ends, 3.5–4 cm long. Embryo with lateral hypocotyl. *Mountain Silkwood.*

Known only from the Bellenden Ker Ra., NE Qld; in montane rain forest, 1300–1550 m alt. Flowers Oct.–Nov.; fruits recorded Jan., May–Aug.

Qld: Mt Bellenden Ker, *M.M.J.van Balgooy* 1445 (CANB); *loc. id.*, *B.Hyland* 5778 & 6569 (CANB); Mt Bartle Frere, *I.R.Telford* 11413 & *R.J.Rudd* (CBG).



6. *Flindersia acuminata* C.T.White, *Bot. Bull. Dept. Agric., Queensland* 21: 5, fig. 2 (1919)

T: Atherton, Qld, 3 July 1915, *H.W.Mocatta*; holotype: BRI; isotype: MEL.

Tree to 33 m high. Trichomes simple, fasciculate, and stellate. Leaves alternate, imparipinnate (occasional leaves paripinnate), (4–) 6–10-foliolate, 12.5–25 (–35) cm long, neither petiole nor rachis winged; petiolules of lateral leaves 4–10 mm long; terminal leaflet with petiolule 10–31 mm long; laminae ovate to elliptic, or narrowly so, or subfalcate, usually inequilateral, 5–15 cm long, 1.3–4.8 cm wide, acute to acuminate. Inflorescences 7–23 cm long. Flowers apparently exclusively bisexual. Sepals 1–1.2 mm long. Petals 3–3.2 mm long, creamy-yellow, sparsely appressed-pubescent abaxially, glabrous or with a few papillae adaxially. Ovules 3 on each side of placental arms. Capsule 9–12 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, puberulous or becoming glabrous, with excrescences to 5 mm long. Seeds 3 on each side of much-enlarged placental arms, c. 5 cm long, winged at both ends. Embryo with lateral hypocotyl. *Icewood*, *Paddy King's Beech*, *Putt's Pine*, *Silver Silkwood*.

Occurs in NE Qld from near Kuranda S to Mission Beach; in rain forest, 200–1000 m alt. Flowers Nov.–Jan.; fruits May–June.

Qld: Mission Beach, 6 km W of Clump Point, *F.Crome* 559 (CANB); c. 16 km SE of Atherton, *T.G.Hartley & B.Hyland* 14109 (CANB); S.F.R. 607, c. 16 km W of Cairns, *L.S.Smith* 10121 (BRI); Gadgarra, *L.S.Smith* 10155 (BRI); S.F.R. 1073, *G.Stocker* 642 (CANB).

**7. *Flindersia schottiana*** F.Muell., *Fragm.* 3: 25 (1862)

T: Wide Bay, Qld, *J.C.Bidwill* 95; lectotype: K, *fide* T.G.Hartley, *J. Arnold Arbor.* 50: 503, 505 (1969).

F. schottiana var. *pubescens* F.Muell., *Fragm.* 5: 143 (1866). T: Rockingham Bay, Qld, *coll. unknown*; holotype: MEL; isotype: BO, BRI, GH.

F. pubescens F.M.Bailey, *Queensland Agric. J.* 3: 353 (1898). T: Wickham Res., Brisbane, Qld, 23 Oct. 1883, *F.M.Bailey*; holotype: BRI.

Illustrations: J.H.Maiden, *Forest Fl. New South Wales* 2: t. 69 & 70 (1905); W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, 181, fig. 103 (1970).

Tree to 36 m high. Trichomes simple, fasciculate, and stellate. Leaves opposite, imparipinnate or sometimes paripinnate, (8–) 10–16-foliolate, 19–40 cm long, neither petiole nor rachis winged; petiolules of lateral leaflets obsolete or nearly so; terminal leaflet with petiolule 11–27 mm long; laminae narrowly ovate to narrowly elliptic, oblong, or falcate, equi- or \pm inequilateral, 7–16 cm long, 1.5–4.5 cm wide, acute to acuminate. Inflorescences 20–27 cm long. Flowers apparently exclusively bisexual. Sepals 1–1.5 mm long. Petals 4–6 mm long, white, sparsely appressed-pubescent abaxially, villous in proximal $\frac{1}{3}$ – $\frac{1}{2}$ adaxially. Ovules 3 on each side of placental arms. Capsule 8–13 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, puberulous or becoming glabrous, with excrescences to 5 mm long. Seeds 3 on each side of much-enlarged placental arms, 5–6 cm long, winged at both ends. Embryo with lateral hypocotyl. $2n = 36$, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954), as *F. pubescens* and *F. schottiana*. *Bumpy Ash*, *Cudgerie*, *Silver Ash*.

Occurs from the Claudie R., NE Qld, to the Hastings R., NE N.S.W.; in rain forest, near sea level to 800 m alt. Also in New Guinea. Flowers Aug.–Dec.; fruits recorded Dec.–Apr., Sept.

Qld: Eungella Ra. via Mackay, 3–12 Oct. 1922, *W.D.Francis* (BRI); Claudie R., *B.Hyland* RFK2749 (CANB); Bingera, c. 16 km WSW of Bundaberg, *L.S.Smith* 4125 (BRI). N.S.W.: Tintenbar, *W.Baerlen* 633 (BM, MICH, NSW); 8 km S of Brunswick Heads, *B. & M.Gray* 3915 (CANB).



8. *Flindersia bourjotiana* F.Muell., *Fragm.* 9: 133 (1875)

T: Rockingham Bay, Qld, *J.Dallachy*; holo: MEL; iso: BO, MEL.

F. tysoni C.DC., *Bull. Herb. Boissier*, sér. 2, 6: 986 (1906). T: Mossman R., Qld, Aug. 1901, *H.Tryon s.n.*; iso: BRI, NSW.

Tree to 35 m high. Trichomes simple, fasciculate, and stellate. Leaves opposite, imparipinnate (occasional leaves paripinnate or trifoliolate), 4–8-foliolate, 9–33 cm long, neither petiole nor rachis winged; petiolules of lateral leaflets 1.5–4 mm long; terminal leaflet with petiolule 10–20 mm long; laminae narrowly ovate to elliptic or narrowly so, usually equilateral, 5.5–17 cm long, 1.5–4.8 cm wide, obtuse to acute or acuminate. Inflorescences 12–24 cm long. Flowers bisexual or at least a few male. Sepals 1–2 mm long. Petals 5–9.5 mm long, white or greenish white, sparsely appressed-pubescent abaxially, glabrous adaxially. Ovules in bisexual flowers 3 on each side of placental arms. Capsule 7–15 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous, with excrescences to 4 mm long. Seeds 3 on each side of much-enlarged placental arms, c. 5.5 cm long, winged at both ends. Embryo with lateral hypocotyl. $2n = 36$, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954). *Queensland Silver Ash*, *Silver Ash*, *White Ash*.

Occurs in NE Qld from the McIvor R. S to Rockingham Bay; in rain forest, near sea level to 1100 m alt. Flowers Apr.–Nov.; fruits Aug.–Jan.

Qld: Mt Milman 7.1 km NNW of Cooktown, *D.G.Fell 3862* & *J.P.Stanton* (CANB); Gadgarra, *S.F.Kajewski 1140* (A, BM, BRI, NY, US); Mt Lewis c. 16 km N of Mt Malloy, *R.Schodde 3326* (CANB); Kirrama Ra. W of Kennedy, *L.S.Smith 3205* (BRI); Etty Bay, *L.J.Webb 905* (CANB).

**9. *Flindersia xanthoxyla* (A.Cunn. ex Hook.) Domin, *Biblioth. Bot.* 89: 298 (1927)**

Oxleya xanthoxyla A.Cunn. ex Hook., *Bot. Misc.* 1: 246, t. 54 (1830); *F. oxleyana* F.Muell., *Fragm.* 1: 65 (1859), *nom. illeg.* T: Brisbane R. [Qld], July 1828, *A.Cunningham 117*; holo: BM; iso: CANB, K.

Illustrations: W.J.Hooker, *op. cit.* t. 54, as *O. xanthoxyla*; J.H.Maiden, *Forest Fl. New South Wales* 2: t. 73 & 74 (1906); W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, 185, fig. 105 (1970).

Tree to 40 m high. Trichomes simple, fasciculate, and stellate. Leaves opposite, imparipinnate (occasional leaves paripinnate), (5–) 7–11-foliolate, 11–32 cm long, neither petiole nor rachis winged; petiolules of lateral leaflets obsolete or to 6 mm long; terminal leaflet with petiolule 8–28 mm long; laminae ovate to elliptic, or narrowly so, or falcate, usually inequilateral, (2.2–) 4–13 cm long, (0.6–) 1–3.2 cm wide, narrowly obtuse to acute or acuminate. Inflorescences 17–25 cm long. Flowers apparently exclusively bisexual. Sepals c. 1 mm long. Petals c. 4.3 mm long, pale yellow, glabrous. Ovules 3 on each side of placental arms. Capsule 6.5–11 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, puberulous, with excrescences to 4 mm long. Seeds (2 or) 3 on each side of much-enlarged placental arms, 3.3–5 cm long, winged at both ends. Embryo with lateral hypocotyl. $2n = 36$, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954), as *F. oxleyana*. *Long Jack*, *Yellow-wood*, *Yellow-wood Ash*.

Occurs from near Kingaroy, SE Qld, to the Hastings R., NE N.S.W.; in rain forest, 75–500 m alt. Flowers Oct.–Feb.; fruits recorded May.

Qld: Petrie, c. 29 km N of Brisbane, *S.T.Blake 3079* (CANB); Imbil, *J.B.McAdam 87* (BRI, NY); Edenvale Hill, near Kingaroy, *N.Michael 3106* (BRI). N.S.W.: Acacia Ck via Killarney, Qld, *W.Dunn 252* (NSW); Whian Whian S.F., *C.T.White 12769* (BRI).



10. *Flindersia bennettii* F.Muell. ex C.Moore, *Cat. Nat. Industr. Prod. New South Wales* 46 (1861)

T: Richmond R., N.S.W., *coll. unknown*; iso: K n.v. (photo CANB).

F. bennettiana F.Muell. ex Benth., *Fl. Austral.* 1: 389 (1863). T: Wide Bay, Qld, *J.C.Bidwill*; lecto: K, *fide* T.G.Hartley, *J. Arnold Arbor.* 50: 510, 511 (1969); isolecto: GH, NY.

F. leichhardtii C.DC., *Monogr. Phan.* 1: 731 (1878). T: Moreton Bay [Qld], 1845, *L.Leichhardt s.n.*; holo: P.

Illustrations: J.H.Maiden, *Forest Fl. New South Wales* 3: t. 77 & 78 (1906); W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, 187, fig. 107 (1970); both as *F. bennettiana*.

Tree to 43 m high. Trichomes simple, fasciculate, stellate, and scale-like. Leaves opposite, imparipinnate or trifoliolate (occasional leaves paripinnate or simple), 3–7 (–9)-foliolate, 8.5–36 (–45) cm long, neither petiole nor rachis winged; petiolules of lateral leaflets obsolete or to 6 mm long; terminal leaflet with petiolule 9–35 mm long; laminae ovate to elliptic, or narrowly so, or rarely subfalcate, usually equilateral, 6–20 cm long, 1.7–6.7 cm wide, obtuse to acute or rarely rounded. Inflorescences 11–25 cm long. Flowers bisexual or at least a few male. Sepals 1–1.5 mm long. Petals 2.5–5 mm long, white, sparsely appressed-pubescent abaxially, glabrous adaxially. Ovules 2 on each side of placental arms. Capsule 4–7 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous, with excrescences to 4 mm long. Seeds 2 on each side of much-enlarged placental arms, winged at both ends, 3–4.3 cm long. Embryo with lateral hypocotyl. *Bennett's Ash*.

Occurs from Fraser Is., SE Qld, to the Clarence R., NE N.S.W.; in coastal and inland rain forest, to 300 m alt. Flowers May–Oct.; fruits July–Dec.

Qld: Eumundi, June 1893, *F.M.Bailey* (BRI, NSW); Wolvi, E of Gympie, 22 May 1967, *E.J.Carroll & I.R.Telford* (CBG); Beechmont, *C.T.White* 1907 (A, BRI). N.S.W.: Cudgen, *H.S.MacKee* 9547 (BRI, CANB, NSW); 13 km N of Woodburn, *J.B.Williams* J43 (NSW).



11. *Flindersia collina* F.M.Bailey, *Queensland Agric. J.* 3: 354 (1898)

F. strzeleckiana var. *latifolia* F.M.Bailey, *Syn. Queensland Fl.*, 1st suppl. 12 (1886). T: Main Ra., Moreton District, Qld, *F.M.Bailey*; lecto: BRI, *fide* T.G.Hartley, *J. Arnold Arbor.* 50: 512, 514 (1969).

Illustrations: J.H.Maiden, *Forest Fl. New South Wales* 3: t. 81 & 82 (1907); W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, 189, fig. 109 (1970).

Tree to 40 m high. Trichomes simple, fasciculate, stellate, and scale-like. Leaves opposite or subopposite, imparipinnate or trifoliolate (occasional leaves, or rarely most of them, simple). Compound leaves 3–7-foliolate, 2.5–14 cm long; petiole and/or rachis often winged; leaflets sessile; laminae elliptic or broadly so to obovate or broadly spathulate, equilateral, 2–9 cm long, 1–5 cm wide, rounded or emarginate to obtuse. Simple leaves: petiole 0.2–1.5 cm long, not winged; lamina elliptic or broadly so to obovate, equilateral, 1.8–4.5 cm long, 1–3 cm wide, rounded or emarginate. Inflorescences 3–18 cm long. Flowers bisexual or at least a few male. Sepals c. 1 mm long. Petals 4–5 mm long, white, glabrous to appressed-pubescent abaxially, shortly pubescent in proximal ½ adaxially. Ovules 2 on each side of placental arms. Capsule 2.8–5 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous or becoming so, with excrescences 1–2 mm long. Seeds 2 on each side of much-enlarged placental arms, 1.5–2.5 cm long, winged at both ends. Embryo with lateral hypocotyl. *Bastard Crow's Ash*, *Broad-leaved Leopard Tree*, *Leatherwood*, *Leopard Ash*. Fig. 6J–L.

Occurs from Lakefield Natl Park, NE Qld, to Unumgar, NE N.S.W.; in rain forest and rather dry scrub, near sea level to 700 m alt. Flowers most of year.



Qld: Lakefield Natl Park, 17 km SSW of New Laura Ranger Base, *D.G.Fell 4510 et al.* (CNS); S.F.R. 220, Malmaison, *P.I.Forster 9134* (CBG); Cooyar–Bunya Mtns road, Rangemore School area, *L.S.Smith 10260* (A, BRI, CANB, K, NSW, NY); Greenvale road N of Charters Towers, *K.A.Williams 84042* & *R.Lieberman* (CANB). N.S.W.: Unumgar, *W.T.Jones 2371* (CANB).

12. *Flindersia dissosperma* (F.Muell.) Domin, *Biblioth. Bot.* 89: 298 (1927)

Strzeleckya dissosperma F.Muell., *Hooker's J. Bot. Kew Gard. Misc.* 9: 308 (1857); *F. strzeleckiana* F.Muell., *Fragm.* 1: 65 (1859), *nom. illeg.* T: Burdiken R. [Qld], *F.Mueller*; holotype: MEL; iso: K.

Illustration: F.M.Bailey, *Compr. Cat. Queensland Pl.* 97, fig. 73 (1913), as *F. strzeleckiana*.

Tree to 10 m high, developing from a divaricately branched shrub stage armed with spur branchlets. Trichomes simple, fasciculate, stellate, and scale-like. Leaves opposite, imparipinnate or trifoliolate (occasional leaves bifoliolate or simple), 3–5-foliolate, (0.8–) 1.5–6.3 cm long; petiole and rachis winged or marginate; leaflets sessile; laminae elliptic to obovate, or narrowly so, or spatulate or sublinear, equilateral, 0.6–3.7 cm long, 0.2–0.8 cm wide, rounded to acute. Inflorescences 2–9 cm long. Flowers bisexual or at least a few male. Sepals 1–1.3 mm long. Petals 3–3.5 mm long, white to cream, glabrous. Ovules 2 on each side of placental arms. Capsule 2–3 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous, with excrescences 1–2 mm long. Seeds 2 on each side of much-enlarged placental arms, 1.5–1.8 cm long, winged at both ends. Embryo with lateral hypocotyl. *Scrub Leopardwood*.

Occurs in east-central Qld from Maryvale Stn (NW of Charters Towers) S to the vicinity of Springsure; mainly in dry scrub, to 400 m alt. Often with Brigalow (*Acacia harpophylla*) and Poplar Box (*Eucalyptus populnea*). Flowers Aug.–Oct.; fruits recorded Apr.

Qld: c. 15 km SW of Anakie, *L.G.Adams 1281* (CANB, MEL, NSW); W of Charters Towers, *S.T.Blake 14906* (BRI); near Guthalungra, *S.T.Blake 18619* (CANB); near Girrah HS, c. 58 km N of Blackwater Township, *M.Lazarides & R.Story 70* (CANB, K, NSW, NY); c. 14 km SW of Duaringa, *N.H.Speck 1820* (BRI, CANB, NSW).



13. *Flindersia maculosa* (Lindl.) Benth., *Fl. Austral.* 1: 389 (1863)

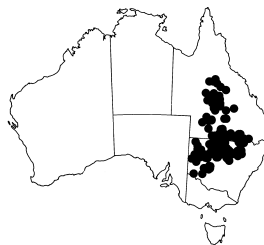
Elaeodendron maculosum Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 384 (1848); *F. maculata* F.Muell., *Quart. J. Trans. Pharm. Soc. Victoria* 2: 44 (1859), *nom. illeg.* T: St George's Bridge, Balonne R., N.S.W., Nov. 1846, *T.L.Mitchell s.n.*; holotype: K; iso: NSW.

Illustrations: J.H.Maiden, *Forest Fl. New South Wales* 1: t. 39 (1904); F.M.Bailey, *Compr. Cat. Queensland Pl.* 97, fig. 73 bis (1913).

Tree to 15 m high, developing from a divaricately branched shrub stage armed with spur branchlets. Trichomes simple, fasciculate, stellate, and scale-like. Leaves opposite, simple (rarely occasional leaves trifoliolate), 1.5–8.5 cm long; petiole neither winged nor marginate, 0.1–1.2 cm long; lamina narrowly elliptic, narrowly obovate, or sublinear, 1–8 cm long, 0.25–1 (–1.5) cm wide, rounded to acute. Inflorescences 1–8 cm long. Flowers apparently exclusively bisexual. Sepals 1–1.5 mm long. Petals 3–4 mm long, white or cream, glabrous abaxially, glabrous or sparsely papillose adaxially. Ovules 2 on each side of placental arms. Capsule 2–4 cm long, separating (or easily separable) into 5 distinct valves at maturity; exocarp muricate, glabrous, with excrescences 1–2 mm long. Seeds 2 on each side of much-enlarged placental arms, c. 1.8 cm long, winged at both ends. Embryo with lateral hypocotyl. *Leopard Tree, Leopardwood*. Plate 20.

Occurs from Hughenden, central Qld, to the Riverina District, SW N.S.W.; in dry, rather open places, to 400 m alt. Flowers Sept.–Dec.; fruits most of year.

Qld: Hughenden, *L.J.Brass & C.T.White 63* (A, BO, BRI, K); c. 55 km N of Charleville on Ward River road, *L.S.Smith 841* (A, BRI, CANB, MEL, NY).



N.S.W.: Koonenberry Mtns c. 100 km SSE of Milparinka, *E.F.Constable 4609* (CANB, NSW); 'Mt Mulyah' c. 80 km NW of Louth, *C.W.E.Moore 4575* (CANB); c. 32 km SE of Bourke, *E.Riek & I.Common 132* (CANB).

14. *Flindersia ifflaiana* F.Muell., *Fragm.* 10: 94 (1877)

T: Trinity Bay, Qld, *W.Hill*; holo: MEL; iso: K.

Tree to 35 m high. Trichomes simple, fasciculate, and stellate. Leaves opposite, paripinnate, 4–12-foliolate, 13–34 cm long, neither petiole nor rachis winged; petiolules 4–10 mm long; laminae ovate to elliptic or narrowly so, or subfalcate, usually inequilateral, 6–13.5 cm long, 2.5–5.5 cm wide, rounded to acute or rarely subacuminate. Inflorescences 10–25 cm long. Flowers bisexual or at least a few male. Sepals 1–1.2 mm long. Petals 2–2.5 mm long, white or cream, sparsely appressed-pubescent abaxially, glabrous or with a few papillae adaxially. Ovules in bisexual flowers 2 on each side of placental arms. Capsule 3.2–5.5 cm long, with valves separating to $\frac{1}{2}$ or more of their length, but not completely; exocarp muricate, puberulous, with excrescences (often becoming blunt with age) to c. 2 mm long. Seeds 2 on each side of much-enlarged placental arms, 2.7–3.3 cm long, winged at apical end only. Embryo with lateral hypocotyl. *Cairns Hickory, Hickory Ash.*

Occurs in NE Qld from Cape Grenville S to the vicinity of Atherton; in rain forest, 30–900 m alt. Also in southern New Guinea. Flowers Oct.–Mar., June; fruits recorded most months.

Qld: S.F.R. 144, Windsor Tableland, *B.Hyland 5636* (CANB); Euluma, *V.K.Moriarty 1931* (CANB); S.F.R. 1073, Fairy L.A., *A.K.Irvine 542* (CANB); Redlynch, *C.T.White 12813* (A, CANB, NY); Cape Grenville, *J.E.Young 64* (BRI).



15. *Flindersia australis* R.Br. in M.Flinders, *Voy. Terra Austral.* 595, Atlas t. 1 (1814)

T: Broad Sound [Qld], Sept. 1802, *R.Brown*; holo: K; iso: BM, CANB, MEL, P.

Illustrations: R.Brown, *op. cit.* t. 1; W.L.Stern, *Austral. Flower Paintings Ferdinand Bauer* t. 6 (1976); B.D.Morley & H.R.Toelken (eds), *Fl. Pl. Australia* 197, fig. 114 (1983).

Tree to 25 m high. Trichomes simple, fasciculate, and stellate. Leaves alternate to opposite, imparipinnate (occasional leaves paripinnate or trifoliolate), 5–13-foliolate, (5.5–) 9–34 cm long, neither petiole nor rachis winged; petiolules of lateral leaflets obsolete or to 3 (–5) mm long; terminal leaflet sessile or with petiolule to 32 mm long; laminae ovate to elliptic or obovate, or narrowly so, usually equilateral, (2.4–) 3–12 cm long, (0.8–) 1.5–4.5 cm wide, rounded to acuminate. Inflorescences 5–15 cm long. Flowers bisexual or at least a few male. Sepals 2.2–2.5 mm long. Petals 6–7 mm long, white to cream, densely appressed-pubescent abaxially, sparsely short-pubescent in proximal $\frac{1}{2}$ – $\frac{2}{3}$ adaxially. Ovules in bisexual flowers 2 on each side of placental arms. Capsule 4.6–9 cm long; valves separating to $\frac{1}{2}$ or more of their length, but not completely; exocarp muricate, puberulous, with excrescences to 10 mm long. Seeds 2 on each side of much-enlarged placental arms, 3.4–5 cm long, winged at apical end only. Embryo with lateral hypocotyl. $2n = 108$, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954). *Crow's Ash, Flindosy, Teak.*

Occurs from the vicinity of Mackay, east-central Qld, to Kempsey, NE N.S.W., in rain forest and rather dry scrub, near sea level to 860 m alt. Flowers seen Sept.–Oct.; fruits most of year.

Qld: Eidsvold, Apr. 1912, *T.L.Bancroft* (BRI); Imbil, *J.B.McAdam 84* (A, BRI); c. 29 km N of Taroom, *N.H.Speck 1861* (BRI, CANB, K); Logan R. at Mt Stapylton, *C.L.Wilson 635* (BRI, US). N.S.W.: Whian Whian S.F., *L.J.Webb & J.G.Tracey 378* (CANB).



Excluded name

Flindersia greavesii C.Moore, *Cat. Nat. Industr. Prod. New South Wales* 53 (1861)

T: Clarence R., N.S.W., coll. unknown (*Northern Woods New South Wales* 63); probable iso: NSW.

This name is excluded because Moore's description refers to *F. australis* whereas the probable isotype is *F. schottiana*. See T.G.Hartley, *J. Arnold Arbor.* 50: 522 (1969) for a full discussion.

7. COATESIA

T.G.Hartley

Coatesia F.Muell., *Fragm.* 3: 26 (1862); after Joannis Coates, specialist in anatomy and technology of Australian timbers.

Type: *C. paniculata* F.Muell.

Small trees, evergreen, unarmed. Trichomes simple. Leaves alternate, simple. Inflorescences paniculate, terminal or terminal and axillary. Flowers bisexual, 5-merous. Sepals basally connate, persistent in fruit. Petals distinct, imbricate, glabrous, deciduous in fruit. Stamens 5, distinct; staminodes lacking. Gynoecium subapocarpous, 5-carpelled; ovules 2 per locule; style lateral; stigma punctiform. Fruit of 1–5 basally connate follicles; exocarp woody, glabrous; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as an obovate piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds solitary, expelled from dehiscent fruit; testa dark brown, lustrous, rugulose, thin and brittle, with sclerotesta; endosperm lacking. Embryo straight; cotyledons plano-convex, broadly to transversely elliptic in outline; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of one species. Reduced to *Geijera* by Bentham (1863).

***Coatesia paniculata* F.Muell., *Fragm.* 3: 26 (1862)**

Geijera muelleri Benth., *Fl. Austral.* 1: 364 (1863), *nom. illeg.*; *G. paniculata* (F.Muell.) Druce, *Bot. Exch. Club Soc. Brit. Isles* 1916: 624 (1917). T: Moreton Bay [Qld], 1857, *F.Mueller*; lecto: MEL, *vide* T.G.Hartley, *Fl. Australia* 26: 580 (2013)

G. helmsiae F.M.Bailey, *Queensland Fl.* 1: 206, t. 9 (1899). T: Childers, Qld, *Mrs Helms*; holo: BRI.

Illustration: F.M.Bailey, *op. cit.* t. 9, as *G. helmsiae*.

Tree to 12 m high. Leaves: petiole 0.5–1.5 cm long; lamina ovate to elliptic or obovate, or broadly so, 4–12 cm long, 1.5–7.5 cm wide. Inflorescences 1.5–9 cm long. Sepals c. 1 mm long. Petals 1.5–2 mm long, cream. Stamens 1.3–1.5 mm long. Gynoecium 1–1.2 mm long, glabrous; style c. 0.5 mm long. Follicles truncately obovoid or rhomboid, 8–9 mm long; seeds ovoid, c. 5 mm long. *Axe-breaker*, *Capivi*, *Scrub Wilga*. Fig. 9.

Occurs from Mt Abbot, east-central Qld, to Wardell, NE N.S.W.; in rain forest (often dry), near sea level to 560 m alt. Flowers July–Nov.; fruits Jan.–Mar.

Qld: Mt Abbot, 50 km W of Bowen, *A.R.Bean* 4733 (BRI); Mt French, 24 July 1983, *L.H.Bird & K.A.Williams* (BRI, CBG); Gogango Ra. near Edungalba, *S.T.Blake* 15345 (BRI); Mt Wooroolin, near Kingaroy, Feb. 1996, *G.Smyrell* (CANB). N.S.W.: Wardell, *A.G.Floyd* 2017 (BRI, NSW).

In sterile condition *C. paniculata* has often been confused with *Geijera salicifolia*. Nevertheless, as has been known for some time now (see, e.g., N.C.W.Beadle, *Student's Fl. NE New South Wales* 4: 548 (1980)), the two can be readily distinguished on their leaves. Both species have canaliculate petioles, but in those of the former the sides of the canal are erect to revolute, whereas in those of the latter the sides of the canal are involute.



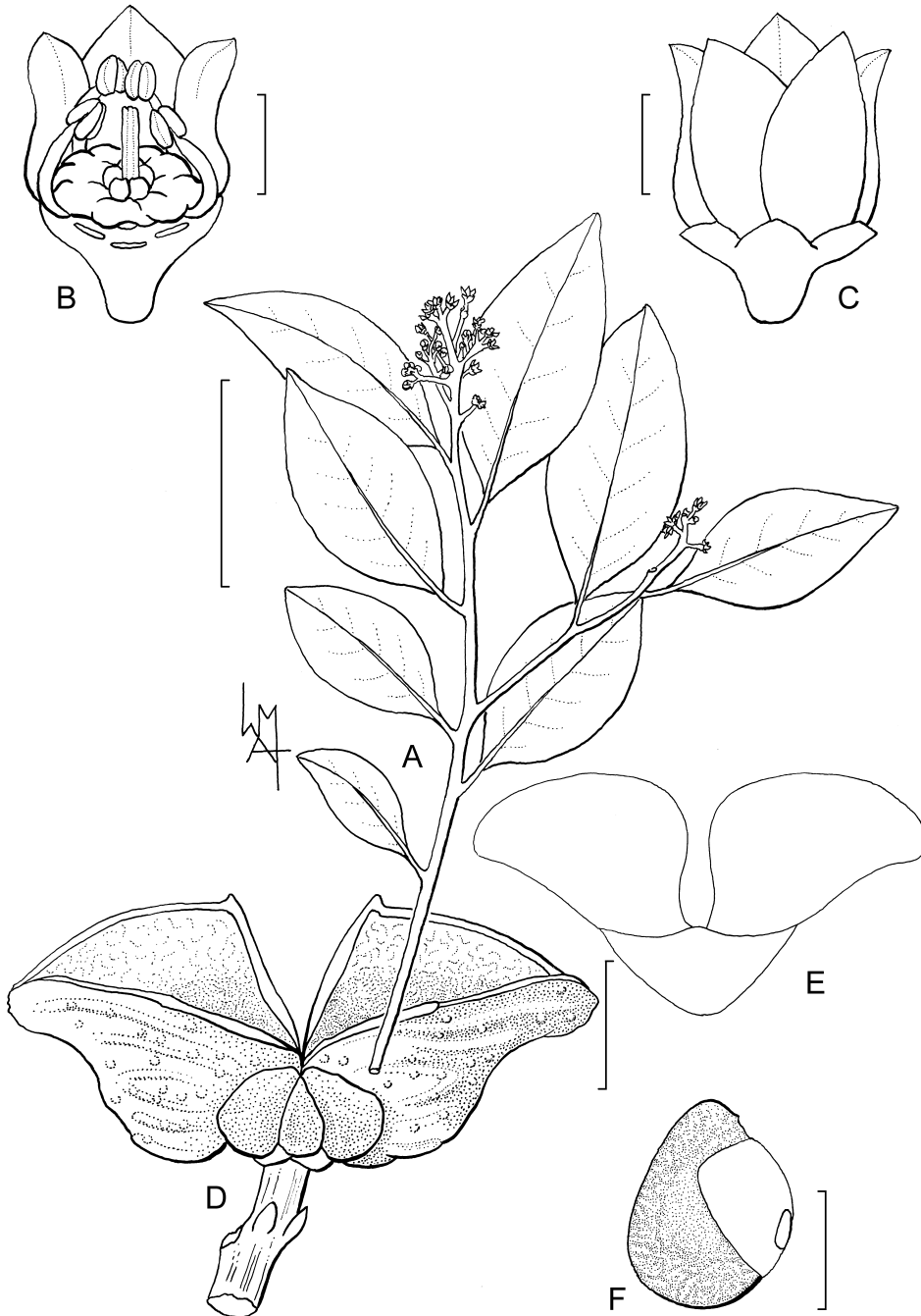


Figure 9. *Coatesia paniculata*. **A**, flowering branchlet; **B**, **C**, flowers; **D**, dehiscent fruit; **E**, dorsilateral endocarp; **F**, seed with ventral endocarp (**A**, P.Forster 3236 et al., BRI, CBG; **B**, **C**, L.Bird & K.Williams s.n., 24 July 1983, BRI, CBG; **D–F**, G.Smyrell s.n., Feb. 1996, CANB). Scale bars: **A** = 5 cm; **B**, **C** = 1 mm; **D**, **E** = 3 mm; **F** = 2 mm. Drawn by W.Murray.

8. ZANTHOXYLUM

T.G.Hartley

Zanthoxylum L., *Sp. Pl.* 1: 270 (1753); from the Greek *xanthox* (yellow) and *xylon* (wood), referring to the colour of the wood.

T: *Z. americanum* Mill.

Fagara L., *Syst. Nat.*, 10th edn, 897 (1759), *nom. cons.* T: *F. pterota* L.

Blackburnia J.R.Forst. & G.Forst., *Char. Gen. Pl.* 6 (1775). T: *B. pinnata* J.R.Forst. & G.Forst.

Shrubs, trees, or woody climbers, dioecious, evergreen or deciduous, usually armed. Trichomes simple. Leaves alternate, mostly pinnate or trifoliolate. Inflorescences panicle or sometimes racemose, terminal and/or axillary or infrafoliar. Flowers comparatively lax, 4-merous. Sepals persistent in fruit. Petals distinct, ±narrowly imbricate, glabrous, deciduous in fruit. Stamens (rudimentary or lacking in female flowers) 4, distinct. Gynoecium (rudimentary or lacking in male flowers) a 4-carpelled subapocarpous pistil or 1-carpelled; ovules 2 per locule; style central-apical and composed of 4 contiguous stylar and stigmatic elements or excentric and composed of single stylar and stigmatic elements. Fruit usually of 1 or 1–4 basally connate follicles; exocarp subfleshy; abortive carpels persistent; ventral endocarp lacking; remaining endocarp cartilaginous, glabrous, adnate. Seeds solitary, ovoid to globose, nearly as large as follicles, persistent in dehiscent follicles, with sclerotesta, sarcotesta, and shiny black or reddish pellicle; endosperm copious or scant. Embryo straight; cotyledons flattened or plano-convex, orbicular to elliptic in outline; hypocotyl terminal, considerable narrower than cotyledons.

A genus of 200 or more species; pantropical, extending to temperate latitudes in E Asia and eastern N America; 4 species in mainland Australia, one of them endemic; one wide-ranging SW Pacific species, *Z. pinnatum* (J.R.Forst. & G.Forst.) W.R.B.Oliv., in Lord Howe and Norfolk Is.

Important as a commercial timber (Satinwood) in tropical Africa (*Z. macrophyllum* W.R.B.Oliv.) and tropical America (*Z. flavum* Vahl). The fruit is used as a condiment in India, the Himalayas, and SE Asia (*Z. acanthopodium* DC., *Z. armatum* DC., *Z. myriacanthum* Wall. ex Hook. f. and *Z. rhetsa* (Roxb.) DC.), in China (*Z. bungeanum* Maxim.) and Japan (*Z. piperitum* DC.). Used in aboriginal medicine, especially as a remedy for toothache, in India and SE Asia (*Z. armatum* DC. and *Z. nitidum* (Roxb.) DC.), S Africa (*Z. capense* (Thumb.) Harv.) and N America (*Z. americanum* and *Z. clava-herculis* L.). Of interest chemo-taxonomically for the synthesis of isoquinoline alkaloids which are otherwise of wide occurrence in the Ranales, notably the Berberidaceae and Papaveraceae.

T.G.Hartley, A revision of the Malesian species of *Zanthoxylum* (Rutaceae), *J. Arnold Arbor.* 47: 171–221 (1966); T.G.Hartley, Additional notes on the Malesian species of *Zanthoxylum* (Rutaceae), *J. Arnold Arbor.* 51: 423–426 (1970); F.Fish & P.G.Waterman, Chemosystematics in the Rutaceae II. The chemosystematics of the *Zanthoxylum/Fagara* complex, *Taxon* 22: 177–203 (1973); K.M.Ng *et al.*, The biochemical systematics of *Tetradium*, *Euodia* and *Melicope* and their significance in the Rutaceae, *Biochem. Syst. Ecol.* 15: 587–593 (1987); C.Beurton, Gynoecium and perianth in *Zanthoxylum* s.l. (Rutaceae), *Pl. Syst. Evol.* 189: 165–191 (1994).

- 1 Plant a woody climber; branchlets and rachis of leaves with retrorse prickles; functional gynoecium and fruit (including abortive carpels, if any) 4-carpelled 1. *Z. nitidum*
- 1: Plant a shrub or tree; branchlets and leaves unarmed or with spreading or ascending prickles; functional gynoecium and fruit usually 1-carpelled
- 2 Leaves trifoliolate (occasional or rather frequent leaves bifoliolate or simple) 4. *Z. ovalifolium*
- 2: Leaves pinnate
- 3 Lateral leaflets in 4–11 pairs, with petiolules 1–7 mm long; pedicels 1.5–6 mm long, 0.15–0.5 mm wide; petals 2.5–3 mm long; disc in male flowers c. 0.5 mm high, inconspicuously 4-lobed or grooved 2. *Z. rhetsa*
- 3: Lateral leaflets in 3–7 (–9) pairs, with petiolules (2–) 3–12 mm long; pedicels obsolete or to 2.5 mm long, 0.5–1 mm wide; petals 3.5–6.5 mm long; disc in male flowers 1–3 mm high, with 8 irregular wing-like flanges 3. *Z. brachyacanthum*

1. *Zanthoxylum nitidum* (Roxb.) DC., *Prodr.* 1: 727 (1824)

Fagara nitida Roxb., *Fl. Ind.* 1: 439 (1820). T: cult. Bot. Gard. Calcutta (plant from Canton, China), *Roxburgh Icones* 2430; lecto: plate at K, *fide* T.G.Hartley, *J. Arnold Arbor.* 47: 180, 183 (1966).

Z. torvum F.Muell., *Fragm.* 7: 140 (1871); *F. torva* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 119 (1896). T: Herberts R., Rockingham Bay, Qld, 21 Aug. 1869, *J.Dallachy*; syn: GH (male specimen), MEL (male and female specimens).

Illustrations: A.P.de Candolle, *Bot. Mag.* 52: t. 2558 (1825); C.C.Huang, *Acta Phytotax. Sin.* 6: t. XV (1957); H.L.Li, *Woody Fl. Taiwan* fig. 134 (1963), as *F. nitida*.

Woody climber, evergreen. Older stems with thick conical spines; branchlets and rachis of leaves and sometimes midrib of leaflets with retrorse prickles. Leaves imparipinnate, 5–9-foliolate, 10–34 cm long; petiolules of lateral leaflets obsolete or to 3 mm long; terminal leaflet with petiolule 7–40 mm long; laminae ovate to elliptic, \pm equilateral, 4.5–10 cm long, 2–5 cm wide, rounded to obtuse or acute at base, entire to crenate, acuminate. Inflorescences terminal and axillary and sometimes infraxillary, racemose or paniculate, to 8 cm long; pedicels 1–1.5 mm long, c. 0.3 mm wide (1–5 mm long and 0.8–1 mm wide in fruit). Sepals distinct or basally connate, 0.5–0.8 mm long. Petals 2–3 mm long, white to pale yellow. Male flowers: stamens c. 3.5 mm long; disc columnar or bell-shaped, c. 0.5 mm high, entire or inconspicuously lobed; rudimentary gynoeceum composed of 4 sterile, distinct finger-like carpels c. 0.6 mm long. Female flowers: stamens lacking; disc columnar, c. 0.3 mm high, entire; gynoeceum 4-carpelled, 1.5–2 mm long; style apical, of 4 contiguous styler elements; stigmas coherent at anthesis, the combined stigmatic structure peltate. Fruit (including abortive carpels, if any) 4-carpelled; follicles subglobose, 5–7 mm long, red or brown. Seeds subglobose, with thick sclerotesta; endosperm copious. Embryo with cotyledons flattened. $n = 34$, P.N.Mehra & P.K.Khosla, *Taxon* 18: 216 (1969).

Ranges from India E to Taiwan and S to Australia. In Australia occurs in NE Qld from the Daintree R. S to Rockingham Bay; in rain forest, near sea level to 400 m alt. Flowers recorded Sept., Oct.; fruits recorded Jan., Feb.

Qld: Daintree R., *L.J.Brass & C.T.White* 180 (A); Mossman, *W.T.Jones* 2060 (CANB); Johnstone R., *H.S.Ludbrook* 58 (BRI); Jarra Ck, Tully, *L.J.Webb* 2352 (CANB).

A very tall, heavy woody climber as seen in Australia and rain forest areas of Malesia. In more open situations, especially in mainland Asia, often grows as a scrambling or \pm erect shrub. Occasionally cultivated as a hedge plant in China. In the Philippines and southern China the plant is pounded and placed in pools to stupefy fish.

**2. *Zanthoxylum rhetsa* (Roxb.) DC., *Prodr.* 1: 728 (1824)**

Fagara rhetsa Roxb., *Fl. Ind.* 1: 438 (1820). T: cult. Bot. Gard. Calcutta (plant from Sikar, India), *Roxburgh Icones* 185; lecto: plate at K, *fide* T.G.Hartley, *J. Arnold Arbor.* 47: 197, 198 (1966).

Z. parviflorum Benth., *Fl. Austral.* 1: 363 (1863); *F. parviflora* (Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 119 (1896). T: Port Essington [N.T.], 1838, *J.Armstrong* 569; lecto: MEL, *fide* T.G.Hartley, *J. Arnold Arbor.* 47: 199, 200 (1966).

Shrub, or tree to 26 m high; deciduous (flowers appearing before or with young leaves) or evergreen. Stems with thick conical spines; branchlets and leaves unarmed. Leaves impari- or paripinnate, 9–23-foliolate, 14–42 cm long; petiolules of lateral leaflets 1–7 mm long; terminal leaflet with petiolule 3–30 mm long; laminae equi- to inequilaterally ovate to elliptic or narrowly so, 4–13 cm long, 1.5–5 cm wide, rounded to acute or oblique at base, entire to crenate, acuminate. Inflorescences terminal or terminal and axillary, paniculate, to 15 cm long; pedicels 1.5–6 mm long, 0.15–0.5 mm wide (their size similar in fruit). Sepals basally connate, 0.5–1 mm long. Petals 1–2 mm long, white or yellowish white. Male flowers: stamens c. 3 mm long; disc \pm conical, c. 0.5 mm high, inconspicuously 4-lobed or -grooved; rudimentary gynoeceum 1 (rarely 2–4)-carpelled, c. 0.3 mm long. Female flowers: stamens lacking; disc columnar, c. 0.5 mm high, entire; gynoeceum 1 (rarely 2)-carpelled, c. 1.5 mm long; style excentric; stigma \pm flattened. Follicles single or rarely in pairs, globose, 6–7 mm

diam., red or brown to black. Seeds globose, with thick sclerotesta; endosperm copious. Embryo with cotyledons \pm flattened, orbicular in outline. $n = 34$, P.H.Mehra & P.K.Khosla, *Taxon* 18: 216 (1969).

Ranges from India E to the Philippines and S to Australia. In Australia occurs from Prince Frederick Harbour, NW W.A., E to Torres Strait Is. (Gabba and Moa) and S in Cape York Penin. to the vicinity of Barrow Point. In mainly coastal thickets and forests. Flowers Nov.–Feb.; fruits Nov.–July.

W.A.: Prince Frederick Harbour, *K.F.Kenneally* 9923 (CNS). N.T.: Gunn Point, *J.J.Russell-Smith* 8172 & *D.Lucas* (CANB); Channel Point, *G.M.Wightman* 330 & *C.R.Dunlop* (CANB). Qld: near Lockerbie, *B.Hyland* 10238 (CANB, CNS); Torres Strait, Gabba Is., *B.Waterhouse* 2731 (CANB).



T.G.Hartley, *op. cit.* 197, treated *Z. rhetsa* (as *Z. limonella* (Dennst.) Alston) as exclusively deciduous, but in subsequent study of the species (not published) he saw both deciduous and evergreen specimens from Thailand. Also, K.Narayanan & M.P.Nayar, in P.K.Hajra *et al.*, *Fl. India* 4: 387 (1997) recorded evergreen and deciduous plants of *Z. rhetsa* from India.

3. *Zanthoxylum brachyacanthum* F.Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 65 (1858), as *Xanthoxylon*

Fagara brachyacantha (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 119 (1896), as *brachyacanthum*. T: upper Brisbane R. [Qld], *W.Hill & F.Mueller*; holo: MEL.

Z. veneficum F.M.Bailey, *Syn. Queensland Fl.*, suppl. 1, 11 (1886); *F. venefica* (F.M.Bailey) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 119 (1896), as *venefica*. T: Johnstone R., Qld, Oct. 1885, *T.L.Bancroft*; iso: MEL.

Shrub, or tree to 25 m high, evergreen. Older stems with thick conical spines; branchlets and/or rachis of leaves with spreading or ascending prickles or unarmed. Leaves impari- or paripinnate, 7–13-foliolate, 12–30 cm long; petiolules of lateral leaflets 3–9 mm long; terminal leaflet with petiolule 3–18 mm long; laminae \pm equilaterally ovate to elliptic or obovate, or narrowly so, 4–15 cm long, 1.5–5.5 cm wide, rounded to obtuse, acute, or attenuate at base, entire to crenate, acuminate. Inflorescences terminal or terminal and axillary, paniculate, to 15 (–25) cm long; pedicels obsolete or to 2.5 mm long, 0.5–1 mm wide (their size similar in fruit). Sepals basally connate, c. 1 mm long. Petals 4–5 mm long, greenish cream. Male flowers: stamens 3.5–8 mm long; disc subglobose to ellipsoid or obovoid, 1–3 mm high, with 8 irregular wing-like flanges (best seen in flowers heated in water); rudimentary gynoeceum lacking. Female flowers: rudimentary stamens ligulate, to 2 mm long or lacking; disc columnar, to 0.5 mm high and entire or lacking; gynoeceum 1-carpelled, 2.5–3 mm long; style excentric; stigma \pm flattened or capitate. Follicles single, globose to obovoid, 7–8 mm long, red or orange-red. Seeds globose to obovoid, with thick sclerotesta; endosperm copious. Embryo with cotyledons flattened. *Satin Tree*, *Satinwood*, *Scrub Mulga*, *Thorny Yellow-wood*. Plate 17; Fig. 10A–D.

Occurs from the Atherton Tableland, NE Qld, to the Clarence R., NE N.S.W.; in rain forest, near sea level to 900 m alt. Flowers Sept.–Nov.; fruits Feb.–May.

Qld: S.F.R. 191, *B.Hyland* 8623 (CANB); Cathu S.F. c. 50 km S of Proserpine, *A.Kanis* 2129 (CANB); near Lamonds Hill on Gourka Pocket Rd 6 km ESE of Malanda, *L.S.Smith* 12094 (CANB); Mt Mistake, *L.S.Smith & L.J.Webb* 3674 (BRI, CANB). N.S.W.: Wiangaree S.F. 6 km NE of Wiangaree, *H.C.Hayes et al.* 2548 (CANB).

Zanthoxylum brachyacanthum appears to be unique among Australian-Malesian plants of *Zanthoxylum* in having 8 wing-like flanges on the disc in its male flowers; in the other species of the region, as far as known, the disc in male, female, and bisexual flowers is entire or 4-lobed. The closest relative of *Z. brachyacanthum* appears to be *Z. conspersipunctatum* Merr. & L.M.Perry, which is endemic to New Guinea.





Figure 10. A–D, *Zanthoxylum brachyacanthum*. A, flowering branchlet; B, male flower; C, female flower; D, dehiscent fruit (A, A.Floyd 2535, CANB; B, A.Floyd 1609, CANB; C, A.Kanis 2129, CANB; D, R.Thorne 20047a, CANB). E–H, *Z. ovalifolium*. E, fruiting branchlet; F, male flower; G, female flower; H, dehiscent fruit (E, H, V.Moriarty 1442, CANB; F, B.Gray 1215, CANB; G, C.Carr 11952, CANB). I–L, *Lunasia amara* var. *amara*. I, flowering branchlet; J, dehiscent fruit; K, dorsilateral endocarp; L, seed with ventral endocarp (I, D.Fell 381, CANB; J–L, A.Millar NGF 12229, CANB). Scale bar: A, E, I = 40 mm; B, F = 4 mm; C = 5 mm; G = 3 mm; D, H = 8 mm; J–L = 10 mm. Drawn by J.Miller.

4. *Zanthoxylum ovalifolium* Wight, *Ill. Ind. Bot.* 1: 169 (1839), as *Zanthoxylon*

Fagara ovalifolia (Wight) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 118 (1896). T: Shevagherry Hills, Madras, India, *R.Wight* 356; holo: K; iso: GH.

Z. inerme C.T.White & W.D.Francis, *Bot. Bull. Dept. Agric., Queensland* 22: 6, fig. on p. 5 (1920), *nom. illeg., non* Sessé & Moc. (1894); *Z. suberosum* C.T.White, *Proc. Roy. Soc. Queensland* 53: 208 (1942). T: near Atherton, Qld, Jan. 1918, *C.T.White s.n.*; holo: BRI; iso: MEL.

F. varians Domin, *Biblioth. Bot.* 89: 292 (1927), *non Z. varians* Benth. (1843); *Z. dominianum* Merr. & L.M.Perry, *J. Arnold Arbor.* 22: 32 (1941). T: L. Eacham, Qld, Feb. 1910, *K.Domin* 5657; holo: PR.

Illustration: C.T.White & W.D.Francis, *op. cit.* 5, as *Z. inerme*.

Shrub, or tree to 8 m high, evergreen. Older stems often with thick conical spines; branchlets unarmed or with spreading or ascending prickles. Leaves trifoliolate (occasional or rather frequent leaves bifoliolate or simple), 7.5–21 cm long; leaflets sessile or terminal leaflet with petiolule to 5 mm long; laminae elliptic to obovate, 6–18 cm long, 2.5–7 cm wide, acute to attenuate at base, entire to crenate, acute to acuminate. Inflorescences terminal or terminal and axillary, paniculate, to 12 cm long; pedicels 2.5–4 mm long, 0.15–0.3 mm wide (2.5–5 mm long, 0.5–0.8 mm wide in fruit). Sepals distinct or basally connate, 0.5–1 mm long. Petals c. 2.5 mm long, white. Male flowers: stamens 2.5–3 mm long; disc ovoid or bell-shaped, 0.5–0.6 mm high, entire or 8-lobed at base; rudimentary gynoeceum 1-carpelled, narrowly ovoid, c. 0.5 mm long. Female flowers: rudimentary stamens ligulate, to 1 mm long or lacking; disc columnar, 0.3–0.8 mm high, entire or inconspicuously ridged; gynoeceum 1-carpelled, 1.5–2 mm long; style excentric; stigma capitate. Follicles single, globose, 6.5 mm diam., red, purple, or brown. Seeds globose, with rather thin sclerotesta; endosperm scant. Embryo with cotyledons plano-convex, orbicular in outline. $n = 18$, P.N.Mehra & P.K.Khosla, *Taxon* 18: 216 (1969). *Thorny Yellow-wood*. Fig. 10E–H.

Ranges from the Himalayas and India S to Australia. In Australia occurs in NE Qld from the Daintree R. S to Ravenshoe; in rain forest, 100–1260 m alt. Flowers Dec.–Feb.; fruits Apr.–Nov.

Qld: S.F.R. 194, Atherton, *T.G.Hartley* & *B.Hyland* 14158 (CANB); Herberton, Scrubby Ck, *S.F.Kajewski* 1358 (A, BRI); Tolga, *H.S.MacKee* 9296 (CANB); Timber Camp Ck, *V.K.Moriarty* 1019 (CANB); Danbulla, *L.J.Webb* & *J.G.Tracey* 5745 (CANB).

**9. GEIJERA**

T.G.Hartley

Geijera Schott, *Rutaceae* 7 (1834); after J.D.Geijer, 17th century Swedish botanist.

Type: *G. salicifolia* Schott

Shrubs or trees, evergreen, unarmed. Trichomes simple. Leaves alternate, simple. Inflorescences paniculate, terminal or terminal and axillary. Flowers bisexual, 5-merous (rarely occasional flowers 4-merous). Sepals connate at base or to c. $\frac{1}{3}$ length, 0.6–1 mm long, persistent in fruit. Petals distinct, valvate, usually hooked adaxially at apex, 1.5–2 mm long, white or cream, glabrous, deciduous in fruit. Stamens as many as petals, distinct, 1–1.5 mm long. Gynoeceum subapocarpous, 5-carpelled (rarely in occasional flowers 4-carpelled), 0.8–1 mm long; ovules 2 per locule; style apical, obsolete or up to 0.5 mm long; stigma punctiform or capitate. Fruit of 1–5 basally connate, globose or subglobose follicles 4.5–5 mm diam.; exocarp subfleshy; abortive carpels persistent; ventral endocarp lacking; remaining endocarp cartilaginous, glabrous, adnate. Seeds solitary, globose or sub-globose, persistent in dehiscent follicles; with thick sclerotesta, sarcotesta, and shiny black pellicle; endosperm rather scant. Embryo straight; cotyledons somewhat plano-convex, suborbicular or broadly elliptic in outline; hypocotyl terminal, considerably narrower than cotyledons.

A genus of c. 10 species; known from New Guinea, Australia, and New Caledonia; 3 species in Australia, 2 of them endemic.

- 1 Hilum c. half as long as seed; leaf lamina 0.25–0.5 (–0.7) cm wide; petiole narrowly canaliculate

1. *G. linearifolia*

- 1: Hilum extending for full length of seed; lamina of larger leaves 1–7 cm wide, or, if narrower, then petiole broadly canaliculate

- 2 Leaf lamina ovate to elliptic, or narrowly so, in larger leaves 1–7 cm wide, 1.5–8 times longer than wide

2. *G. salicifolia*

- 2: Leaf lamina linear or sublinear, in larger leaves 0.3–1.4 cm wide, 10–50 times longer than wide

3. *G. parviflora*

1. *Geijera linearifolia* (DC.) J.M.Black, *Fl. S. Australia* 346 (1924)

Eriostemon linearifolius DC., *Prodr.* 1: 720 (1824), as *linearifolium*; *Zanthoxylum australasicum* A.Juss., *Mém. Mus. Hist. Nat.* 12: 503 (1825), *nom. illeg.*; *G. parviflora* var. *crassifolia* Benth., *Fl. Austral.* 1: 365 (1863). T: “Novâ-Hollandiâ,” *coll. unknown*; G-DC, microfiche seen.

Illustration: J.M.Black, *Fl. S. Australia*, 2nd edn, 2: 501, fig. 671 (1948).

Shrub to 4 m high. Leaves: petiole narrowly canaliculate, 0.2–0.5 cm long; lamina linear or linear-obovate, 1.5–6.5 cm long, 0.25–0.5 (–0.7) cm wide, 5–16 times longer than wide, obtuse or emarginate. Inflorescences 1–6 cm long. Flowers glabrous throughout. Hilum c. 1/2 as long as seed. *Oilbush*, *Sheepbush*. Plate 24.

Occurs from L. Kirk, south-central W.A., to the Murray R., SE S.A.; in woodland, dry scrub, and open places; to 250 m alt. Flowers Aug.–Nov.; fruits Oct.–July.

W.A.: c. 3.2 km S of L. Kirk, *N.T.Burbidge* 2689 (CANB); Eyre Hwy near Cocklebidgy Tank, *Hj.Eichler* 21307 (AD, CANB). S.A.: Murray Flats W of Blanchetown, May, 1911, *B.Cleland* (NSW); near Weekes Cave, *D.E.Symon* 4540 (CANB, NSW); 25 km S of Lake Everard HS, *J.Z.Weber* 3177 (CANB, MEL).



2. *Geijera salicifolia* Schott, *Rutaceae* 7, t. 4 (1834)

T: Broad Sound near Upper Head [Qld], 15 Sept. 1802, *R.Brown*; iso: CANB.

G. latifolia Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 236 (1848); *G. salicifolia* var. *latifolia* (Lindl.) Domin, *Biblioth. Bot.* 89: 293 (1927). T: Balmy Ck, Mantuan Downs [Qld], *T.L.Mitchell* 170; iso: NSW.

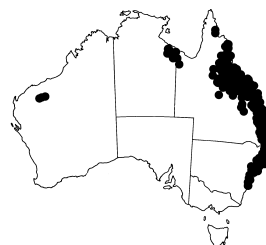
G. salicifolia var. *angustifolia* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 26: 80 (1901). T: Tia Falls, New England, N.S.W., Oct. 1900, *W.Forsyth & E.Cheel*; holo: NSW.

Illustrations: J.H.Maiden, *Forest Fl. New South Wales* 7: t. 243A–I (1920); W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, 173, fig. 98 (1970).

Shrub, or tree to 35 m high. Leaves: petiole narrowly canaliculate (only in broad-leaved plants) to broadly canaliculate, 0.3–3 cm long; lamina ovate to elliptic, or narrowly so, in larger leaves 4–15 cm long, 1–7 cm wide, 1.5–8 times longer than wide, narrowly obtuse or acute to acuminate. Inflorescences 2–18 cm long. Flowers glabrous throughout or sepals and ovary puberulous. Hilum extending for full length of seed. *Glasswood*, *Green Satinheart*, *Scrub Wilga*. Fig. 11.

Known from New Guinea, Australia, and New Caledonia. In Australia occurs in W.A. (Hamersley Ra.), NE N.T., and from Coen, NE Qld, to Budderoo Natl Park, east-central N.S.W.; in rain forest, woodland, and dry scrub, near sea level to 880 m alt. Flowers and fruits most months.

W.A.: Hamersley Ra. 8.9 km E of Mt Samson, *S.van Leeuwen* 952 (CANB, PERTH). N.T.: at turn-off to Fish River HS, *J.R.Maconochie* 1986 (AD, BRI, CANB, MEL). Qld: 12 km SW of Goombungee, *J.H.Ross* 3069 (BRI, CBG, MEL); Coen, *L.J.Webb & J.G.Tracey* 7550 (BRI). N.S.W.: Budderoo Natl Park, Minnamurra Falls, 23 Mar. 1953, *H.K.Judd* (NSW).



This species and the next are very closely related, differing mainly in the shape and length/width ratio of their leaf laminae.

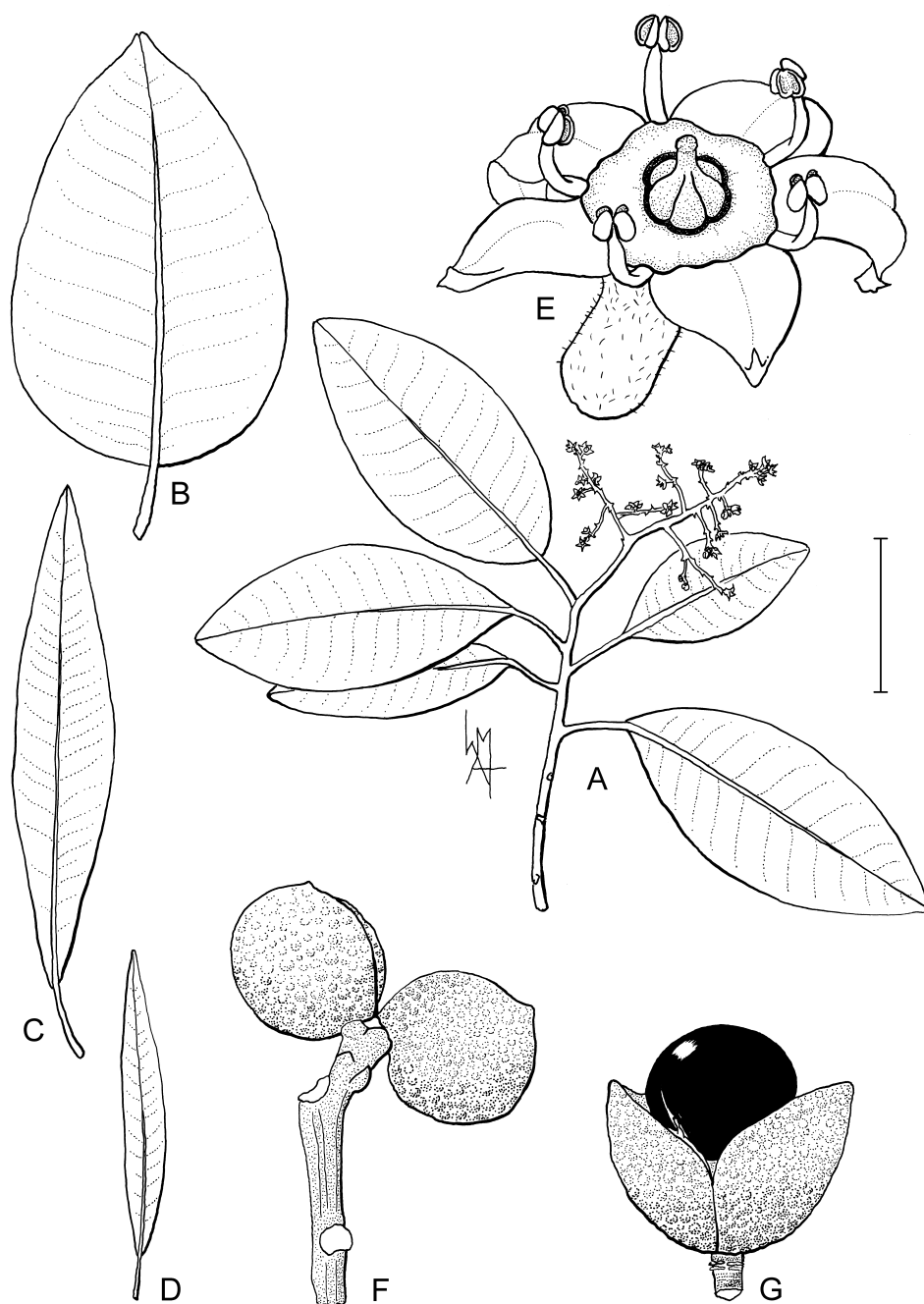


Figure 11. *Geijera salicifolia*. A–D, flowering branchlet and main variability of leaves; E, flower; F, G, immature and dehiscent fruit (A, S.Blake & L.Webb 15603, BRI, CANB; B, L.Webb & G.Tracey 13788, BRI, CANB; C, H.Fallding 10, CANB, NSW; D, N.Speck 1934, BRI, CANB, MEL; E, H.Fallding 1934, CANB, NSW; F, G, P.Grimshaw 2478 & R.Price, CANB). Scale bar: A–D = 5 cm; E = 2 mm; F, G = 5 mm. Drawn by W.Murray.

3. *Geijera parviflora* Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 102 (1848)

T: Narran R., N.S.W., *T.L.Mitchell* 33; iso: NSW.

G. pendula Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 251 (1848). T: Belyando R. [Qld], 29 July 1846, *T.L.Mitchell s.n.*; iso: K n.v. (photo CANB).

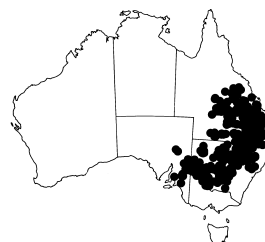
Illustration: J.H.Maiden, *Forest Fl. New South Wales* 7: t. 243K–O (1920).

Shrub, or tree to 10 m high. Leaves: petiole broadly canaliculate, 0.15–0.7 cm long; lamina linear or sublinear, in larger leaves 5–18 cm long, 0.3–1.4 cm wide, 10–50 times longer than wide, narrowly obtuse to acute or attenuate. Inflorescences 3–6 cm long. Flowers glabrous throughout or sepals ciliolate. Hilum extending for full length of seed. *n* = 54, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954); *n* = 81, V.K.Singhal *et al.*, *Taxon* 29: 356 (1980). *Wilga*.

Occurs in SE S.A. and from the vicinity of Goonyella, east-central Qld, to Piambie Parish, NW Vic.; in dry rain forest, woodland, dry scrub, and open places, to 400 m alt. Flowers and fruits most months.

S.A.: Danggali Cons. Park, *P.Gibbons* 622 (AD, MEL). Qld: Charleville, *S.T.Blake* 5325A (BRI, CBG); 34 km W of Goonyella, *N.Byrnes & J.Clarkson* 3899 (BRI). N.S.W.: 56 km from Rankin Springs on road to Monia Gap, *G.D'Aubert* 467 *et al.* (CANB, NSW). Vic.: Parish of Piambie 48 km NW of Nyah, 5 July 1943, *E.R.Jones* (MEL).

The chromosome numbers reported for this species are of considerable interest. Unfortunately, Smith-White did not cite a voucher and I have not been able to obtain on loan the voucher cited by Singhal *et al.*

**10. PENTACERAS**

T.G.Hartley

Pentaceras Hook.f. in G.Bentham & J.D.Hooker, *Gen. Pl.* 1: 298 (1862), *nom. cons.*; from the Greek *pente* (five) and *keras* (horn), referring to the prominent gland at the top of each of the 5 carpels.

Type: *P. australe* (F.Muell.) Benth.

Trees, evergreen, unarmed. Trichomes simple. Leaves alternate, imparipinnate (occasional leaves paripinnate). Inflorescences paniculate, terminal. Flowers bisexual, 5-merous. Sepals basally connate, deciduous in fruit. Petals distinct, valvate, deciduous in fruit. Stamens 10, distinct, alternately unequal in length. Gynoecium a 5-carpelled pistil; carpels in ovary joined in style, otherwise contiguous, each with prominent apical gland; ovules 2 per locule; style lateral; stigma punctiform or capitellate. Fruit of 1–5 distinct samaras, these winged all around, asymmetrically elliptic or broadly so; abortive carpels deciduous; exocarp membranaceous, glabrous; mesocarp woody; endocarp cartilaginous. Seeds 1 or 2 per samara, irregular in shape; testa with thin sclerotesta bounded externally by dull reddish brown spongy tissue; endosperm scant. Embryo straight; cotyledons plano-convex, broadly elliptic in outline; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of one species.

Pentaceras australe* (F.Muell.) Benth., *Fl. Austral.* 1: 365 (1863), as *australis

Cookia australis F.Muell., *Fragm.* 1: 25 (1858). T: Moreton Bay [Qld], *W.Hill*; holo: MEL.

Ailanthus punctata F.Muell., *Fragm.* 3: 42 (1862). T: MacConnell's Brush [Qld], 17 Nov. 1843, *L.Leichhardt s.n.*; syn: MEL; Richmond R., N.S.W., *C.Moore*; syn: MEL.

Tree to 27 m high. Leaves 5–15-foliolate, 15–50 cm long; petiolules of lateral leaflets obsolete or to 9 mm long; terminal leaflet with petiolule 7–35 mm long; laminae \pm inequilaterally ovate

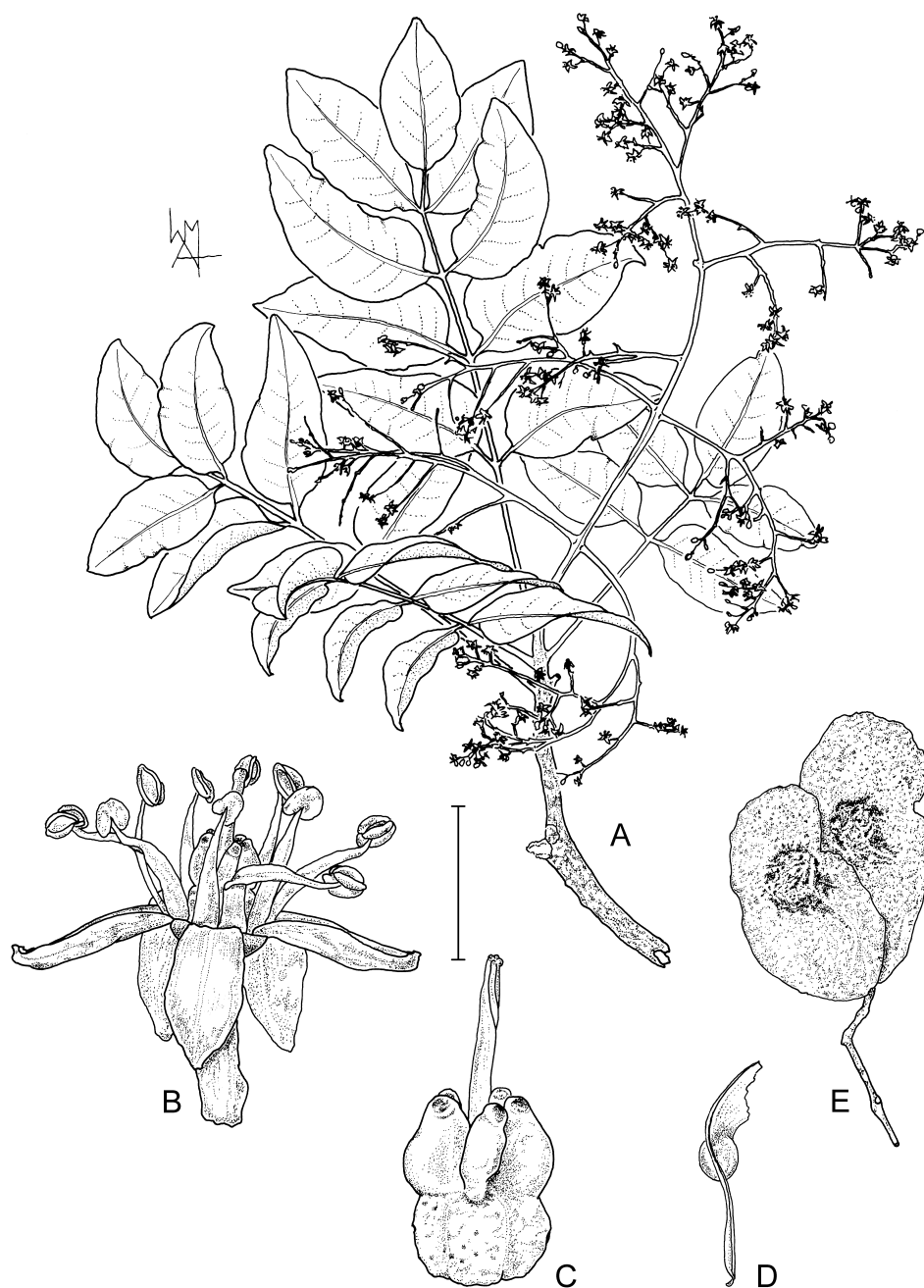


Figure 12. *Pentaceras australe*. **A**, flowering branchlet; **B**, flower; **C**, disc & gynoecium; **D**, **E**, fruits (**A**–**C**, L.Bird & K.O'Brien s.n., 17 Sept. 1988, CANB; **D**, **E**, K.Williams s.n., 24 Jan. 1971, CANB). Scale bar: **A** = 5 cm; **B** = 5 mm; **C** = 2.5 mm; **D**, **E** = 30 mm. Drawn by W.Murray.

to lanceolate, 5–13 cm long, 1.5–5 cm wide. Inflorescences 12–35 cm long. Flowers glabrous throughout or sepals ciliolate. Sepals 0.6–1 mm long. Petals 2.5–3 mm long, white. Samaras 2–4.5 cm long. Seeds c. 3 mm long. *Bastard Crow's Ash*. Plate 22; Fig. 12.

Occurs from the vicinity of Gympie, SE Qld, to the vicinity of Stroud, east-central N.S.W.; in rain forest (often dry), near sea level to 900 m. alt. Flowers Sept.–Oct., Jan; fruits Nov.–Jan., May.

Qld: Glastonbury, 7 Sept. 1982, *C.Fryar* (BRI); Templin, *N.Michael* 1973 (BRI, CANB); Lamington Natl Park, O'Reilly's, *L.S.Smith & L.J.Webb* 3640 (BRI, CANB). N.S.W.: Lennox Head, Nov. 1891, *W.Baeuerlen s.n.* (MEL, NSW); Stroud District, Aug. 1896, *A.Rudder* (NSW).



11. HALFORDIA

T.G.Hartley

Halfordia F.Muell., *Fragm.* 5: 43 (1865); after George Britton Halford, 1824–1910, Melbourne professor of medicine.

Type: *H. drupifera* F.Muell.

Shrubs or trees, evergreen, unarmed. Trichomes simple and fasciculate. Leaves alternate, simple. Inflorescences cymose to paniculate, terminal or terminal and axillary. Flowers bisexual, 5-merous (very rarely occasional flowers 4-merous). Sepals connate in proximal ½ or up to their full length, persistent in fruit. Petals distinct, narrowly imbricate or valvate, deciduous in fruit. Stamens twice as many as petals, distinct, alternately unequal in length. Gynoecium syncarpous, 3–5-loculed (sometimes with sterile interlocular spaces), glabrous; ovules 1 per locule; style subapical; stigma punctiform, capitate, or inconspicuously lobed. Fruit 3–5-loculed, drupaceous; exocarp fleshy, glabrous, pink or red to purple or black; mesocarp woody; endocarp cartilaginous. Seeds solitary; testa black, granulose, rather lustrous, thin and brittle, with sclerotesta; endosperm copious. Embryo straight; cotyledons flattened, elliptic-oblong; hypocotyl terminal, considerably narrower than cotyledons.

A genus of one species; known from Australia, New Guinea, New Britain, Vanuatu, and New Caledonia.

Halfordia kendack (Montrouz.) Guillaumin, *Notul. Syst. (Paris)* 2: 98 (1911)

Eriostemon kendack Montrouz., *Mém. Acad. Roy. Sci. Lyon, Sect. Sci.*, sér. 2, 10: 191 (1860). T: Isle Art, New Caledonia, *X.Montrouzier* 17; holotype: P.

E. leichhardtii F.Muell., *Fragm.* 5: 5 (1865); *H. drupifera* F.Muell., *Fragm.* 5: 43, t. 36 (1865), *nom. illeg.*; *H. leichhardtii* (F.Muell.) Baill. ex Guillaumin, *Notul. Syst. (Paris)* 2: 98 (1911), as *leichhardtii*. T: Mr. Archer's Brush, Moreton Bay [Qld], 20 Jan. 1844, *L.Leichhardt s.n.*; holotype: MEL.

H. scleroxyla F.Muell., *Fragm.* 7: 142 (1871). T: Coast Ra. [Rockingham Bay], Qld, 27 July 1868, *J.Dallachy*; lectotype: MEL, *fide* T.G.Hartley, *Fl. Australia* 26: 580 (2013).

Illustrations: F.Mueller, *Fragm.* 5: t. 36 (1865), as *H. drupifera*; W.D.Francis, *Austral. Rain-forest Trees* 3rd edn, 193, fig. 111 (1970).

Shrub, or tree to 30 m high. Leaves sessile or with petiole to 2 cm long; lamina elliptic to obovate, or narrowly so, 4–15 cm long, 1.5–6 cm wide, attenuate at base, entire, rounded or obtuse to acuminate at apex. Inflorescences 3–6 cm long; pedicels 1.5–3 mm long. Sepals 0.5–1 mm long. Petals c. 4.5 mm long, greenish white or white to yellowish, appressed-pubescent abaxially, glabrous adaxially. Staminal filaments frequently glandular-papillose towards apex; anthers glabrous or those of antipetalous stamens with 1 or a few apical trichomes. Fruit globose to ellipsoid or ovoid, 8–12 mm long. Seeds narrowly ovoid to ellipsoid, 3.5–5 mm long. *Ghittoe*, *Saffronheart*. Plate 23; Fig. 13.

In Australia occurs from islands of the Torres Strait, NE Qld, to the Clarence R., NE N.S.W.; in monsoon woodland and coastal and inland rain forest, to 1260 m alt. Flowers Jan.–May; fruits most months.

Qld: Torres Strait, Badu Is., *S.T.Garnett 171* (BRI); Thornton Peak, *T.G.Hartley 14029* (BRI, CANB); Cooloola Natl Park, *T.J.McDonald 445* (BRI, CANB, MEL). N.S.W.: Ulmarra, Jan. 1907, *A.J.Hammond* (NSW); Wiangaree S.F., *B.Hyland RFK4109* (BRI, CANB).

Judging from collector's notes the ripe fruit of *H. kendack* is consistently purple or black in SE Qld and N.S.W., whereas in NE Qld, New Guinea, and New Caledonia it ranges from pink or red to purple or black. These differences in colour apparently do not correlate with states of any other characters and are thus considered to be taxonomically insignificant.

Another variable feature of *H. kendack* worth mentioning is the presence vs. absence of trichomes on the antipetalous anthers. Both conditions are seen among specimens from N.S.W., NE Qld, New Guinea, and New Caledonia. As in the differences in fruit colour these differences apparently do not correlate with states of any other characters.

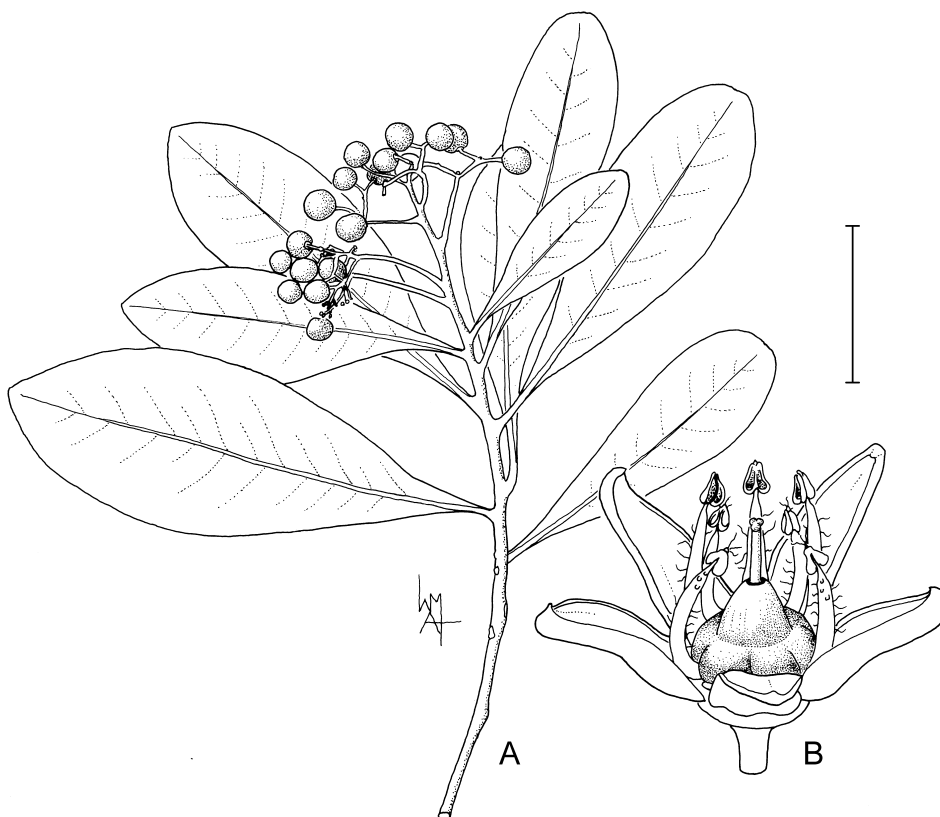


Figure 13. *Halfordia kendack*. **A**, fruiting branchlet; **B**, flower (**A**, W.Jones 1568, CANB; **B**, D.Jones 3649, CBG.) Scale bar: **A** = 5 cm; **B** = 4 mm. Drawn by W.Murray.

RUTACEAE

12. EUODIA

T.G.Hartley

Euodia J.R.Forst. & G.Forst., *Char. Gen. Pl.* 7 (1775) & 2nd edn, 13 (1776); from the Greek *euodia* (sweet scent), referring to the aniseed-like odour of the type species.

Evodia G.Forst., *Fl. Ins. Austr.* 10 (1786), *orth. var.*; *Ampacus* Kuntze, *Revis. Gen. Pl.* 1: 98 (1891), *nom. illeg.*
T: *E. hortensis* J.R.Forst. & G.Forst.

Shrubs or trees, evergreen, unarmed. Trichomes simple. Leaves opposite, trifoliolate or simple. Inflorescences compoundly or simply racemose, axillary. Flowers bisexual, 4-merous. Sepals basally connate, persistent in fruit. Petals valvate. Stamens 4; filaments sublinear. Gynoecium subapocarpous, 4-carpelled; ovules 2 per locule; style subapical; stigma capitate, punctiform, or becoming inconspicuously 4-parted. Fruit of 1–4 basally connate follicles, these \pm asymmetrically ovoid to ellipsoid, usually with short styler beak; exocarp subwoody; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and \pm persistent on seed as an ovate to elliptic piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds solitary or in pairs, ovoid or ovoid-ellipsoid, expelled from dehiscent fruit; testa thin and brittle, lustrous, verrucose, with sclerotesta; endosperm copious. Embryo straight, cotyledons flattened, elliptic; hypocotyl terminal, considerably narrower than cotyledons.

A genus of 7 species; ranges from New Guinea and Australia E to New Caledonia and Vanuatu and, apparently as an aboriginal introduction, on to Fiji, Tonga, Samoa, and Niue Is.; 2 species in Australia, both endemic.

Euodia hortensis, which occurs throughout the range of the genus except for Australia and New Caledonia, is well known in aboriginal medicine. Leaves are said to be applied to boils, chewed for toothache, and used to prepare a remedial bath, and a decoction of them is reputedly taken for stomach pains, fever, and menstrual pains. A decoction of the bark is said to be taken for stomach ulcers, to bring on menstruation, and to relieve pain in childbirth.

K.M.Ng *et al.*, The biochemical systematics of *Tetradium*, *Euodia* and *Melicope* and their significance in the Rutaceae, *Biochem. Syst. Ecol.* 15: 587–593 (1987); T.G.Hartley, On the taxonomy and biogeography of *Euodia* and *Melicope* (Rutaceae), *Allertonia* 8: 1–319 (2001).

Leaves trifoliolate and/or simple; laminae pubescent or sparsely so, at least below

1. *E. pubifolia*

Leaves simple; laminae becoming glabrous

2. *E. hylandii*

1. *Euodia pubifolia* T.G.Hartley, *Allertonia* 8: 64 (2001)

T: Oliver Ck, near Cape Tribulation, Qld, 20 Aug. 1972, *L.J.Webb & J.G.Tracey 10761*; holo: CANB.

Tree to 8 m high. Leaves trifoliolate and/or simple. Trifoliolate leaves: petiole 2–5.5 cm long; laminae elliptic or elliptic-obovate, in terminal leaflet 6.5–12.5 cm long, 2.5–4.5 cm wide, pubescent or sparsely so, at least abaxially on midrib and secondary veins, with 7–10 secondary veins on each side of midrib, divergent at angle of c. 50°. Simple leaves: petiole 0.65–1.5 cm long; lamina elliptic, 4.5–8 cm long, 2–3 cm wide, otherwise similar to trifoliolate leaves. Inflorescences 1.8–9 cm long; axis pubescent. Sepals 1.5–2 mm long, adaxially pubescent or sparsely so. Petals c. 2.5 mm long, white or cream, adaxially pubescent, deciduous in fruit. Anthers 0.3–0.4 mm long. Gynoecium tomentose; stigma capitate, 4-lobed. Follicles 4.5–5 mm long; exocarp puberulous. Seeds 4–4.5 mm long, black. Plate 26.

Known only from the vicinity of Cape Tribulation, NE Qld; in lowland rain forest. Flowers June–Sept.; fruits most months.

Qld: Noah Ck, *K.Hill 2043 et al.* (CANB); Noah Ck, *B.Hyland 8283* (CANB); Oliver Ck, *L.J.Webb & J.G.Tracey 10897* (BRI, CANB); Oliver Ck, *L.J.Webb & J.G.Tracey 11438* (CANB).



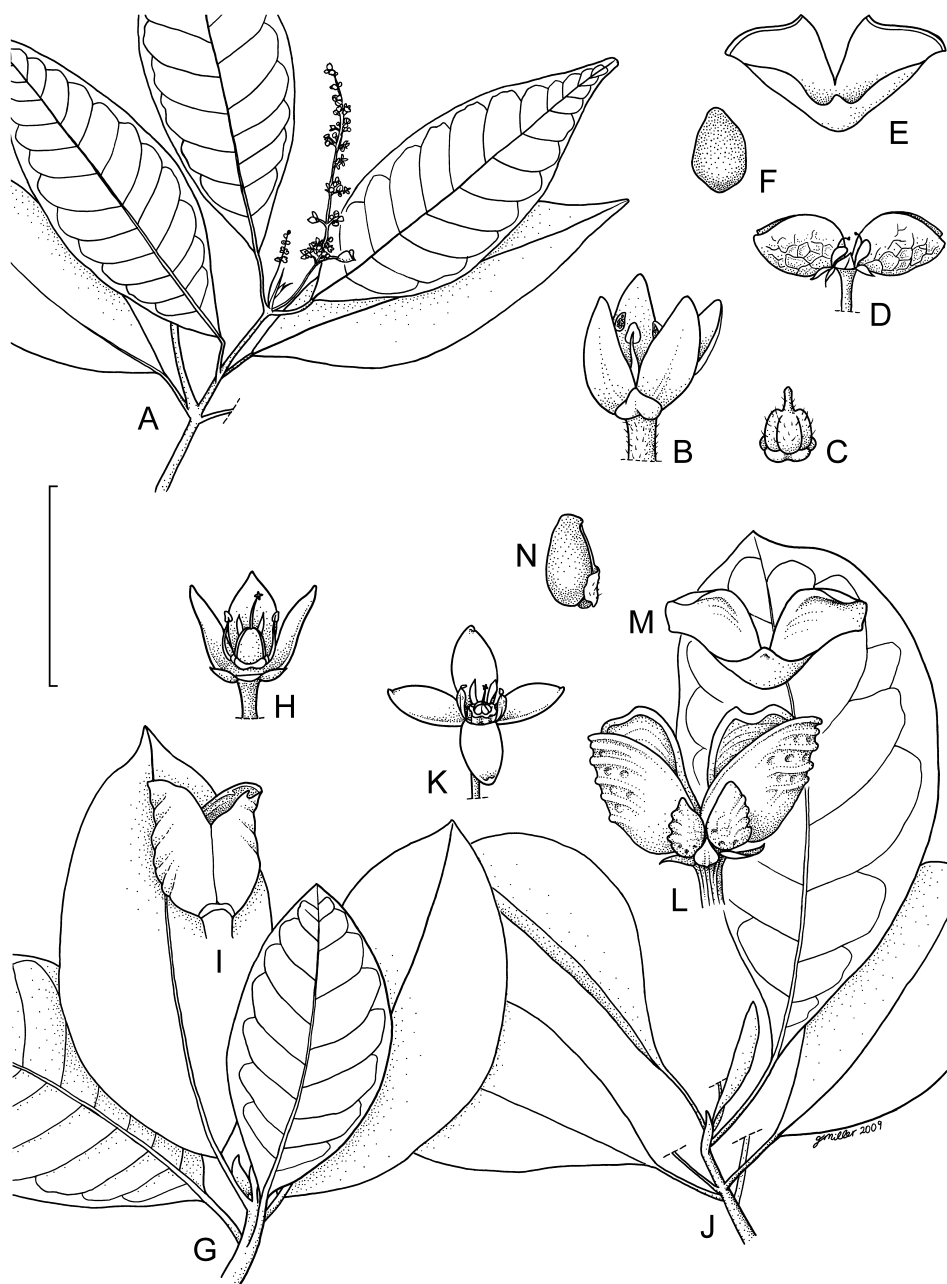


Figure 14. A–F, *Euodia hylandii*. A, flowering branchlet; B, flower; C, gynoecium; D, dehiscent fruit; E, dorsilateral endocarp; F, seed with ventral endocarp (A–F, L.Craven & J.Matarczyk 10017, CANB). G–I, *Brombya smithii*. G, branchlet; H, flower; I, fruit (G–I, L.Brass 20180, CANB). J–N, *B. platynema*. J, branchlet; K, flower; L, fruit; M, dorsilateral endocarp; N, seed with ventral endocarp (J, A.Bean 4558, CBG; K, V.Moriarty 1438, CANB; L–N, K.Sanderson 887, CANB). Scale bar: A, G, J = 20 mm; B, F, K = 2.5 mm; C = 0.5 mm; D, H = 4 mm; E = 6 mm; I = 8 mm; L, M = 5 mm; N = 3 mm. Drawn by J.Miller.

2. *Euodia hylandii* T.G.Hartley, *Allertonia* 8: 64 (2001)

T: near Noah Ck, Portion 62, Qld, 11 Apr. 1972, *B.Hyland* 5987; holo: CANB.

Shrub, or tree to 7 m high. Leaves simple; petiole 0.5–2 cm long; lamina elliptic, 6–18 cm long, 2.5–5.5 cm wide, becoming glabrous, with 11–17 secondary veins on each side of midrib, divergent at angle of c. 70°. Inflorescences 1.5–13.5 cm long; axis nearly glabrous or strigillose. Sepals 1–1.5 mm long, adaxially pubescent. Petals 2–2.5 mm long, white or cream, adaxially pubescent or sparsely so, subsistent in fruit. Anthers 0.5–0.6 mm long. Gynoecium with pilose ovary and \pm glabrous style; stigma punctiform, becoming inconspicuously 4-parted. Follicles 5–6 mm long; exocarp becoming glabrous. Seeds 4–4.5 mm long, reddish brown. Fig. 14A–F.

Occurs in NE Qld from Mt Carter S to the vicinity of the Daintree R.; in rain forest, sea level to 540 m alt. Flowers and fruits most months.

Qld: Portion 62, Alexandra, *B.Hyland* 6359 (CANB); Mt Carter, *B.Hyland* 7544 (CANB, CNS); T.R. 165, Pieter Botte L.A., *B.Hyland* 9361 (CNS).

**13. BROMBYA**

T.G.Hartley

Brombya F.Muell., *Fragm.* 5: 4 (1865); after John Edward Bromby, 1809–1889, Melbourne clergyman and educator.

Melicope sect. *Brombya* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 122 (1896). T: *B. platynema* F.Muell.

Shrubs or trees, evergreen, unarmed. Trichomes simple. Leaves opposite, simple. Inflorescences paniculate, axillary. Flowers bisexual, 4-merous. Sepals basally connate, glabrous adaxially, persistent in fruit. Petals distinct, valvate or narrowly imbricate, adaxially nearly glabrous or sparsely minutely pilose, subsistent or deciduous in fruit. Stamens 8, alternately unequal in length; filaments flattened and \pm petaloid; anthers of antipetalous stamens usually lacking pollen. Gynoecium a 4-carpelled subapocarpous pistil; ovules 2 per locule; style apical; stigma punctiform or 4-lobed. Fruit of 1–4 basally connate follicles, these ellipsoid to obovoid, without stylar beak; exocarp subwoody; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and \pm persistent on seed as an ovate piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds solitary or in pairs, ovoid, expelled from dehiscent fruit; testa thin and brittle, black, lustrous, granulate, with sclerotesta; endosperm copious. Embryo straight; cotyledons flattened, elliptic; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of 2 species.

Young branchlets and leaves glabrous or nearly so

Young branchlets and leaves pubescent

1. *B. platynema*

2. *B. smithii*

1. *Brombya platynema* F.Muell., *Fragm.* 5: 4 (1865)

Melicope platynema (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 122 (1896). T: Bald Hill, Seaview Ra., Qld, 30 June 1864, *J.Dallachy*; holo: MEL.

Shrub, or tree to 20 m high. Young branchlets like leaves, ovary, and exocarp of follicles glabrous or nearly so. Leaves: petiole 1.5–4 cm long; lamina elliptic to obovate, 9–25 cm long, 3.5–9 cm wide. Inflorescences 4–17 cm long. Sepals 0.8–1.2 mm long. Petals 1.5–2.5 mm long, white. Staminal filaments orbicular or obovate to spatulate; antisepalous anthers c. 0.3 mm

long; antipetalous anthers c. 0.15 mm long. Stigma punctiform. Follicles 4–5 mm long. Seeds 2.5–3 mm long. *Brombya*. Plate 27; Fig. 14J–N.

Occurs in NE Qld from the vicinity of Daintree S to the Seaview Ra.; in rain forest, near sea level to 800 m alt. Flowers and fruits most months.

Qld: Daintree R., *L.J.Brass* 2224 (A, B, BISH, BRI, P); near Tully, *F.Crome* 76 (CANB); Bridle Ck, c. 19 km SE of Mareeba, *T.G.Hartley & B.Hyland* 14139 (CANB); W foothills of Bartle Frere, *V.K.Moriarty* 1438 (CANB); Tolga, *L.S.Smith* 3424 (BRI, CANB, LAE).



2. *Brombya smithii* T.G.Hartley, *Fl. Australia* 26: 581 (2013)

T: Gap Ck c. 38 km SE of Cooktown, Qld, 7 Sept. 1960, *L.S.Smith* 11116; holo: BRI; iso: A, LAE.

B. sp. Gap Creek (L.S.Smith 11116), R.J.F.Henderson (ed.), *Names Distrib. Queensland Pl., Algae Lichens* 178 (2002).

Shrub, or tree to 12 m high. Young branchlets like leaves, ovary, and exocarp of follicles pubescent. Leaves: petiole 1.5–3 cm long; lamina elliptic or elliptic-obovate, 8–20 cm long, 3.5–10 cm wide. Inflorescences 2.5–13 cm long. Sepals 1–2 mm long. Petals 3.5–4 mm long, white. Staminal filaments elliptic or narrowly so; antisepalous anthers c. 0.6 mm long; antipetalous anthers c. 0.5 mm long. Stigma 4-lobed. Follicles 5–8 mm long. Seeds c. 3 mm long. Fig. 14G–I.

Occurs in NE Qld from the Annan R. S to the Bloomfield R.; in rain forest, near sea level to 800 m alt. Flowers Aug.–Dec.

Qld: Annan R., upper Parrot Ck, *L.J.Brass* 20180 (A, BRI, CANB, L, SING); 13.2 km S of Rossville, *L.W.Jessup* 3091 *et al.* (BRI); Bloomfield R., *W.T.Jones* 6534 (CANB); Gap Ck, *E.Volck* AFO 2731 (CNS); Mt Finnigan, *L.J.Webb & J.G.Tracey* 19872 (BRI, CANB).



14. MEDICOSMA

T.G.Hartley

Medicosma Hook.f. in G.Bentham & J.D.Hooker, *Gen. Pl.* 1: 296 (1862); from the Latin name of the Citron (*Citrus medica* L.) and the Greek *osmos* (odour), referring to the Citron-like scent of the type species.

Type: *M. cunninghamii* (Hook.) Hook.f.

Shrubs or trees, evergreen, unarmed. Trichomes simple to stellate or scale-like. Leaves opposite or whorled or rarely subopposite or alternate, simple or trifoliolate (rarely some leaves palmately 4- or 5-foliolate). Inflorescences cymose or reduced to fascicles or solitary flowers, axillary and/or infraxillary. Flowers bisexual, 4-merous. Sepals basally connate, glabrous adaxially, persistent in fruit. Petals distinct or rarely coherent for part of length, narrowly imbricate, erect or spreading-ascending, persistent or subpersistent in fruit. Stamens 8, alternately unequal in length; filaments ±flattened, gradually tapering from base to subulate apex, distinct or rarely connate for part of length, glabrous or at margin woolly, villous, or ciliate, eglandular or with raised glands towards apex, persistent or subpersistent in fruit. Gynoecium a 4-carpelled subapocarpous pistil; ovules 2 per locule; style apical or subapical. Fruit of 1–4 basally connate follicles, these ellipsoid to obovoid, 4–10 mm long, rarely with short stylar beak; exocarp subwoody; abortive carpels persistent; ventral endocarp membranaceous to subfleshy, tearing free from rest of endocarp and ±persistent on seed as a suborbicular to triangular piece of tissue; dorsilateral endocarp cartilaginous, glabrous, separate and usually expelled from dehiscent fruit. Seeds solitary or

in pairs, ±ovoid or sometimes irregularly shaped due to crowding, c. $\frac{1}{3}$ – $\frac{3}{4}$ as long as follicle, expelled from dehiscent fruit; testa thin and brittle, with sclerotesta, the surface variously uneven, dull to rather lustrous, brown to black; endosperm copious. Embryo straight; cotyledons flattened, elliptic; hypocotyl terminal, considerably narrower than cotyledons.

A genus of 25 species; known from New Guinea, Australia, and New Caledonia; 10 species in Australia, 9 of them endemic.

T.G.Hartley, A revision of the genus *Medicosma* (Rutaceae), *Austral. J. Bot.* 33: 27–64 (1985).

- 1 Leaves, or some of them, compound
 - 2 Leaves trifoliate (occasional leaves palmately 4- or 5-foliate or simple); inflorescences 2.5–12 cm long; sepals 4–5.5 mm long 4. *M. mulgraveana*
 - 2: Leaves trifoliate and simple; inflorescences to 1.2 cm long; sepals 1.5–2 mm long 5. *M. heterophylla*
- 1: Leaves simple
 - 3 Pedicels (1–) 2.5–25 mm long
 - 4 Petals abaxially and adaxially pubescent or abaxially puberulous and adaxially glabrous except for puberulous margin and apex, 9–20 mm long 1. *M. cunninghamii*
 - 4: Petals glabrous, 7–10 mm long 3. *M. farcana*
 - 3: Pedicels obsolete or to 2 mm long
 - 5 Petals 20–40 mm long 9. *M. riparia*
 - 5: Petals 2.5–7 mm long
 - 6 Petals abaxially minutely puberulous towards apex, otherwise glabrous, 2.5–3.5 mm long 10. *M. glandulosa*
 - 6: Petals abaxially densely appressed-pubescent, 4.5–7 mm long
 - 7 Petals adaxially puberulous in c. distal half 2. *M. forsteri*
 - 7: Petals adaxially glabrous
 - 8 Lamina of leaves 5.5–22.5 cm long, with secondary veins (9–) 12–25 on each side of midrib, divergent at angle of (60–) 70–80° 8. *M. sessiliflora*
 - 8: Lamina of leaves 4.5–12.5 cm long, with secondary veins 8–14 on each side of midrib, divergent at angle of 50–60°
 - 9 Lamina of leaves usually elliptic or narrowly so; sepals abaxially appressed-puberulous 6. *M. elliptica*
 - 9: Lamina of leaves obovate or mostly so; sepals abaxially nearly glabrous 7. *M. obovata*

1. *Medicosma cunninghamii* (Hook.) Hook.f. in G.Bentham & J.D.Hooker, *Gen. Pl.* 1: 296 (1862)

Acronychia cunninghamii Hook., *Bot. Mag.* 69: t. 3994 (1843), as *cunninghami*; *Euodia cunninghamii* (Hook.) F.Muell., *Fragm.* 3: 2 (1862). T: cult. Bot. Gard. Kew (introduced by Allan Cunningham from Moreton Bay, Qld), *coll. unknown*; *holo*: K.

Illustrations: W.J.Hooker, *loc. cit.*, as *A. cunninghamii*; H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19a: 241, fig. 101H–M (1931).

Shrub, or tree to 20 m high. Leaves opposite or rarely subopposite, simple; petiole 0.3–2 cm long; lamina elliptic to obovate, or narrowly so, 5.5–23 cm long, 2–7 cm wide; secondary veins 8–20 on each side of midrib, divergent at angle of 50–60°. Inflorescences few- or several-flowered, 1.5–9 cm long; pedicels (1–) 2.5–12 mm long. Sepals 3–5 mm long, abaxially puberulous to pubescent. Petals distinct, 9–17 mm long, white or cream, abaxially and adaxially pubescent or abaxially puberulous and adaxially glabrous except for puberulous margin and apex, persistent and accrescent to c. 20 mm long in fruit. Staminal

filaments distinct, woolly at margin, glandular-muricate towards apex. Stigma capitate. Follicles 6–6.5 mm long. *Bonewood*, *Pinkheart*.

Occurs from Gladstone, east-central Qld, to the Clarence R., NE N.S.W.; in rain forest, sea level to 500 m alt. Flowers Nov.–June; fruits Dec.–June.

Qld: Little Yabba F.R., Blacksnake Ck, *D.A.Goy & L.S.Smith 666* (BRI); S.F. 82, Brooyar, 14 km W of Gympie, 28 Nov. 1973, *R.Henderson* (BRI); Granite Ck, *W.J.F.McDonald 3262 et al.* (CANB); upper Coomera Valley, *L.J.Webb & J.G.Tracey 11259* (CANB). N.S.W.: Tintenbar, Dec. 1897, *W.Baeuerlen s.n.* (AD).



2. *Medicosma forsteri* T.G.Hartley, *Fl. Australia* 26: 581 (2013)

T: London Ck 2.5 km NNW of Mt Mellum, 12 km WSW of Landsborough, Qld, 26 Apr. 2000, *P.I.Forster 25572 & P.D.Bostock*; holo: CANB; iso: CANB.

M. sp. Mt Mellum (P.I.Forster PIF25572), R.J.F.Henderson (ed.), *Names Distrib. Queensland Pl., Algae Lichens* 180 (2002).

Tree to 12 m high. Leaves opposite or subopposite, simple, 6.5–16 cm long; petiole 0.5–2.5 cm long; lamina narrowly elliptic or narrowly elliptic-obovate, 6–14 cm long, 1.7–4.5 cm wide; secondary veins 13–17 on each side of midrib, divergent at angle of c. 60°. Inflorescences 1–several-flowered, to 2 cm long; pedicels obsolete or to 2 mm long. Sepals 1.5–2 mm long, abaxially densely appressed-puberulous, accrescent to c. 3 mm long in fruit. Petals c. 5 mm long, distinct, cream, abaxially densely appressed-pubescent, adaxially puberulous in c. distal 1/2, subsistent and accrescent to c. 6.5 mm long in fruit. Staminal filaments distinct, villous at margin; antisepalous ones glandular-muricate towards apex. Stigma capitate. Follicles c. 6.5 mm long.

Known only from the type locality, in SE Qld; in rain forest dominated by Bangalow Palm (*Archontophoenix cunninghamiana*), 220 m alt. Flowers and fruits Apr.

This species is probably most nearly related to *M. cunninghamii*, differing mainly in its smaller inflorescences, pedicels, sepals, and petals.



3. *Medicosma fareana* (F.Muell.) T.G.Hartley, *Austral. J. Bot.* 33: 36 (1985)

Euodia fareana F.Muell., *Fragm.* 9: 101 (1875); *Melicope fareana* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 122 (1896). T: Rockingham Bay, Qld, 2 Nov. 1870, *J.Dallachy*; holo: MEL.

Tree to 10 m high. Leaves opposite or in whorls of 3 or rarely subopposite or alternate, simple; petiole 1–1.7 cm long; lamina elliptic or narrowly so to narrowly obovate, 7–28 cm long, 2–8.5 cm wide; secondary veins 14–18 on each side of midrib, divergent at angle of 70–80°. Inflorescences 1–several-flowered, to 4 cm long; pedicels 7–25 mm long. Sepals 3.5–5 mm long, abaxially glabrous, accrescent to c. 8 mm long in fruit. Petals distinct, 7–7.5 mm long, white or cream, glabrous, persistent and accrescent to c. 10 mm long in fruit. Staminal filaments distinct, woolly at margin in c. proximal 1/2, eglandular. Stigma capitate. Follicles 5.5–6 mm long. *White Aspen*. Plate 28.

Occurs in NE Qld from near Cooktown S to Mt Fox; in rain forest, sea level to 800 m alt. Flowers and fruits most months.

Qld: Mt Fox, Sept.–Dec. 1949, *M.S.Clemens* (BRI, GH, L, NY, UC); Davies Ck forestry road c. 16 km ENE of Mareeba, *R.D.Hoogland 8535* (BRI, CANB); Danbulla F.R. c. 24 km E of Tinaroo, *R.Schodde 3302* (BRI, CANB); Malanda, Jan. 1923, *C.T.White s.n.* (A, BISH, BRI, CHR, SING, UC); Etty Bay, *C.T.White 11683* (A, NY, US).



4. *Medicosma mulgraveana* T.G.Hartley, *Fl. Australia* 26: 581 (2013)

T: East Mulgrave R., Qld, 25 Nov. 1995, *R.L.Jago 3696 et al.*; holo: CANB; iso: BRI, CANB.

M. sp. (East Mulgrave River), W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 468 (2004).

Tree to 8 m high. Leaves opposite, trifoliolate (occasional leaves palmately 4- or 5-foliolate or simple); petiole 1.5–9 cm long; laminae elliptic to obovate, 7.5–18 cm long, 3–7 cm wide; secondary veins 9–17 on each side of midrib, divergent at angle of c. 70°. Inflorescences several-flowered, 2.5–12 cm long; pedicels c. 1.5 mm long (to 2.5 mm long in fruit). Sepals 4–5.5 mm long, abaxially glabrous except for puberulous apex, not accrescent in fruit. Petals distinct, 4–5.5 mm long, white, abaxially densely appressed-pubescent, adaxially glabrous, persistent and not accrescent in fruit. Staminal filaments distinct, ciliate at margin; antisepalous ones glandular-muricate towards apex. Stigma punctiform. Follicles 7.5–8 mm long.

Known only from the type locality, in NE Qld; in rain forest, 700 m alt. Flowers and fruits Nov.

Qld: East Mulgrave R., *P.I.Forster 26442 et al.* (CANB); *loc. id.*, *R.Jensen 479* (CNS).

The closest relative of this new species is probably *M. heterophylla*, which differs mainly in its smaller inflorescences and sepals.

**5. *Medicosma heterophylla*** T.G.Hartley, *Fl. Australia* 26: 582 (2013)

T: track to Pinnacle Rock 4 km W of Karnak, Qld, 12 July 1994, *P.I.Forster 15541 et al.*; holo: CANB.

M. sp. Karnak (P.I.Forster PIF15541), R.J.F.Henderson (ed.), *Names Distrib. Queensland Pl., Algae Lichens* 180 (2002).

Tree to 7 m high. Leaves opposite, trifoliolate and simple. Trifoliolate leaves: petiole 1.5–6 cm long; laminae elliptic or narrowly so to obovate, 3.5–8 cm long, 1.3–3 cm wide; secondary veins 8–12 on each side of midrib, divergent at angle of 70–80°. Simple leaves: petiole 0.2–1.5 cm long; lamina ovate to elliptic or obovate, 3.8–7 cm long, 1.8–3 cm wide; secondary veins as in trifoliolate leaves. Inflorescences 1–several-flowered, to 1.2 cm long; pedicels 0.5–1.5 mm long. Sepals 1.5–2 mm long, abaxially glabrous. Petals distinct, 3–4 mm long, cream to pink or reddish, abaxially densely appressed-pubescent, adaxially glabrous, subsistent in fruit. Staminal filaments distinct, villous at margin; antisepalous ones glandular-muricate towards apex. Stigma punctiform. Follicles 4.5–5 mm long.

Occurs in NE Qld along Roaring Meg Ck and in the vicinity of Karnak; in rain forest and cloud forest, 650–1000 m alt. Flowers Feb.–July; fruits June–Sept.

Qld: Roaring Meg Ck, Mt Pieter Botte, *A.Ford 1994* (CNS); track to Pinnacle Rock, W of Karnak, *P.I.Forster 10701 et al.* (CANB); Pinnacle Rock Track, Whyanbeel, *B.Gray 6560* (CANB).



This new species, which is probably the closest relative of *M. mulgraveana* (*q.v.*), is also closely related to *M. elliptica*, *M. obovata* and *M. sessiliflora*, differing mainly in its trifoliolate leaves and smaller petals.

6. *Medicosma elliptica* T.G.Hartley, *Austral. J. Bot.* 33: 37, fig. 2a, b (1985)

T: upper Granite Ck, Bulburin S.F., Qld, 22 July 1978, *W.J.F.McDonald 2384* & *J.P.Stanton*; holo: BRI.

Illustration: T.G.Hartley, *op. cit.* 38.

Shrub, or tree to 7 m high. Leaves opposite or rarely subopposite, simple; petiole 0.4–1 cm long; lamina elliptic or narrowly so or rarely narrowly obovate, 4.5–12.5 cm long, 1.8–6 cm wide; secondary veins 11–13 on each side of midrib, divergent at angle of 50–60°. Inflorescences 1–few-flowered, to 1 cm long; pedicels obsolete or to 1 mm long. Sepals c. 2 mm long, abaxially appressed-puberulous. Petals distinct, 4.5–5.5 mm long, white, abaxially densely appressed-pubescent, adaxially glabrous, subsistent in fruit. Staminal

filaments distinct, woolly at margin; antisepalous ones glandular-muricate towards apex. Stigma clavate. Follicles immature, c. 7 mm long. Fig. 15A.

Known only from Bulburin State Forest, east-central Qld; in rain forest, 270–570 m alt. Flowers and fruits Apr., July.

Qld: Bulburin S.F., upper Granite Ck, *W.J.F.McDonald* 2394 & *J.P.Stanton* (BRI, CANB); Boyne L.A., *W.J.F.McDonald* 3163 *et al.* (BRI, CANB); upper Boyne R. near Scott Rd crossing, *W.J.F.McDonald* 3172 *et al.* (BRI); Bulburin S.F., loading ground near Podargus Ck, *W.J.F.McDonald* 3258 *et al.* (BRI, CANB).

Listed as Vulnerable under the EPBC Act, 1999.



7. *Medicosma obovata* T.G.Hartley, *Austral. J. Bot.* 33: 39, fig. 2c (1985)

T: Mt Dryander, N of Proserpine, Qld, July 1967, *W.T.Jones s.n.*; holo: CANB.

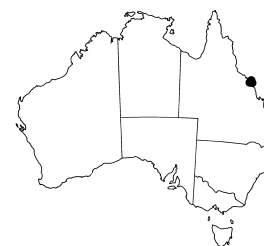
Illustration: T.G.Hartley, *op. cit.* 38.

Shrub, or tree to 6 m high. Leaves opposite or rarely subopposite, simple; petiole 0.5–1.2 cm long; lamina obovate (in occasional leaves elliptic), 4.5–10.5 cm long, 2.5–6 cm wide; secondary veins 8–14 on each side of midrib, divergent at angle of 50–60°. Inflorescences 1–few-flowered, to 1.3 cm long; pedicels obsolete or to 1 mm long. Sepals c. 2 mm long, abaxially nearly glabrous. Petals distinct, 4.5–7 mm long, white, abaxially densely appressed-pubescent, adaxially glabrous, subpersistent in fruit. Staminal filaments distinct, woolly at margin; antisepalous ones glandular-muricate towards apex. Stigma capitate. Follicles 6.5–7 mm long. Fig. 15B.

Known only from Mt Dryander and its foothills, east-central Qld; in rain forest and cloud forest, to 820 m alt. Flowers Apr.–July; fruits July.

Qld: Mt Dryander, *G.P.Guymer* 1723 (CANB), foothills of Mt Dryander, *W.T.Jones* 3218 (CANB); Mt Dryander, *C.F.Puttock UNSW* 13294 (CANB); NW branch of Dryander Ck, *C.F.Puttock & P.G.Wilson UNSW* 13283 (CANB); SE foothills of Mt Dryander, *L.S.Smith* 14543 (CANB).

Listed as Vulnerable under the EPBC Act, 1999.



8. *Medicosma sessiliflora* (C.T.White) T.G.Hartley, *Austral. J. Bot.* 33: 40 (1985)

Melicope sessiliflora C.T.White, *Proc. Roy. Soc. Queensland* 47: 54 (1936). T: Mossman R. Gorge, Qld, 9 Feb. 1932, *L.J.Brass* 2108; holo: A; iso: BISH, BRI.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 468 (2004).

Shrub, or tree to 10 m high. Leaves opposite or in whorls of 3 or rarely subopposite or alternate, simple; petiole 0.5–4.5 cm long; lamina elliptic to obovate, or narrowly so, 5.5–22.5 cm long, 2–8.5 cm wide; secondary veins (9–) 12–25 on each side of midrib, divergent at angle of (60–) 70–80°. Inflorescences 1–few-flowered, to 1.2 cm long; pedicels obsolete or to 1 mm long. Sepals 1–2 mm long, abaxially glabrous to appressed-puberulous. Petals distinct or coherent in c. proximal $\frac{1}{6}$, 5–7 mm long, cream, abaxially densely appressed-pubescent, adaxially glabrous, subpersistent in fruit. Staminal filaments distinct or connate in c. proximal $\frac{1}{5}$, woolly at margin; antisepalous ones glandular-muricate towards apex. Stigma subclavate. Follicles 5–10 mm long.

Occurs in NE Qld from near Cooktown S to the Atherton Tableland; in gallery forest and rain forest, sea level to 750 m alt. Flowers and fruits May–Nov.

Qld: Shiptons Flat, *L.J.Brass* 20017 (BRI, CANB); T.R. 130, Leichhardt L.A., *B.Hyland* 3400 (BRI); T.R. 1230, Boonjie L.A., *B.Hyland* 6394 (CNS); Mossman Gorge c. 4.8 km SW of Mossman, *R.Schodde* 4168 (CANB); Gap Ck, c. 38 km SSE of Cooktown, *L.S.Smith* 11129 (A, BRI, L).



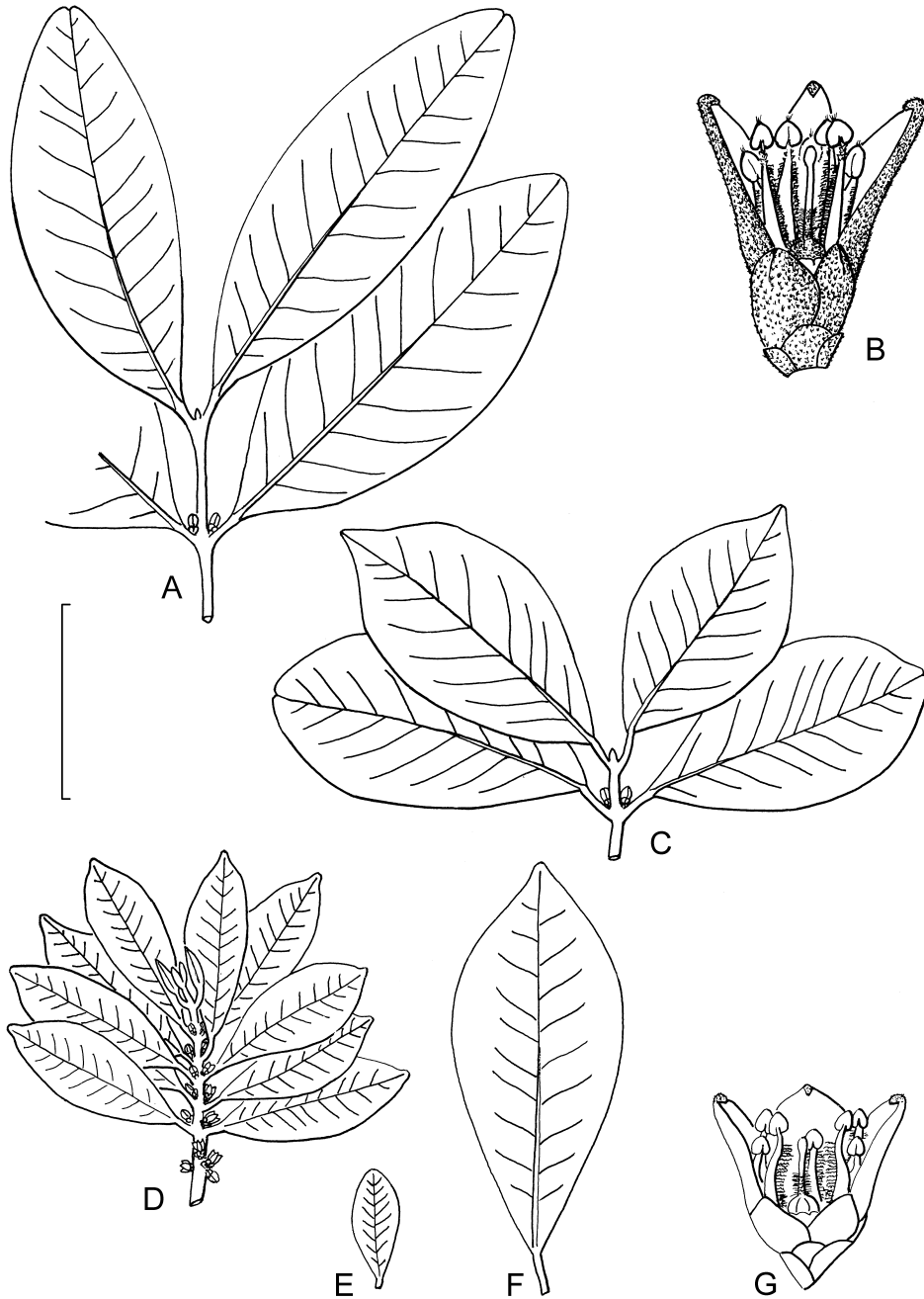


Figure 15. *Medicosma*. **A, B,** *M. elliptica*. **A,** young flowering branchlet; **B,** flower with 1 petal and 1 stamen removed (**A,** W.McDonald 2394 & J.Stanton, CANB; **B,** W.McDonald 3258 *et al.*, CANB). **C,** *M. obovata*, young flowering branchlet (W.Jones *s.n.*, July, 1967, CANB). **D–G,** *M. glandulosa*. **D,** flowering branchlet; **E, F,** variation in leaf size; **G,** flower with 1 petal and 1 stamen removed (**D, G,** B.Hyland RFK3172, CANB; **E,** J.Powell & J.Armstrong 709, NSW; **F,** T.Risley 85, CANB). Scale bar: **A, C–F** = 5 cm; **B, G** = 5 mm. Drawn by T.Hartley. Reproduced with permission from *Austral. J. Bot.* 33: 38 (1985).

According to Chan *et al.* (*J. Org. Chem.* 54: 2098–2103 (1989)) leaves of *M. sessiliflora* (as *Melicope sessiliflora*) have been found to yield three novel isomeric phloroglucinols with inhibitory activity against herpes simplex virus types I and II *in vitro*.

9. *Medicosma riparia* (P.Royen) T.G.Hartley, *Austral. J. Bot.* 33: 41 (1985)

Coombea riparia P.Royen, *Nova Guinea, Bot.* 2: 10, fig. 1 (1960). T: between Boepoel and L. Wam, Merauke District, southern New Guinea, 17 Aug. 1954, *P.van Royen 4709*; holo: L.

Illustration: P.van Royen, *op. cit.* 11, as *C. riparia*.

Shrub, or tree to 3 m high. Leaves opposite, simple; petiole 0.3–1.8 cm long; lamina elliptic to obovate, or narrowly so, 5–11 cm long, 1.5–4.5 cm wide; secondary veins 9–17 on each side of midrib, divergent at angle of 60–70°. Inflorescences 1- or 2-flowered, to c. 4 cm long; pedicels obsolete. Sepals 2.5–3.5 mm long, abaxially minutely appressed-puberulous. Petals coherent in c. proximal ¼, 20–40 mm long, cream, abaxially densely appressed-pubescent, adaxially puberulous towards apex, subsistent in fruit. Staminal filaments connate in c. proximal ¾, villous at margin; antisepalous ones glandular-muricate towards apex. Stigma capitate. Follicles 8–10 mm long.

Occurs in NE Qld from near Cape York S to the vicinity of Coen; in gallery forest and rain forest, near sea level to 220 m alt. Also in southern New Guinea. Flowers and fruits recorded June.

Qld: 1 km E of Kennedy Hill, *P.I.Forster 8874* (BRI); 6 km S of Cape York, *D.L.Jones 2304* (BRI); Stenocarpus Hill near Wenlock R., *G.Sankowsky 991 et al.* (BRI, CBG); upper Massey Ck, c. 24 km ENE of Coen, *L.S.Smith 11744* (BRI).



10. *Medicosma glandulosa* T.G.Hartley, *Austral. J. Bot.* 33: 42, fig. 2d–g (1985)

T: Carbine L.A., S.F.R. 143, Qld, 12 Feb. 1975, *B.Hyland RFK3172*; holo: CANB; iso: CNS.

Illustration: T.G.Hartley, *op. cit.* 38.

Shrub, or tree to 10 m high. Leaves opposite or in whorls of 3 or 4 or rarely subopposite or alternate, simple; petiole 0.3–1 cm long; lamina elliptic to obovate, or narrowly so, 2.3–12 cm long, 1–4 cm wide; secondary veins (sometimes obscure) 9–12 on each side of midrib, divergent at angle of 65–70°. Inflorescences 1–few-flowered, to 0.7 cm long; pedicels obsolete or to 1.5 mm long. Sepals 1–1.5 mm long, abaxially glabrous. Petals distinct, 2.5–3.5 mm long, white with red tips or cream, abaxially minutely puberulous towards apex, otherwise glabrous, subsistent in fruit. Staminal filaments distinct, villous at margin; antisepalous ones often with papillate glands towards apex. Stigma clavate. Follicles 4–5 mm long. Fig. 15D–G.

Occurs in NE Qld from Mt Finnigan S to Mt Lewis and vicinity; in montane rain forest and shrubbery, 1000–1200 m alt. Flowers and fruits most months.

Qld: headwaters of Daintree R., *P.I.Forster 22944 et al.* (CANB); Mt Lewis, North Mary L.A., *B.Hyland RFK3149* (CNS); Mt Lewis road 28 km from intersection with Mt Malloy–Mossman road, *L.W.Jessup 278 & J.R.Clarkson* (CANB); Mt Finnigan, *J.M.Powell & J.Armstrong 709* (NSW).



RUTACEAE

15. MELICOPE

T.G.Hartley

Melicope J.R.Forst. & G.Forst., *Char. Gen. Pl.* 28 (1775); from the Greek *meli* (honey) and *kope* (a cutting), referring to the nectariferous disc in the type species, which is \pm lobed.

Type: *M. ternata* J.R.Forst. & G.Forst.

Shrubs or trees, evergreen, unarmed. Trichomes simple, fasciculate, or stellate. Leaves opposite, trifoliolate or simple. Inflorescences paniculate, axillary, infrafoliar, or cauline. Flowers bisexual, male, or female, 4-merous. Sepals usually glabrous adaxially (sometimes puberulous adaxially in *M. elleryana*), persistent in fruit. Petals narrowly imbricate to valvate. Stamens (rudimentary in female flowers) 8 or 4; filaments linear or sublinear. Gynoecium (rudimentary in male flowers) a 4-carpelled, subapocarpous, subsyncarpous, or syncarpous pistil; ovules 1 or 2 per locule; style apical or subapical. Fruit of 1–4 follicles connate at or towards base (abortive carpels persistent) or a 4-loculed capsule with carpels connate at least in proximal $\frac{1}{2}$; ventral endocarp lacking; remaining endocarp cartilaginous, adnate or rarely separate (*M. vitiflora*). Seeds solitary or in pairs, usually \pm enlarged in chalazal region, remaining attached in or sometimes tardily released from dehiscent fruit; testa with thick sclerotesta, sarcotesta, and shiny black pellicle; endosperm copious. Embryo straight or slightly curved; cotyledons \pm flattened, elliptic or broadly so; hypocotyl terminal, considerably narrower than cotyledons.

A genus of c. 230 species; ranges from the Malagasy and Indo-Himalayan regions E to the Hawaiian and Marquesas Islands and S to New Zealand; 12 species in mainland Australia, 7 of them endemic. Two species, *M. contermina* C.Moore & F.Muell. and *M. polybotrya* (C.Moore & F.Muell.) T.G.Hartley, are endemic to Lord Howe Is., and another, *M. littoralis* (Endl.) T.G.Hartley, is endemic to Norfolk Is.

As discussed by Hartley (*Allertonia* 8: 19, fig. 5 (2001)), two types of attachment of mature seed are seen in dehiscent fruit of *Melicope*. In Type A, the attachment is by a partially detached axile strip of pericarp tissue or by a partially detached raphe, or by both. In Type B, neither the axile pericarp tissue nor the raphe is detached, and the seed is connected to the axile placental region by a funiculus, which is simply the funiculus of the ovule enlarged.

K.M.Ng *et al.*, The biochemical systematics of *Tetradium*, *Euodia* and *Melicope* and their significance in the Rutaceae, *Biochem. Syst. Ecol.* 15: 587–593 (1987); T.G.Hartley, On the taxonomy and biogeography of *Euodia* and *Melicope* (Rutaceae). *Allertonia* 8: 1–319 (2001).

- | | | |
|----|--|-----------------------------------|
| 1 | Stamens 8; fruit of 1–4 follicles, these each with stylar beak
0.5–1.5 mm long; leaves trifoliolate and/or simple | 1. <i>M. broadbentiana</i> |
| 1: | Stamens 4; fruit of 1–4 follicles or a 4-loculed capsule, not beaked;
leaves trifoliolate or mostly so | |
| 2 | Sepals connate in proximal $\frac{1}{2}$ – $\frac{3}{4}$; fruit a capsule 8–12 mm long | |
| 3 | Petals 5–6 mm long; carpels of capsule divaricate after dehiscence | 11. <i>M. peninsularis</i> |
| 3: | Petals c. 3.5 mm long; carpels of capsule ascending after dehiscence | 12. <i>M. fellii</i> |
| 2: | Sepals connate basally; fruit of 1–4 follicles, or, if a capsule (as in
<i>M. rubra</i>), then 20–30 mm long | |
| 4 | Petals adaxially longitudinally 3-ridged; raphe of seeds (best seen by
removing pellicle) sinuous or contorted, especially in chalazal region | 9. <i>M. elleryana</i> |
| 4: | Petals adaxially plane or longitudinally 1-ridged; raphe of seeds
\pm straight or gently curved | |
| 5 | Inflorescences infrafoliar or mostly so | |
| 6 | Terminal leaflet of trifoliolate leaves sessile, 10–30 cm long, 5–12 cm
wide; endocarp glabrous | 4. <i>M. bonwickii</i> |
| 6: | Terminal leaflet of trifoliolate leaves often petiolulate, with lamina
5–15 cm long, 1.5–4.5 cm wide; endocarp usually with indumentum | |

- 7 Petals white, (2.5–) 3.5–5 mm long; fruit of 1–4 follicles
4–5 mm long **5. *M. micrococca***
- 7: Petals pink, 5–6 mm long; fruit a capsule 20–30 cm long **10. *M. rubra***
- 5: Inflorescences axillary or mostly so
- 8 Trichomes simple, fasciculate, and stellate **2. *M. xanthoxyloides***
- 8: Trichomes simple
- 9 Flowers bisexual, male, or female; sepals ovate-triangular;
functional style 0.6–1.5 mm long; follicles 5–7 mm long;
endocarp glabrous **3. *M. vitiflora***
- 9: Flowers bisexual; sepals suborbicular or ovate; style 1.5–6.5 mm
long; follicles 3.5–6 mm long; endocarp with at least sparse
indumentum (or rarely glabrous in *M. micrococca*)
- 10 Terminal leaflet of trifoliolate leaves with lamina 10–17.5 cm
long, 4–8 cm wide; staminal filaments, disc, and gynoecium
glabrous; follicles c. 6 mm long **7. *M. jonesii***
- 10: Terminal leaflet of trifoliolate leaves with lamina 3.7–12.5 cm
long, 1.2–4.5 cm wide; staminal filaments, disc, or gynoecium
with indumentum; follicles 3.5–5 mm long
- 11 Petals glabrous, c. 2 mm long; follicles 3.5–4 mm long **6. *M. affinis***
- 11: Petals adaxially sparsely pilose or villous in proximal $\frac{1}{3}$ – $\frac{1}{2}$,
(2.5–) 3–5 mm long; follicles 4–5 mm long
- 12 Terminal leaflet of trifoliolate leaves with lamina obovate or
elliptic-obovate or narrowly so (in occasional leaves elliptic
or narrowly so), rounded or obtuse to acuminate; gynoecium
with indumentum; petals usually persistent or subsistent
in fruit **5. *M. micrococca***
- 12: Terminal leaflet of trifoliolate leaves with lamina elliptic or
narrowly so, acuminate; gynoecium glabrous; petals deciduous
in fruit **8. *M. hayesii***

1. *Melicope broadbentiana* F.M.Bailey, *Bot. Bull. Dept. Agric., Queensland* 2: 9 (1891)

T: Palm Camp, Mt Bellenden Ker, Qld, 1889, *F.M.Bailey (Bellenden Ker Exped.)*; holo: BRI; iso: MEL.

M. dielsii Lauterb., *Bot. Jahrb. Syst.* 55: 244 (1918). T: lower Russell R., Qld, 6 June 1902, *L.Diels 8504*; iso: WRS�.

M. glabrifolia C.T.White & W.D.Francis, *Bot. Bull. Dept. Agric., Queensland* 22: 3, fig. on p. 4 (1920). T: Atherton, Qld, Jan. 1918, *C.T.White s.n.*; holo: BRI.

M. simplicifolia Domin, *Biblioth. Bot.* 89: 288 (1927). T: Harveys Ck, Qld, Dec. 1909, *K.Domin s.n.*; syn: PR; Harveys Ck, Qld, Dec. 1910 (Jan. 1910 in protologue), *K.Domin s.n.*; syn: PR.

Illustrations: C.T.White & W.D.Francis, *op. cit.* 4, as *M. glabrifolia*; W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 469 (2004).

Shrub or tree 1–9 m high. Trichomes simple. Leaves trifoliolate and/or simple. Trifoliolate leaves: petiole 2–9 cm long; terminal leaflet with petiolule 4–13 mm long; terminal lamina elliptic, 4.5–16 cm long, 1.5–5.5 cm wide, subattenuate or attenuate at base, acute to acuminate at apex. Simple leaves: petiole 1–3 cm long; petiolule obsolete or to 3 mm long; lamina ovate to elliptic, 4–10 cm long, 1.5–4 cm wide, rounded to acute or rarely subcordate at base, acute to acuminate at apex. Inflorescences axillary, 1.3–6 cm long. Flowers bisexual, male, or female; plants monoclinal or dioecious. Sepals basally connate, suborbicular to ovate, 1–1.3 mm long. Petals erect or spreading-ascending, 2.5–3.5 mm long, white, glabrous, adaxially plane or longitudinally 1-ridged, deciduous in fruit. Stamens 8, alternately unequal in length; filaments adaxially pilose in proximal $\frac{1}{3}$ – $\frac{1}{2}$; anthers in bisexual and male flowers c. 1 mm long (c. 0.5 mm long in female flowers). Disc glabrous. Gynoecium in female and bisexual flowers subapocarpous, 1.5–3 mm long (in male flowers c. 1 mm long); ovary glabrous; ovules 2 per locule; style 1–2 mm long, minutely pilose up to $\frac{2}{3}$ its length or glabrous; stigma capitate, 4-lobed, 0.3–0.7 mm wide. Fruit of 1–4 follicles

9–12 mm long, each with stylar beak 0.5–1.5 mm long; exocarp subwoody; endocarp glabrous, adnate. Seed attachment Type A; seeds subglobose to ovoid or ellipsoid, 5–7 mm long; raphe of seeds \pm straight or gently curved. *False Euodia*.

Occurs in NE Qld from Mt Spurgeon S to the Paluma Ra.; in rain forest, near sea level to 1500 m alt. Flowers and fruits most months.

Qld: Mt Bellenden Ker, *L.J.Brass* 18328 (BRI, CANB); Boonjie, *S.F.Kajewski* 1076 (A, BRI, NY, UC); Tinaroo Ck, *V.K.Moriarty* 342 (CANB); Paluma Ra., MacLellands Lookout, *I.R.Telford* 1952 (BRI, CBG); Mt Spurgeon, *C.T.White* 10543 (BRI).



In the ripe fruit of this species the outer part of the pericarp sometimes falls, leaving the seeds and dorsilateral endocarp attached to the plant.

2. *Melicope xanthoxyloides* (F.Muell.) T.G.Hartley, *Allertonia* 8: 119, fig. 18 (2001)

Euodia xanthoxyloides F.Muell., *Fragm.* 4: 155 (1864); *Ampacus xanthoxyloides* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 98 (1891), *nom. illeg.*, as *xanthoxylodes*. T: Rockingham Bay, Qld, 19 May 1864, *J.Dallachy*; lecto: MEL, *fide* T.G.Hartley, *loc. cit.*; isolecto: NSW.

E. alata F.Muell., *Fragm.* 7: 142 (1871); *A. alatus* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 98 (1891), *nom. illeg.*, as *alata*. T: Herbert R., Qld, 28 Apr. 1865, *J.Dallachy*; holo: MEL; iso: L, NSW.

E. bakeriana Domin, *Biblioth. Bot.* 89: 291 (1927), as *Evodia*. T: Harveys Ck, Qld, Dec. 1909 (Jan. 1910 in protologue), *K.Domin s.n.*; holo: PR.

Illustration: T.G.Hartley, *op. cit.* 120.

Tree to 21 m high. Trichomes simple, fasciculate, and stellate. Leaves trifoliolate (occasional leaves simple); petiole 3.5–14 cm long; terminal leaflet sessile or with petiolule to 3 mm long; terminal lamina elliptic to obovate, or narrowly so, 11–27 cm long, 5–12.5 cm wide, narrowly obtuse to cuneate at base, acuminate at apex. Inflorescences axillary, 5–14 cm long. Flowers male or female (rarely occasional flowers bisexual); plants dioecious or rarely andromonoecious. Sepals basally connate, ovate-triangular or triangular, 0.5–0.7 mm long. Petals 1.3–2 mm long, green to yellow or cream, abaxially glabrous to pubescent, adaxially glabrous and plane or longitudinally 1-ridged, deciduous or mostly so in fruit. Stamens 4; filaments glabrous; anthers in bisexual and male flowers 0.6–0.8 mm long (0.3–0.5 mm long in female flowers). Disc short-velutinous at least on top. Gynoecium in female and bisexual flowers subapocarpous, 1–1.5 mm long (c. 0.5 mm long in male flowers); ovary pubescent or sparsely so; ovules 2 per locule; style 0.5–1 mm long, sparsely pubescent; stigma peltate and 4-lobed or 4-branched, 0.5–0.6 mm wide. Fruit of 1–4 follicles 3–4 (–4.5) mm long, not beaked; exocarp subwoody; endocarp glabrous, adnate. Seed attachment Type A; seeds subglobose to ellipsoid, 2.5–3.5 (–4) mm long; raphe of seeds \pm straight or gently curved. *Yellow Evodia*.

Known from Australia, New Guinea, and the Bismarck Archipelago. In Australia occurs in NE Qld from the McIlwraith Ra. S to the Herbert R.; in rain forest, near sea level to 1100 m alt. Flowers Nov.–Apr.; fruits June–Aug.

Qld: Silver Plains, Leo Ck, *P.I.Forster* 23074 *et al.* (CANB); S.F.R. 194, Atherton, *T.G.Hartley & B.Hyland* 14157 (CANB); Etty Bay, *L.S.Smith* 3248 (BRI); Wongabel, *L.S.Smith* 3800 (BRI, CANB); Kuranda, *C.T.White* 1523 (A, BRI, NSW).



3. *Melicope vitiflora* (F.Muell.) T.G.Hartley, *Telopea* 4: 34 (1990)

Euodia vitiflora F.Muell., *Fragm.* 7: 144 (1871). T: Rockingham Bay, Qld, 19 Oct. 1870, *J.Dallachy*; holo: MEL.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 470 (2004).

Tree to 40 m high. Trichomes simple. Leaves trifoliolate (occasional leaves simple); petiole 3–16 cm long; terminal leaflet with petiolule 2–30 mm long; terminal lamina elliptic to

obovate, 9–20 cm long, 3.5–9 cm wide, acute to attenuate at base, acute to acuminate at apex. Inflorescences axillary, 6–20 cm long. Flowers bisexual, male, or female; plants monoclinal or dioecious. Sepals basally connate, ovate-triangular, 0.6–1 mm long. Petals 1.5–3 mm long, green to white or cream, abaxially nearly glabrous to pubescent, adaxially pubescent at least in proximal $\frac{1}{4}$ and plane or longitudinally 1-ridged, deciduous in fruit. Stamens 4; filaments pilose or sparsely so, especially adaxially in proximal $\frac{1}{2}$ – $\frac{2}{3}$; anthers in bisexual and male flowers 1–1.2 mm long (0.5–0.6 mm long in female flowers). Disc glabrous or rarely sparsely pubescent. Gynoecium in female and bisexual flowers subapocarpous, 1–2 mm long (c. 0.6 mm long in male flowers); ovary pubescent or sparsely so or villous; ovules 1 or 2 per locule; style 0.6–1.5 mm long, pubescent at base; stigma capitate, 4-lobed, 0.5–0.6 mm wide. Fruit of 1–4 follicles 5–7 mm long, not beaked; exocarp subwoody; endocarp glabrous, separate. Seed attachment Type A; seeds ellipsoid to lenticular, 4–5.5 mm long; raphe of seeds \pm straight or gently curved.

Fishpoison Wood, Leatherjacket, Leatherwood, Northern Evodia.

Occurs from the McIlwraith Ra., NE Qld, to Tintenbar, NE N.S.W.; in coastal and inland rain forest, to 1200 m alt. Also in New Guinea. Flowers Oct.–Jan.; fruits most months.

Qld: Ramsays Scrub, E of Gympie, *S.L.Everist 7681* (CANB); McIlwraith Ra., T.R. 14, Leo Ck road, *A.K.Irvine 347* (BRI, CANB, CNS); L. Barrine, *S.F.Kajewski 1357* (A, BRI, NSW, NY); Eungella Ra., *C.T.White 12867* (BRI, NSW). N.S.W.: Tintenbar, *W.Baeuerlen 746* (MEL, NSW).



4. *Melicope bonwickii* (F.Muell.) T.G.Hartley, *Sandakania* 4: 56 (1994)

Euodia bonwickii F.Muell., *Fragm.* 5: 56 (1865). T: Seaview Ra. near Rockingham Bay, Qld, 1 June 1865, *J.Dallachy*; holotype: MEL.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 469 (2004).

Tree to 40 m high. Trichomes simple. Leaves trifoliolate; petiole 3–9.5 cm long; terminal leaflet sessile, obovate, 10–30 cm long, 5–15 cm wide, acute to attenuate at base, acuminate at apex. Inflorescences infrafoliar, 3.5–10 cm long. Flowers bisexual. Sepals basally connate, suborbicular, 1.5–2 mm long. Petals c. 4.5 mm long, pink, abaxially glabrous or sparsely puberulous, adaxially villous and plane or longitudinally 1-ridged, deciduous in fruit. Stamens 4; filaments glabrous; anthers 1.5–2 mm long. Disc pubescent to villous. Gynoecium subapocarpous, 5–10 mm long; ovary villous; ovules 2 per locule; style 4–9 mm long, glabrous; stigma punctiform or capitate, 0.2–0.3 mm wide. Fruit of 1–4 follicles 4–6 mm long, not beaked; exocarp subwoody; endocarp adnate, glabrous. Seed attachment Type B; seeds subglobose to ellipsoid or subhemispherical, 3–4.5 mm long; raphe of seeds \pm straight or gently curved. *Yellow Evodia.* Fig. 16.

Ranges from Borneo and the Philippines S to Australia. In Australia occurs from the Atherton Tableland, NE Qld, to the vicinity of Proserpine, east-central Qld; in rain forest, near sea level to 900 m alt. Flowers Mar.–June; fruits June–Nov.

Qld: Clump Point, *F.Crome 196* (CANB); S.F.R. 299, Conway, *B.Hyland RFK4085* (CANB); S.F.R. 755, North Johnstone L.A., *A.K.Irvine 2* (BRI, CNS, L); Gadgarra, *S.F.Kajewski 1013* (A, BRI, NY, UC); Wongabel, *J.O'Farrell 3* (BRI, CANB, CNS, L).

In the Tanimbar Islands (Moluccas), *M. bonwickii* is said to be used to treat dysentery.



5. *Melicope micrococca* (F.Muell.) T.G.Hartley, *Telopea* 4: 34 (1990)

Euodia micrococca F.Muell., *Fragm.* 1: 144 (1859); *Ampacus micrococcus* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 98 (1891), *nom. illeg.*, as *micrococca*. T: near Cabramatta, N.S.W., *W.Woolls*; holotype: MEL.

E. micrococca var. *pubescens* L.R.Fraser & Vickery, *Proc. Linn. Soc. New South Wales* 62: 289 (1937), as *Evodia*. T: Bellingen, N.S.W., 26 Jan. 1936, *L.R.Fraser & J.W.Vickery*; holotype: NSW.

Shrub, or tree to 24 m high. Trichomes simple. Leaves trifoliolate; petiole 1.5–8 cm long; terminal leaflet sessile or with petiolule to 7 mm long; terminal lamina obovate or elliptic-obovate, or narrowly so (in occasional leaves elliptic or narrowly so), 3–12.5 cm long, 1–4.5 cm wide, attenuate or rarely cuneate at base, rounded or obtuse to acuminate at apex. Inflorescences axillary and/or infrafoliar, (1.5–) 2.5–10 cm long. Flowers bisexual. Sepals basally connate, suborbicular or broadly ovate, 1–1.5 mm long. Petals (2.5–) 3.5–5 mm long, white, abaxially glabrous or sparsely puberulous, adaxially sparsely pilose to villous in proximal $\frac{1}{3}$ – $\frac{1}{2}$ and plane or longitudinally 1-ridged, usually persistent or subsistent in

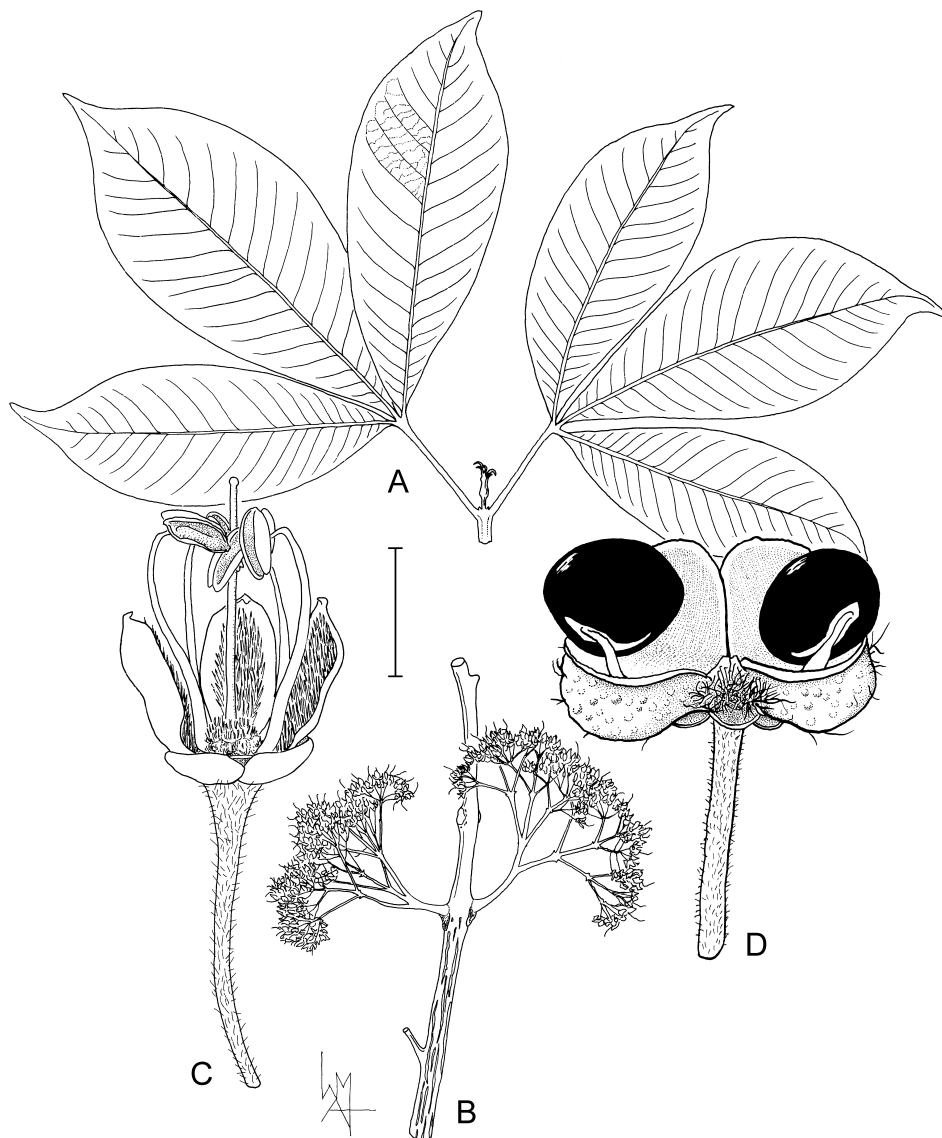


Figure 16. *Melicope bonwickii*. **A**, branchlet apex; **B**, inflorescences; **C**, flower, 1 petal removed; **D**, dehiscent fruit (**A**, **D**, R.Schodde 3263, BRI, CANB; **B**, B.Gray 1713, CANB; **C**, R.Hoogland 4422, CANB). Scale bar: **A**, **B** = 5 cm; **C**, **D** = 7 mm. Drawn by W.Murray.

fruit. Stamens 4; filaments pilose to villous, especially adaxially at base or up to c. $\frac{1}{2}$ length, or rarely glabrous; anthers (1–) 1.5–2 mm long. Disc glabrous to sparsely pubescent. Gynoecium subapocarpous, 3–7 mm long; ovary minutely hirsute; ovules 2 per locule; style 2–6.5 mm long, pilose to villous at base or up to $\frac{3}{4}$ length; stigma punctiform, 0.15–0.2 mm wide. Fruit of 1–4 follicles 4–5 mm long, not beaked; exocarp subfleshy; endocarp sparsely pubescent or rarely glabrous, adnate. Seed attachment Type B; seeds ovoid, 2.5–3 mm long; raphe of seeds \pm straight or gently curved. $2n = 36$, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954), as *Evodia micrococca*. *Hairy-leaved Doughwood*, *White Euodia*.

Occurs from near Duaringa, east-central Qld, to Batemans Bay, SE N.S.W.; in rain forest and rarely in eucalypt woodland, near sea level to 1050 m alt. Flowers Nov.–Feb., fruits Feb.–May.

Qld: 24 km SSW of Duaringa, *E.R.Anderson 3881* (BRI, CBG); Lamington Natl Park, *L.S.Smith & L.J.Webb 3591* (CANB, NY). N.S.W.: Razorback Range SSW of Camden, *R.Coveny 7487 et al.* (CANB); Whian Whian S.F., *V.K.Moriarty 704* (BRI, CANB); Broughton Ck between Nowra and Kiama, *L.J.Webb & J.G.Tracey 3675* (BRI).



6. *Melicope affinis* T.G.Hartley, *Allertonia* 8: 195 (2001)

T: Windmill L.A., S.F.R. 143, Qld, 1 Mar. 1979, *B.Gray 1299*; holotype: CANB.

Shrub, or tree to 20 m high. Trichomes simple. Leaves trifoliolate; petiole 2–7.5 cm long; terminal leaflet with petiolule 2–10 mm long; terminal lamina elliptic (in occasional leaves elliptic-obovate or obovate), 6–10 cm long, 2.5–4 cm wide, attenuate at base, acuminate at apex. Inflorescences axillary, 3–6 (–14) cm long. Flowers bisexual. Sepals basally connate, suborbicular or ovate, c. 0.8 mm long. Petals c. 2 mm long, greenish white, glabrous, adaxially plane or longitudinally 1-ridged, deciduous in fruit. Stamens 4; filaments glabrous; anthers c. 1.2 mm long. Disc glabrous. Gynoecium subapocarpous, 2–2.8 mm long; ovary puberulous; ovules 2 per locule; style 1.5–2.5 mm long, glabrous; stigma punctiform or capitellate, 0.15–0.2 mm wide. Fruit of 1–4 follicles 3.5–4 mm long, not beaked; exocarp subfleshy; endocarp adnate, sparsely puberulous. Seed attachment Type B; seeds ovoid, c. 3 mm long; raphe of seeds \pm straight or gently curved.

Occurs in NE Qld, inland between Cooktown and Cairns; in rather dry rain forest, 560–900 m alt. Flowers recorded Mar.; fruits June.

Qld: S.F.R. 144, Windsor Tableland, *B.Hyland 5529* (BRI, CNS, L); c. 13 km SSE of Mossman, *V.K.Moriarty 2353* (CNS).



7. *Melicope jonesii* T.G.Hartley, *Allertonia* 8: 196 (2001)

T: Robson L.A., S.F.R. 185, Qld, 18 Jan. 1979, *B.Gray 1232*; holotype: CANB.

Tree to 35 m high. Trichomes simple. Leaves trifoliolate (occasional leaves simple); petiole 5–11 cm long; terminal leaflet with petiolule 2–10 mm long; terminal lamina elliptic, 10–17.5 cm long, 4–8 cm wide, acute to attenuate at base, acuminate at apex. Inflorescences axillary, 8–9.5 cm long. Flowers bisexual. Sepals basally connate, suborbicular, 0.7–1 mm long. Petals 4–5 mm long, greenish or cream, abaxially glabrous, adaxially villous in proximal $\frac{1}{3}$ – $\frac{1}{2}$ and plane or longitudinally 1-ridged, deciduous in fruit. Stamens 4; filaments glabrous; anthers 2.2–2.3 mm long. Disc glabrous. Gynoecium subapocarpous, 4.5–5.5 mm long, glabrous; ovules 2 per locule; style 3.5–4 mm long; stigma punctiform, 0.2–0.3 mm wide. Fruit of 1–4 follicles c. 6 mm long, not beaked; exocarp subfleshy; endocarp pubescent, adnate. Seed attachment Type B; seeds ellipsoid, c. 4 mm long; raphe of seeds \pm straight or gently curved.



Occurs in NE Qld from the vicinity of Daintree River Natl Park S to the vicinity of Mount Major Natl Park; in rain forest, 720–1000 m alt. Flowers Jan., Feb.; fruits May, June.

Qld: S.F.R. 143, Windmill L.A., *B.Gray 1071* (CANB); T.R. 1230, Boonjie L.A., *B.Gray 1243* (CANB); S.F.R. 310, Gillies L.A., *B.Gray 1261* (CANB); Atherton, *S.J.Dansie (W.T.Jones 885)* (CANB); Kollmoon Ck, *L.S.Smith 10458* (BRI).

8. *Melicope hayesii* T.G.Hartley, *Telopea* 4: 33 (1990)

T: Carricks Rd near Purling Brook, Springbrook, Qld, 30 Dec. 1981, *L.W.Jessup 466*; holo: CANB.

Tree to 18 m high. Trichomes simple. Leaves trifoliolate; petiole 2–6 cm long; terminal leaflet with petiolule 1–9 mm long; terminal lamina elliptic or narrowly so, 3.7–9 cm long, 1.2–4 cm wide, acute to attenuate at base, acuminate at apex. Inflorescences axillary, 2.5–6 cm long. Flowers bisexual. Sepals basally connate, suborbicular, 0.7–1 mm long. Petals 3–3.5 mm long, white, abaxially glabrous, adaxially villous in c. proximal ½ and plane or longitudinally 1-ridged, deciduous in fruit. Stamens 4; filaments glabrous or nearly so; anthers 1.5–2.3 mm long. Disc with a few tufts of trichomes on top or glabrous. Gynoecium subapocarpous, 3–4.5 mm long, glabrous; ovules 2 per locule; style 2–3.5 mm long; stigma punctiform, 0.2–0.3 mm wide. Fruit of 1–4 follicles c. 5 mm long, not beaked; exocarp subfleshy; endocarp sparsely pubescent or puberulous, adnate. Seed attachment Type B; seeds ovoid, c. 3.5 mm long; raphe of seeds ±straight or gently curved. *Small-leaved Doughwood*.

Occurs from McPherson Ra., SE Qld, to Bellangry S.F., NE N.S.W.; in rain forest and wet sclerophyllous forest, 140–900 m alt. Flowers Oct.–Jan.; fruits recorded Jan. & June.

Qld: The Head, near Killarney, Oct. 1967, *W.T.Jones s.n.* (CANB). N.S.W.: Coramba, Nov. 1912, *J.L.Boorman* (NSW); Whian Whian S.F., *R.Coveny 9911* & *L.Haegi* (NSW); Bellangry S.F., 6 Nov. 1958, *H.C.Hayes* & *A.G.Floyd* (CFSHB); Dorriggo Natl Park, *C.T.White 7557A* (BRI).



9. *Melicope elleryana* (F.Muell.) T.G.Hartley, *Telopea* 4: 34 (1990)

Euodia elleryana F.Muell., *Fragm.* 5: 4 (1865); *E. muelleri* Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 121, fig. 67G, H, J (1896), as *Evodia*, *nom. illeg.*; *Acronychia muelleri* (Engl.) W.D.Francis, *Kew Bull.* 1931: 190 (1931), *nom. illeg.*; *Evodiella muelleri* (Engl.) B.L.Linden, *Nova Guinea* n. ser. 10: 147 (1959), *nom. illeg.* T: Beddome Ck [near Rockhampton], Qld, *A.Thozet*; holo: MEL.

[*Euodia accedens* auct. non Blume: F.Mueller, *Syst. Census Austral. Pl.* 12 (1882)].

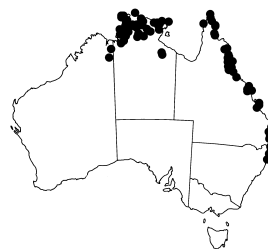
Illustrations: J.H.Maiden, *Forest Fl. New South Wales* 1: t. 36 (1904), as *E. accedens*; W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 469 (2004).

Shrub, or tree to 18 m high. Trichomes mostly simple. Leaves trifoliolate (occasional leaves simple); petiole 2–11 cm long; terminal leaflet with petiolule 5–17 mm long; terminal lamina elliptic to obovate, 8–21 cm long, 4–8.5 cm wide, obtuse to attenuate at base, usually acuminate at apex. Inflorescences infrafoliar and sometimes axillary, 2.5–6 cm long. Flowers bisexual. Sepals basally connate, suborbicular to ovate, 1.3–2 mm long, adaxially puberulous or glabrous. Petals 3.5–6.5 mm long, pink to white, abaxially nearly glabrous, adaxially pubescent at least in proximal ½ and longitudinally 3-ridged, deciduous in fruit. Stamens 4; filaments glabrous; anthers 1.5–2.5 mm long. Disc pubescent. Gynoecium subapocarpous, 5–16 mm long; ovary pubescent; ovules 2 per locule; style subapical, 4–14 mm long, pilose at least in proximal ½; stigma punctiform or capitellate, 0.2–0.3 mm wide. Fruit of 1–4 follicles 5–8 mm long, not beaked; exocarp subfleshy; endocarp pubescent, adnate. Seed attachment Type B; seeds subglobose to ovoid or ellipsoid or subhemispherical, 4–7 mm long; raphe of seeds sinuous or contorted, especially in chalazal region. *Corkwood*, *Pink Evodia*, *Pink-flowered Doughwood*.

Ranges from the Moluccas E to the Solomon Islands and S to Australia. In Australia occurs from the Kimberley region, W.A., E to NE Qld and thence S to the Clarence R., NE N.S.W.; in coastal and inland swamp forest, monsoon forest, eucalypt woodland, and rain forest, to 760 m alt. Flowers Nov.–Feb.; fruits Jan.–Sept.

W.A.: base of Northern Carr Boyd Ra. bordering Ord R., *T.G.Hartley 14447* (CANB). N.T.: Channel Point, *G.Wightman 331* & *C.Dunlop* (CANB, DNA). Qld: Iron Ra., *L.J.Brass 19146* (BRI, CANB); Fraser Is., Mar. 1916, *W.R.Petrie* (BRI). N.S.W.: Byron Bay, *R.Coveny 9394* (CANB).

In New Guinea, pieces of the bark of *M. elleryana* are said to be added to fermenting palm wine, apparently for flavouring. Also there, the bark when blazed exudes a clear sap which hardens to an opaque substance and is variously used as an adhesive, e.g. to fasten bow strings, and as a caulking material for canoes; it is also placed on sores.



10. *Melicope rubra* (Lauterb. & K.Schum.) T.G.Hartley, *Allertonia* 8: 211 (2001)

Euodia rubra Lauterb. & K.Schum. in K.M.Schumann & C.Lauterbach, *Fl. Deut. Schutzgeb. Südsee* 375 (1900), as *Evodia*. T: Bismarck Mtns, NE New Guinea, Sept. 1896, *C.Lauterbach 2787*; lecto: K, *fide* T.G.Hartley, *loc. cit.*

Tree to 7 m high. Trichomes (particularly those on endocarp) mostly stellate. Leaves trifoliate; petiole 2–7.5 cm long; terminal leaflet sessile or with petiolule to 10 mm long; terminal lamina ovate to obovate, or narrowly so, 4–15 cm long, 1.5–4.5 cm wide, obtuse to attenuate at base, acute to acuminate or subcaudate at apex. Inflorescences infrafoliar and/or cauline, 2.5–6.5 cm long. Flowers bisexual. Sepals basally connate, suborbicular to ovate, 1.5–2.5 mm long. Petals 5–6 mm long, pink, abaxially glabrous or with sparse indumentum towards base, adaxially villous and plane or longitudinally 1-ridged, deciduous in fruit. Stamens 4; filaments villous, especially adaxially, in proximal $\frac{1}{4}$ – $\frac{1}{3}$; anthers 2–3 mm long. Disc villous or sparsely so. Gynoecium subsyncarpous, c. 9 mm long; ovary villous; ovules 2 per locule; style c. 8 mm long, pilose to villous in proximal $\frac{1}{2}$ – $\frac{3}{4}$; stigma punctiform or capitate, 0.2–0.3 mm wide. Fruit a 4-loculed septicidal capsule 20–30 mm long; carpels in dehiscent capsule connate in proximal $\frac{1}{2}$ – $\frac{2}{3}$, erect, not beaked; exocarp fleshy; endocarp pubescent, adnate. Seed attachment Type B; seeds ovoid to ellipsoid, 4–8 mm long; raphe of seeds \pm straight or gently curved. *Little Evodia*. Plate 25.

Occurs in NE Qld from Shiptons Flat S to near Cardwell; in rain forest and wet sclerophyllous forest, near sea level to 850 m alt. Also in New Guinea. Flowers Feb.–June; fruits Feb.–Aug.

Qld: c. 50 km W of Cardwell, *D.E.Boyland & J.G.Gillieatt 567* (A, BRI); Danbulla, *V.K.Moriarty 1378* (BRI, CANB); Station Ck, 2 km N of Mt Molloy, *L.S.Smith 3920* (BRI); Shiptons Flat, Tin Mine Rd, *L.S.Smith 14360* (BRI, CANB, LAE); Millstream Falls, SW of Ravenshoe, *J.Wrigley & I.R.Telford NQ 575* (CBG, L).



11. *Melicope peninsularis* T.G.Hartley, *Allertonia* 8: 217 (2001)

T: Lockerbie Scrub, top of Cape York Penin., Qld, 3 Feb. 1992, *G.Sankowsky 1319* & *N.Sankowsky*; holo: BRI; iso: CANB.

Tree c. 10 m high. Trichomes mostly simple. Leaves trifoliate; petiole 4–12 cm long; terminal leaflet sessile, elliptic or elliptic-obovate, 9–17 cm long, 4.5–7 cm wide, attenuate at base, rounded to obtusely acuminate at apex. Inflorescences infrafoliar, c. 4 cm long. Flowers bisexual. Sepals connate in proximal $\frac{1}{2}$ – $\frac{3}{4}$, the free part ovate-triangular, 2–2.5 mm long. Petals 5–6 mm long, white, abaxially sparsely puberulous, adaxially pubescent in c. proximal $\frac{1}{2}$ and longitudinally 3-ridged, deciduous in fruit. Stamens 4; filaments minutely pilose in proximal $\frac{1}{6}$; anthers 2.5–3 mm long. Disc pubescent. Gynoecium syncarpous, 5–7 mm long, pubescent; ovules 2 per locule; style 4–6 mm long; stigma punctiform or capitate, 0.2–0.3 mm wide. Fruit a 4-loculed septicidal capsule 8–12 mm long; carpels in dehiscent capsule connate in proximal $\frac{1}{2}$ – $\frac{2}{3}$, divaricate, not beaked; exocarp fleshy; endocarp nearly



glabrous, adnate. Seed attachment Type B; seeds ellipsoid, c. 5.5 mm long; raphe of seeds \pm straight or gently curved.

Known as a wild plant only from Torres Strait (Darnley Is.) and the top of Cape York Penin., NE Qld; in rain forest, to 60 m alt. Flowers Feb.; fruits Feb.–May.

Qld: Torres Strait, Darnley Is., *B.M. Waterhouse 5085* (CANB); Tolga, cult. from material collected at the type locality, *G. Sankowsky 1465* & *N. Sankowsky* (CANB).

12. *Melicope fellii* T.G.Hartley, *Allertonia* 8: 218 (2001)

T: Round Mtn, Embley Ra., Qld, 3 July 1997, *P.I. Forster 21358 et al.*; holotype: BRI; iso: CANB.

Tree to 28 m high. Trichomes mostly simple. Leaves trifoliolate; petiole 2.5–6.5 cm long; terminal leaflet sessile, elliptic to obovate, 6.5–13.5 cm long, 3.5–5.5 cm wide, attenuate at base, obtuse or obtusely acuminate at apex. Inflorescences axillary and/or infraxillary, 2–3.5 cm long. Flowers bisexual. Sepals connate in c. proximal $\frac{3}{4}$, the free part ovate-triangular, c. 1.5 mm long. Petals c. 3.5 mm long, white, abaxially sparsely puberulous, adaxially pubescent in c. proximal $\frac{1}{2}$ and longitudinally 3-ridged, deciduous in fruit. Stamens 4; filaments minutely pilose in c. proximal $\frac{1}{5}$; anthers c. 2 mm long. Disc pubescent on top. Gynoecium syncarpous, c. 4 mm long; ovary pubescent; ovules 2 per locule; style c. 3 mm long, sparsely minutely pilose in c. proximal $\frac{2}{3}$; stigma punctiform, c. 0.2 mm wide. Fruit a 4-loculed septicidal capsule 8–10 mm long, not beaked; carpels in dehiscent capsule connate in proximal $\frac{1}{2}$ – $\frac{2}{3}$, ascending; exocarp fleshy; endocarp glabrous, adnate. Seed attachment Type B; seeds ellipsoid, 4.5–5 mm long; raphe of seeds \pm straight or gently curved.

Restricted to E Cape York Penin., NE Qld, where known from only 2 collections; in rain forest, 240–320 m alt. Flowers recorded July; fruits recorded May.

Qld: Cape Melville Natl Park, headwaters of Temple Ck, *D.G. Fell 4332* (CANB).



Excluded species

Melicope littoralis (Endl.) T.G.Hartley, *Kew Bull.* 45: 250 (1990)

Euodia littoralis Endl., *Prodr. Fl. Norfolk* 86 (1833), as *Evodia*; *Ampacus littoralis* (Endl.) Kuntze, *Revis. Gen. Pl.* 1: 98 (1891), *nom. illeg.*, as *littoralis*. T: Anson Bay, Norfolk Is., *F. Bauer*; holotype: W.

This species is considered to be endemic to Norfolk Is. There is, however, a specimen of it at BRI labelled in Allan Cunningham's hand as Brisbane River, *Cunningham 23*. It is probably mislabelled. No other material of the species has been seen from Australia and according to P.S.Green (*in litt.*) there is a K sheet of *M. littoralis* which is labelled in Cunningham's hand as Norfolk Island, *Cunningham 23*. Frederick M. Bailey, *Queensland Fl.* 1: 201 (1899), reported *M. littoralis* from Queensland (as *Evodia littoralis*), citing the above Brisbane R. collection and a *Field Naturalists' Excursion* collection from Eumundi. The latter is *M. vitiflora*. There are some other reports of *M. littoralis* (as *E. littoralis*) from Australia, (e.g., N.C.W. Beadle, *Student's Fl. N E New South Wales* 4: 545 (1980)), but they are probably erroneous, most likely being based on misidentified *M. vitiflora*.

There is no doubt that *Melicope vitiflora* and *M. littoralis* are distinct from one another. The former differs mainly in having smaller, persistent (vs. deciduous) sepals, smaller, adaxially pubescent (vs. adaxially glabrous) petals, pilose, apically subulate (vs. glabrous, apically obtuse) staminal filaments, and smaller, non-beaked (vs. beaked) follicles.

16. ACRONYCHIA

T.G.Hartley

Acronychia J.R.Forst. & G.Forst., *Char. Gen. Pl.* 27 (1775) & 2nd edn, 53 (1776), *nom. cons.*; from the Greek *akros* (tip) and *onyx* (claw), referring to the petals, which are usually hooked adaxially at the apex.

Type: *A. laevis* J.R.Forst. & G.Forst.

Jambolifera L., *Sp. Pl.* 1: 349 (1753), *nom. rej.*; *Cyminosma* Gaertn., *Fruct. Sem. Pl.* 1: 280 (1788), *nom. illeg.* T: *J. pedunculata* L.

Pleiococca F.Muell., *Fragm.* 9: 117 (1875); *Errerana* Kuntze, *Revis. Gen. Pl.* 2: 937 (1891), *nom. illeg.* T: *P. wilcoxiana* F.Muell.

Shrubs or trees, evergreen, unarmed. Trichomes simple. Leaves opposite, trifoliolate or simple. Inflorescences paniculate to cymose or rarely reduced to solitary flowers, axillary and/or infraxillary, similar to infructescences in size and surface features. Flowers bisexual, longer than wide in bud, 4-merous. Sepals persistent in fruit. Petals valvate, usually hooked adaxially at apex and usually becoming recurved or reflexed. Stamens 8, alternately unequal in length; filaments gradually tapering from rather broad base to subulate apex, usually ciliate towards base and retrorsely pilose at about middle adaxially, without raised glands. Gynoecium a 4-carpelled subapocarpous pistil (*A. octandra*) or syncarpous and 4- or rarely 4–8-loculed; ovules 2 per locule; style apical; stigma punctiform or capitellate, not more than c. 0.3 mm wide. Fruit drupaceous, of 4 basally connate carpels (*A. octandra*) or syncarpous and 4- or rarely 4–8-carpelled; endocarp cartilaginous or thinly so. Seeds in pairs or occasionally solitary, ovoid or ellipsoid or irregular in shape due to crowding, smooth to finely tuberculate, muricate, or rugose, usually with enlarged chalazal region; testa with thick or sometimes thin sclerotesta surrounded by an outer layer of compact parenchymatous tissue; endosperm copious. Embryo straight or slightly curved; cotyledons flattened, ovate to elliptic; hypocotyl terminal, considerably narrower than cotyledons.

A genus of 48 species; ranges from India E to Taiwan and S to Australia and New Caledonia; 20 species in mainland Australia, 19 of them endemic. One species (*A. trifoliolata* Zoll. & Moritz), which is otherwise Malesian in distribution) occurs in Christmas Is. and there is a doubtful record of another (*A. laevis*, which is otherwise known from mainland Australia and New Caledonia) from Lord Howe Is.

About half of the species of *Acronychia* have at least some fruiting carpels in which the wall opens into the locule. In these species the tissues of the pericarp tend to be weak and the stress the plants are subjected to in preparing herbarium specimens evidently causes some of the carpel walls to rupture.

The presence or absence of septicidal fissures in ovaries and fruit is a useful diagnostic character in *Acronychia*. See the illustration in T.G.Hartley (p. 474, 1974) for a diagrammatic representation.

T.G.Hartley, A revision of the genus *Acronychia* (Rutaceae), *J. Arnold Arbor.* 55: 469–523, 525–567 (1974).

- | | | |
|----|--|------------------------------------|
| 1 | Inflorescences to 24 cm long; sepals tomentulose adaxially | 1. <i>A. octandra</i> |
| 1: | Inflorescences not more than 10 cm long; sepals glabrous adaxially | |
| 2 | Pedicels tomentose or rarely pubescent | 17. <i>A. pubescens</i> |
| 2: | Pedicels glabrous to finely pubescent | |
| 3 | Leaves trifoliolate or mostly so | |
| 4 | Petioles glabrous | |
| 5 | Pedicels glabrous | 3. <i>A. chooreechillum</i> |
| 5: | Pedicels puberulous at least towards base | 4. <i>A. peninsularis</i> |
| 4: | Petioles of young leaves puberulous at least adaxially or at base | |

- 6 Inflorescences 1.8–3.5 cm long; petioles 1–4.5 cm long **2. *A. suberosa***
- 6: Inflorescences 3–10 cm long; petioles 1–8 cm long **19. *A. acronychioides***
- 3: Leaves simple or mostly so
- 7 Leaflet laminae sparsely to rather densely pubescent below; inflorescences 4–7 cm long **16. *A. vestita***
- 7: Leaflet laminae glabrous or nearly so, or, if pubescent below (as in some plants of *A. pauciflora* and *A. parviflora*), then inflorescences not more than 1.2 cm long
- 8 Inflorescences 0.5–1.2 cm long; petioles of young leaves often puberulous or pubescent, at least adaxially or at base
- 9 Petals 4–6 mm long; fruit with septicidal fissures at least in distal $\frac{1}{2}$ **7. *A. pauciflora***
- 9: Petals 2.5–3.5 mm long; fruit with septicidal fissures in c. distal $\frac{1}{4}$ **10. *A. parviflora***
- 8: Inflorescences at least 1.5 cm long; petioles glabrous or nearly so (or sometimes puberulous in *A. laevis*)
- 10 Leaflet laminae acuminate at apex, the acumen 1.5–2 cm long **9. *A. acuminata***
- 10: Leaflet laminae rounded to acuminate at apex, the acumen not more than 1 cm long
- 11 Internodes of young branchlets concavely compressed and sharply tetragonous **15. *A. aberrans***
- 11: Internodes of young branchlets terete or slightly compressed or subtetragonous
- 12 Plants flowering
- 13 Ovary without septicidal fissures (septicidal fissures are generally not evident in dried flowers without heating in water).
- 14 Petioles 2–7 cm long; leaflet laminae 4.3–12 cm wide **14. *A. acidula***
- 14: Petioles not more than 3 cm long; leaflet laminae not more than 6 cm wide
- 15 Pedicels 3.5–13 mm long; sepals 0.7–1.3 mm wide; flower buds acuminate **11. *A. laevis***
- 15: Pedicels 1.5–4.5 (–7) mm long; sepals 1.5–2.5 mm wide; flower buds obtuse **20. *A. imperforata***
- 13: Ovary with septicidal fissures
- 16 Petals 4.5–7 mm long
- 17 Leaflet laminae widest above middle or mostly so; ovary densely pubescent at apex **8. *A. oblongifolia***
- 17: Leaflet laminae widest at c. middle; ovary sparsely pubescent at apex or glabrous **13. *A. eungellensis***
- 16: Petals at least 7 mm long
- 18 Pedicels 4–9.5 mm long **6. *A. baeuerlenii***
- 18: Pedicels not more than 5.5 mm long
- 19 Ovary with septicidal fissures in distal $\frac{1}{4}$ – $\frac{1}{2}$ **18. *A. littoralis***
- 19: Ovary with septicidal fissures at least in distal $\frac{1}{2}$
- 20 Pedicels 4–5.5 mm long **13. *A. eungellensis***
- 20: Pedicels not more than 3 mm long
- 21 Inflorescences 2–3.5 cm long, axillary and/or infrafoliar; petals 9–12 mm long **5. *A. crassipetala***
- 21: Inflorescences 3–6.5 cm long, axillary; petals 7.5–9 mm long **12. *A. wilcoxiana***

- 12:** Plants fruiting
- 22** Dried fruit as seen in medial transverse section with outer pericarp at least 0.5 mm thick, with spongy or woody mesocarp
- 23** Mesocarp spongy
- 24** Fruit glabrous, 10–15 mm long, with septicidal fissures at least in distal $\frac{1}{2}$ **5. A. crassipetala**
- 24:** Fruit densely pubescent at apex, 5–9 mm long, with septicidal fissures in distal $\frac{1}{3}$ – $\frac{1}{2}$ **8. A. oblongifolia**
- 23:** Mesocarp woody
- 25** Fruit with septicidal fissures in distal $\frac{1}{4}$ – $\frac{1}{2}$ **18. A. littoralis**
- 25:** Fruit without septicidal fissures **20. A. imperforata**
- 22:** Dried fruit as seen in medial transverse section with outer pericarp less than 0.5 thick, fleshy (c. the texture of a sultana)
- 26** Fruit without septicidal fissures
- 27** Leaflet laminae 1–5 cm wide; fruit 7–10 (–12) mm long **11. A. laevis**
- 27:** Leaflet laminae 4.3–12 cm wide; fruit 13–16 mm long **14. A. acidula**
- 26:** Fruit with septicidal fissures
- 28** Leaflet laminae 7–21 cm long; fruit 4–8-loculed, 12–15 mm long **12. A. wilcoxiana**
- 28:** Leaflet laminae not more than 12 cm long; fruit 4-loculed, not more than 12 mm long
- 29** Leaflet laminae widest above middle or mostly so; fruit 5–9 mm long, densely pubescent at apex **8. A. oblongifolia**
- 29:** Leaflet laminae widest at middle or mostly so; fruit 10–12 mm long, glabrous (or sparsely pubescent at apex in *A. eungellensis*)
- 30** Pedicels 6–10 mm long; fruit with septicidal fissures in distal $\frac{1}{3}$ – $\frac{3}{4}$ **6. A. baeuerlenii**
- 30:** Pedicels 4.5–5.5 mm long; fruit with septicidal fissures at least in distal $\frac{1}{2}$ **13. A. eungellensis**

1. *Acronychia octandra* (F.Muell.) T.G.Hartley, *Austral. Syst. Bot.* 4: 445, fig. 1 (1991)

Euodia octandra F.Muell., *Fragm.* 2: 102 (1860); *Melicope australasica* F.Muell. ex Benth., *Fl. Austral.* 1: 360 (1863), *nom. illeg.*, *E. octandra* in synonym.; *M. octandra* (F.Muell.) Druce, *Bot. Soc. Exch. Club Brit. Isles. Rep.* 1916: 635 (1917). T: Clarence R., N.S.W., *H.Beckler*; holo: MEL; probable iso: BRI, NSW.

Illustration: T.G.Hartley, *op. cit.* 446.

Tree to 27 m high. Internodes of young branchlets terete or compressed. Leaves trifoliolate (occasional leaves simple); petiole glabrous to sparsely puberulous when young, 2–8 cm long; laminae elliptic or elliptic-obovate, or narrowly so, 9–20 cm long, 2.5–8 cm wide, obtuse to acuminate, with acumen to 1 cm long, glabrous. Inflorescences several- or many-flowered, axillary, 5–24 cm long; pedicels 3–6 mm long (3–7 mm long in fruit), puberulous. Flower buds obtuse. Sepals 1–2 mm wide, tomentulose adaxially. Petals 6–8 mm long, like staminal filaments persistent in fruit. Gynoecium subapocarpous, 4-carpelled; ovary glabrous towards base, otherwise villous. Fruit of 4 basally connate carpels; carpels ovoid to ellipsoid, 3–3.5 mm long (excluding stylar beak 0.6–4 mm long), sparsely pilose or becoming glabrous, none with wall ruptured into locule; dried fruiting carpels as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, with chartaceous exocarp but apparently lacking mesocarp; endocarp thinly cartilaginous. Seeds c. 2.5 mm long. *Doughwood*, *Silver Birch*, *Soapwood*. Fig. 17.



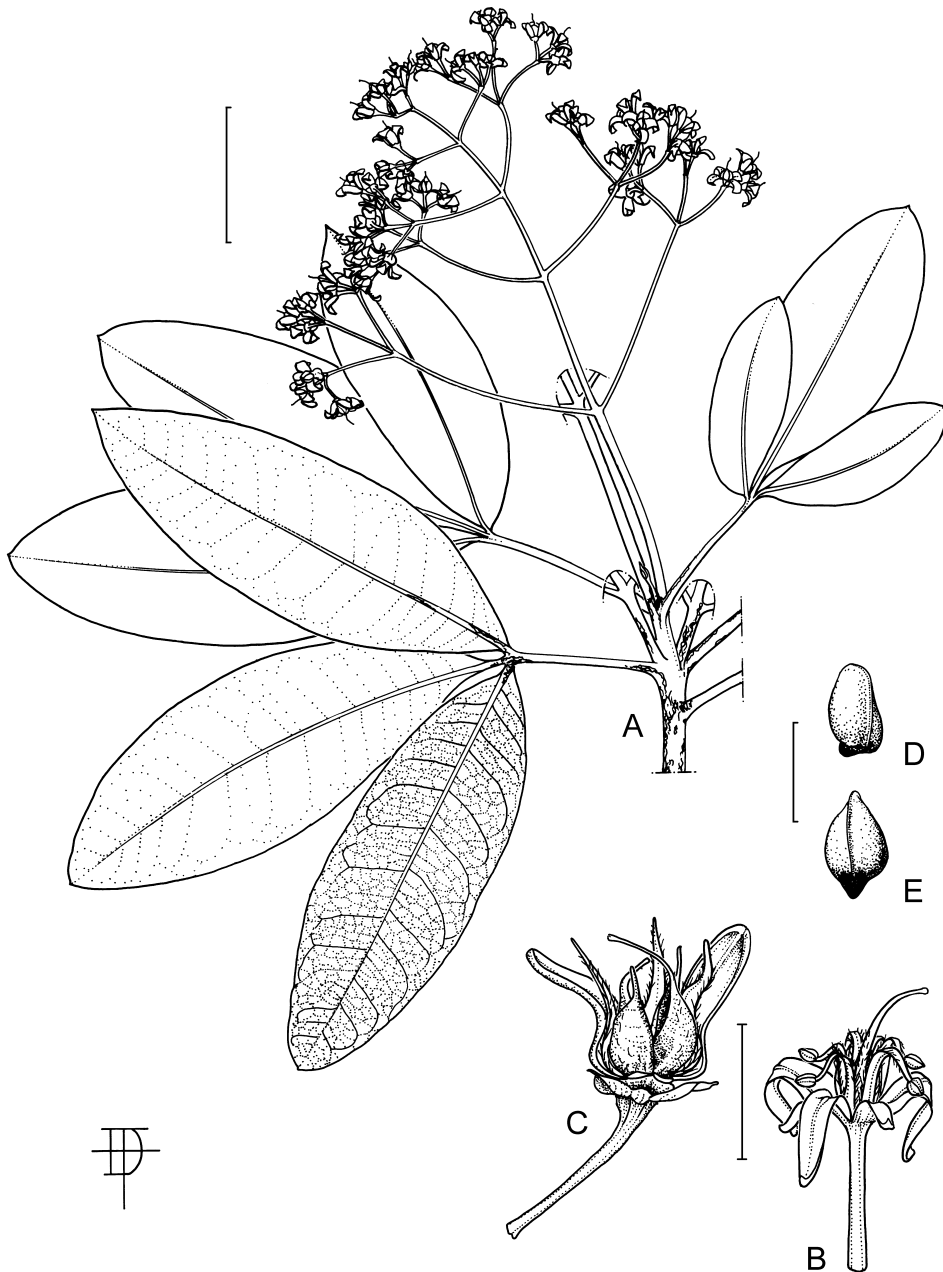


Figure 17. *Acronychia octandra*. **A**, Fertile branchlet; **B**, flower; **C**, fruit, with 2 petals & 5 staminal filaments removed; **D**, **E**, seeds (**A**, V.Moriarty 1512, CANB; **B**, A.Campbell s.n., Mar. 1910, NSW; **C**, E.Ross s.n., 1 Mar. 1978, CANB; **D**, **E**, C.White 12513, BRI). Scale bars: **A** = 3 cm; **B**, **C** = 5 mm; **D**, **E** = 3 mm. Drawn by D.Fortescue. Reproduced with permission from *Austral. Syst. Bot.* 4: 446 (1991).

Occurs from the McPherson Ra., SE Qld, to the Clarence R., NE N.S.W.; in rain forest, near sea level to 900 m alt. Flowers Dec.–Apr.; fruits Feb.–Apr.

Qld: Lamington Natl Park, *L.S.Smith & L.J.Webb 3631* (BRI); Springbrook, *C.T.White 6274A* (BRI). N.S.W.: Byrangery Ck N of Lismore, *E.F.Constable 4868* (BRI, NSW); Richmond R., *R.Fitzgerald* (MEL); Wiangaree S.F. N of Kyogle, *V.K.Moriarty 1512* (CANB).

2. *Acronychia suberosa* C.T.White, *Proc. Roy. Soc. Queensland* 43: 47 (1932)

T: Lamington Natl Park, Qld, Jan. 1921, *H.Tryon & C.T.White*; lecto: BRI, *fide* T.G.Hartley, *J. Arnold Arbor.* 55: 488, 489 (1974); isolecto: A, K.

Tree to 20 m high. Internodes of young branchlets terete or slightly compressed. Leaves trifoliolate (occasional leaves simple); petiole puberulous when young, at least towards base adaxially, 1–4.5 cm long; laminae elliptic to obovate, or narrowly so, 3.5–8.5 cm long, 0.9–3 cm wide, obtuse to acuminate, with acumen to 1 cm long, glabrous. Inflorescences few-flowered, axillary, 1.8–3.5 cm long; pedicels 1–3.5 mm long (length similar in fruit), puberulous or finely pubescent. Flower buds obtuse. Sepals 2–2.7 mm wide, glabrous adaxially. Petals 6–9 mm long, like staminal filaments subpersistent in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary sparsely pubescent at apex or glabrous, like fruit with septicial fissures extending for full length. Fruit syncarpous, subglobose to ellipsoid, 12–15 mm long, without stylar beak, sparsely pubescent at apex or glabrous; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, with fleshy exocarp and spongy mesocarp; endocarp thinly cartilaginous. Seeds c. 4 mm long. $2n = 36$. M.dos S.Guerra, *Pl. Syst. Evol.* 146: 18 (1984). *Corky Acronychia*.

Occurs from the McPherson Ra., SE Qld, to Whian Whian S.F., NE N.S.W.; in rain forest, 200–1000 m alt. Flowers Feb.; fruits Mar.–May.

Qld: Springbrook, *D.A.Goy & L.S.Smith 190* (A, BRI); Lamington Natl Park, *L.S.Smith & L.J.Webb 3599* (CANB). N.S.W.: Whian Whian S.F., 14 Jan. 1953, *E.F.Constable* (A, NSW); Gibberagunyah, *W.T.Jones 3429* (CANB); near Kyogle, June 1943, *W.T.Jones s.n.* (BRI, NSW).



3. *Acronychia chooreechillum* (F.M.Bailey) C.T.White, *Contr. Arnold Arbor.* 4: 49 (1933)

Melicope chooreechillum F.M.Bailey, *Rep. Govt. Sci. Exped. Bellenden Ker Range* 33 (1889). T: Mt Bartle Frere, Qld, 1889, *Bellenden Ker Exped.*; holo: BRI; iso: K.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 457 (2004).

Shrub, or tree to 15 m high. Internodes of young branchlets terete. Leaves trifoliolate (occasional or rather frequent leaves simple), glabrous; petiole 1.5–6 cm long; laminae elliptic to obovate, or narrowly so, 4–7.5 (–12) cm long, 1.6–3.5 (–4) cm wide, rounded to obtusely acuminate, with acumen to 0.4 cm long. Inflorescences few-flowered, axillary, 2.5–6 cm long; pedicels 1.5–3 mm long (1.5–4 mm long in fruit), glabrous. Flower buds obtuse. Sepals 1.3–2 mm wide, glabrous adaxially. Petals 6–9 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary with a few apical trichomes or glabrous, like fruit with septicial fissures in c. distal $1/2$. Fruit syncarpous, ovate or elliptic in outline, 10–15 mm long, without stylar beak, with a few apical trichomes or glabrous; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, with fleshy exocarp but apparently lacking mesocarp; endocarp thinly cartilaginous. Seeds c. 4 mm long. *Mountain Aspen*.

Occurs in NE Qld from Mt Finnigan S to the Bellenden Ker Ra.; in montane rain forest and shrubbery, 1000–1600 m alt. Flowers June–Dec.; fruits Nov.–Dec.



Qld: Thornton Peak, *T.G.Hartley 14040* (CANB); Mt Alexandra, *S.F.Kajewski 1491* (A, BRI, NY); Mt Finnigan, *V.K.Moriarty 1053* (CANB); Mt Bellenden Ker, *L.S.Smith 14619* (BRI); Mt Spurgeon, *C.T.White 10668* (A, BM, BRI).

4. *Acronychia peninsularis* T.G.Hartley, *Fl. Australia* 26: 582 (2013)

T: mouth of Pascoe R., Cape York Penin., Qld, 28 Apr. 1993, *D.G.Fell 3132A* & *W.Butcher*; holo: CANB.

A. sp. Batavia Downs (J.R.Clarkson 8511), R.J.F.Henderson (ed.), *Names Distrib. Queensland Pl., Algae Lichens* 178 (2002).

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 458 (2004), as *A. sp. Batavia Downs*.

Shrub, or tree to 30 m high. Internodes of young branchlets terete or subtetragonous. Leaves trifoliolate, glabrous; petiole 2–6 cm long; laminae elliptic to obovate, or narrowly so, 6–11 cm long, 2.5–5 cm wide, rounded or obtuse. Inflorescences few–many-flowered, axillary and/or infraxillary, 2–4 cm long; pedicels 1.5–2 mm long (1.5–2.5 mm long in fruit), puberulous at least towards base. Flower buds obtuse. Sepals c. 1.5 mm wide, glabrous adaxially. Petals 6–7 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent at apex, otherwise glabrous, like fruit with septicial fissures in distal $\frac{1}{3}$ – $\frac{3}{4}$. Fruit syncarpous, subglobose to ellipsoid or obovoid, 6–10 (–15) mm long, without stylar beak, pubescent at apex, otherwise glabrous; frequent or occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, with fleshy exocarp but apparently lacking mesocarp; endocarp thinly cartilaginous. Seeds c. 3 mm long. Plate 29.

Occurs on Cape York Penin., NE Qld, from Batavia Downs S to the McIlwraith Ra.; in coastal and inland rain forest, to 420 m alt. Flowers Apr.–Sept.; fruits May, June.

Qld: 9 km N of Batavia Downs, *J.R.Clarkson 8511* & *V.J.Neldner* (BRI); Restoration Is., *D.G.Fell 2524* (BRI); 5.5 km WNW of mouth of Olive R., *D.G.Fell 4459* & *R.Buck* (CANB); McIlwraith Ra., T.R. 9, Lankelly Ck, *P.I.Forster 10368* & *G.Sankowsky* (CANB); Macrossan Ra., Turrel Hill, *P.I.Forster 23082 et al.* (CANB).

This species appears to be most nearly related to *A. chooreechillum*, differing mainly in its puberulous (vs. glabrous) pedicels and usually smaller fruit.



5. *Acronychia crassipetala* T.G.Hartley, *J. Arnold Arbor.* 55: 490, fig. 2 (1974)

T: Mt Spurgeon, Qld, *T.Carr*; holo: BRI.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 457 (2004).

Tree to 18 m high. Internodes of young branchlets terete. Leaves simple, glabrous; petiole 0.9–2.5 cm long; lamina elliptic to obovate, or narrowly so, 6–13 cm long, 2–5.5 cm wide, rounded to obtusely acuminate, with acumen to 0.5 cm long. Inflorescences few-flowered, axillary and/or infraxillary, 2–3.5 cm long; pedicels 1–2 mm long (2–4 mm long in fruit), glabrous to puberulous. Flower buds obtuse. Sepals 2.2–3 mm wide, glabrous adaxially. Petals 9–12 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary sparsely pubescent at apex, otherwise glabrous, like fruit with septicial fissures at least in distal $\frac{1}{2}$. Fruit syncarpous, subglobose in outline, 10–15 mm long, without stylar beak, glabrous; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp 0.5–1.5 mm thick, with fleshy exocarp and spongy mesocarp; endocarp thinly cartilaginous. Seeds c. 4 mm long.

Occurs in NE Qld from the Windsor Tableland S to the Atherton Tableland; in rain forest, 800–1200 m alt. Flowers Oct.–Apr.; fruits Dec.–May.

Qld: S.F.R. 144, Windsor Tableland, *B.Gray 1208* (CANB); c. 6 km SE of Atherton, *T.G.Hartley* & *B.Hyland 14084* (CANB); S.F.R. 194, *B.Hyland 4019* (BRI); Kennedy Hwy 0.8 km S of The Crater, *A.K.Irvine 1210* (CANB).



6. *Acronychia baeuerlenii* T.G.Hartley, *J. Arnold Arbor.* 55: 491, fig. 3 (1974)

T: Burringbar, N.S.W., Oct. 1898, *W.Forsyth*; holotype: NSW.

Shrub, or tree to 10 m high. Internodes of young branchlets terete. Leaves simple, glabrous; petiole 0.5–1.8 cm long; lamina elliptic or narrowly so (in occasional leaves elliptic-obovate), 5–11 cm long, 2–4.5 cm wide, obtuse to obtusely acuminate, with acuminate to 1 cm long. Inflorescences few-flowered, axillary, 3–7 cm long; pedicels 4–9.5 mm long (6–10 mm long in fruit), glabrous. Flower buds obtuse. Sepals 1.5–2.5 mm wide, glabrous adaxially. Petals 8.5–14 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary glabrous, like fruit with septicidal fissures in distal $\frac{1}{3}$ – $\frac{3}{4}$. Fruit syncarpous, subglobose, 10–12 mm long, without stylar beak, glabrous; frequent fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, exocarp fleshy but apparently lacking mesocarp; endocarp thinly cartilaginous. Seeds c. 4 mm long. *Byron Bay Acronychia*.

Occurs from the McPherson Ra., SE Qld, to the Richmond R., NE N.S.W.; in rain forest, near sea level to 800 m alt. Flowers Dec.; fruits Feb., Apr.

Qld: Lamington Natl Park, Mar. 1920, *C.T.White* & *H.Tryon s.n.* (BRI). N.S.W.: Richmond R., *W.Baeuerlen* 217 (MEL); Alstonville, *W.Baeuerlen* 697 (MEL); Terania Ck 10 km NNE of The Shannon, *R.Coveny* 10626 (CANB); Whian Whian S.F., *A.G.Floyd* 1161 (CANB).



7. *Acronychia pauciflora* C.T.White, *Proc. Roy. Soc. Queensland* 57: 21 (1947)

T: Mt Glorious, Qld, Jan. 1945, *M.S.Clemens*; holotype: BRI; isotype: GH, MICH, NY, UC.

Shrub, or tree to 10 m high. Internodes of young branchlets terete or subtetragonous. Leaves simple; petiole 0.4–1.4 (–1.8) cm long, puberulous or finely pubescent when young, at least adaxially, rarely nearly glabrous; lamina obovate or narrowly so or sometimes elliptic, 2–9.5 cm long, 1–4.8 cm wide, obtuse to obtusely acuminate with acuminate to 1 cm long, or occasionally rounded or subacute, glabrous, or rarely very sparsely short-pubescent below. Inflorescences few-flowered, axillary and/or infraxillary, 0.8–1.2 cm long; pedicels 0.6–2 mm long (length similar in fruit), glabrous to puberulous. Flower buds obtuse. Sepals c. 1 mm wide, glabrous adaxially. Petals 4–6 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary with a few apical trichomes or glabrous, like fruit with septicidal fissures at least in distal $\frac{1}{2}$. Fruit syncarpous, subglobose, 7–9 mm long, without stylar beak, with a few apical trichomes or glabrous; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with fleshy exocarp and spongy mesocarp; endocarp thinly cartilaginous. Seeds c. 4 mm long. *Few-flowered Acronychia*, *Soft Acronychia*.

Occurs from east-central Qld (vicinity of Broad Sound SW to the Carnarvon Ra.) to the Richmond R., NE N.S.W.; grading from rain forest to Brigalow scrub (*Acacia harpophylla*), near sea level to 650 m alt. Flowers Dec.–July; fruits Mar.–Aug.

Qld: Rockhampton, July 1863, *J.Dallachy* (BM, BRI, MEL, W); 2.4 km ESE of Edungalba, *R.W.Johnson* 1973 (BRI); Marlborough Rd, 80 Mile, *W.T.Jones* 3181 (CANB); Imbil, *L.S.Smith* & *L.J.Webb* 3141 (CANB). N.S.W.: Lismore, Mar. 1898, *W.Baeuerlen s.n.* (NSW).



8. *Acronychia oblongifolia* (A.Cunn. ex Hook.) Endl. ex Heynh., *Nomencl. Bot. Hort.* 2: 8 (1846)

Cyminosma oblongifolia A.Cunn. ex Hook., *Bot. Mag.* 61: t. 3322 (1834); *Eriostemon oblongifolium* (A.Cunn. ex Hook.) Sweet, *Hort. Brit.* 3rd edn, 129 (1839); *Jambolifera oblongifolia* (A.Cunn. ex Hook.) Steud., *Nomencl. Bot.* 2nd edn, 1: 796 (1840); *A. laurina* F.Muell., *Fragm.* 1: 27 (1858), *nom. illeg.* T: Port Jackson, N.S.W., *A. Cunningham s.n.*; *holo*: K.

A. laevis var. *leucocarpa* F.M.Bailey, *Bot. Bull. Dept. Agric., Queensland* 14: 7 (1896). T: Eumundi, Qld, *F.M.Bailey*; *holo*: BRI; *iso*: K.

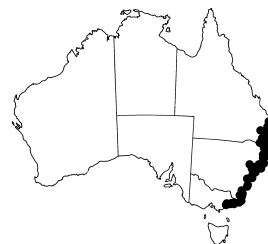
A. laevis var. *dictyophleba* Domin, *Biblioth. Bot.* 89: 294 (1927). T: Tamborine Mtn, Qld, Mar. 1910, *K.Domin* 5582; *holo*: PR.

Illustration: W.J.Hooker, *loc. cit.*, as *C. oblongifolia*.

Shrub, or tree to 27 m high. Internodes of young branchlets terete or slightly compressed. Leaves simple (occasional ones trifoliolate), glabrous; petiole 0.5–3.2 cm long; lamina obovate or narrowly so (in occasional leaves elliptic or narrowly so), 4–12 cm long, 1.4–5 cm wide, rounded or obtuse. Inflorescences few-flowered, axillary or axillary and infrafoliar, 2–6 cm long; pedicels 1.5–8 mm long (length similar in fruit), glabrous. Flower buds obtuse. Sepals 0.9–1.5 mm wide, glabrous adaxially. Petals 4.5–7 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary densely pubescent at apex, otherwise glabrous, like fruit with septicial fissures in distal $\frac{1}{3}$ – $\frac{1}{2}$. Fruit syncarpous, subglobose or mitriform, 5–9 mm long, without stylar beak, densely pubescent at apex, otherwise glabrous; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp 0.5–1.5 mm thick, with fleshy exocarp and spongy mesocarp (or mesocarp apparently lacking); endocarp thinly cartilaginous. Seeds c. 3.5 mm long. $2n = 36$, S.Smith-White, *Austral. J. Bot.* 2: 294 (1954), as *A. laevis*. *Common Acronychia*, *Hard Aspen*, *White Lilly Pilly*.

Occurs from near Gympie, SE Qld, to the vicinity of Lakes Entrance, SE Vic.; in rain forest, near sea level to 1100 m alt. Flowers Feb.–June; fruits May–Dec.

Qld: Spring Ck near Killarney, *C.E.Hubbard* 5810 (A, BRI, K); Noosa, *L.S.Smith & D.J.McGillivray* 3078 (NSW). N.S.W.: Gerringong, 20 Apr. 1934, *L.Fraser & J.Vickery* (CANB); Dorrigo, 3 Apr. 1944, *M.Tindale* (A, NSW, UC). Vic.: Kalimna, near Lakes Entrance, 15 Aug. 1944, *J.H.Willis* (MEL).



9. *Acronychia acuminata* T.G.Hartley, *J. Arnold Arbor.* 55: 498, fig. 4 (1974)

T: MacDowall Ra. between Daintree R. and Bloomfield R., Qld, 20 Aug. 1972, *L.J.Webb & J.G.Tracey* 10760; *holo*: CANB.

Tree 5–8 m high. Internodes of young branchlets terete. Leaves simple, glabrous; petiole 1.5–3.5 cm long; lamina elliptic, 9–15 cm long, 3–5 cm wide, acuminate, with acumens 1.5–2 cm long. Inflorescences few-flowered, axillary, c. 1.5 cm long; pedicels 1–2 mm long (c. 2.5 mm long in fruit), nearly glabrous. Flower buds obtuse. Sepals c. 1.2 mm wide, glabrous adaxially. Petals c. 3.5 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent at apex, otherwise glabrous, like fruit with septicial fissures in c. distal $\frac{1}{3}$. Fruit syncarpous, ovoid, 12–13 mm long, without stylar beak, sparsely pubescent at apex, otherwise glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial transverse section with outer part of pericarp less than 0.5 mm thick, with fleshy exocarp but apparently lacking mesocarp; endocarp thinly cartilaginous. Seeds c. 4.5 mm long.

A rare species. Occurs in NE Qld between Bloomfield R. and Daintree R.; in rain forest, 600 m alt. Flowers July; fruits Aug.

Qld: Roaring Meg Ck near junction with Alexandra Ck, *L.J.Webb & J.G.Tracey* 11671 (BISH, CANB).



10. *Acronychia parviflora* C.T.White, *Contr. Arnold Arbor.* 4: 51 (1933)

T: Glen Allyn, East Malanda, Qld, 22 Sept. 1929, *S.F.Kajewski 1214*; holo: BRI; iso: K, NY.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 458 (2004).

Shrub, or tree to 8 m high. Internodes of young branchlets terete or slightly compressed. Leaves simple; petiole 0.5–1.5 cm long, nearly glabrous to pubescent when young; lamina ovate to elliptic, or narrowly so (in occasional leaves elliptic-obovate), 3–10 (–14) cm long, 1.4–4.5 (–6.5) cm wide, acuminate or obtusely so with acumen to 1 cm long, or in occasional leaves rounded or obtuse, finely pubescent or puberulous below or glabrous. Inflorescences 1–few-flowered, axillary, 0.5–1.1 cm long; pedicels 0.5–2 mm long (length similar in fruit), nearly glabrous to puberulous. Flower buds obtuse. Sepals 1–1.2 mm wide, glabrous adaxially. Petals 2.5–3.5 mm long, like staminal filaments usually subpersistent in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary sparsely pubescent at apex or glabrous, like fruit with septicial fissures in c. distal $\frac{1}{4}$. Fruit syncarpous, subglobose in outline, 7–8 mm long, without styler beak, sparsely pubescent at apex or glabrous; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, with fleshy exocarp but apparently lacking mesocarp; endocarp thinly cartilaginous. Seeds c. 3.8 mm long.

Occurs in NE Qld from the vicinity of Mt Lewis S to Tully Falls; in rain forest, 200–1350 m alt. Flowers and fruits most of year.

Qld: Mt Bartle Frere, *S.T.Blake 9822* (BRI); Boonjie, near Malanda, *S.T.Blake 15181* (BRI, MEL); Tully Falls, *A.Fielding (North Qld Naturalists' Club) 13333* (BRI); S.F.R. 607, Davies Ck L.A., *P.I.Forster 3889* (CANB); S.F.R. 650, *B.Hyland 8270* (CANB); Mt Lewis forestry road, *J.Wrigley & I.R.Telford 237* (CBG).



11. *Acronychia laevis* J.R.Forst. & G.Forst, *Char. Gen. Pl.* 27, t. 27 (1775)

Jambolifera laevis (J.R.Forst. & G.Forst.) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891). T: New Caledonia, *J.R. & G.Forster*; holo: K; iso: BM, W (photo P).

A. laevis var. *purpurea* F.M.Bailey, *Bot. Bull. Dept. Agric., Queensland* 14: 7 (1896). T: not designated.

A. laevis var. *longiflora* Domin, *Biblioth. Bot.* 89: 294 (1927). T: Gladstone, Qld, Dec. 1909, *K.Domin 5585*; syn: PR; Brisbane R., Qld, 1863–1865, *A.Dietrich 648*; syn: NY, P.

Illustrations: J.Banks & D.Solander, *Ill. Pl. Cook's Voy.* 1: t. 35 (1900), as *J. laevis*; W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 457 (2004).

Shrub, or tree to 12 m high. Internodes of young branchlets terete or ±compressed. Leaves simple; petiole glabrous or sometimes puberulous, 0.3–3 cm long; lamina elliptic to obovate, or narrowly so, 2.5–10 cm long, 1–5 cm wide, rounded to obtusely acuminate, with acumen to 0.8 cm long, glabrous or nearly so. Inflorescences few–many-flowered, axillary or axillary and infraxillary, 1.5–7 cm long; pedicels 3.5–13 mm long (length similar in fruit), glabrous. Flower buds acuminate. Sepals 0.7–1.3 mm wide, glabrous adaxially. Petals 5–9 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary sparsely pubescent at apex or glabrous, without septicial fissures or very rarely with apical septicial fissures. Fruit syncarpous, mitriform or occasionally subglobose, 7–10 (–12) mm long, without styler beak, without septicial fissures, sparsely pubescent at apex or glabrous; frequent fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, exocarp fleshy but mesocarp apparently lacking; endocarp thinly cartilaginous. Seeds 4–4.5 mm long. *Glossy Acronychia*, *Hard Aspen*, *Northern White Lilly Pilly*.

Occurs from the Tozer Ra., NE Qld, to near Liston, NE N.S.W.; in rain forest and scrub, sea level to 600 m alt. Also in New Caledonia. Flowers Feb.–June; fruits Mar.–Oct.



Qld: Mt Fraser, *L.J.Brass* 2435 (A, BISH, BRI); Tozer Ra., Tozer Gap, *L.J.Brass* 19438 (BRI, CANB); Coalstoun Lakes, Coongarra Rock, *C.T.White* 7728 (A, BRI, NY); Whitsunday Is., *C.T.White* 10086 (BRI, NY). N.S.W.: Rivertree area, c. 65 km E of Liston, *S.Clark et al.* 1772 (NSW).

A record of this species from Lord Howe Is. is based on a single collection, collector unknown, housed at GH, K, & W. According to P.S.Green, *Fl. Australia* 49: 248 (1994), the record has never been verified.

12. *Acronychia wilcoxiana* (F.Muell.) T.G.Hartley, *J. Arnold Arbor.* 55: 516 (1974)

Pleiococca wilcoxiana F.Muell., *Fragm.* 9: 117 (1875); *Errerana wilcoxiana* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 2: 937 (1891), *nom. illeg.* T: between Clarence and Brisbane Rivers, eastern Australia, *coll. unknown*; holo: MEL; iso: BRI.

Tree to 9 m high. Internodes of young branchlets terete or slightly compressed or subtetragonous. Leaves simple, glabrous; petiole 0.6–3 cm long; lamina elliptic to obovate, or narrowly so, 7–21 cm long, 2.5–9 cm wide, rounded to obtusely acuminate, with acumen to 0.5 cm long. Inflorescences many-flowered, axillary, 3–6.5 cm long; pedicels 0.5–3 mm long (1.5–5 mm long in fruit), glabrous. Flower buds obtuse. Sepals 1.6–3 mm wide, glabrous adaxially. Petals 7.5–9 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4–8-carpelled; ovary pubescent at apex or glabrous, like fruit with septical fissures at least in distal 1/2. Fruit syncarpous, conical or subglobose in outline, 12–15 mm long, without styler beak, with tuft of apical trichomes or glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, exocarp fleshy but mesocarp apparently lacking; endocarp thinly cartilaginous. Seeds c. 4.5 mm long.

Silver Aspen.

Occurs from Fraser Is., SE Qld, to Gosford, east-central N.S.W.; in coastal and inland rain forest, to 450 m alt. Flowers Feb.; fruits Apr.–July.

Qld: One Mile Ck, Lawnton, *S.T.Blake* 2323 (BRI); Noosa R. NE of Gympie, *L.S.Smith* 12118 (BRI). N.S.W.: Seal Rocks, 1 Aug. 1964, *B.G.Briggs* (NSW); upper Williams R., 8 Jan. 1934, *L.Fraser* & *J.Vickery* (NSW); Brunswick Heads, *R.Schodde* & *H.C.Hayes* 3555 (AD, CANB).



13. *Acronychia eungellensis* T.G.Hartley & B.Hyland, *Austrobaileya* 1: 451, fig. 31 (1982)

T: Gamma, S.F.R. 62, Eungella Ra., Qld, 12 Oct. 1976, *B.Hyland* 9129; holo: CANB; iso: CNS.

Illustration: T.G.Hartley & B.Hyland, *op. cit.* 452.

Tree to 20 m high. Internodes of young branchlets terete. Leaves simple, glabrous; petiole 1–2 cm long; lamina elliptic or narrowly so, 5.5–9 cm long, 2–4.5 cm wide, rounded or obtuse. Inflorescences few–several-flowered, axillary, 2–9 cm long; pedicels 4–5.5 mm long (length similar in fruit), glabrous. Flower buds obtuse. Sepals 1.5–2 mm wide, glabrous adaxially. Petals 6.5–7.5 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary sparsely pubescent at apex or glabrous, like fruit with septical fissures at least in distal 1/2. Fruit syncarpous, broadly ovate to elliptic in outline, c. 12 mm long, without styler beak, sparsely pubescent at apex or glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, exocarp fleshy but mesocarp apparently lacking; endocarp thinly cartilaginous. Seeds c. 5 mm long. Fig. 18.

Known only from the Eungella Ra., east-central Qld; in rain forest, c. 900 m alt. Flowers Oct.; fruits Apr.–May.

Qld: Dalrymple Heights, *I.G.Champion* 547 (CBG); Eungella Natl Park, *S.G.Pearson* E118A (CBG); *loc. id.*, *S.Pearson* 461 (CBG).



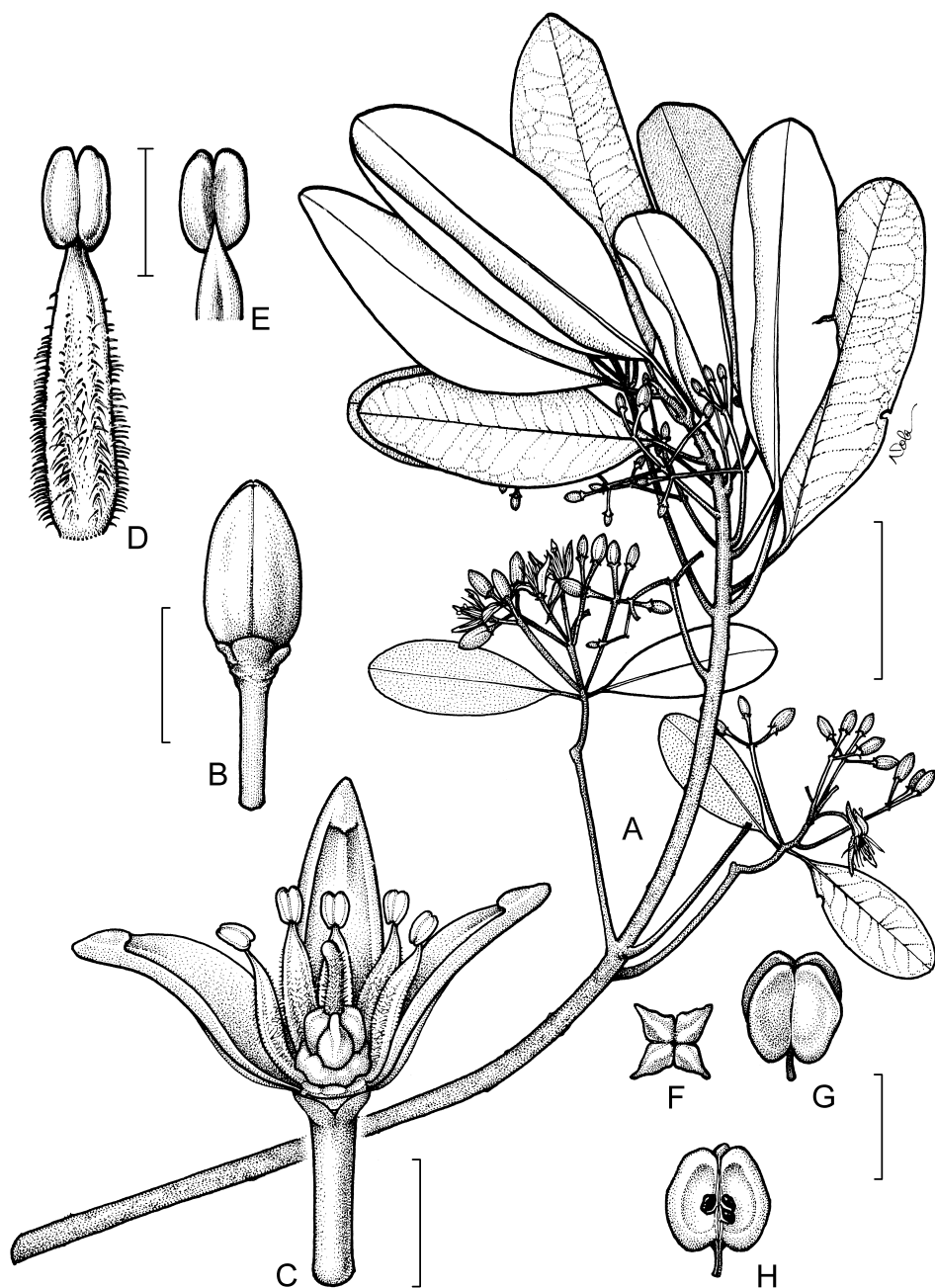


Figure 18. *Acronychia eungellensis*. A, flowering branchlet; B, flower bud; C, flower with 1 petal and 3 stamens removed; D, stamen, adaxial view; E, anther, abaxial view; F–H, fruit, top and side view and L.S. (A–E, B.Hyland 9129, CANB; F–H, B.Hyland 4197, CANB). Scale bars: A = 30 mm; B = 5 mm; C = 3 mm; D, E = 2 mm; F–H = 15 mm. Drawn by T.Nolan. Reproduced with permission from *Austrobaileya* 1: 452 (1982).

14. *Acronychia acidula* F.Muell., *Fragm.* 4: 154 (1864)

Jambolifera acidula (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891). T: Rockingham Bay, Qld, *J.Dallachy*; holo: MEL; iso: K, NSW.

A. superba Domin, *Biblioth. Bot.* 89: 295 (1927). T: Allumbah (Yungaburra), Qld, Feb. 1910, *K.Domin* 3406; holo: PR.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 456 (2004).

Tree to 27 m high. Internodes of young branchlets terete, slightly compressed, or sub-tetragonous. Leaves simple, glabrous; petiole 2–7 cm long; lamina elliptic or broadly so (occasional leaves obovate), 8–23.5 cm long, 4.3–12 cm wide, rounded to obtusely acuminate, with acumen to 1 cm long. Inflorescences several- or many-flowered, axillary and/or infra-foliar, 3–10 cm long; pedicels 2–4 mm long (3–5 mm long in fruit), glabrous. Flower buds obtuse. Sepals 2–2.5 mm wide, glabrous adaxially. Petals 7–8.5 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary glabrous, like fruit without septicidal fissures. Fruit syncarpous, subglobose to broadly conical in outline, 13–16 mm long, without stylar beak, glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp less than 0.5 mm thick, exocarp fleshy and mesocarp spongy between locules; endocarp cartilaginous. Seeds c. 4.5 mm long. *Lemon Aspen, Lemon Wood.*

Occurs from the Atherton Tableland, NE Qld, to the Eungella Ra., east-central Qld; in upland rain forest to 1000 m alt. Flowers Jan.–Mar.; fruits Mar.–Aug.

Qld: Malanda, *S.T.Blake* 15157 (BRI); Bromfield Crater, *L.J.Brass* 33485 (BRI); Eungella Ra. via Mackay, 3–12 Oct. 1922, *W.D.Francis* (BRI); Gadgarra, *S.F.Kajewski* 1049 (BRI, NSW, NY); State Forest Res. 191, Wongabel, *V.K.Moriarty* 1936 (CANB).

**15. *Acronychia aberrans* T.G.Hartley, *J. Arnold Arbor.* 55: 518, fig. 11 (1974)**

T: Swipers L.A., S.F.R. 310, Qld, 3 Oct. 1967, *B.Hyland* 998; holo: BRI.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 456 (2004).

Tree to 10 m high. Internodes of young branchlets concavely compressed and sharply tetragonous. Leaves simple, glabrous; petiole 1.5–5.5 cm long; lamina elliptic to obovate, 6–23 cm long, 3–10.3 cm wide, obtuse or acute. Inflorescences few-flowered, axillary, 3–4 cm long; pedicels 3–5 mm long (length similar in fruit), nearly glabrous. Flower buds obtuse. Sepals c. 1.5 mm wide, glabrous adaxially. Petals 7–9 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent at apex, otherwise glabrous, like fruit without septicidal fissures. Fruit syncarpous, subglobose or broadly pyriform, 13–16 mm long, without stylar beak, sparsely pubescent at apex or glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp 2.5–3.5 mm thick, exocarp fleshy but mesocarp apparently lacking; endocarp cartilaginous. Seeds 6–7 mm long. *Acid Berry, Lemon Aspen.*

Occurs in NE Qld from Mt Spurgeon S to the Atherton Tableland; in rain forest, 720–1000 m alt. Flowers Feb.–Apr.; fruits recorded Apr.

Qld: S.F.R. 310, Swipers L.A., *B.Hyland* 1996 & 2191 (BRI); S.F.R. 310, Windin L.A., *B.Hyland* 6703 (CANB); Mt Lewis, *I.R.Telford* 9333 & *G.Butler* (CBG); Mt Spurgeon, *C.T.White* 10678 (A, BM, BRI, P, UC).



16. *Acronychia vestita* F.Muell., *Fragm.* 4: 155 (1864)

Jambolifera vestita (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891). T: Dalrymple Ck, Rockingham Bay, Qld, 1 June 1864, *J.Dallachy*; holo: MEL; iso: BM, BRI, K, NSW.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 458 (2004).

Tree to 21 m high. Internodes of young branchlets terete or slightly compressed. Leaves simple; petiole 1–4 cm long, sparsely to densely pubescent; lamina elliptic to obovate, 8–23 cm long, 3.8–11.5 cm wide, rounded to obtusely acuminate, with acumen to 1 cm long, sparsely to rather densely pubescent below. Inflorescences many-flowered, axillary and/or infraxillary, 4–7 cm long; pedicels 3–4.5 mm long (4–5.5 mm long in fruit), nearly glabrous to sparsely pubescent. Flower buds obtuse. Sepals 1.2–1.5 mm wide, glabrous adaxially. Petals 6–7.5 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent at apex, otherwise glabrous, like fruit without septicial fissures. Fruit syncarpous, pyriform, subglobose, or elliptic in outline, 10–20 mm long, without styler beak, pubescent at apex or glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp 1–2 mm thick, exocarp fleshy and mesocarp woody; endocarp cartilaginous. Seeds 5–5.5 mm long. *White Aspen*.

Occurs in NE Qld from Cairns S to Rockingham Bay; in rain forest, near sea level to 900 m alt. Flowers Feb.–Mar.; fruits Apr.–Nov.

Qld: Behana Ck, 1899, *F.M.Bailey (Meston's Bellenden Ker Exped.)* (BRI); Lacey's Ck, El Arish, *W.T.Jones 1269* (CANB); Boonjie, *S.F.Kajewski 1210* (A, BRI, NY); Mission Beach, *J.McKean MB 1* (BRI, CANB); Gadgarra, *C.T.White 1565* (A, BRI, NSW).

**17. *Acronychia pubescens*** (F.M.Bailey) C.T.White, *Proc. Roy. Soc. Queensland* 50: 68 (1939)

Melicope pubescens F.M.Bailey, *Bot. Bull. Dept. Agric., Queensland* 3: 9 (1891). T: Yandina, Qld, 1 Mar. 1891, *Field Naturalists' Club Excursion*; lecto: BRI, *vide* T.G.Hartley, *J. Arnold Arbor.* 55: 526, 528 (1974); isolecto: MEL.

A. melicopoides var. *lasiantha* F.Muell., *Fragm.* 7: 145 (1871). T: Clarence R., N.S.W., *C.Moore*; holo: MEL; iso: K, NSW.

M. pubescens var. *superba* Domin, *Biblioth. Bot.* 89: 289 (1927). T: Tamborine Mtn, Qld, Mar. 1910, *K.Domin 5638*; holo: PR.

Illustration: F.M.Bailey, *Compr. Cat. Queensland Pl.* t. 59 (1912), as *M. pubescens*.

Shrub, or tree to 15 m high. Internodes of young branchlets terete or slightly compressed. Leaves trifoliolate or mostly so or rarely exclusively simple; petiole 0.8–8.5 cm long, nearly glabrous to tomentose; laminae elliptic to obovate, or narrowly so, 5–26 cm long, 1.8–7.7 cm wide, acuminate with acumen to 2.3 cm long or occasionally obtuse, sparsely to densely pubescent below or sometimes glabrous. Inflorescences few–many-flowered, axillary, 2.5–6.5 cm long; pedicels 1–4.5 mm long (length similar in fruit), tomentose or rarely pubescent. Flower buds obtuse. Sepals 1.5–2.5 mm wide, glabrous adaxially. Petals 6–9 mm long, like staminal filaments subsistent in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent at least towards apex, like fruit with septicial fissures in distal $\frac{1}{3}$ – $\frac{3}{4}$. Fruit syncarpous, ellipsoid to subglobose, 12–18 mm long, without styler beak, pubescent at least at apex; occasional fruiting carpels with ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part pericarp less than 0.7 mm thick, exocarp fleshy but mesocarp apparently lacking; endocarp cartilaginous. Seeds 4–4.5 mm long. $2n = 34$, M.dos S.Guerra, *Pl. Syst. Evol.* 146: 18 (1984). *Hairy Acronychia*.

Occurs from Pomona, SE Qld, to Dorrigo Natl Park, NE N.S.W.; in rain forest, near sea level to 1080 m alt. Flowers and fruits most of year.



Qld: Lamington Natl Park, *R.Schodde* 3376 (CANB); E of Bald Mtn c. 35 km E of Warwick, *L.S.Smith* 11456 (BRI, CANB); Mt Glorious, *C.T.White* 12071 (A, BRI, US). N.S.W.: Whian Whian S.F., 10 June 1957, *L.A.S.Johnson & E.F.Constable* (A, NSW); Dorrigo Natl Park, Aug. 1963, *J.B.Williams* (NSW).

18. *Acronychia littoralis* T.G.Hartley & J.B.Williams, *Brunonia* 6: 251, fig. 1 (1983)

T: c. 2 km N of Brunswick Heads, N.S.W., 11 Aug. 1979, *J.B.Williams* 2086; holotype: CANB; isotype: NE, NSW.

Illustration: T.G.Hartley & J.B.Williams, *op. cit.* 252.

Tree to 8 m high. Internodes of young branchlets terete or ±compressed. Leaves simple, glabrous; petiole (0.5–) 1–2.5 cm long; lamina elliptic to obovate, (3.5–) 5–14 cm long, (2–) 3–6.5 cm wide, rounded or obtuse. Inflorescences usually several-flowered, axillary or axillary and infrafoliar, 2–6 (–8) cm long; pedicels 1.5–3.5 mm long (3–5 mm long in fruit), glabrous or nearly so. Flower buds obtuse. Sepals (1.5–) 2.5–3 mm wide, glabrous adaxially. Petals 8–9 mm long, like staminal filaments deciduous in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent at apex or glabrous, like fruit with septicidal fissures in distal $\frac{1}{4}$ – $\frac{1}{2}$. Fruit syncarpous, broadly ovate to subglobose in outline, 8–14 mm long, without stylar beak, pubescent at apex or glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp 1–2 mm thick, with fleshy exocarp and woody mesocarp; endocarp cartilaginous. Seeds c. 5.5 mm long. *Scented Acronychia*.

Occurs from near Cooloola, SE Qld, to the vicinity of Iluka, NE N.S.W.; in coastal rain forest. Flowers Feb.–Mar.; fruits Apr.–Aug.

Qld: Currumbin Public Park, 2 Feb. 1992, *K.Robinson* (BRI, CBG). N.S.W.: Ross Lane 0.6 km off Byron Bay–Lennox Head road, *P.Beesley* 4232 (CBG); Woombah–Iluka road 1 km E of Esk R., *I.R.Telford* 9716 & *P.Beesley* (CBG); Kingscliff–Cabarita road near Cudgen L., *J.B.Williams* 2105 (CANB, NE); 2 km S of Broken Head, 27 Jan. 1980, *J.B.Williams* (CANB, NE).



Listed as endangered under the EPBC Act 1999.

19. *Acronychia acronychioides* (F.Muell.) T.G.Hartley, *J. Arnold Arbor.* 55: 545 (1974)

Euodia acronychioides F.Muell., *Fragm.* 4: 117 (1864); *A. melicopoides* F.Muell., *Fragm.* 5: 3 (1865), *nom. illeg.*; *Jambolifera melicopoides* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891), *nom. illeg.*, as *melicopodes*. T: Rockingham Bay, Qld, Mar. 1864, *J.Dallachy*; holotype: MEL; isotype: BM, BRI, K, L, W.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 457 (2004).

Tree to 25 m high. Internodes of young branchlets terete or slightly compressed or sub-tetragonous. Leaves trifoliate (occasional leaves simple); petiole 2–8 cm long, puberulous when young, at least adaxially or towards base; laminae elliptic to obovate, or narrowly so, 7–21 cm long, 2–6.5 cm wide, rounded to acute or obtusely acuminate, with acumens to 0.8 cm long, glabrous. Inflorescences many-flowered, axillary, 3–10 cm long; pedicels 3–7.5 mm long (length similar in fruit), puberulous or finely pubescent. Flower buds obtuse. Sepals 2–3 mm wide, glabrous adaxially. Petals 8–10 mm long, like staminal filaments usually subpersistent in fruit. Gynoecium syncarpous, like fruit 4-loculed; ovary pubescent, like fruit with apical septicidal fissures or these lacking. Fruit syncarpous, subpyriform or occasionally subglobose, 8–13 mm long, without stylar beak, pubescent at least towards apex or becoming glabrous; fruiting carpels without ruptured wall opening into locule; dried fruit as seen in medial T.S. with outer part of pericarp c. 1 mm thick, with fleshy exocarp and woody mesocarp; endocarp cartilaginous. Seeds c. 4 mm long. *White Aspen*.

Occurs from the Tozer Ra., NE Qld, to the Eungella Ra., east-central Qld; in rain forest, sea level to 1200 m alt. Flowers Apr.–May; fruits June–Sept.



Qld: head of Wild R., 3 July 1899, *J.F.Bailey* (BRI, NSW); Tozer Ra. c. 1 km E of Mt Tozer, *L.J.Brass* 19467 (BRI, CANB); Annan R., upper Parrot Ck, *L.J.Brass* 20220 (BRI, CANB); Gadgarra, *S.F.Kajewski* 1078 (A, BRI, K, NY, UC); Eungella Ra., *C.T.White* 12872 (BRI).

20. *Acronychia imperforata* F.Muell., *Fragm.* 1: 26 (1858)

Jambolifera imperforata (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891). T: Moreton Bay [Qld], *W.Hill*; lecto: MEL, *fide* T.G.Hartley, *J. Arnold Arbor.* 55: 547, 548 (1974); isolecto: K.

A. scortechinii F.M.Bailey, *Queensland Agric. J.* 3: 281 (1898). T: Fraser Is., Qld, Aug. 1894, *Miss Lovell*; syn: BRI; Logan R., Qld, *B.Scortechini*; syn: BRI, K.

Illustration: W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 457 (2004).

Shrub, or tree to 10 m high. Internodes of young branchlets terete or slightly compressed. Leaves simple; petiole 0.3–2.5 cm long, glabrous or nearly so; lamina elliptic to obovate, or narrowly so, 3.3–13 cm long, 1.6–6 cm wide, rounded to obtusely acuminate, with acumens to 0.5 cm long, glabrous. Inflorescences usually few-flowered, axillary and/or infrafoliar, 2–5 cm long; pedicels 1.5–4.5 (–7) mm long, glabrous to puberulous. Flower buds obtuse. Sepals 1.5–2.5 mm wide, glabrous adaxially. Petals 5.5–9 mm long. Gynoecium syncarpous, 4-loculed; ovary sparsely pubescent at apex or glabrous, like fruit without septicial fissures. Fruit syncarpous, 4-loculed, pyriform to subglobose, 9–16 mm long, without stylar beak, with a few apical trichomes or glabrous; dried fruit as seen in medial T.S. with outer part of pericarp 0.7–1 mm thick, with fleshy exocarp and woody mesocarp; endocarp cartilaginous. Seeds 4–6 mm long. *Beach Acronychia*, *Fraser Island Apple*, *Green Tree*.

Occurs from near Somerset, NE Qld, to Port Macquarie, east-central N.S.W.; in coastal and inland rain forest, to 900 m alt. Flowers most of year; fruits Apr.–Oct.

Qld: upper Mowbray R., *L.J.Brass* 2522 (A, BISH, BRI, US); Newcastle Bay c. 4 km S of Somerset, *L.J.Brass* 18668 (BRI, CANB); Rockingham Bay, *J.Dallachy* (MEL). N.S.W.: Hat Head, E of Kempsey, 18 Jan. 1953, *E.F.Constable* (NSW); Byron Bay, *C.T.White* 10449 (A, BRI, NY).



17. SARCOMELICOPE

T.G.Hartley

Sarcomelicope Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 122 (1896); from the Greek *sarkos* (fleshy) and *Melicope* (a related genus), referring to the fleshy fruit, as opposed to subwoody in *Melicope* as then known.

Type: *S. sarcococca* (Baill.) Engl.

Bauerella Borzi, *Boll. Reale Orto Bot. Giardino Colon. Palermo* 1: 155 (1897). T: *B. australiana* Borzi

Shrubs or trees, dioecious, evergreen, unarmed. Trichomes simple. Leaves opposite or rarely in whorls of 3, simple. Inflorescences paniculate or racemose, axillary. Flowers 4-merous, globose or subglobose in bud. Sepals persistent in fruit. Petals narrowly imbricate, persistent or deciduous in fruit. Stamens 8, alternately unequal in length, without pollen in female flowers; filaments \pm elliptic-oblong or lanceolate, ciliate, otherwise glabrous or nearly so, persistent in fruit or at least proximal portion of antisepalous filaments persistent (and \pm concealed) in axils of sepals. Gynoecium (rudimentary and with neither fully developed ovules nor fully differentiated stigma in male flowers) syncarpous, 4-loculed; ovary velutinous, apparently lacking septicial fissures; ovules 2 per locule; style apical, velutinous proximally; stigma peltate, broadly 4-lobed. Fruit syncarpous, 4-loculed, drupaceous, subglobose to obovoid, rarely with apical septicial fissures; carpels connate for full length; outer part of pericarp with fleshy, glabrescent exocarp and woody or subwoody mesocarp; endocarp cartilaginous. Seeds solitary or in pairs, obovoid to reniform, with enlarged chalazal region, otherwise irregularly roughened; testa with thick sclerotesta and

outer layer of compact parenchymatous tissue with patches, or large areas, of spongy tissue; endosperm copious. Embryo straight or slightly curved; cotyledons flattened, elliptic or narrowly so; hypocotyl terminal, considerably narrower than cotyledons.

A genus of 9 species; known from Australia (including Lord Howe and Norfolk Islands), New Caledonia, Vanuatu, and Fiji; one species (not endemic) in Australia.

T.G.Hartley, The taxonomic status of the genus *Bauerella* (Rutaceae), *J. Arnold Arbor.* 56: 164–170 (1975); T.G.Hartley, A revision of the genus *Sarcomelicope* (Rutaceae), *Austral. J. Bot.* 30: 359–372 (1982); T.G.Hartley, Three new species of *Sarcomelicope* (Rutaceae) from New Caledonia (with a key to the species of the genus), *Bull. Mus. Natl. Hist. Nat., B, Adansonia* 8: 183–189 (1986).

***Sarcomelicope simplicifolia* (Endl.) T.G.Hartley, *Austral. J. Bot.* 30: 369, figs 2f, 3a, d (1982)**

subsp. ***simplicifolia***

Vepris simplicifolia Endl., *Prodr. Fl. Norfolk.* 89 (1833); *Acronychia endlicheri* Schott, *Rutaceae* 3, t. 2 (1834), *nom. illeg.*; *A. simplicifolia* (Endl.) Steud., *Nomencl. Bot.*, 2nd edn, 2: 747 (1841); *Jambolifera endlicheri* (Schott) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891), *nom. illeg.*; *Bauerella simplicifolia* (Endl.) T.G.Hartley, *J. Arnold Arbor.* 56: 168, fig. 1b, c (1975). T: Norfolk Is., 5 Dec. 1804, *F.Bauer*; *holo*: W.

A. baueri Schott, *Rutaceae* 5, t. 3 (1834); *J. baueri* (Schott) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891); *B. australiana* Borzi, *Boll. Reale Orto Bot. Giardino Colon. Palermo* 1: 155 (1897), *nom. illeg.*; *B. baueri* (Schott) Däniker, *Vierteljahrsschr. Naturf. Ges. Zurich* 77 (Beibl. 19): 202 (1932). T: locality unknown, perhaps Norfolk Is., *F.Bauer*; *n.v.*

A. hillii F.Muell., *Fragm.* 1: 26 (1858); *Citrus hillii* (F.Muell.) B.D.Jacks., *Ind. Kew.* 1: 551 (1895). T: Brisbane R. [Qld], *W.Hill*; *syn*: MEL; *loc. id.*, July 1855, *F.Mueller*; *syn*: BM, GH, K, MEL, P.

A. baueri f. *majoriflora* Domin, *Biblioth. Bot.* 89: 294 (1927). T: Brisbane R., Qld, *A.Dietrich s.n.*; *iso*: BRI, W.

Illustrations: T.G.Hartley, *J. Arnold Arbor.* 56: 166, fig. 1b, c (1975), as *B. simplicifolia*; T.G.Hartley, *Austral. J. Bot.* 30: 361, fig. 2f; 362, fig. 3a, d (1982); W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 471 (2004).

Shrub, or tree to 26 m high. Leaves with petiole 1.5–5 cm long; lamina elliptic to obovate, 5–16 cm long, 2.5–7 cm wide. Inflorescences 0.8–6 cm long; pedicels obsolete or to 1 mm long (length similar in fruit). Petals 2.5–4.5 mm long, appressed-pubescent abaxially. Fruit 10–15 mm long. Seeds 5–7.5 mm long. *Bauerella*, *Hard Aspen*, *Yellow-wood*. Plate 30; Fig. 19.

Known from mainland Australia and Lord Howe and Norfolk Is; on the mainland occurs from Cairns, NE Qld, to Mt Dromedary, SE N.S.W.; in rain forest (often dry), sea level to 900 m alt. Flowers Feb.–Aug.; fruits year round.

Qld: Boyne Valley c. 60 km SSW of Gladstone, *W.J.F.McDonald* 1961 (CANB); S.F.R. 185, Platypus L.A., *J.O'Farrell* 6 (CANB); Mt Glorious, *C.T.White* 11078 (A, BRI). N.S.W.: Mt Dromedary, *L.A.Craven* 2583 & 2588 (CANB); Brunswick Heads, *R.Schodde* & *H.C.Hayes* 3553 (AD, CANB).

Two other infraspecific taxa are recognised. *Sarcomelicope simplicifolia* subsp. *neo-scotica* (P.S.Green) T.G.Hartley occurs in New Caledonia and Vanuatu, and subsp. *petiolaris* (A.Gray) T.G.Hartley is endemic to Fiji.



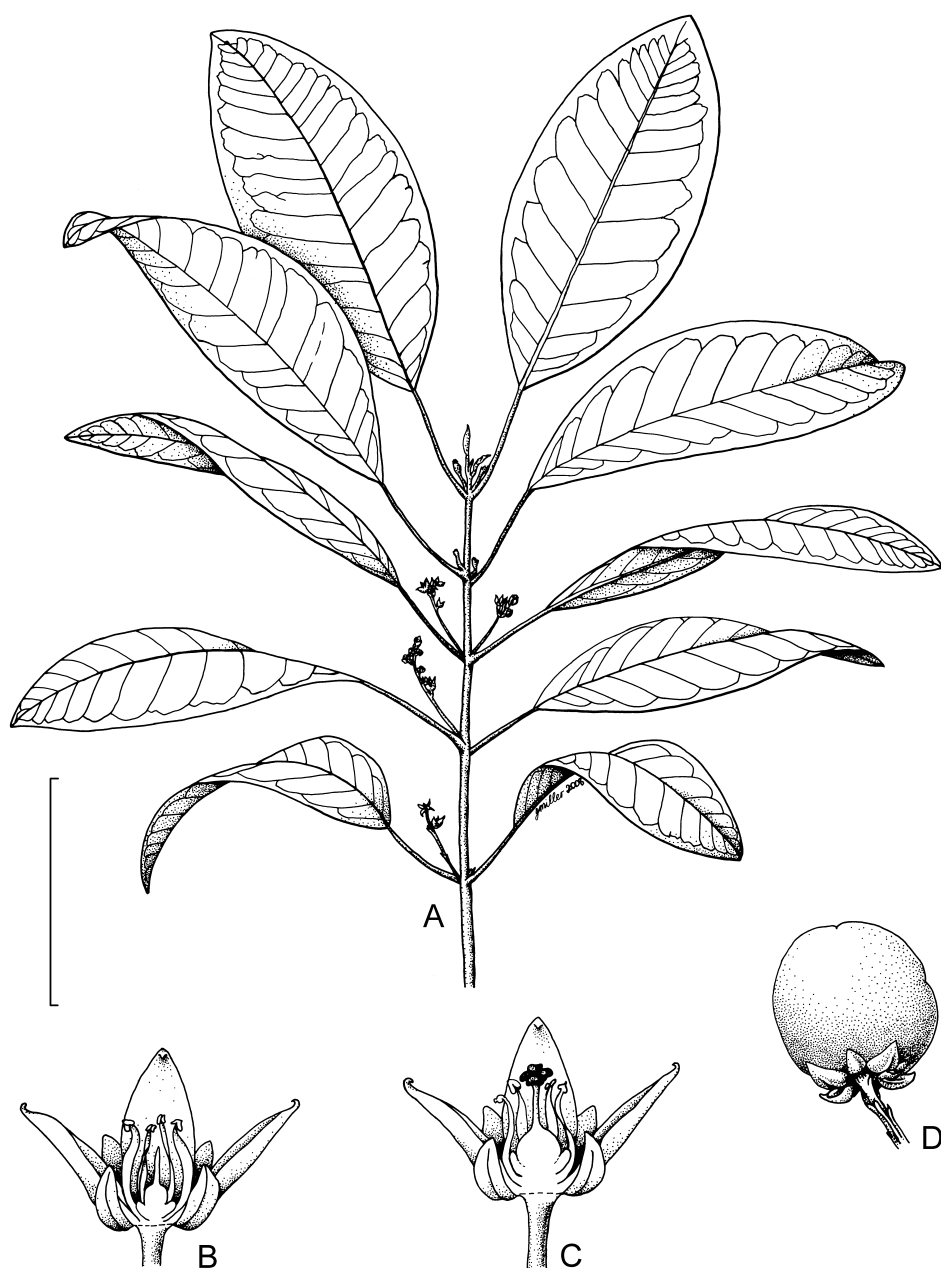


Figure 19. *Sarcomelicope simplicifolia* subsp. *simplicifolia*. **A**, branchlet with male flowers; **B**, male flower, 1 petal & several stamens removed; **C**, female flower, 1 petal & several stamens removed; **D**, fruit (**A**, **B**, L.Smith & L.Webb 3146, CANB; **C**, V.Moriarty 1510, CANB; **D**, R.Hoogland 11165, CANB). Scale bar: **A** = 30 mm; **B**, **C** = 4 mm; **D** = 10 mm. Drawn by J.Miller.

18. PITAVIASTER

T.G.Hartley

Pitaviaster T.G.Hartley, *Adansonia*, sér. 3, 19: 200 (1997); from *Pitavia* and the Latin suffix *-aster* (incomplete resemblance), referring to the state of similarity to that genus.

Type: *P. haplophyllus* (F.Muell.) T.G.Hartley

Shrub or small to medium tree, evergreen, unarmed. Trichomes simple. Leaves opposite, simple. Inflorescences paniculate, axillary. Flowers bisexual, 4-merous. Sepals glabrous or nearly so adaxially. Petals valvate. Stamens 4; anthers rounded or emarginate at apex. Gynoecium 4-carpelled; carpels in ovary joined in the style, otherwise contiguous; ovules 2 per locule; style apical; stigma punctiform, finally becoming inconspicuously 4-parted. Fruit drupaceous, 1-carpelled and -loculed (3 of the 4 carpels abortive and deciduous); exocarp fleshy; mesocarp woody; endocarp cartilaginous. Seeds solitary; testa very thin and brittle, with sclerotesta; endosperm copious. Embryo straight; cotyledons flattened, ovate; hypocotyl terminal, considerably narrower than cotyledons.

An endemic Australian genus of one species.

Pitaviaster haplophyllus (F.Muell.) T.G.Hartley, *Adansonia*, sér. 3, 19: 202, fig. 6 (1997)

Euodia haplophylla F.Muell., *Fragm.* 5: 179 (1866); *Acronychia tetrandra* F.Muell., *Fragm.* 9: 104 (1875), *nom. illeg.*; *Jambolifera tetrandra* (F.Muell.) Kuntze, *Revis. Gen. Pl.* 1: 102 (1891), *nom. illeg.*; *A. haplophylla* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 180 (1896). T: Coast Ra., Rockingham Bay, Qld, 17 Nov. 1865, *J.Dallachy*; holo: MEL.

Illustrations: T.G.Hartley, *op. cit.* 203; W.Cooper & W.T.Cooper, *Fr. Austral. Trop. Rainforest* 471 (2004).

Shrub, or tree to 13 m high. Leaves: petiole 1–3 cm long; lamina elliptic to obovate, or narrowly so, 8–23 cm long, 3–9 cm wide. Inflorescences 2.5–14 cm long; pedicels 2.5–4.5 mm long, nearly glabrous to strigillose (length similar in fruit). Sepals 0.8–1 mm long. Petals 2–2.5 mm long. Anthers 0.6–1 mm long. Fruit ovoid to ellipsoid, 15–20 mm long. Seed ovoid, 8–10 mm long. *Yellow Aspen*. Plate 31; Fig. 20.

Occurs in NE Qld from the Annan R. S to Rockingham Bay; also known by a single collection from SE Qld (Fraser Is.); in rain forest, near sea level to 1100 m alt. Flowers and fruits most months.

Qld: Babinda, *S.F.Blake 15023* (BRI, MEL); Annan R., upper Parrot Ck, *L.J.Brass 20254* (BRI, CANB); Keoughs Scrub, Herberton, *T.G.Hartley & B.Hyland 14095* (CANB); Mt Spurgeon, *C.T.White 10690* (A, BM, BRI); Fraser Is., 1 km SE of L. Allom, 29 Aug. 1986, *J.B.Williams* (CANB).



GROUP 2

Anthers with or without apical gland. Fruit dehiscent. Cotyledons in seed linear, c. same width as hypocotyl.

A group of 18 genera in Australia; mostly small-leaved shrubs of sclerophyllous vegetation.

Group 2 corresponds to Tribe Boronieae as outlined by Engler (1931), with later modifications by Hartley (1995) who excluded five genera. The group contains 18 Australian genera; two genera also have single species in New Caledonia (*Zieria*) or New Zealand (*Leionema*). They are most diverse across southern Australia where the majority of species and genera are confined. A few genera extend to north Qld, *Neobyrsnia* is confined to a small area of the N.T. and only *Boronia* is found in north-west Qld, across the Top End of the N.T. and in the Kimberley region of W.A. Group 2, in contrast to Group 1, are mostly

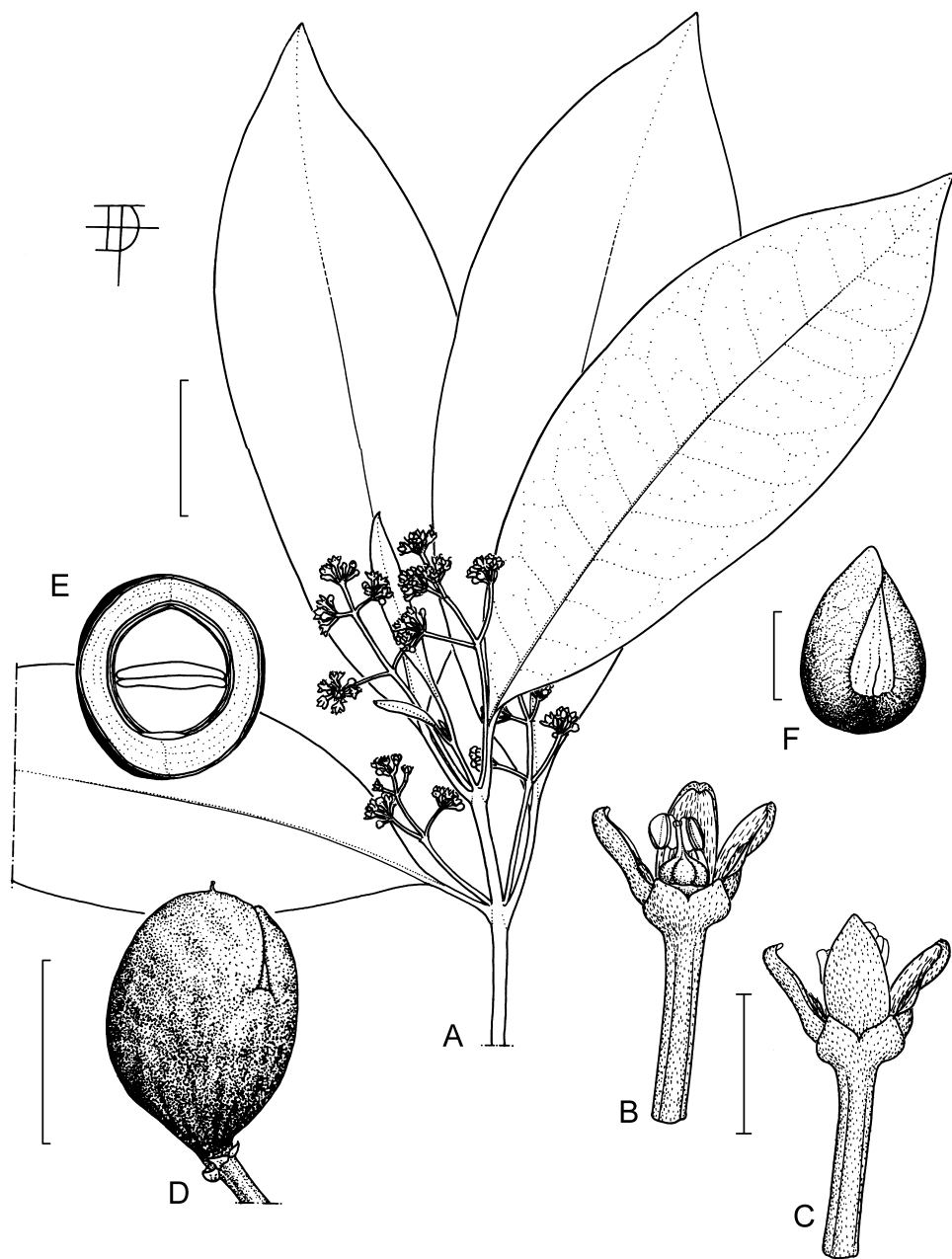


Figure 20. *Pitaviaster haplophyllus*. **A**, flowering branchlet; **B**, **C**, flowers; **D**, fruit; **E**, fruit T.S.; **F**, seed (**A**, T.Risley 116, CNS; **B**, **C**, R.Schodde 4182, AD, CANB; **D–F**, A.Rudder 3651, L). Scale bars: **A** = 3 cm; **B**, **C** = 3 mm; **D**, **E** = 10 mm; **F** = 5 mm. Drawn by D.Fortescue. Reproduced with permission from *Adansonia* sér. 3, 19(2): 203 (1997).

RUTACEAE

small-leaved shrubs of sclerophyllous vegetation. The only uniting feature for this group is that all have cotyledons in the seed that are linear and about the same width as the hypocotyl.

Recent molecular work (Groppe *et al.*, 2008; Bayly *et al.*, unpubl.) indicates that Tribe Boronieae is polyphyletic, and it and its subtribes require revision. *Boronia* (with the New Caledonian *Boronella*) and *Zieria* with *Neobrynesia* are sister to or form a grade with a clade of largely Australian and New Caledonia rain forest genera (including Group 1 here). *Correa* is sister to a clade containing the 5-merous taxa of Group 2 with *Halfordia* and two New Caledonian genera.

Kubitski *et al.* (2011), recognising that further work was needed to resolve the classification of the family, described a number of informal alliances and groups under the subfamilies. Group 2 here corresponds to their *Boronia* Alliance that was classified into three Groups: the *Boronia* Group (*Boronia*, *Zieria* and *Neobrynesia*; 4-merous), the *Correa* Group (*Correa*; 4-merous), and the *Eriostemon* Group (remaining 14 genera; 5-merous).

H.G.A.Engler, Rutaceae, in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19A: 187–359 (1931); T.G.Hartley, A new combination in *Boronella* (Rutaceae) and a view on relationships of the genus, *Bull. Mus. Natl. Hist. Nat. B, Adansonia*, 17: 107–111 (1995); M.Groppe *et al.*, Phylogeny of Rutaceae based on two noncoding regions from cpDNA, *Amer. J. Bot.* 95: 985–1005 (2008); K.Kubitzki *et al.*, Rutaceae, in K.Kubitzki (ed.), *Fam. Gen. Vasc. Pl.* 10: 276–356 (2011).

KEY TO GENERA

- 1 Leaves opposite, simple or pinnate or bipinnate; flowers 4 (5)-merous
- 2 Leaves simple; calyx hemispherical, sometimes lobed; petals connate and forming a tube or lately separating and then often still connate at base and stamens spreading 22. CORREA
- 2: Leaves simple or pinnate or bipinnate; sepals distinct; petals distinct, usually spreading, sometimes urceolate; stamens erect or inwardly curved
- 3 Stamens 8 (rarely 4 caducous); leaves simple or pinnate or bipinnate 19. BORONIA
- 3: Stamens 4; leaves simple or ternate
- 4 Disc distinctly 4-lobed; leaves simple or ternate 20. ZIERIA
- 4: Disc entire; leaves simple 21. NEOBYRNESIA
- 1: Leaves alternate, simple; flowers usually 5-merous, rarely 4- or 6–8-merous
- 5 Leaves lepidote on abaxial surface, sometimes also so on branches, perianth, stamens and ovary
- 6 Flowers sessile, in dense or compact heads or rarely solitary
- 7 Carpels 5 34. PHEBALIUM
- 7: Carpels 2–4 35. MICROCYBE
- 6: Flowers pedicellate, in an open inflorescence or solitary
- 8 Inflorescences umbellate or rarely flowers solitary; anthers basifixed, with a prominent apical gland 34. PHEBALIUM
- 8: Inflorescences cymose or solitary; anthers versatile, without an apical gland
- 9 Sepals distinct; anthers retuse at apex 31. NEMATOLEPIS
- 9: Sepals connate; anthers obtusely apiculate 32. RHADINOTHAMNUS
- 5: Leaves and stems glabrous or variously hairy but not lepidote (rarely, *Asterolasia*, *Eriostemon*) stellate-lepidote on petals

RUTACEAE

- | | | |
|------------|--|------------------------|
| 10 | Leaf margin deeply sinuate or lobed | 33. CHORILAENA |
| 10: | Leaf margin entire | |
| 11 | Inflorescence heads surrounded by large imbricate involucre bracts in 3 or 4 rows | 36. DIPLOLAENA |
| 11: | Inflorescence not surrounded by large involucre bracts | |
| 12 | Corolla cylindrical | |
| 13 | Stamens 5, alternating with 5 staminodes, densely hairy on abaxial surface | 28. DRUMMONDITA |
| 13: | Stamens 10, all fertile, pilose at swollen base | 30. MUIRIANTHA |
| 12: | Corolla spreading | |
| 14 | Sepals larger than petals, coloured and similar to inflorescence bracts | 26. GELEZNOWIA |
| 14: | Sepals much smaller than petals, not showy | |
| 15 | Staminal filaments glabrous, divergent | |
| 16 | Sepals minute or 0; carpels 1–5 | 27. ASTEROLASIA |
| 16: | Sepals obvious; carpels 5 | 29. LEIONEMA |
| 15: | Staminal filaments variously hairy, rarely glabrous, erect or pyramidally arranged | |
| 17 | Petals 5-veined, stellate-lepidote; staminal filaments subapically verrucose | 23. ERIOSTEMON |
| 17: | Petals 1-veined, glabrous or with simple hairs; staminal filaments smooth | |
| 18 | Anther and apiculum pilose | 24. CROWEA |
| 18: | Anther and apiculum glabrous | 25. PHILOTHECA |

BORONIA

Marco F.Duretto, Paul G.Wilson & Pauline Y.Ladiges

Boronia Sm., *Tracts Nat. Hist.* 288 (1798); named for Francesco Borone (1789–94), botanical assistant to Sir James Smith in Europe.

Type: *B. pinnata* Sm.

Perennial herbs or shrubs, rarely small trees (*B. muelleri*), glabrous or with simple and/or stellate hairs, unarmed. Leaves opposite (rarely alternate), simple or compound. Flowers solitary or in cymes or rarely cymose panicles, 4-merous or rarely 5-merous (*B. scabra*), bibracteolate. Sepals free. Petals free. Stamens 4 + 4, rarely 4 caducous (*B. parviflora*), inserted beneath disc, all or only 4 fertile; filaments inwardly curved, flat or semiterete, glabrous or hairy, often enlarged at apex and often with a subapical inflexed tip; anthers introrse, minutely or prominently white-apiculate or not. Disc prominent. Carpels 4; ovaries free, united at apex on adaxial margin by the solitary style.

A genus of 148 species endemic to Australia, found in all states and territories, but predominantly in temperate areas.

Boronella Baill. (6 spp.) is here recognised as being generically distinct and endemic to New Caledonia though current research suggests it is nested in section *Boronia* (Weston *et al.*, 1984; Bayly *et al.*, unpubl.). *Boronia megastigma* is cultivated for the cut flower trade and for the perfume industry, and other species are of horticultural interest.

P.G.Wilson, Taxonomic notes on the family Rutaceae, principally of Western Australia, *Nuytsia* 1: 197–207 (1971); P.H.Weston *et al.*, A cladistic analysis of *Boronia* Sm. and *Boronella* Baill. (Rutaceae), *Austral. J. Bot.* 32: 187–203 (1984); P.H.Weston, Notes on *Boronia* (Rutaceae) in New South Wales, including descriptions of three new subspecies, *Telopea* 4: 121–128 (1990); T.G.Hartley, A new combination in *Boronella* (Rutaceae) and a view on relationships of the genus, *Bull. Mus. Natl. Hist. Nat., B, Adansonia* 17: 107–111 (1995); M.F.Duretto & P.Y.Ladiges, Morphological variation within the *Boronia grandisepala* group (Rutaceae) and the description of nine taxa endemic to the Northern Territory, *Austral. Syst. Bot.* 10: 249–302 (1997); M.F.Duretto, Taxonomic notes on *Boronia* species of north-western Australia, including a revision of the *Boronia lanuginosa* group (*Boronia* section *Valvatae*: Rutaceae), *Nuytsia* 11: 301–346 (1997); P.G.Wilson, New names and new taxa in the genus *Boronia* (Rutaceae) from Western Australia, with notes on seed characters, *Nuytsia* 12: 119–154 (1998); M.F.Duretto, *Boronia* section *Valvatae* (Rutaceae) in Queensland, Australia, *Austrobaileya* 5: 263–298 (1999); M.F.Duretto, Systematics of *Boronia* section *Valvatae sensu lato* (Rutaceae), *Muelleria* 12: 1–131 (1999); M.F.Duretto & P.Y.Ladiges, A cladistic analysis of *Boronia* section *Valvatae* (Rutaceae), *Austral. Syst. Bot.* 11: 636–665 (1999); P.G.Neish & M.F.Duretto, The taxonomy of *Boronia anemonifolia* and *B. rigens* (*Boronia* sect. *Cyanothamnus*, Rutaceae), *Muelleria* 14: 3–16 (2000); M.F.Duretto, Notes on *Boronia* (Rutaceae) in eastern and northern Australia, *Muelleria* 17: 19–135 (2003); B.-K.Choi *et al.*, Comparative seed morphology of *Boronia* and related genera (Boroniinae: Rutaceae) and its systematic implications, *Nordic J. Bot.* 30: 241–256 (2012).

KEY TO SECTIONS - PETAL AESTIVATION KNOWN

- 1 Petals imbricate in bud
 - 2 Petals variably glandular, tip not inflexed in bud; plant glabrous or with simple hairs: anthers without a dark-coloured abaxial connective; leaves simple or pinnate
 - 3 Petals usually subterminally or terminally apiculate; seed smooth, usually glossy; branches not developing a cream-coloured spongy layer; leaves simple or pinnate, opposite; inflorescences terminal or axillary, 1-flowered or cymose sect. 1. *Boronia* (p. 126)
 - 3: Petals not apiculate; seed rugose; branches developing a visible cream-coloured spongy layer; leaves simple, linear, often in fascicles; flowers in terminal pedunculate cymes sect. 2. *Imbricatae* (p. 187)
 - 2: Petals usually prominently glandular-punctate, tip with a small but distinct incurved hook (if blunt then branchlets stellate-pubescent); anthers often with a broad dark-coloured abaxial connective; leaves simple, pinnate or bipinnate or tripinnate sect. 3. *Cyanothamnus* (p. 189)
- 1: Petals valvate in bud
 - 4 Inflorescences axillary; stellate hairs present (except *B. anomala*), if only on flowers sect. 6 *Valvatae* (p. 223)
 - 4: Inflorescences terminal and sometimes also axillary; stellate hairs absent
 - 5 Leaves pinnate or bipinnate; inflorescence a many-flowered, cymose panicle; peduncle woody (near coastal SW W.A.) sect. 4 *Alatae* (p. 219)
 - 5: Leaves pinnate or simple; inflorescence cymose, 1 (–3)-flowered, peduncle absent (N.S.W.; Vic.; S.A.; inland SW W.A.) sect. 5. *Algidae* (p. 221)

KEY TO SECTIONS - PETAL AESTIVATION UNKNOWN

- 1 Stellate hairs present, if only on flowers; inflorescence axillary
- 2 Petals prominently glandular-punctate; seed usually rugose (SW W.A.) **sect. 3. Cyanothamnus** (p. 189)
- 2: Petals not glandular-punctate; seed not rugose (W.A.; N.T.; Qld; N.S.W.; Vic.) **sect. 6 Valvatae** (p. 223)
- 1: Stellate hairs absent; inflorescence axillary or terminal
- 3 Petals usually prominently glandular-punctate, tip with a small but distinct incurved hook **sect. 3. Cyanothamnus** (p. 189)
- 3: Petals not prominently glandular-punctate, tip not inflexed
- 4 Inflorescences axillary
- 5 Antipetalous anthers smaller than or equal to antisepalous anthers, if larger then stems hairy; leaves simple or pinnate (S W.A.; S.A.; Qld; N.S.W.; Vic.; Tas.) **sect. 1. Boronia** (p. 126)
- 5: Antipetalous anthers much larger than antisepalous anthers; branches glabrous; leaves pinnate (N W.A.) **sect. 6. Valvatae** (p. 223)
- 4: Inflorescences terminal and sometimes also axillary
- 6 Petals usually subterminally or terminally apiculate; seed glossy or dull, smooth at magnification **sect. 1. Boronia** (p. 126)
- 6: Petals not apiculate; seeds dull, not smooth at magnification
- 7 Inflorescence cymose, 1 (–3)-flowered, peduncle absent (SW W.A.; S.A.; N.S.W.; Vic.) **sect. 5. Algidae** (p. 221)
- 7: Inflorescence a pedunculate many-flowered cyme or cymose panicle (SW W.A.)
- 8 Leaves simple **sect. 2. Imbricatae** (p. 187)
- 8: Leaves compound **sect. 4 Alatae** (p. 219)

Sect. 1. Boronia

*Marco F. Duretto (eastern species)**Paul G. Wilson (western species)**Boronia* Sm. sect. *Boronia*Type: *B. pinnata* Sm.

Hairs simple. Leaves simple or pinnate. Flowers axillary or terminal, solitary or in cymes. Sepals open, valvate or imbricate, persistent or caducous. Petals imbricate, usually terminally or subterminally apiculate abaxially (tip not inflexed), mostly multiveined at base or with steeply ascending basal lateral nerves. Stamens 8, rarely 4 caducous (*B. parviflora*), all or rarely only 4 fertile; filaments linear or semiterete, swollen and verrucose towards apex, glabrous or hairy, with tip usually appearing subterminal, inflexed, and laterally flattened; anthers equal or unequal, not or minutely or prominently white-apiculate; connective tissue not visible or prominent; loculi often reflexed after dehiscence. Seed with smooth sclerotesta, glossy or dull; adaxial surface with a linear hilum which is often in an adaxial groove; raphe sometimes forming a cream-coloured pulpy elaiosome at base.

A southern Australian section with 58 species: 31 confined to SW W.A. and 26 to the eastern states. There are 2 series.

In some species of *Boronia* sect. *Boronia* the mature petals have a short (c. 0.5 mm long) point on the abaxial side just below the margin. In the very young petals this point is terminal and the medial nerve of the petal passes into it. As the petal matures a membrane,

continuous with the petal margin, may grow on the adaxial side of the point and eventually become equal to it or longer. This point is referred to in the text as the apiculum and, where appropriate, as a sub-terminal apiculum.

KEY TO SERIES

Sepals imbricate or open in bud, glabrous or hairy, persistent in fruit; seed with an adaxial linear hilum, usually in a distinctive groove, without a basal elaiosome

ser. 1. Boronia (p. 127)

Sepals valvate in bud, glabrous or rarely woolly abaxially, usually caducous; seed with an adaxial linear hilum (not in a groove) and a cream coloured spongy elaiosome at base

ser. 2. Pedunculatae (p. 177)

Ser. 1. Boronia

Boronia Sm. ser. *Boronia*

Type: *B. pinnata* Sm.

B. ser. Octarrhena F.Muell., *Pl. Victoria* 1: 113 (1862). T: *B. pinnata* Sm.

B. ser. Heterandrae Benth., *Fl. Austral.* 1: 308, 315 (1863); *B. sect. Heterandrae* (Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3 (4): 136 (1896); *B. sect. Heteroboronia* Kuntze in T.von Post & O.Kuntze. *Lex. Gen. Phan.* 74 (1903), *nom. illeg.* T: *B. megastigma* Nees

B. ser. Pinnatae Benth., *Fl. Austral.* 1: 309, 317 (1863); *B. sect. Pinnatae* (Benth.) De Wild., *Icon. Select.* 2: 67 (1901). T: *B. pinnata* Sm.

B. ser. Variabiles Benth., *Fl. Austral.* 1: 309, 320 (1863). T: *B. crenulata* Sm.

B. ser. Terminales Benth., *Fl. Austral.* 1: 310, 323 (1863); *B. sect. Terminales* (Benth.) F.Muell., *Fragm.* 9: 115 (1875). T: *B. capitata* Benth.

B. ser. Ovatae Paul G.Wilson, *Nuytsia* 1: 204 (1971). T: *B. ovata* Lindl.

Leaves simple or pinnate. Flowers axillary or terminal. Bracts and bracteoles persistent. Sepals open or imbricate, persistent; abaxial surface glabrous or hairy. Stamens 8, all or rarely only 4 fertile. Seed usually with an adaxial linear hilum which is sometimes in a groove; raphe small and covered by brown outer testa.

A series of 47 species with 24 confined to the eastern states, 22 to SW W.A. and one, *B. inornata*, found in both W.A. and S.A.

The series is treated in two parts covering two geographical areas: SW W.A. and E Australia (S.A., Qld, N.S.W., Vic., Tas.). The species found in each of these areas form discrete groups. Keys are provided to the species for the entire series, plus regional keys for W.A. species (p. 132) and eastern species (p. 134).

KEY TO SERIES BORONIA (ALL STATES)

1 Leaves simple

2 Leaves flat to recurved, linear to broadly ovate, cordate, or obovate to almost circular

3 Flowers in terminal, and sometimes also upper axillary, slender pedunculate open cymes; leaf base cordate or obtuse (SW W.A.)

4 Leaf margin recurved to revolute

1. B. scabra

4: Leaves flat, or margins slightly recurved

5 Leaves scabridulous above, obtuse at base; sepals c. 1.5 mm long

2. B. humifusa

- 5: Leaves smooth above, cordate at base; sepals c. 2.5 mm long **3. *B. ovata***
- 3: Flowers axillary or in compact terminal cymes; leaf base not cordate (SW W.A.; N.S.W.; Tas.)
- 6 Staminal filaments glabrous (N.S.W.; Tas.)
- 7 Leaves linear **21. *B. heterophylla***
- 7: Leaves broadly obovate to almost circular or obovate **47. *B. rhomboidea***
- 6: Staminal filaments variously hairy (SW W.A.; N.S.W.)
- 8 Staminal filaments woolly-ciliate **6. *B. crenulata***
- 8: Staminal filaments sparsely to densely pilose with rigid simple hairs
- 9 Leaf margin smooth, recurved to revolute **1. *B. scabra***
- 9: Leaf margin finely toothed or minutely crenulate, plane
- 10 Inflorescences axillary; stigma minute, not concealing style (SW W.A.) **22. *B. crassipes***
- 10: Inflorescences terminal; stigma massive, obscuring style (N.S.W.) **32. *B. serrulata***
- 2: Leaves terete or subterete or if narrowly oblong then concave above
- 11 Stamens glabrous; stems glandular-verrucose **44. *B. deanei***
- 11: Stamens variously hairy, rarely glabrous and then stems not obviously glandular
- 12 Staminal filaments woolly-ciliate (SW W.A.)
- 13 Leaves narrowly oblong or semiterete, concave above, 4–15 mm long, glabrous or pilose **4. *B. capitata***
- 13: Leaves slender terete, mucronate, mostly c. 2 cm long (range 1–3 cm long), glabrous **5. *B. nematophylla***
- 12: Staminal filaments pilose or glabrous (S.A.; Qld; N.S.W.; Vic.)
- 14 Sepals 3.5–4 mm long; peduncles 2–9 mm long; leaves or leaflets channelled above; stamens glandular-verrucose towards apex (Qld; N.S.W.) **42. *B. falcifolia***
- 14: Sepals 1–3 mm long; peduncles 8–17 mm long; leaves or leaflets not or slightly channelled above; stamens glandular for most of length (S.A.; Vic.) **43. *B. filifolia***
- 1: Leaves compound
- 15 Leaflets terete, subterete, or club-shaped, sometimes somewhat flattened but not channelled above
- 16 Branchlets pilose
- 17 Anthers with prominent narrow apiculum; stems often with persistent petioles; inflorescence axillary (SW W.A.) **7. *B. oxyantha***
- 17: Anther apiculum absent or minute; stems never with persistent petioles; inflorescence terminal and axillary (N.S.W.) **38. *B. subulifolia***
- 16: Branchlets puberulous or glabrous
- 18 Style absent; stigma large, entire or distinctly divided
- 19 Pedicels slender, c. 10 mm long; petals dark brown to purple black abaxially **19. *B. megastigma***
- 19: Pedicels thickened towards apex, to 5 mm long; petals green to cream or reddish brown
- 20 Leaves 3–5-foliolate, subterete; stigma with 4 lobes **14. *B. octandra***
- 20: Leaflets 3–7-foliolate, flattened but thick; stigma cushion-shaped **15. *B. crassifolia***
- 18: Style evident, terete; stigma minute or only slightly wider than style, entire

- 21 Branches glandular-verrucose; staminal filaments glabrous **8. *B. inornata***
- 21: Branches not glandular-verrucose; staminal filaments pilose or glabrous
- 22 Branchlets and leaves glabrous (S.A.; Qld; N.S.W.; Vic.)
- 23 Sepals 3.5–4 mm long; peduncles 2–9 mm long; leaves channelled above (Qld; N.S.W.) **42. *B. falcifolia***
- 23: Sepals 1–3 mm long; peduncles 8–17 mm long; leaves not or slightly channelled above (S.A.; Vic.) **43. *B. filifolia***
- 22: Branchlets puberulous; leaves puberulous to pilose, sometimes only a few hairs (SW W.A.; Vic.; Tas.)
- 24 Anthers with prominent, narrow apiculum; stems often with persistent petioles; petals c. 7 mm long (SW W.A.) **7. *B. oxyantha***
- 24: Anthers not apiculate; stems never with persistent petioles; petals 3–7 mm long (Vic.; Tas.)
- 25 Style glabrous; sepals 1.5–3 mm long, 1–1.5 mm wide, abaxial surface glabrous to puberulous (W Tas.) **37. *B. elisabethiae***
- 25: Style pilose; sepals 1–2 mm long, 0.75–1 mm wide, glabrous or minutely ciliate (Vic.; E Tas.) **39. *B. pilosa***
- 15: Leaflets not subterete or if so then channelled or concave above
- 26 Petals pale yellow-green; style and stigma together massive, club-shaped, c. 4 mm long **23. *B. clavata***
- 26: Petals cream or white to red or reddish brown, or black or yellow or pale greenish yellow; stigma minute to globular; stigma and style together 0.5–3 mm long
- 27 Stems glabrous
- 28 Stems glandular-verrucose
- 29 Entire leaf 45–70 mm long, 20–45 mm wide; leaflets 4–25 mm long **26. *B. muelleri***
- 29: Entire leaf 12–30 mm long, 5–14 mm wide; leaflets 2–9 (–14) mm long **46. *B. galbraithiae***
- 28: Stems not glandular-verrucose
- 30 Stigma sessile or subsessile, large; style absent or vestigial (SW W.A.; N.S.W.)
- 31 Staminal filaments glabrous; antisepalous anthers larger than antipetalous, sterile and black (SW W.A.) **21. *B. heterophylla***
- 31: Staminal filaments densely hairy; anthers equal, yellow (N.S.W.) **31. *B. floribunda***
- 30: Stigma minute, scarcely wider than obvious style (S.A.; Vic.; N.S.W.; Qld)
- 32 Staminal filaments glandular for most of length (S.A.; Vic.) **43. *B. filifolia***
- 32: Staminal filaments glandular-verrucose towards apex, sometimes barely so (Qld; N.S.W.; Vic.)
- 33 Sepals narrowly triangular, 3.5–4 mm long, 1–1.5 mm wide **42. *B. falcifolia***
- 33: Sepals deltate, 0.6–1.5 mm long and wide
- 34 Leaf margins slightly glandular-crenulate; decurrent leaf bases prominent **25. *B. thujona***
- 34: Leaf margins smooth; leaf bases not or only faintly decurrent
- 35 Sepals 0.6–0.8 (–1) mm long; inflorescence longer than leaves, 1–9-flowered; leaf bases not decurrent (Qld) **30. *B. rivularis***
- 35: Sepals 1–1.5 mm long; inflorescence shorter or slightly longer than leaves, 3–40-flowered; leaf bases not or only faintly decurrent (N.S.W.; Vic.)

- 36 Leaflets narrowly elliptic or narrowly oblong, 1–3 (–7) mm wide; staminal filaments densely pilose (N.S.W.) **24. *B. pinnata***
- 36: Leaflets elliptic to slightly lanceolate or obovate, widest leaflet 4–8 mm wide; staminal filaments sparsely pilose (Vic.) **28. *B. latipinna***
- 27: Stems puberulous to pilose
- 37 Stems pilose
- 38 Sepals narrowly triangular
- 39 Stamens glabrous; sepals very narrowly triangular, 3–7 mm long, pilose (SW W.A.) **12. *B. stricta***
- 39: Stamens variously hairy; sepals narrowly triangular, 1–4.5 mm long, puberulous or pilose, sometimes only a few hairs (SW W.A.; N.S.W.; Vic.; Tas.)
- 40 Anthers with prominent apiculum; ovary densely pubescent (SW W.A.) **20. *B. albiflora***
- 40: Anther apiculum absent or minute; ovary glabrous (S.A.; N.S.W.; Vic.; Tas.)
- 41 Leaflets 0.5–1 mm wide; sepals pilose abaxially (N.S.W.) **38. *B. subulifolia***
- 41: Widest leaflets 1–4 mm wide, flat; sepals pilose abaxially, sometimes with only a few hairs (Vic.; Tas.) **39. *B. pilosa***
- 38: Sepals triangular to orbicular
- 42 Antisepalous anthers black and large, 1.5–2 mm long **18. *B. molloyae***
- 42: Antisepalous anthers usually yellow, small, to 1 mm long
- 43 Style cylindrical; stigma minute, as wide or slightly wider than style
- 44 Ovary densely pubescent (SW W.A.) **20. *B. albiflora***
- 44: Ovary glabrous or with few hairs along suture (Qld; N.S.W.; Tas.)
- 45 Sepals 1–1.5 mm long, glabrous; petals 4.5–7 mm long **29. *B. saffrolifera***
- 45: Sepals c. 2 mm long, ciliate; petals 8–10 mm long **40. *B. rozefeldsii***
- 43: Style absent or much shorter than stigma; stigma large, cushion-shaped to obovoid
- 46 Antisepalous anthers minute, < 0.5 mm long, and terminal to filament; stigma spherical to obovoid, 4-winged **17. *B. purdieana***
- 46: Antisepalous anthers 0.5–1 mm long, subterminal to filament; stigma cushion-shaped, 4-lobed or globular
- 47 Inflorescence as long or longer than leaves, not pendulous; pedicels 10–30 mm long; sepals 0.5–1 mm long **13. *B. gracilipes***
- 47: Inflorescence shorter than leaves, sometimes pendulous; pedicel 1–2 mm long; sepals 2–3 mm long **16. *B. tetrandra***
- 37: Stems puberulous
- 48 Branches glandular-verrucose; stigma minute, barely wider than style
- 49 Stamens glabrous **9. *B. coriacea***
- 49: Stamens variously hairy
- 50 Leaflets elliptic to oblanceolate to broadly spatulate; terminal leaflets 1–3 (–7) mm long (Qld; N.S.W.) **45. *B. microphylla***
- 50: Leaflets linear to narrowly elliptic to narrowly oblanceolate; terminal leaflets 1–25 mm long (N.S.W.; Vic.; Tas.)

- 51 Leaves 45–70 mm long; branchlets glabrous or sparsely puberulous between decurrent leaf bases (N.S.W.; Vic.) **26. *B. muelleri***
- 51: Leaves 6–32 mm long; branchlets puberulous (N.S.W.; Tas.)
- 52 Sepals sparsely to densely puberulous abaxially
- 53 Leaves puberulous all over; cocci puberulous **35. *B. hippopala***
- 53: Leaves puberulous only on petiole, rhachis segments and proximal half of leaflets; cocci glabrous **36. *B. hemichiton***
- 52: Sepals glabrous or ciliate
- 54 Largest lateral leaflets 17–25 mm long; leaflets narrowly oblanceolate; glands on leaves and branchlets usually appearing as shiny discs **41. *B. gunnii***
- 54: Lateral leaflets to 16 mm long; leaflets elliptic to oblong to narrowly elliptic to narrowly oblanceolate; glands on leaves not appearing as shiny discs
- 55 Leaves 7–13-foliolate; petiole 4–8 mm long; pedicels 5–10 mm long; sepals 1–1.5 mm long, glabrous or minutely ciliate and then with few hairs (N.S.W.) **27. *B. imlayensis***
- 55: Leaves (1–) 3–9-foliolate; petiole 1.5–6 mm long; pedicels 1.5–15 mm long; sepals 0.75–2.5 mm long, minutely ciliate (Tas.) **33. *B. citriodora***
- 48: Branches not glandular-verrucose or if slightly glandular-verrucose then stigma prominent and globose
- 56 Petals chocolate-brown to purple-black abaxially, yellow adaxially; stamens glabrous (SW W.A.) **19. *B. megastigma***
- 56: Petals white to pink or reddish brown; stamens pilose (SW W.A.; S.A.; N.S.W.; Vic.; Tas.)
- 57 Stigma significantly wider and longer than style and often concealing it (SW W.A.; S.A.; Vic.; Tas.)
- 58 Flowers usually pendant; disc and staminal filaments minutely pubescent; style absent **15. *B. crassifolia***
- 58: Flowers usually erect; disc glabrous; staminal filaments variously hairy; style visible
- 59 Anthers minutely apiculate; stigma c. 1 mm wide, globular (SW W.A.) **10. *B. pulchella***
- 59: Anthers not apiculate; stigma to 0.3 mm wide, cushion-shaped (S.A.; Vic.; Tas.) **39. *B. pilosa***
- 57: Stigma usually shorter and as wide or slightly wider than style, not concealing it (SW W.A.; Qld; N.S.W.; Tas.)
- 60 Semierect to weakly spreading subshrub; leaves 5–11 (–15) mm long, 5–18 mm wide, 3–9-foliolate; leaflets to 1 mm wide (W Tas.) **37. *B. elisabethiae***
- 60: Erect shrubs, or if semi-erect then leaflets > 1 mm wide; leaves 6–47 mm long, 4–50 mm wide, 3–19-foliolate; widest leaflets 1–4 mm wide (SW W.A.; Qld; N.S.W.; Vic.; Tas.)
- 61 Sepals puberulous abaxially
- 62 Leaves puberulous on proximal portion only, 3–7-foliolate, 7–14 mm long; flowers solitary (Tas.) **33. *B. citriodora***
- 62: Leaves puberulous all over, 5–11-foliolate, 6–22 mm long, longest leaves 14–22 mm long; inflorescences 1–5-flowered (Vic.) **34. *B. citrata***
- 61: Sepals ciliate or glabrous abaxially
- 63 Sepals narrowly triangular, tips acute to acuminate; petals to 6 (–8) mm long; widest lateral leaflets to 2 mm wide

- 64 Style and stigma together c. 1 mm long; pedicels glabrous (SW W.A.) 11. *B. virgata*
- 64: Stigma and style together to 0.5 mm long; pedicels variously puberulous (S.A.; Vic.; Tas.) 39. *B. pilosa*
- 63: Sepals deltate (if narrowly triangular then petals 8–10.5 mm long and widest lateral leaflets > 2.5 mm wide), tips acute; widest lateral leaflets 1–4 mm wide
- 65 Sepals and pedicels glabrous (Qld; N.S.W.) 29. *B. saefrolifera*
- 65: Sepals with few hairs or ciliate; pedicels sparsely puberulous (Tas.)
- 66 Largest lateral leaflets 17–25 mm long, 0.75–2.5 mm wide, narrowly oblanceolate; glands on leaflets and branchlets usually appearing as shiny discs; sepals c. 1 mm long, 0.75–1 mm wide 41. *B. gunnii*
- 66: Lateral leaflets 2–16 mm long, 0.5–4 mm wide, narrowly obovate to narrowly elliptic or rarely narrowly oblanceolate; glands on leaflets and branchlets not appearing as shiny discs; sepals (0.75–) 1–3.5 mm long, 0.75–2.5 mm wide
- 67 Petals 3.5–7 mm long (if 7–8.5 mm long then petiole 3–6 mm long and leaves not congested); petiole 2–6 mm long; lateral leaflets 0.5–3.5 mm wide (W & central Tas.) 33. *B. citriodora*
- 67: Petals 8–10 mm long; leaves congested; petiole 1–3 mm long; lateral leaflets 2.5–4 mm wide (Tas. – Schouten Is.) 40. *B. rozefeldsii*

KEY TO SERIES BORONIA (WESTERN AUSTRALIA)

- 1 Leaves simple
- 2 Leaf margin recurved to revolute 1. *B. scabra*
- 2: Leaves flat, or concave above, or subterete and channelled above, or terete
- 3 Leaves flat, linear to broadly ovate, cordate, or obovate
- 4 Flowers in terminal slender pedunculate open cymes; leaf base sometimes cordate
- 5 Leaves scabridulous above, obtuse at base 2. *B. humifusa*
- 5: Leaves smooth above, cordate at base 3. *B. ovata*
- 4: Flowers axillary or in compact terminal cymes; leaf base not cordate
- 6 Leaves linear to narrow elliptic; staminal filaments sparsely ciliate; flowers axillary 22. *B. crassipes*
- 6: Leaves linear to broadly elliptic or obovate; staminal filaments pilose or woolly-ciliate; flowers axillary or terminal
- 7 Staminal filaments glabrous or sparsely pilose; leaves hairy beneath 1. *B. scabra*
- 7: Staminal filaments woolly-ciliate; leaves glabrous beneath; flowers axillary or terminal 6. *B. crenulata*
- 3: Leaves terete or subterete or if narrowly oblong then concave above
- 8 Leaves narrowly oblong or semiterete, concave above, 4–15 mm long, glabrous or pilose 4. *B. capitata*
- 8: Leaves slender terete, glabrous, mucronate, generally c. 2 cm long (range 1–3 cm long) 5. *B. nematophylla*
- 1: Leaves compound

- 9 Leaflets terete, subterete, or club-shaped, sometimes somewhat flattened but not channelled above
- 10 Branchlets pilose 7. *B. oxyantha*
- 10: Branchlets puberulous or glabrous
- 11 Style evident, terete; stigma minute
- 12 Sepals narrowly triangular; staminal filaments ciliate 7. *B. oxyantha*
- 12: Sepals triangular to orbicular; staminal filaments glabrous 8. *B. inornata*
- 11: Style absent; stigma large, sessile
- 13 Pedicels slender, c. 10 mm long; petals dark brown to purple black abaxially 19. *B. megastigma*
- 13: Pedicels thickened towards apex, to 5 mm long; petals green to cream or reddish brown
- 14 Leaflets 3 (5), subterete; stigma with 4 lobes 14. *B. octandra*
- 14: Leaflets 3–7, flattened but thick; stigma cushion-shaped 15. *B. crassifolia*
- 9: Leaflets not subterete or if so then channelled or concave above
- 15 Petals pale yellow-green; style and stigma together massive, club-shaped 23. *B. clavata*
- 15: Petals white to red or brown or black or yellow or pale greenish yellow; style and stigma not as above
- 16 Sepals very narrowly to narrowly triangular; leaflets linear to narrowly oblong to subterete and channelled above
- 17 Stem pilose
- 18 Sepals very narrowly triangular, 3–7 mm long, pilose 12. *B. stricta*
- 18: Sepals narrowly triangular, 1–2 mm long, puberulous or glabrous 20. *B. albiflora*
- 17: Stem puberulous to glabrous
- 19 Style c. 0.5 mm long; stigma prominent, globose; sepals triangular 10. *B. pulchella*
- 19: Style together with stigma terete, c. 1 mm long; sepals narrowly triangular 11. *B. virgata*
- 16: Sepals ovate to suborbicular to triangular; leaflets various
- 20 Pedicels slender, equal to or longer than subtending leaf; branches pilose 13. *B. gracilipes*
- 20: Pedicels shorter than subtending leaf or if equal to leaf then branches not pilose
- 21 Petals chocolate-brown to purple-black abaxially, yellow adaxially; leaves sessile 19. *B. megastigma*
- 21: Petals not as above; leaves sessile or petiolate
- 22 Branchlets puberulous or glabrous
- 23 Flowers terminal; leaflets narrowly obcuneate, thick, c. 12 mm long 9. *B. coriacea*
- 23: Flowers axillary
- 24 Leaves petiolate, mostly trifoliate; petiole 1–2 cm long; stigma sessile, massive, cylindrical 21. *B. heterophylla*
- 24: Leaves subsessile, 3–15-foliate
- 25 Flowers erect, pink; sepals ovate, acute; style thick; stigma globose 10. *B. pulchella*
- 25: Flowers nodding, cream to reddish brown; sepals suborbicular; stigma sessile, cushion-shaped, quadrangular 15. *B. crassifolia*
- 22: Branchlets variably pilose

- | | | |
|-----|---|-------------------------|
| 26 | Antisepalous anthers large and black; shrub to 3 m high | 18. <i>B. molloyae</i> |
| 26: | Antisepalous anthers from minute to 1.5 mm long; shrub to 1 m high | |
| 27 | Style cylindrical; stigma minute | 20. <i>B. albiflora</i> |
| 27: | Style absent; stigma large, cushion-shaped to obovoid | |
| 28 | Antisepalous anthers 0.5–1 mm long, subterminal to filament; stigma cushion-shaped, 4-lobed | 16. <i>B. tetrandra</i> |
| 28: | Antisepalous anthers minute and terminal to filament; stigma spherical to obovoid, 4-winged | 17. <i>B. purdieana</i> |

KEY TO SERIES BORONIA (EASTERN AUSTRALIA)

- 1 Leaves simple
 - 2 Leaves linear, terete or flat
 - 3 Inflorescence terminal, often on short axillary shoots; staminal filaments glabrous; stems slightly glandular-verrucose (N.S.W.) 44. *B. deanei*
 - 3: Inflorescence terminal and axillary; staminal filaments pilose or rarely glabrous; stems smooth (S.A.; Vic.; N.S.W.; Qld)
 - 4 Sepals 3.5–4 mm long; peduncles 2–9 mm long; leaves channelled above; stamens glandular-verrucose towards apex (Qld; N.S.W.) 42. *B. falcifolia*
 - 4: Sepals 1–3 mm long; peduncles 8–17 mm long; leaves not or slightly channelled above; stamens glandular for most of length (S.A.; Vic.) 43. *B. filifolia*
 - 2: Leaves obovate or rhombic or circular, flat
 - 5 Leaf margins finely toothed; staminal filaments pilose (N.S.W.) 32. *B. serrulata*
 - 5: Leaf margin entire; staminal filaments glabrous (N.S.W.; Tas.) 47. *B. rhomboidea*
- 1: Leaves compound
 - 6 Branchlets glandular-verrucose, sometimes slightly so and then leaves also slightly glandular-verrucose
 - 7 Stamens glabrous; leaves 3 (–5)-foliolate; leaflets terete, club-like (W.A.; S.A.) 8. *B. inornata*
 - 7: Stamens variously pilose; leaves 3–17-foliolate; leaflets flat, elliptic to obovate (N.S.W.; Vic.; Tas.)
 - 8 Sepals sparsely to densely puberulous abaxially
 - 9 Leaves puberulous all over; cocci puberulous 35. *B. hippopala*
 - 9: Leaves puberulous only on petiole, rhachis segments and proximal half of leaflets; cocci glabrous 36. *B. hemichiton*
 - 8: Sepals glabrous or ciliate
 - 10 Leaves 45–70 mm long 26. *B. muelleri*
 - 10: Leaves 5–32 mm long
 - 11 Glands on branches with a distinct crown or ring of hairs or tubercles; terminal leaflets 1–3 (–7) mm long, 0.5–2.5 mm wide 45. *B. microphylla*
 - 11: Glands on branches glabrous; terminal leaflets 1.5–16 mm long, (0.5–) 1.5–4 mm wide
 - 12 Branchlets glabrous (Vic.) 46. *B. galbraithiae*
 - 12: Branchlets puberulous
 - 13 Largest lateral leaflets 17–25 mm long; leaflets narrowly oblanceolate; glands on leaves and branchlets usually appearing as shiny discs 41. *B. gunnii*

- 13:** Lateral leaflets to 16 mm long; leaflets elliptic to oblong to narrowly elliptic to narrowly oblanceolate; glands on leaves not appearing as shiny discs
- 14** Leaves 7–13-foliolate; petiole 4–8 mm long; pedicels 5–10 mm long; sepals 1–1.5 mm long, glabrous or minutely ciliate and then with few hairs (N.S.W.) **27. *B. imlayensis***
- 14:** Leaves (1–) 3–9-foliolate; petiole 1.5–6 mm long; pedicels 1.5–15 mm long; sepals 0.75–2.5 mm long, minutely ciliate (Tas.) **33. *B. citriodora***
- 6:** Branchlets and leaves not glandular-verrucose
- 15** Branchlets glabrous
- 16** Style vestigial, obscured by the massively swollen globose stigma **31. *B. floribunda***
- 16:** Style distinct; stigma minute, scarcely wider than obvious style
- 17** Staminal filaments glandular for most of length (S.A.; Vic.) **43. *B. filifolia***
- 17:** Staminal filaments glandular-verrucose towards apex, sometimes barely so (Qld; N.S.W.; Vic.)
- 18** Sepals narrowly triangular, 3.5–4 mm long, 1–1.5 mm wide **42. *B. falcifolia***
- 18:** Sepals deltate or ovate-deltate, 0.6–1.5 mm long and wide
- 19** Leaf margins slightly glandular-crenulate; decurrent leaf bases prominent **25. *B. thujona***
- 19:** Leaf margins smooth; leaf bases not or only faintly decurrent
- 20** Sepals 0.6–0.8 (–1) mm long; inflorescence longer than leaves, 1–9-flowered; leaf bases not decurrent (Qld) **30. *B. rivularis***
- 20:** Sepals 1–1.5 mm long; inflorescence shorter or slightly longer than leaves, 3–40-flowered; leaf bases not or only faintly decurrent (N.S.W.; Vic.)
- 21** Leaflets narrowly elliptic or narrowly oblong, 1–3 (–7) mm wide; staminal filaments densely pilose (N.S.W.) **24. *B. pinnata***
- 21:** Leaflets elliptic to slightly lanceolate or obovate, widest leaflet 4–8 mm wide; staminal filaments sparsely pilose (Vic.) **28. *B. latipinna***
- 15:** Branchlets hairy, hairs sometimes confined to area between decurrent leaf bases
- 22** Stems pilose
- 23** Sepals deltate, 1–2 mm long, glabrous or ciliate
- 24** Leaves (3–) 7–19-foliolate, 12–47 mm long; sepals 1–1.5 mm long, glabrous; petals 4.5–7 mm long; pedicels glabrous (Qld; NE N.S.W.) **29. *B. saffrolifera***
- 24:** Leaves 3–7-foliolate, 10–20 mm long; sepals 2 mm long, ciliate; petals 8–10 mm long; peduncles 1–2 mm long; pedicels puberulous in parts **40. *B. rozefeldsii***
- 23:** Sepals narrowly triangular, 0.5–4.5 mm long, abaxial surface with very few hairs to pilose; petioles variously pilose; leaves 3–7 (–13)-foliolate, 3–22 mm long (SE N.S.W.; Vic.; Tas.)
- 25** Leaflets 0.5–1 mm wide, subterete; sepals pilose abaxially (N.S.W.) **38. *B. subulifolia***
- 25:** Widest leaflets 1–4 mm wide, flat; sepals with very few hairs to pilose abaxially (Vic.; Tas.) **39. *B. pilosa***
- 22:** Stems puberulous
- 26** Sepals puberulous abaxially
- 27** Semi-erect to weakly spreading subshrub; leaves 5–11 (–15) mm long, 5–18 mm wide; leaflets to 1 mm wide (W Tas.) **37. *B. elisabethiae***
- 27:** Erect shrub; leaves 6–22 mm long and wide; leaflets 1–3.5 mm wide (Vic.; NE Tas.)

- 28 Leaves puberulous on proximal portion only, 3–7-foliolate, 7–14 mm long; flowers solitary (Tas.) **33. *B. citriodora***
- 28: Leaves puberulous all over, 5–11-foliolate, 6–22 mm long, longest leaves > 14 mm long; inflorescence 1–5-flowered (Vic.) **34. *B. citrata***
- 26: Sepals ciliate or glabrous abaxially
- 29 Stigma significantly wider and longer than style, often concealing it (S.A.; Vic.; Tas.) **39. *B. pilosa***
- 29: Stigma shorter and slightly wider than style, not concealing it (Qld; N.S.W.; Tas.)
- 30 Semi-erect to weakly spreading shrub; leaves 5–11 (–15) mm long, 5–18 mm wide, 3–9-foliolate; leaflets to 1 mm wide (W Tas.) **37. *B. elisabethiae***
- 30: Erect shrubs, or if semi-erect then leaflets > 1 mm wide; leaves 6–47 mm long, 4–50 mm wide, 3–19-foliolate; widest leaflets 1–4 mm wide (Qld; N.S.W.; Tas.)
- 31 Sepals and pedicels glabrous (Qld; N.S.W.) **29. *B. saefrolifera***
- 31: Sepals ciliate or with very few hairs; pedicels sparsely puberulous (Tas.)
- 32 Sepals narrowly triangular, acute to acuminate; petals to 6 mm long (very rarely to 7.5 mm long and then leaflets < 2 mm wide); widest lateral leaflets to 2 mm wide **27. *B. pilosa***
- 32: Sepals deltate (if narrowly triangular then petals 8–10.5 mm long and widest lateral leaflets > 2.5 mm wide), acute; widest lateral leaflets 1–4 mm wide
- 33 Lateral leaflets 17–25 mm long, 0.75–2.5 mm wide; leaflets narrowly oblanceolate; largest glands on leaflets and branchlets usually appearing as shiny discs; sepals c. 1 mm long, 0.75–1 mm wide **41. *B. gunnii***
- 33: Lateral leaflets 2–16 mm long, 0.5–4 mm wide; leaflets narrowly obovate to narrowly elliptic or rarely narrowly oblanceolate; glands on leaflets and branchlets not appearing as shiny discs; sepals (0.75–) 1–3.5 mm long, 0.75–2.5 mm wide
- 34 Petals 3–7 mm long (if 7–8.5 mm long then petiole 3–6 mm long and leaves not congested); lateral leaflets 0.5–3.5 mm wide (W & central Tas.) **33. *B. citriodora***
- 34: Petals 8–10 mm long; leaves congested; petiole 1–3 mm long; lateral leaflets 2.5–4 mm wide (Tas. - Schouten Is.) **40. *B. rozefeldsii***

1. *Boronia scabra* Lindl., *Sketch Veg. Swan R.* 17 (1839)

T: W.A., *J. Drummond s.n.*; holo: CGE (photo seen).

Shrub to 0.6 m high. Branchlets puberulous to pilose. Leaves opposite or alternate, often clustered, shortly petiolate, simple, narrowly oblong to elliptic, or subterete due to the recurved to revolute margins, 5–12 mm long, glabrous to pilose. Flowers in terminal pedunculate cymes, often umbel-like, or solitary in axils of terminal leaves; pedicels 2–20 mm long. Sepals 4 (or 5), triangular to ovate, 2–6 mm long, acute to acuminate or attenuate, glabrous or pilose. Petals 4 (or 5), ovate, 5–8 mm long, glabrous or sparsely hirsute, pink. Stamens: filaments terete, glabrous or pilose, swollen and verrucose at apex; anthers usually white-apiculate. Disc broad, glabrous. Ovary glabrous or pilose; style terete, 0.5–2 mm long, sparsely pilose; stigma minute. *Rough Boronia*.

Found in south-west W.A. from Geraldton S to Albany and E to Mt Ragged.

A variable species. Three subspecies are recognised but their delineation is imprecise.

- 1 Flowers in pedunculate leafless cymes; staminal filaments smooth **1a. subsp. *scabra***
- 1: Flowers congested in axils of terminal leaves; staminal filaments smooth or verrucose
- 2 Flowers all 4-merous; sepals narrowly elliptic to narrowly triangular and acuminate **1b. subsp. *condensata***
- 2: Flowers both 4- and 5-merous; sepals narrowly triangular, long-attenuate **1c. subsp. *attenuata***

1a. *Boronia scabra* Lindl. subsp. *scabra*

B. thymifolia Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 165 (1852). T: W.A., *J.Drummond colln* 5, 195; iso: K (photo seen), MEL, TCD.

B. fasciculifolia F.Muell., *Fragm.* 1: 99 (1859). T: Salt R. and Fitzgerald R., W.A., *G.Maxwell*; syn: MEL.

Illustration: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 483, fig. 191 (1987).

Leaves narrowly elliptic or subterete due to the revolute margins. Cymes slender-pedunculate. Flowers 4-merous. Sepals narrowly triangular to broadly ovate, 2–3 mm long, acute to acuminate, glabrous or pilose. Petals 5–7 mm long. Staminal filaments smooth.

Found in SW W.A. from near Geraldton S to Gingin and from Woodanilling S to Stirling Ra. and E to Stokes Inlet. Flowers and fruits Sept.–Oct.

W.A.: Ravensthorpe Ra., *J.Armstrong* 7054 (PERTH); Howatharra, near Geraldton, *A.M.Ashby* 2644 (PERTH); Chittering, *R.J.Cranfield* 1985 (PERTH); Fitzgerald River Natl Park, *R.D.Royce* 9198 (PERTH).



1b. *Boronia scabra* subsp. *condensata* Paul G.Wilson, *Nuytsia* 12: 130 (1998)

T: Dinner Hill, W.A., 26 Aug. 1969, *K.Newbey* 2861; holo: PERTH.

Leaves elliptic, flat. Flowers 4-merous, shortly pedicellate in axils of terminal leaves or leaf-like bracts. Sepals narrowly elliptic or narrowly triangular and acuminate, 4–6 mm long, often open at base, glabrous or sparsely pilose. Petals c. 8 mm long. Staminal filaments glandular-verrucose.

Found in the Badgingarra area of S W.A. Often growing in gravel. Flowers Aug.–Sept.

W.A.: Alexander Morrison Natl Park, *E.A.Griffin* 4725 (PERTH); Coomaloo Ck, *G.J.Keighery* 3199 (PERTH); Dinner Hill, *K.Newbey* 2861 (PERTH).



This taxon is variable in the shape and size of the sepals; it grades into the typical subspecies.

1c. *Boronia scabra* subsp. *attenuata* Paul G.Wilson, *Nuytsia* 12: 129 (1998)

T: Mt le Grand, W.A., 3 Oct. 1990, *J.Armstrong* 7051; holo: PERTH.

Leaves narrowly elliptic to terete due to the recurved to revolute margins. Flowers on slender peduncles or congested at branch apices, 4- or 5-merous. Sepals narrowly triangular, c. 6 mm long, long-attenuate, strongly pilose. Petals c. 8 mm long. Staminal filaments smooth except for verrucose swollen apex.

Found on the S coast of W.A. at Cape Le Grand, on neighbouring islands of the Recherche Archipelago, and in Cape Arid Natl Park. Growing among granite rocks. Flowers and fruits Sept.–Oct.

W.A.: Mt Le Grand, *J.Armstrong* 7051 (PERTH); Hellfire Bay, *M.Carter* 225 (PERTH); Cape Arid Natl Park, *R.D.Royce* 9874 (PERTH); Sandy Hook Is., 10 Nov. 1950, *J.H.Willis* (PERTH).

At Cape Le Grand and on some of the islands of the Recherche Archipelago is found a variant with congested inflorescences, while at Thistle Cove, c. 6 km E of Cape Le Grand, and in Cape Arid Natl Park is found a variant with slender peduncles and pedicels.

This subspecies frequently has alternate leaves and 5-merous flowers for which reasons it has sometimes been assumed to be a species of *Eriostemon*.



2. *Boronia humifusa* Paul G.Wilson, *Nuytsia* 12: 126 (1998)

T: Between Capel and Donnybrook, W.A., 16 June 1996, *B.Lepschi* & *T.Lally* 2611; holo: PERTH; iso: CANB, K.

Illustrations: P.G.Wilson, *Nuytsia* 12: 127, fig. 2 (1998); J.R.Wheeler *et al.*, *Fl. South West* 2: 869 (2002).

Low growing wiry perennial. Branches sharply 4-angled, \pm glabrous. Leaves sessile, simple, oblong to oblong-elliptic, 1–3 cm long, entire, flat, obtuse, glabrous below, scabridulous above. Flowers in terminal and upper axillary cymes; peduncle short or slender, to 1 cm long; pedicels slender, 5–10 mm long. Sepals deltate, c. 1.5 mm long, glabrous. Petals elliptic, 6–7 mm long, wrinkled on margin, red; adaxial surface pilose towards base; abaxial surface glabrous. Stamens all similar; filaments flat or terete, densely ciliate, globular and verrucose at apex; anther apiculum prominent, c. 0.5 mm long. Disc entire, glabrous. Ovary glabrous; style and stigma together cylindrical, c. 0.5 mm long, glabrous. Fig. 21.

Found in SW W.A. between Busselton and Donnybrook; on sand or lateritic gravel. Flowers July–Oct.; fruits Sept.–Oct.

W.A.: SSE of Capel on Donnybrook road, *R.Davies* 125 (PERTH); 10 km W of Donnybrook, *P.A.Jurjevich* 1831 (PERTH); Capel–Donnybrook road, *D.Papenfuss* 300 (PERTH); Tutunup, Sept. 1945, *Forester Weston* (PERTH).

The relationships of this species are uncertain. The petals lack an apiculum and have only one medial vein while the seed lacks an adaxial groove; these characters separate it from the other members of sect. *Boronia*.



3. *Boronia ovata* Lindl., *Edward's Bot. Reg.* 27: sub. tab. 47 (1841)

T: Swan R., W.A., *D.Toward*; holo: CGE (photo seen).

Illustration: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 482, fig. 189 (1987).

Diffuse shrub to 40 cm high, glabrous or sparsely pilose. Leaves subsessile, broadly ovate, c. 1 cm long, cordate, flat or slightly recurved. Flowers in terminal pedunculate glabrous cymes; pedicels slender, 5–15 mm long. Sepals broadly ovate, c. 2.5 mm long, acute, red. Petals elliptic, c. 8 mm long, glabrous, or sparsely puberulous on adaxial surface, pink to mauve. Stamens: filaments slender-terete, glabrous, with a globular-verrucose apex; anthers c. 1 mm long, shortly white-apiculate. Disc narrow, glabrous. Ovary glabrous; style narrowly fusiform, c. 1.5 mm long, sparsely pilose; stigma minute.

Occurs in the Darling Ra., SW W.A., from New Norcia S to Boddington; on lateritic gravel in eucalypt woodland. Flowers Sept.–Nov.; fruits Oct.–Nov.

W.A.: 15 km SW of New Norcia, *R.J.Cranfield* 4266 (PERTH); 16 km S of Boddington, *D.Halford* 80104 (PERTH); Kalamunda, *R. & M.Hamilton* 47 (PERTH); 8 miles [13 km] NE of Wannamal, *K.Newbey* 2319 (PERTH).



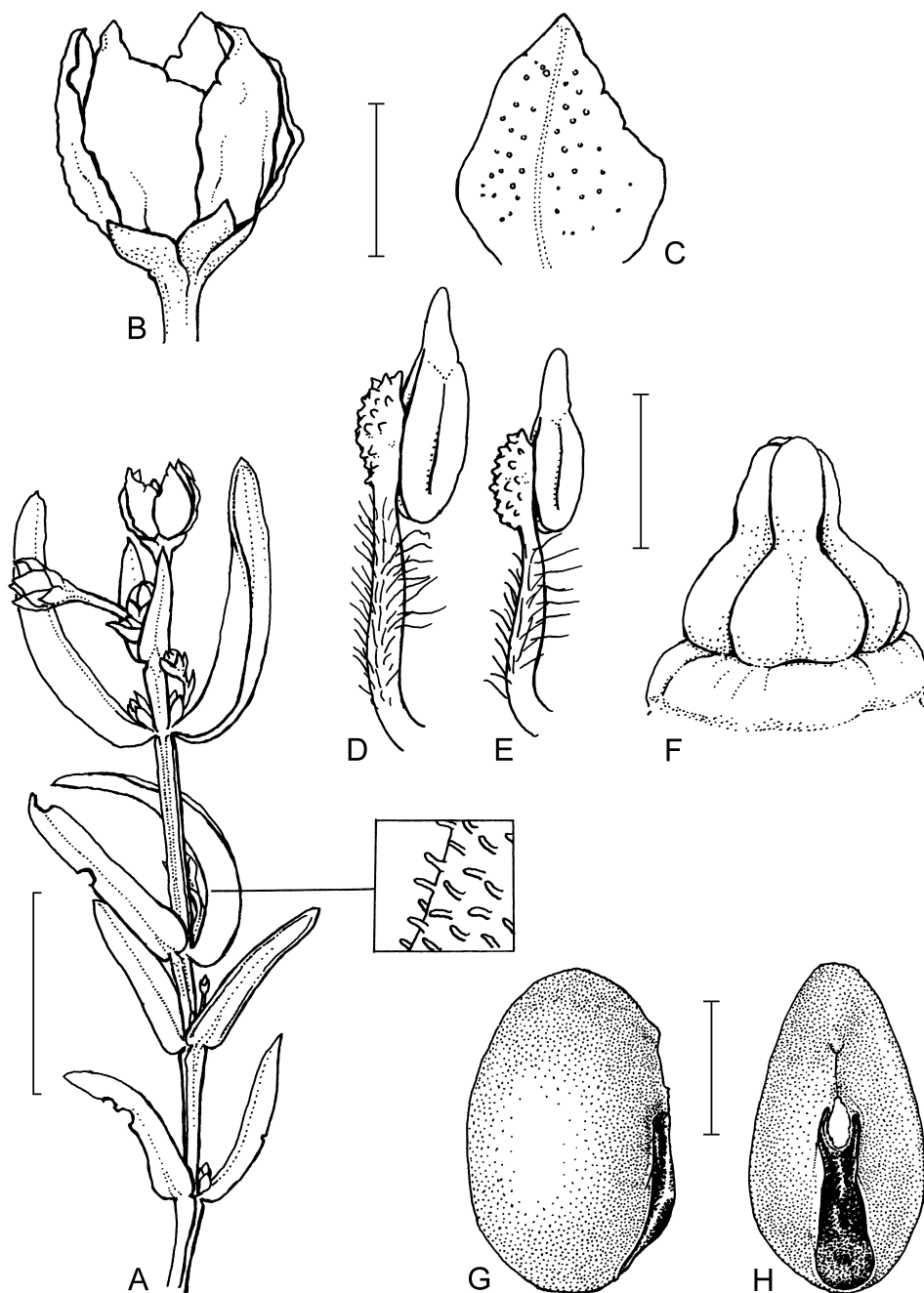


Figure 21. *Boronia humifusa*. A, habit; B, flower; C, petal; D, antisepalous stamen; E, antipetalous stamen; F, disc and pistil; G, seed, lateral view; H, seed, adaxial surface (A–F, B.J.Lepschi & T.R.Lally 2611, PERTH; G, H, R.P.Davies 125, PERTH). Scale bars: A = 2 cm; B, C = 4 mm; D–H = 1 mm. Drawn by A.Menadue, reproduced with permission from *Nuytsia* 12: 127, fig. 2 (1998).

4. *Boronia capitata* Benth., *Fl. Austral.* 1: 323 (1863)

T: Swan River Colony, W.A., eastern regions, 1862, *J.Drummond s.n.*; holo: K; iso: MEL.

Shrub to 1.3 m high. Branchlets pilose. Leaves simple, sessile, narrowly oblong or semiterete or fleshy, clavate to semiobovoid, 4–15 mm long, flat to concave above, glabrous or pilose. Flowers terminal, in compact heads or solitary; pedicels 1–3 mm long. Sepals broadly elliptic to narrowly triangular, glabrous or pilose. Petals broadly elliptic, c. 6 mm long, entirely glabrous or puberulous on midrib, pink. Stamens: filaments terete, verrucose, somewhat swollen at apex, densely woolly-ciliate; anthers c. 1 mm long, with a white recurved apiculum. Disc narrow, glabrous. Ovary glabrous; style terete, \pm equal to stamens, sparsely pilose; stigma very small. *Cluster Boronia*.

Occurs in SW W.A. There are 3 subspecies.

- | | | |
|----|---|-----------------------------------|
| 1 | Leaves and sepals pilose | 4a. subsp. <i>capitata</i> |
| 1: | Leaves and sepals glabrous or ciliate | |
| 2 | Leaves thick; sepals broadly elliptic, ciliate | 4b. subsp. <i>clavata</i> |
| 2: | Leaves slender; sepals narrowly ovate, eciliate | 4c. subsp. <i>gracilis</i> |

4a. *Boronia capitata* Benth. subsp. *capitata*

Leaves slender, narrowly oblong to semiterete, c. 10 mm long, flat or concave above, pilose. Pedicels c. 3 mm long; bracteoles similar to leaves. Sepals ovate to triangular, c. 4 mm long, pilose, often subapically horned. Petals sparsely puberulous on midrib. Stigma equal in width to style.

Once found in SW W.A. E of the Darling Ra between Cunderdin and Narrogin. Recent collections all come from a small area near Pingelly, where it grows on sandplains. Flowers and fruits Sept.–Oct.

W.A.: L. Deborah, 1893, *Mr Cronin* (MEL); sources of the Swan R., 1888, *M.Eaton* (MEL); Younegin, 1888, *M.Eaton* (MEL); 42 km W of Pingelly, *C.A.Gardner 14253* (PERTH); Tutanning Res., *E.M.Scrymgeour 610* (PERTH).



4b. *Boronia capitata* subsp. *clavata* Paul G.Wilson, *Nuytsia* 1: 202 (1971)

T: 30 km W of Lake Grace, W.A., 13 Sept. 1959, *A.S.George 348*; holo: PERTH.

Leaves fleshy, clavate to semi-obovoid, 4–5 mm long, \pm flat to slightly concave above, ciliate, otherwise glabrous. Pedicel turbinate, c. 2 mm long; bracteoles broadly elliptic, slightly exceeding pedicel, glabrous. Sepals broadly elliptic, c. 2.5 mm long, with thickened apex, ciliate, otherwise glabrous. Petals glabrous. Stigma equal in width to style.

Occurs in SW W.A. from Corrigin E to Hyden and S to Kojonup. Grows in heath on sand or gravel. Flowers Apr.–Oct.

W.A.: Dryandra Forest, *G.J.Keighery 1542* (PERTH); 4.5 km N of Nyabing, *D.J.McGillivray 3529* (PERTH); 1 mile [1.6 km] W of Corrigin, *K.Newbey 2610* (PERTH).



Material collected from near Corrigin is somewhat intermediate between the subspecies *clavata* and *capitata*.

4c. *Boronia capitata* subsp. *gracilis* Paul G.Wilson, *Nuytsia* 1: 203 (1971)

T: Black Swamp, Metricup, W.A., 3 Oct. 1953, *R.D.Royce 4571*; holo: PERTH.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 869 (2002), as *B. capitata*.

Branchlets quadrangular with 4 scabrous, pilose ridges. Leaves slender, semiterete, c. 10 mm long, glabrous or ciliate. Bracteoles boat-shaped to leaf-like, glabrous. Sepals narrowly ovate

or narrowly triangular, c. 4 mm long, glabrous. Petals glabrous, eciliate. Stigma minutely capitate. Fig. 22N–Q.

Occurs in SW W.A. from Yarloop S to Margaret R. Grows in seasonally waterlogged situations. Flowers June–Nov.; fruits Oct.–Nov.

W.A.: W of Yarloop, 20 Aug. 1978, *R.J.Cranfield s.n.* (PERTH); Yelverton Forest, *G.J.Keighery 11120* (PERTH); 8 miles [13 km] W of Harvey, *B.R.Maslin 440* (PERTH).



5. *Boronia nematophylla* F.Muell., *Fragm.* 2: 100 (1860)

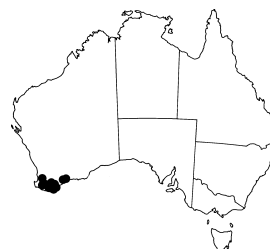
T: Near King George Sound, W.A., *A.Oldfield*; holotype: MEL.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 871 (2002).

Shrub 0.5–2 m high, with slender branches, glabrous except inflorescence. Leaves sessile, slender-terete, generally c. 2 cm long (range 1–3 cm long), mucronate, channelled above. Flowers axillary and terminal, solitary or in small cymes; pedicels c. 4 mm long, thickened towards apex, glabrous or puberulous in lines between decurrent sepal bases, otherwise glabrous. Sepals broadly ovate or orbicular, 1.5–2 mm long, thick, with scarious margin, glabrous. Petals elliptic, c. 8 mm long, obtuse, glabrous, pale red to purple. Stamens: filaments terete, woolly-ciliate; antisepalous ones thickened and glandular-verrucose towards apex; anthers minutely apiculate. Ovary glabrous; style slender-terete, sparsely pilose towards apex; stigma small, capitate. $n = 9$, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954). Fig. 22J–M.

Occurs in SW W.A. from Collie S to Walpole and E to Ravensthorpe; growing in woodland on sand. Flowers June–Nov.; fruits Oct.–Nov.

W.A.: Walpole-Nornalup Natl Park, *A.R.Annels 972* (PERTH); 40 miles [64 km] W of Ravensthorpe, *A.S.George 9303* (PERTH); 10 km W of Wellstead, *G.J.Keighery 6048* (PERTH).



6. *Boronia crenulata* Sm., *Trans. Linn. Soc. London* 8: 284 (1807)

T: King George Sound, [W.A.], 1803, *A.Menzies*; holotype: LINN.

B. crenula F.Cels, *Ann. Fl. Pomone* 1841–42: 258 (1842), *ex desc.* T: “originaire du port du Roi Georges, a la Nouvelle-Hollande”, W.A.; *n.v.*

B. viminea hort. *ex F.Cels, Ann. Fl. Pomone* 1841–42: 258 (1842), *nom. illeg. non Lindl.* (1839), *ex desc.* T: “Hort. Angl.”; *n.v.*

Shrub to 1 m high. Branchlets glabrous or puberulous or pilose. Leaves sessile, linear to broadly elliptic or broadly obovate, 5–30 mm long, flat, usually crenulate towards apex, coriaceous, glabrous or ciliate. Flowers axillary or terminal, solitary or in short cymes; pedicels 2–5 mm long, clavate distally, glabrous or hairy. Sepals ovate and obtuse to narrowly triangular, 1.5–5 mm long, glabrous or ciliate. Petals ovate, c. 6 mm long, rounded to acute or acuminate, with or without a prominent apiculum, glabrous or sparsely puberulous, pink. Stamens: filaments terete, woolly-ciliate, verrucose towards apex; anthers shortly apiculate. Stigma continuous with the pyramidal sparsely pilose style. $n = 9, 18$, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954); $n = 18$, F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Aniseed Boronia*.

Occurs in SW W.A. There are 4 subspecies and within the type subspecies 2 varieties are recognised.

The terminal flower clusters of this species are sometimes replaced by rose-galls.

- | | |
|--|------------------------------------|
| <p>1 Leaves broadly elliptic to obovate, sometimes cordate at base, sparsely long-ciliate; branchlets pilose</p> | <p>6d. subsp. pubescens</p> |
| <p>1: Leaves linear to broadly obovate, narrowed at base, eciliate; branchlets glabrous or puberulous</p> | |
| <p>2 Petals subterminally apiculate, usually prominently so; sepals acuminate or obtuse with small subterminal acumen, prominently ciliate</p> | <p>6a. subsp. crenulata</p> |
| <p>2: Petals either not apiculate or only minutely so; sepals obtuse or acute, glabrous or minutely ciliate</p> | |
| <p>3 Sepals ovate to triangular, 1.5–2 mm long, obtuse to acute, glabrous or only minutely ciliate</p> | <p>6b. subsp. viminea</p> |
| <p>3: Sepals broadly ovate, c. 2 mm long, obtuse or rounded at apex, minutely subterminally apiculate, ciliate</p> | <p>6c. subsp. obtusa</p> |

6a. *Boronia crenulata* Sm. subsp. *crenulata*

B. viminea var. *gracilis* Benth., *Fl. Austral.* 1: 325 (1863); *B. crenulata* var. *gracilis* (Benth.) Paul G. Wilson, *Nuytsia* 1: 204 (1971). T: W.A., 1848, *J. Drummond* 92; holo: K; iso: TCD.

B. crenulata var. *typica* Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přír.* 2: 52 (1923), *nom. illeg.* (type var.).

Branchlets typically puberulous in interpetiolar strips. Leaves narrowly to broadly obovate and 7–12 mm long, or linear and up to 30 mm long, narrowly cuneate at base, rounded to acute at apex, glabrous, eciliate. Pedicel puberulous in grooves, often pilose; bracteoles thin, conduplicate, 2–3 mm long. Sepals triangular to narrowly triangular to ovate-acuminate, 2–3 mm long, acuminate or obtuse with small subterminal acumen, densely ciliate. Petals slightly to prominently subterminally apiculate, entirely glabrous or puberulous towards margins.

Occurs towards the S coast of W.A. from Augusta E to Bremer Bay N to the Stirling Ra. and from there to the eastern margin of the Darling Ra. Two varieties are recognised.

Leaves narrowly to broadly obovate

6a1. var. *crenulata*

Leaves linear

6a2. var. *angustifolia*

6a1. *Boronia crenulata* Sm. subsp. *crenulata* var. *crenulata*

Leaves narrowly to broadly obovate, 7–12 mm long, rounded to obtuse. Flowers predominantly axillary with 1 or 2 pairs of bracteoles. Sepals ovate, 2–3 mm long, acuminate, Petals minutely subterminally apiculate, glabrous abaxially.

Occurs towards the S coast of W.A. from Augusta E to Bremer Bay and N to the Stirling Ra., and from there to the eastern margin of the Darling Ra. Flowers Aug.–Nov.; fruits Oct.–Nov.

W.A.: Mt Trio, Stirling Ra., *G.J. Keighery* 3509 (PERTH); Lower King, Albany, *S. Pfeiffer* 27 (PERTH); 15 miles [24 km] W of Pemberton, *S. Paust* 288 (PERTH); Walpole-Nornalup Natl Park, *J.R. Wheeler* 3115 (PERTH).

Over most of its distribution the branches of this variety are puberulous but in the Pemberton–Walpole area they are pilose which suggests intergradation with subsp. *pubescens*.

A variant from near Albany with broadly obovate leaves corresponds to the type of *B. crenulata* while a variant from near Bremer Bay with narrowly obovate leaves corresponds to the type of *B. viminea* var. *gracilis*. A variant found NW of the Stirling Ra. towards the Darling Ra. is sometimes puberulous all over; it has narrow leaves and narrowly triangular to triangular sepals and is somewhat intermediate in morphology between subsp. *crenulata* and subsp. *viminea*.



6a2. *Boronia crenulata* subsp. *crenulata* var. *angustifolia* Paul G. Wilson, *Nuytsia* 12: 124 (1998)

T: Near junction of Ellen and South Bluff tracks, Stirling Ra., W.A., 26 Sept. 1975, *R. Voutier* 795; holo: PERTH.

Leaves linear, 15–30 mm long, acute. Flowers mostly terminal to short axillary shoots. Sepals narrowly triangular, c. 3 mm long, acuminate. Petals prominently subterminally apiculate, glabrous.

Known only from the type locality. Flowers Sept.–Oct.

W.A.: Ellen's Peak, 21 Oct. 1902, *A. Morrison* (PERTH).

**6b. *Boronia crenulata* subsp. *viminea* (Lindl.) Paul G. Wilson, *Nuytsia* 12: 125 (1998)**

B. viminea Lindl., *Sketch Veg. Swan R.* 17 (1839). T: Swan River Colony, W.A.; syn: CGE; 1839, *J. Drummond*; syn: CGE; *J. Mangles*; syn: CGE (photos seen).

B. tenuifolia Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 168 (1845). T: Near Canning R., W.A., Nov. 1841, *L. Preiss* 2022; lecto: LD, *fide* P.G. Wilson, *op. cit.* 126; isolecto: MEL.

B. viminea var. *latifolia* Benth., *Fl. Austral.* 1: 325 (1863). T: Near Canning R., W.A., Nov. 1841, *L. Preiss* 2022; lecto: LD, *fide* P.G. Wilson, *loc. cit.*

B. machardiana F. Muell., *Fragm.* 9: 115 (1875). T: Blackwood R., W.A., 1874, *M. McHard*; holo: MEL; iso: PERTH (fragment).

Illustration: N.G. Marchant *et al.*, *Fl. Perth Region* 1: 480, fig. 186 (1987), as *B. crenulata* var. *gracilis*.

Plant glabrous or rarely minutely puberulous. Leaves linear to narrowly obovate, 8–15 mm long, obtuse, eciliate. Pedicels to 5 mm long, glabrous or sparsely puberulous; bracteoles narrowly triangular, 1–1.5 mm long. Sepals ovate to triangular, 1.5–2 mm long, obtuse, glabrous, eciliate or minutely ciliolate. Petals blunt, minutely subterminally apiculate or apiculum scarcely apparent, sparsely puberulous adaxially and often abaxially towards margins.

Occurs from Pinjarra N to Shark Bay, W.A., both on the coastal plain and in the Darling Ra. Near Perth it is sometimes found in seasonally waterlogged situations but it generally occurs in sand over limestone. Flowers June–Feb.; fruits Nov.–Feb.

W.A.: Carrarang Stn, *H. Demarz* 5167 (PERTH); Mundaring, *J. Havel* 616 (PERTH); 29 km WSW of Coorow, *G.J. Keighery* 4102 (PERTH); Jandakot, *F.M.C. Schock* 388 (PERTH).

From near Coorow to the W coast the plants of subsp. *viminea* are sometimes minutely puberulous but they are otherwise identical with the glabrous variant that grows in the same area.

The particular variant described under the name *B. machardiana* is known only from the type which is most similar to material collected from just S of Perth although it is stated to have come from the Blackwood R. area in the far SW of the State.

A variant found near Collie is intermediate in morphology between subsp. *viminea* and subsp. *pubescens*.

**6c. *Boronia crenulata* subsp. *obtusa* Paul G. Wilson, *Nuytsia* 12: 125 (1998)**

T: 3 km SW of gate in Rabbit Proof Fence, E of Lake King, W.A., 7 Aug. 1968, *R.A. Saffrey* 332; holo: PERTH; iso: K.

Branchlets glabrous or minutely puberulous in strips. Leaves narrowly obovate, 10–15 mm long, attenuate at base, entire or almost so, rounded or obtuse, glabrous, eciliate. Pedicels glabrous or sparsely puberulous, thick; bracteoles c. 1 mm long, obtuse. Sepals broadly ovate, 2 mm long, obtuse or rounded, minutely subterminally apiculate, thick, ciliolate, glabrous. Petals rounded at apex, either not apiculate or minutely subterminally apiculate, glabrous.

Occurs from Nyabing and Ongerup, W.A., E to Norseman and from Newdegate S to the coast. Flowers Aug.–Oct.; fruits Sept.–Oct.

W.A.: 73 km E of Jerramungup, *G.Perry 131* (PERTH); 14 km E of the mouth of the Oldfield R., *A.E.Orchard 1487* (PERTH); 17 km E of Grass Patch, *P.van der Moezel 445* (PERTH); 40 km ESE of Lake King township, *P.G.Wilson 6855* (PERTH).



6d. *Boronia crenulata* subsp. *pubescens* (Benth.) Paul G.Wilson, *Nuytsia* 12: 125 (1998)

B. crenulata var. *pubescens* Benth., *Fl. Austral.* 1: 323 (1863); *B. haloragoides* F.Muell., *Fragm.* 11: 97 (1880). T: Vasse R., W.A., *A.Oldfield*; lecto: MEL, *fide* P.G.Wilson, *loc. cit.*

Branchlets pilose. Leaves broadly elliptic to obovate, c. 10 mm long, obtuse, rounded or slightly cordate at base, sparsely ciliate with long hairs mostly towards base. Flowers in congested axillary cymes. Pedicels c. 2 mm long, pilose; bracteoles oblong, c. 3 mm long, boat-shaped, pilose. Sepals narrowly triangular, 3.5–5 mm long, acuminate, pilose and prominently ciliate. Petals prominently subterminally apiculate, sparsely pilose.

Occurs in the far SW of W.A. in the Cape Naturaliste–Pemberton district; growing in Jarrah woodland. Flowers Aug.–Nov.; fruits Dec.

W.A.: 11 km W of Donnybrook, *R.J.Cranfield 8317D* (PERTH); Ruabon, 25 Oct. 1987, *N.G.Marchant s.n.* (PERTH); Cowaramup, *R.D.Royce 2831* (PERTH).

A plant intermediate in morphology between subsp. *pubescens* and subsp. *viminea* is found near Collie, while in the Walpole–Manjimup–Augusta region there occurs a variant of subsp. *pubescens* that approaches subsp. *crenulata*.



7. *Boronia oxyantha* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25 (2): 165 (1852)

T: W.A., *J.Drummond 5th colln 198*; holo: KW (photo seen); iso: MEL, TCD.

Much-branched shrub c. 60 cm high. Branches puberulous or pilose, often bearing persistent petioles. Leaves frequently crowded, sparsely pilose, sometimes with only a few hairs, pinnately 3–7-foliolate; petiole 0.5–2 mm long; rachis c. 2 mm long; leaflets narrowly clavate, 3–7 mm long. Flowers axillary, solitary; pedicels c. 2 mm long, glabrous. Sepals very narrowly to narrowly triangular, 2–3.5 mm long, glabrous. Petals broadly elliptic, c. 7 mm long, with very few hairs, pink with dark midrib. Stamens: filaments ciliate, glandular-verrucose at apex; anthers with prominent, narrow apiculum. Disc rounded, glabrous. Style subterete, c. 0.5 mm long, shortly pilose; stigma minute.

Occurs near the S coast of W.A. between Ongerup and Hopetoun. Two varieties are recognised.

Branches puberulous

7a. var. *oxyantha*

Branches pilose

7b. var. *brevicalyx*

7a. *Boronia oxyantha* Turcz. var. *oxyantha*

B. brachyphylla F.Muell., *Fragm.* 1: 99 (1859). T: Fitzgerald Ra., W.A., *R.Maxwell 207*; holo: MEL.

Branches puberulous. Leaves with very few hairs. Sepals very narrowly triangular, 2–3.5 mm long.

Known only from the type collections of *B. oxyantha* and *B. brachyphylla* and one other collection made in 1974. Occurs near the S coast of W.A. between Bremer Bay and Hopetoun, growing on rocky hills. Fig. 22A–E.

W.A.: 11 km WNW of Point Charles, Fitzgerald River Natl Park, *K.R.Newbey* (PERTH, NSW).

The two type collections differ only slightly in their flower morphology and it is likely that they were made in the same area when the two collectors were on a combined trip. The rarity of further collections, and the fact that *B. oxyantha* var. *oxyantha* is intermediate in appearance between *B. oxyantha* var. *brevicalyx* and *B. inornata*, suggests that it may be of hybrid origin.



7b. *Boronia oxyantha* var. *brevicalyx* (Benth.) Paul G.Wilson, *Nuytsia* 1: 202 (1971)

B. lanuginosa var. *brevicalyx* Benth., *Fl. Austral.* 1: 317 (1863).

T: Phillips R., W.A., *Herb. Mueller*; holo: MEL.

Branches pilose. Leaves sparsely pilose. Sepals narrowly triangular, c. 2 mm long.

Occurs between Ongerup and Ravensthorpe, W.A., growing in laterite on rocky hills. Flowers July–Feb.

W.A.: 8 km NW of Chillinup, *A.S.George* 6889 (PERTH); Ravensthorpe area, *F.Lullfitz* 5264 (PERTH); Mt Drummond, *K.Newbey* 2693 (PERTH).



8. *Boronia inornata* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 164 (1852), as *B. inornata*

T: W.A., *J.Drummond* 5th colln 197; iso: MEL, TCD.

Much branched shrub c. 30 cm high. Branches somewhat puberulous, glandular-verrucose. Leaves glabrous or pubescent, pinnately 3 (5)-foliolate; petiole 0.5–2 mm long; leaflets terete or narrowly to broadly clavate, 3–5 mm long, the middle one often shortest. Flowers terminal to main branches or to dwarf axillary branches, solitary; pedicels fleshy, 1–3 mm long. Sepals triangular to orbicular, 1–2 mm long, coriaceous. Petals ovate, c. 5 mm long, with very few hairs, pink. Disc broad. Stamens: filaments terete, glabrous, the apex verrucose; anthers shortly apiculate. Style terete, c. 0.5 mm long, glabrous; stigma minute. *Desert Boronia*.

Occurs in southern W.A. and S.A. and in far western Vic. Two subspecies are recognised.

A variable species. Distinguished from otherwise similar species by the broad disc, the glabrous staminal filaments, and the generally terete leaflets.

Leaves puberulous or, if glabrous, then sepals puberulous

8a. subsp. *inornata*

Leaves glabrous; sepals usually ciliate, sometimes glabrous

8b. subsp. *leptophylla*

8a. *Boronia inornata* Turcz. subsp. *inornata*

B. xerophila Diels in F.L.E.Diels & E.Pritzel, *Bot. Jahrb. Syst.* 35: 319 (1904). T: Gilmores, W.A., *F.L.E.Diels* 5279; n.v.

Leaves puberulous (rarely glabrous). Pedicels c. 1 mm long, usually puberulous. Sepals puberulous.

Occurs in S W.A. between the Stirling Ra. and Mt Ragged. Flowers June–Oct.; fruits Sept.–Oct.

W.A.: Bremer Ra., L. Medcalf, c. 93 km SW of Norseman, *B.Archer* 2212 (CANB, HO, MEL); Norseman–Lake King track, 21.5 km W of Coolgardie to Esperance Hwy, *B.Archer* 2442 (MEL, PERTH); 25 km NE of Mt Ney, *M.A.Burgman* 1239 (PERTH); Kundip, *K.Newbey* 73 (PERTH); 30 km N of Bremer Bay, *P.G.Wilson* 4375 (PERTH).



A variable subspecies. Near Norseman a variant with short broad leaflets that corresponds to the type of *B. xerophila* is found. In the Ravensthorpe district a variant with hirtellous sepals and pedicels but with almost glabrous leaves occurs. Both of these variants grade into the typical form.

8b. *Boronia inornata* subsp. *leptophylla* (Turcz.) Burgman, *Austral. J. Bot.* 33: 423 (1985)

B. leptophylla Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 164 (1852). T: W.A., *J.Drummond 5th colln* 196; holo: KW (photo seen); iso: MEL.

B. clavellifolia F.Muell., *Trans. Philos. Soc. Victoria* 1: 12 (1854). T: Desert around L. Lalbert [L. Albert], S.A., *F.Mueller*; syn: MEL; Murray [River], Oct. 1848, *F.Mueller*; syn: K.

Illustration: J.P.Jessop (ed.), *Fl. S. Australia* 4th edn, 2: following 770, pl. 22 (1986).

Leaves glabrous. Pedicels 1–3 mm long, glabrous. Sepals usually ciliate, sometimes glabrous. Fig. 22F–I.

Found in southern W.A. E of the Stirling Ra. to the Cape Arid area, and southern S.A. from near Ceduna to the South-East. Flowers May–Oct.; fruits Sept.–Oct.

W.A.: Eyre Hwy, 82.4 km E of Norseman P.O., *B.Archer 2404* (CANB, HO, MEL, PERTH); 9.5 km S of Varley, *B. & B.Backhouse H/6* (PERTH); Bandalup Ck, *F.Lullfitz 5490* (PERTH). S.A.: E side of Todd Hwy, Peachna, 26.5 km S of Lock, *P.C.Jobson 5775 & K.M.Downs* (BRI, MEL, NSW); 200 m E of Chapman Bore Hall towards Karoonda, *M.F.Duretto 1245* (AD, CANB, MEL, NSW).



9. *Boronia coriacea* Paul G.Wilson, *Nuytsia* 1: 203 (1971)

T: Between Mt Ragged and Israelite Bay, W.A., 3 Oct. 1970, *P.G.Wilson 10083*; holo: PERTH.

Shrub c. 50 cm high. Branches minutely puberulous between decurrent leaf bases, glandular-verrucose. Leaves coriaceous, glabrous, pinnately 3 (or 5)-foliolate; petiole 3–4 mm long; leaflets flat, narrowly obtusate, c. 12 mm long, c. 1.5 mm wide, obtuse. Flowers in small terminal cymes shortly exceeding leaves, glabrous; pedicels 2–6 mm long. Sepals broadly ovate to suborbicular, c. 1 mm long, coriaceous. Petals broadly ovate, c. 5 mm long, pink. Disc broad. Stamens: filaments terete, glabrous, swollen and glandular-verrucose at apex; anthers c. 1 mm long, shortly apiculate. Style c. 1 mm long, terete, glabrous; stigma minute, subcapitate.

Only recorded from between Mt Ragged and Israelite Bay in SE W.A., where it grows on a gentle limestone scarp in open mallee woodland. Flowers (Apr.) Oct.–Nov.

W.A.: SE of Sheoaks Hill, Nuytsland Nature Reserve, *G.F.Craig 2567* (PERTH); N of Tooklejenne Rock, *K.Newbey 7882* (PERTH).



10. *Boronia pulchella* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 162 (1852)

T: W.A., *J.Drummond 5th colln* 202; holo: KW (photo seen); iso: MEL.

B. drummondii Planch., *Fl. Serres Jard. Eur.* 9: 65, t. 881 (1853–54). T: Lucky Bay, W.A., *J.Drummond s.n.*; n.v.

B. drummondii var. *alba* hort., *J. Hort. Cottage Gardener* ser. 2, 34: 430 (1878). T: cult.; n.v.

B. pulchella var. *distans* Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přír.* 2: 51 (1923). T: Mt Toolbrunup, W.A., 1910, *A.A.Dorrien-Smith*; holo: K.

B. pulchella var. *typica* Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přír.* 2: 51 (1923), *nom. illeg.* (type var.).

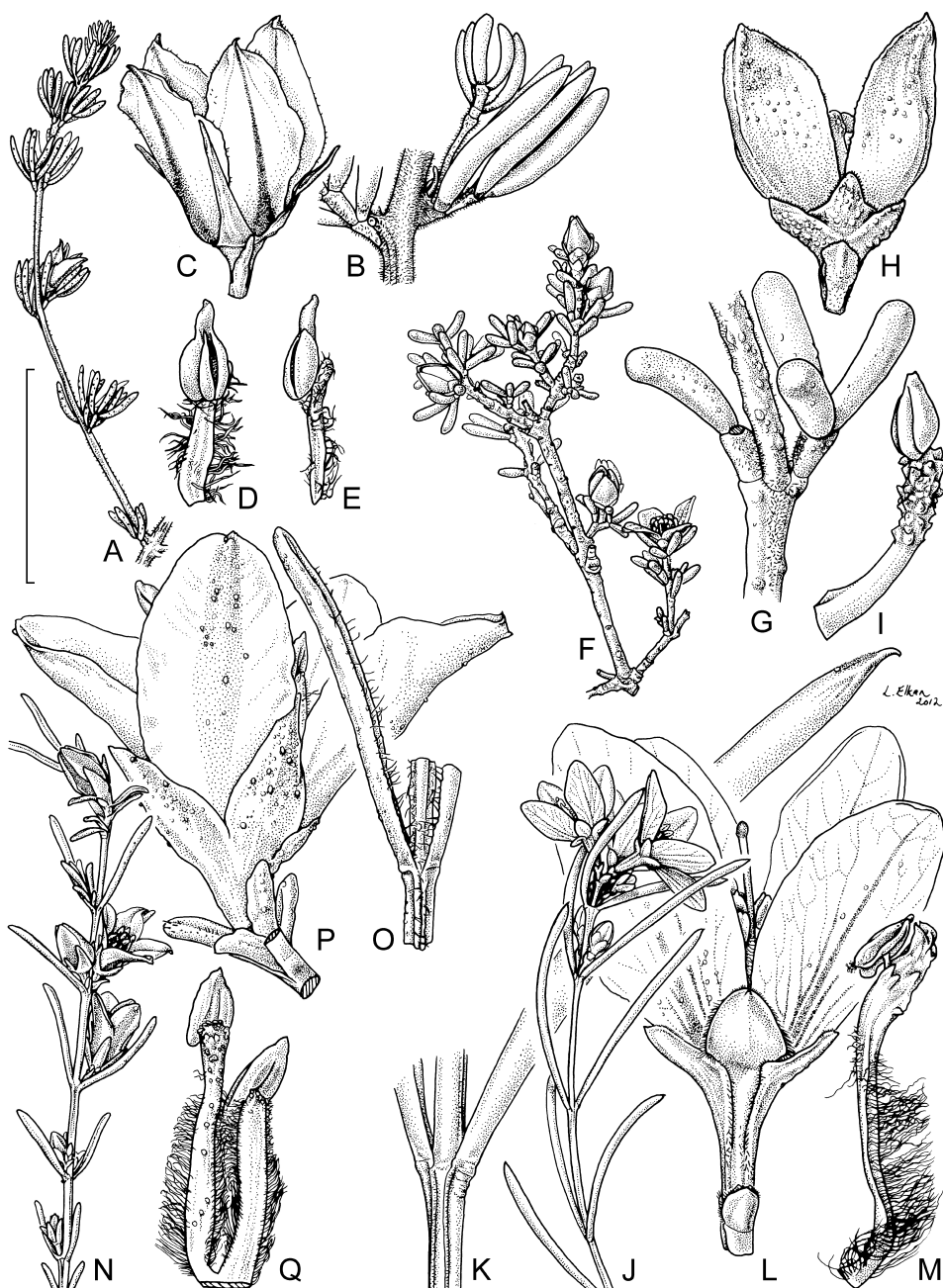


Figure 22. *Boronia*. A–E, *B. oxyantha* var. *oxyantha*. A, habit; B, stem detail; C, flower, lateral view; D, stamen, adaxial view; E, stamen, lateral view (A–E, K.R.Newbey 4562, NSW). F–I, *B. inornata* subsp. *leptophylla*. F, habit; G, stem detail; H, flower, lateral view; I, stamen, lateral view (F–I, M.F.Duretto 1245, NSW). J–M, *B. nematophylla*. J, habit; K, stem detail; L, flower, lateral view; M, stamen, lateral view (J–M, S.Smith-White, July/Aug. 1952, NSW). N–Q, *B. capitata* subsp. *gracilis*. N, habit; O, stem detail; P, flower, lateral view; Q, antipetalous and antisepalous stamens, abaxial view (N–Q, P.H.Weston 2231, NSW). Scale bar: A, F, J, N = 2 cm; B, C, G, H, K, L, O, P = 5 mm; D, E, I, M = 2 mm; Q = 4 mm. Drawn by L.Elkan.

B. pulchella var. *alba* W.Miller & N.Taylor in L.H.Bailey, *Standard Cyclop. Hort.* 2nd edn, 2: 526 (1928), *nom. dub.* T: not cited.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 874 (2002).

Slender virgate shrub to 1 m high. Branches puberulous between decurrent leaf bases. Leaves subsessile, 5–15-foliolate, 1.5–3 cm long, glabrous; leaflets linear to narrowly oblong, 5–12 mm long, entire or minutely crenulate. Flowers axillary, solitary; pedicel 6–10 mm long. Sepals ovate to narrowly triangular, c. 2 mm long, glabrous. Petals broadly ovate, 6–9 mm long, minutely apiculate, sparsely puberulous adaxially and abaxially, deep pink. Disc prominent, glabrous. Stamens: filaments subterete, glandular-verrucose, sparsely hispid; antisepalous filaments with prominent apical swelling; anthers c. 1 mm long, minutely apiculate. Ovary pilose at apex; style thick, c. 0.5 mm high, pilose; stigma prominent, globose, 1 mm diam. *n* = 7, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). *Pink Boronia*. Fig. 23K–M.

Found in the Stirling and Porongorup Ranges, possibly also in the Karri forest between Pemberton and Walpole, SW W.A. Growing among rocks or stones in moist situations. Flowers Sept.–Nov.

W.A.: Beedelup Natl Park, *A.C.Beauglehole* 12961 (PERTH); Porongorup Ra., Oct. 1911, *S.Dunn* (NSW); The Arrows, Stirling Ra., *A.S.George* 10441 (PERTH); Mt Trio, Stirling Ra., *N.Hoyle* 1261 (PERTH).

Lucky Bay, the locality given by Planchon for the type of *B. drummondii*, is an error since Drummond never travelled so far east nor is the species found there.



11. *Boronia virgata* Paul G.Wilson, *Nuytsia* 1: 203 (1971)

T: 19 km W of Denmark, W.A., 7 Oct. 1970, *P.G.Wilson* 10219; holo: PERTH.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 875 (2002).

Virgate shrub to 1 m high. Branches minutely puberulous in lines. Leaves 3–5 (–7)-foliolate, 1–1.5 cm long, coriaceous, glabrous; petiole and rachis slender, terete, 3–5 mm long; leaflets narrowly oblong-elliptic, 3–10 mm long, acute. Flowers axillary, solitary or in 3-flowered cymes; pedicels slender, 6–14 mm long, glabrous. Sepals narrowly triangular, 2–3 mm long, glabrous, red. Petals ovate, c. 8 mm long, slender apiculate, puberulous adaxially and towards margins abaxially, deep pink. Stamens: filaments slender, 3 mm long, sparsely ciliate, swollen and verrucose at apex; anthers 1 mm long, minutely apiculate. Style (including stigma) terete, c. 1 mm long, medially pilose. Fig. 23D–F.

Occurs near the S coast of W.A. between Walpole and Denmark; growing in open forest in seasonally waterlogged soil. Flowers Aug.–Feb.

W.A.: 13.5 km NE of Walpole, *A.R.Annels* 2144 (PERTH); 12 miles [19 km] W of Denmark, *A.R.Fairall* 629 (PERTH).



12. *Boronia stricta* Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 169 (1844)

T: Between Mt Melville and Mt Elphinstone, W.A., 11 Oct. 1840, *L.Preiss* 2034; iso: LD, MEL (2 sheets), W.

[*B. lanuginosa* auct. non Endl.: G.Bentham, *Fl. Austral.* 1: 317 (1863)]

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 874 (2002).

Slender somewhat pilose shrub to 2 m high. Leaves often crowded, subsessile, pinnately 5–9-foliolate, 1–2 cm long; rachis segments terete, 1–2 mm long; leaflets ascending, linear to subterete, to 1.5 cm long, channelled or concave above. Flowers axillary, solitary or in 2- or 3-flowered cymes; pedicels 2–5 mm long, pilose. Sepals very narrowly triangular, 3–7 mm long, acuminate, pilose. Petals broadly elliptic, 5–9 mm long, apiculate, puberulous, pink with dark midrib. Stamens: filaments terete, c. 2 mm long; antisepalous filaments swollen

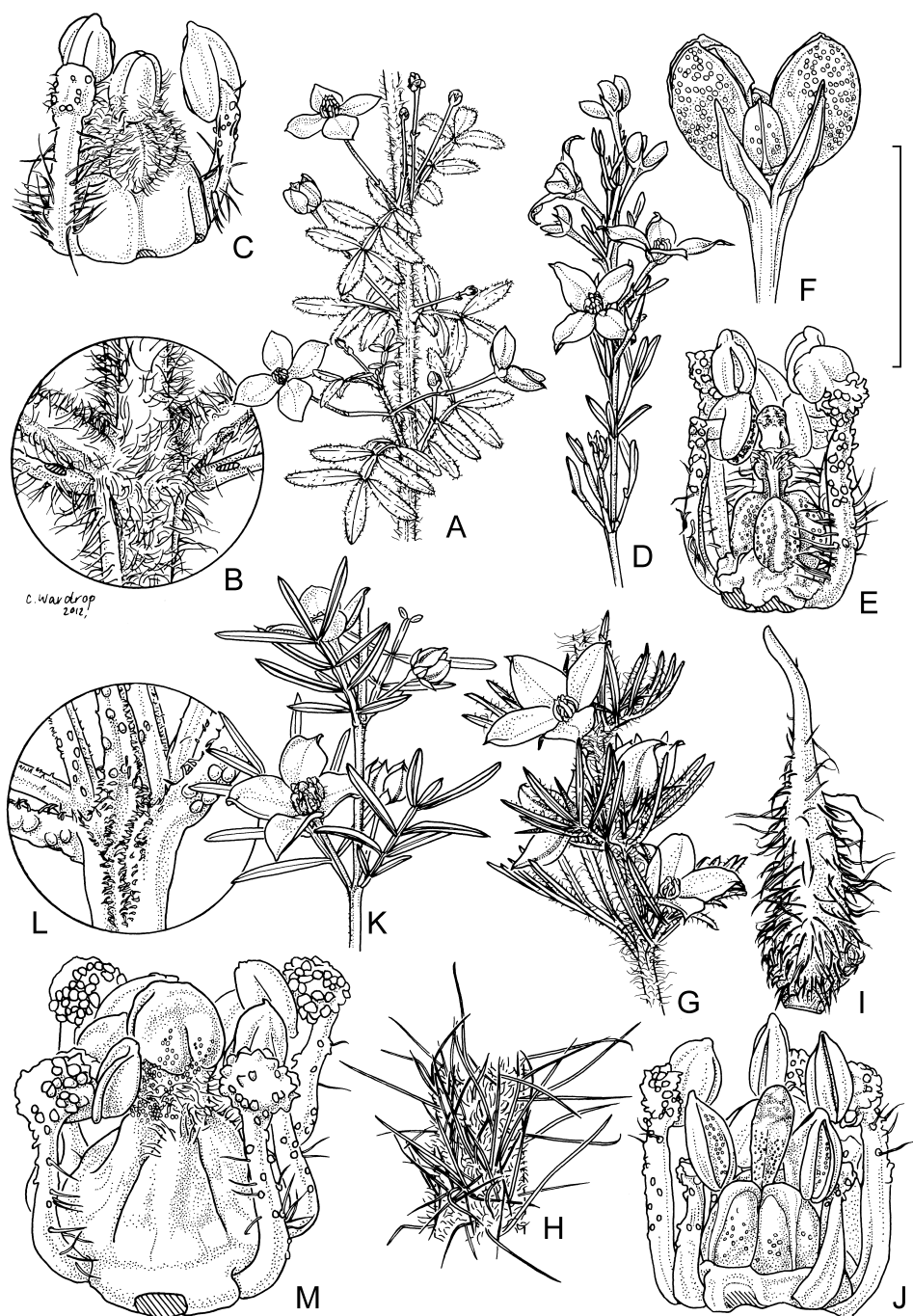


Figure 23. *Boronia*. A–C, *B. gracilipes*. A, habit; B, stem detail; C, carpel, disc, 2 stamens (A–C, C.H.Gittens 1753, NSW). D–F, *B. virgata*. D, habit; E, carpel, disc, stamens (2 stamens removed); F, fruit (D–F, P.G.Wilson 10219, NSW). G–J, *B. stricta*. G, habit; H, stem detail; I, sepal; J, carpel, disc, stamens (1 stamen removed) (G–J, C.H.Gittens 1764, NSW). K–M, *B. pulchella*. K, habit; L, stem detail; M, disc & carpel (1 stamen removed) (K–M, S.Dunn, Oct. 1911, NSW). Scale bar: A, D, G, K = 2.25 cm; B, F = 5 mm; C, E, J, M = 2.25 mm; H, I, L = 2.5 mm. Drawn by C.Wardrop.

and verrucose at apex, glabrous. Ovary glabrous or puberulous; style clavate, c. 1 mm long, with very few hairs; stigma continuous with style. Fig. 23G–J.

Occurs in SW W.A. from Margaret R. E to the Stirling Ra. and Albany. Restricted to seasonally swampy land. Flowers (Apr.) Sept.–Dec.; fruits Oct.–Mar.

W.A.: William Bay Natl Park, *B.G.Hammersley* 993 (PERTH); 2 km SSE of Pillenorup Swamp, Stirling Ra., *G.J.Keighery* 4852 (PERTH); Bramley, *R.D.Royce* 1409 (PERTH); near Walpole, *F.W.Went* 123 (PERTH).



13. *Boronia gracilipes* F.Muell., *Fragm.* 2: 99 (1860)

T: Frankland R., W.A., *G.Maxwell*; holo: MEL.

Shrub to 1 m high. Branchlets pilose. Leaves pinnately 5–9-foliolate, sparsely puberulous; 1–2 cm long; petiole 2–5 mm long; rachis segments narrowly oblong, c. 3 mm long; leaflets elliptic, 5–8 mm long, flat or recurved on margins. Flowers axillary, solitary or paired; pedicels slender, 1–3 cm long. Sepals broadly ovate to triangular, 0.5–1 mm long, glabrous, red. Petals broadly elliptic, c. 5 mm long, sparsely puberulous, pink. Disc glabrous. Stamens: filaments terete, 1.5–2 mm long, ciliate; antisepalous filaments with globular verrucose apex; anthers minutely apiculate, 0.6–1 mm long. Ovary pubescent; stigma and pubescent style a subglobular mass c. 0.6 mm high. $n = 8$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Karri Boronia*. Fig. 23A–C.

Occurs in far SW W.A. from Margaret R. E to Mt Manypeaks. Often growing in damp Karri forest. Flowers July–Dec.; fruits Oct.–Dec.

W.A.: Mt Manypeaks, 4 Oct. 1994, *S.Barrett* (PERTH); 6 miles [10 km] S of Northcliffe, *A.S.George* 2652 (PERTH); Mt Lindesay, *B.G.Hammersley* 306 (PERTH); Yelverton Forest, *G.J.Keighery* 10864 (PERTH).



14. *Boronia octandra* Paul G.Wilson, *Nuytsia* 1: 199 (1971)

T: 28 km W of Ravensthorpe, W.A., 14 Aug. 1969, *P.G.Wilson* 7108; holo: MEL.

Rounded shrub to 30 cm high. Branchlets puberulous in opposite lines. Leaves subsessile, 3 (5)-foliolate, glabrous; leaflets subterete, c. 5 mm long, obtuse, fleshy. Flowers axillary, solitary, pendulous; pedicel c. 2 mm long, shortly turbinate at apex. Sepals ovate, c. 3 mm long, acute, with very few hairs. Petals c. 8 mm long, with very few hairs, pale green to reddish brown. Disc puberulous to glabrous, divided into antipetalous masses. Stamens: filaments minutely pilose; antisepalous filaments with large apical abaxial verrucose swelling; anthers c. 0.8 mm long. Ovary not exceeding disc, densely pubescent; stigma sessile, hemispherical, c. 0.6 mm wide with 4 rounded lobes. Plate 32.

Occurs in SW W.A. from Gnowangerup E to Ravensthorpe; growing in loam. Flowers June–Oct.; fruits Aug.–Oct.

W.A.: 2 km W of Gnowangerup, *E.J.Croxford* 4799 (PERTH); 3 miles [5 km] S of Ravensthorpe, *K.Newbey* 2751 (PERTH); North Tarin Rock Reserve, *B.G.Muir* 389 (PERTH).

This species is very similar to *B. crassifolia* but may be readily distinguished by the compressed-terete leaves, the prominent bracteoles that subtend the calyx, and the acute sepals.



15. *Boronia crassifolia* Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 169 (1845)

T: Interior of SW W.A., Oct. 1840, *L.Preiss 2033*; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 123 (1998); isolecto: MEL.

B. humilis Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 160 (1852). T: W.A., *J.Drummond 5th colln 199*; iso: TCD.

B. multicaulis Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 161 (1852). T: W.A., *J.Drummond s.n.*; holo: KW (photo seen).

Rounded shrub to 30 cm high. Branches puberulous all over or in lines. Leaves subsessile, 3–7-foliolate, 1–1.5 cm long, coriaceous, glabrous or sparsely puberulous; leaflets linear-spathulate, 5–10 mm long, flat or convex. Flowers axillary, solitary, pendulous, frequently on older wood; pedicel 3–5 mm long, thickened above. Sepals suborbicular, c. 2.5 mm long, sparsely puberulous or glabrous, dark red. Petals 4 mm long, sparsely puberulous, cream to reddish brown. Disc entire, puberulous. Stamens: filaments terete, puberulous; antisepalous filaments with spherical, verrucose apex and anthers 0.2–0.6 mm long; antipetalous filaments slightly verrucose and with anthers 1–2 mm long. Ovary puberulous; stigma sessile, cushion-shaped and quadrangular, 1–1.5 mm wide. $n = 9, 18$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). Fig. 24G–M.

Disjunctly distributed in southern W.A.; recorded from near Mt Lesueur, and from E of Perth to the Stirling Ra., and towards the S coast as far E as Twilight Cove on the Great Australian Bight. Growing on sand or on sandy loam. Flowers Aug.–Dec.

W.A.: 4 km W of Tincurrin, *E.J.Croxford 5368* (PERTH); 1.5 km W of Mt Lesueur, *E.A.Griffin 2099* (PERTH); 4 km N of Eyre, *G.J.Keighery 7538* (PERTH); Hamersley R. crossing, *K.Newbey 2473* (PERTH).

A variable species. The type of *B. multicaulis* is representative of a variant that has the antisepalous anthers nearly equal to the antipetalous ones, whereas the type of *B. crassifolia* is representative of a variant that has minute antisepalous anthers (viz. much smaller than the antipetalous ones) that are probably sterile.

For characters that distinguish *B. crassifolia* from *B. octandra* see under that species.

**16. *Boronia tetrandra* Labill., *Nov. Holl. Pl. Sp.* 1: 98, t. 125 (1805)**

T: “Terra Van Leuwin” (probably Esperance area) [W.A.], 1791, *J.J.H.de Labillardière; n.v.*

B. psoraleoides DC., *Prodr.* 1: 721 (1824). T: “In novae-Hollandiae ora meridionali” [S coast of Australia] *coll. unknown*; holo: G-DC (photo seen).

B. bicolor Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 163 (1852); *B. tetrandra* var. *bicolor* (Turcz.) Ewart, *Victorian Naturalist* 23: 44 (1906). T: W.A., *J.Drummond 5th colln 200*; holo: KW (photo seen); iso: PERTH, TCD.

Shrub to 1 m high. Branchlets pilose. Leaves shortly petiolate, 3–11-foliolate, 1–2.5 cm long, glabrous to sparsely hirsute; leaflets narrowly spathulate, 5–8 mm long. Flowers axillary, solitary, sometimes pendulous; pedicel 1–2 mm long. Sepals ovate, 2–3 mm long, acute, glabrous or hirsute. Petals suborbicular, c. 6 mm long, glabrous or minutely puberulous, pale greenish yellow or dull red. Disc with antisepalous lobes. Stamens: filaments sparsely pilose, not swollen; antisepalous filaments c. 2 mm long with minute terminal vestigial anthers; antipetalous filaments c. 1 mm long with narrow cordate anthers c. 1.5 mm long. Stigma massive, sessile, spherical to obovoid, smooth, glabrous, of 4 fleshy vertical wings. *Yellow Boronia*. Fig. 24A–F.

Occurs near the S coast of W.A. from Albany E to Israelite Bay. Growing in sand or on hills in decomposed granite. Flowers May–Sept.; fruits Sept.



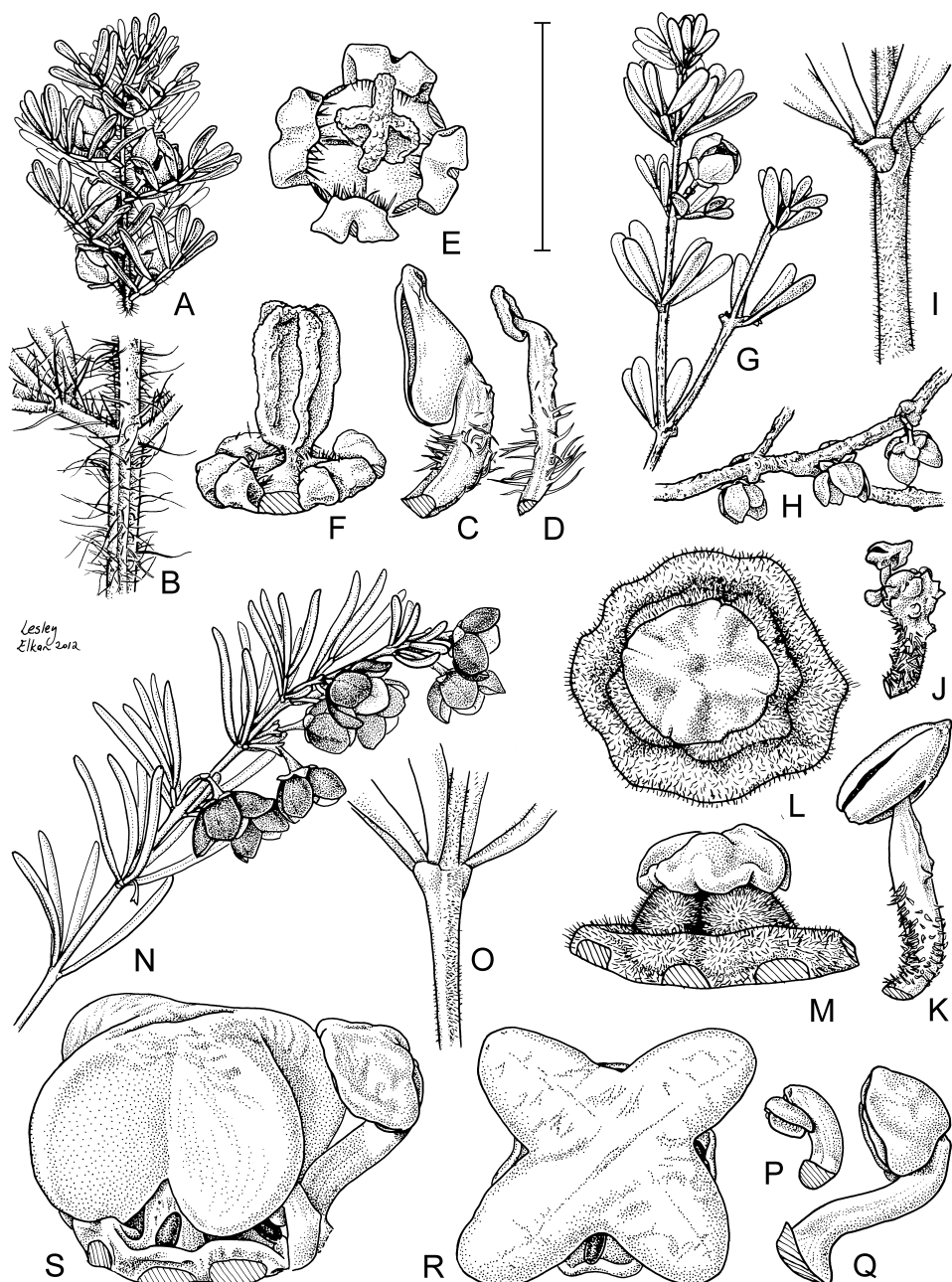


Figure 24. *Boronia*. A–F, *B. tetrandra*. A, habit; B, stem detail; C, antipetalous stamen; D, antisepalous stamen; E, disc, ovary & stigma from above; F, disc, ovary & stigma, lateral view (A–F, A.C.Beaglehole 12977, NSW). G–M, *B. crassifolia*. G, leafy habit; H, flowers on older wood; I, stem detail; J, antisepalous stamen; K, antipetalous stamen; L, disc, ovary & stigma from above; M, disc, ovary & stigma, lateral view (G–M, J.R.Wrigley, 1 Nov. 1968, NSW). N–S, *B. megastigma*. N, habit; O, stem detail; P, antisepalous stamen; Q, antipetalous stamen; R, disc, ovary & stigma from above; S, disc, ovary & stigma, lateral view, with 1 visible stamen (N–S, E.Kalmborg, 3 Sept. 1938, NSW). Scale bar: A, G, H, N = 25 mm; B, I, O = 5 mm; C–F, J–M, P–S = 2 mm. Drawn by L.Elkan.

W.A.: Hamersley R. estuary, *M.Crisp* 5040 (PERTH); Beaufort Inlet, *E.J.Croxford* 5074 (PERTH); W of Israelite Bay, *A.S.George* 16008 (PERTH); Bald Head, Albany, *G.J.Keighery* 8279 (PERTH).

The sepals are glabrous over most of the range but near Esperance and in the Recherche Archipelago they are hirsute.

17. *Boronia purdieana* Diels, *Bot. Jahrb. Syst.* 35: 318 f. 38 b, c (1904)

T: Near Bullsbrook, W.A., July, *L.Diels* 3564; *n.v.*

Shrub 0.3–1.5 m high. Branchlets pilose. Leaves subsessile, (3) 5–9-foliolate, 1–2 cm long, sparsely pilose to glabrous; leaflets thick, linear to narrowly oblong-cuneate, 5–8 mm long. Flowers solitary, axillary, pendulous to erect forming leafy panicles; pedicel slender, 3–5 mm long. Sepals ovate, 2–3 mm long, obtuse to acuminate, glabrous. Petals broadly obovate, 5–8 mm long, rounded at apex, glabrous, yellow (rarely red in subsp. *calcicola*). Disc undulate, puberulous or glabrous. Stamens: filaments 0.5–1 mm long; antisealous filaments verrucose, with vestigial anthers; antipetalous filaments smooth, with anthers 0.4 or 0.8 mm long, reddish brown. Ovary puberulous or glabrous, sunken into disc; stigma sessile, cushion-shaped, 1–2 mm diam., cross-shaped with 4 broad truncate or obcordate lobes. *n* = 9, *F.Shan et al.*, *Bot. J. Linn. Soc.* 142: 312 (2003). *Winter Boronia*.

Occurs in disjunct locations in southern W.A. from near Perth N to Shark Bay and also near Leonora. There are 2 subspecies.

Antipetalous anthers ±square (abaxial surface), not curved inwards, c. 0.45 mm long

17a. subsp. *purdieana*

Antipetalous anthers oblong (abaxial surface), curved inward and broadened at base, c. 0.8 mm long

17b. subsp. *calcicola*

17a. *Boronia purdieana* Diels subsp. *purdieana*

Illustration: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 483, fig. 190 (1987), as *B. purdieana*.

Petals yellow. Antipetalous anthers with abaxial surface ±square, c. 0.45 mm long. *n* = 9, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs in widely scattered localities; near Busselton, and from Gnangara (c. 20 km N of Perth) N to Coorow, where growing on sandy seasonally waterlogged soil in *Banksia* woodland, and also near Leonora where growing on a shale and diorite hillside. Flowers June–Oct.

W.A.: Coorow road, *R.Cranfield & D.Kabay* 8964 (PERTH); Gnangarra, *C.A.Gardner* 13112 (PERTH); Busselton, Oct. 1901, *Miss Lambert* (PERTH); Sturt Meadow Stn, July 1987, *D.Wilcox* (PERTH).



17b. *Boronia purdieana* subsp. *calcicola* Paul G.Wilson, *Nuytsia* 12: 128 (1998)

T: Between Pot Alley and Bluff Point, near Kalbarri, W.A., 1 Aug. 1972, *C.Cockman*; holo: PERTH, iso: K.

Petals yellow, rarely red. Antipetalous anthers with abaxial surface oblong, curved inward and broadened at base, c. 0.8 mm long.

Found from Kalbarri Natl Park N to Shark Bay, W.A. Growing in heath and scrub in sand over limestone. Flowers May–Aug.; fruits Aug.

W.A.: coast road S of Red Bluff, *A.M.Ashby* 1827 (PERTH); Murchison House Stn, *B. & B.Backhouse* WO 174 (PERTH); 16 miles [c. 24 km] SSE of Tamala HS, *A.S.George* 9583 (PERTH); Kalbarri, *R.C.Wemm* 1800 (PERTH).



18. *Boronia molloyae* J.Drumm. in W.J.Hooker, *London J. Bot.* 2: 169, 170 (1843), as *B. Molloyi*

T: Between the Vasse R. and Augusta, W.A., *J.Drummond*; syn: MEL.

B. elatior Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 170 (1845). T: Darling Ra., Perth, W.A., Sept. 1841, *L.Preiss 2013*; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 140 (1998); isolecto: MEL.

B. semifertilis F.Muell., *Fragm.* 2: 98 (1860). T: Franklin R., W.A., *G.Maxwell*; syn: MEL.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 873 (2002).

Shrub to 3 m high. Branchlets pilose. Leaves shortly petiolate, 3–7 (–19)-foliolate, pilose to glabrous; leaflets very narrowly elliptic, 1–5 cm long. Flowers axillary, solitary; pedicel slender with turbinate apex, 4–11 mm long. Sepals suborbicular, c. 3 mm long, obtuse with apiculum, ciliate, papery. Petals broadly elliptic, c. 8 mm long, minutely puberulous adaxially, deep rose pink. Disc narrow, entire. Stamens: filaments ±terete, c. 1 mm long, shortly pilose on adaxial side; antisepalous anthers sterile, acutely triangular-cordate, 1.5–2 mm long, black; antipetalous anthers fertile, c. 0.5 mm long. Ovary puberulous; stigma sessile, fleshy, pyramidal, c. 3 mm high. *n* = 8, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Tall Boronia*.

Occurs in SW W.A. from Gingin S to Albany. Generally found growing along streams. Flowers Sept.–Dec.; fruits Nov.–Dec.

W.A.: near source of Gingin Brook, *A.S.George 11150* (PERTH); Millbrook, *B.T.Goadby 167* (PERTH); near Collie, *A.L.Fairall 764* (PERTH); Byford, *G.E.Storr 297* (PERTH).



19. *Boronia megastigma* Nees ex Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 2: 227 (1848)

T: Interior of SW Australia, W.A., Oct. 1840, *L.Preiss 1232*; iso: LD.

B. tristis Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 162 (1852). T: W.A., *J.Drummond 5th colln 201*; holo: KW (photo seen); iso: MEL.

B. megastigma var. *aurea* hort., *J. Roy. Hort. Soc.* 28: 56, f. 52 (1903). T: cult.; *n.v.*

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 873 (2002).

Shrub to 2 m high. Branches slender, minutely puberulous. Leaves sessile, 3–5-foliate, glabrous or sparsely puberulous; leaflets linear, thick, 1–2 cm long. Flowers axillary, solitary, somewhat pendulous, forming floriferous branches; pedicel c. 1 cm long. Sepals very broadly ovate, 2 mm long, glabrous. Petals orbicular, 6–7 mm long, minutely puberulous or glabrous; abaxial surface dark brown to purple-black, rarely yellow; adaxial surface yellow. Disc narrow, glabrous. Stamens: filaments terete, glabrous; antisepalous anthers sterile, suborbicular, c. 1 mm long, dark purple; antipetalous anthers fertile, suborbicular, c. 0.5 mm long, pale yellow. Ovary ±glabrous; stigma sessile, massive, depressed-spherical, obtusely 4-lobed, glabrous, dark purple to black. *n* = 7, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Sweet-scented Boronia*. Fig. 24N–S.

Occurs in SW W.A. from Harvey S to Cape Riche. Grows in winter swamp-lands, mainly in the Karri forests and the southern limits of the Jarrah forests. Flowers July–Dec.; fruits Oct.–Dec. (Apr.).

W.A.: Cape Riche, *G.J.Keighery 1585* (PERTH); Albany, *S.Muldownie 63* (PERTH); Manjimup, *R.D.Royce 3131* (PERTH); near Collie, *E.M.Scrymgeour 2016* (PERTH).

The flowers are sweet orange-scented and are used in the perfume industry. A yellow-flowered variant occurs sporadically among plants with the normal colour.



20. *Boronia albiflora* R.Br. ex Benth., *Fl. Austral.* 1: 317 (1863)

T: Bay 1 [Lucky Bay, W.A.], [Jan. 1802], *R. Brown, iter Austral.* 5296, lecto: K, *fide* P.G. Wilson, *Nuytsia* 12: 123 (1998); isolecto: MEL.

Shrub to 50 cm high. Branchlets pilose in lines or all over. Leaves crowded; petiole 0.5–1 mm long; lamina 5–7 (–11)-foliolate, to 2 cm long, pilose or glabrous; leaflets thick, linear-spathulate, slightly falcate, 5–7 mm long, entire, recurved. Flowers axillary, solitary, shortly pedicellate. Sepals ovate to narrowly triangular, 1–2 mm long, glabrous or puberulous. Petals 5–8 mm long, sparsely puberulous, pink. Disc glabrous. Stamens: filaments terete, c. 2 mm long, sparsely verrucose, hirsutely ciliate; antisepalous filaments and often the antipetalous ones also swollen at apex; anthers 0.2–0.6 mm long, shortly apiculate. Ovary densely pubescent; style cylindrical, to 1 mm long, sparsely pilose, stigma minute. Fig. 25E–J.

Occurs in SW W.A. from the Stirling Ra. eastwards near the S coast to Mt Ragged. Usually found in well-drained situations such as granite outcrops and on sand. Flowers Aug.–Dec. (May); fruits Oct.–Dec.

W.A.: Thistle Cove, *D.B. Foreman* 1289 (PERTH); E of Mt Barren, *C.A. Gardner* 13664 (PERTH); Red Gum Spring, Stirling Ra., *W. Rogerson* 48 (PERTH); Lucky Bay, *E.M. Scrymgeour* 889 (PERTH).

There is considerable variation in the degree of hairiness of the branchlets and leaves, in the relative sizes of the antisepalous and antipetalous anthers, and in the size of the swelling on the antipetalous filaments.

**21. *Boronia heterophylla* F.Muell., *Fragm.* 2: 98 (1860)**

T: Kalgee [Kalgan], W.A., *G. Maxwell*; holo: MEL.

B. pteropoda Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 36/1: 595 (1863). T: W.A., 1852, *J. Gilbert* 326; holo: KW (photo seen).

B. heterophylla var. *brevipes* Hook.f., *Bot. Mag.* 111: t. 6845 (1885). T: Cult.; seeds from W.A., 1881, *M. North*; n.v.

Illustration: J.R. Wheeler *et al.*, *Fl. South West* 2: 872 (2002).

Glabrous shrub to 2 m high. Branches slender. Leaves usually trifoliate, rarely simple or pinnate; petiole 1–2 cm long; leaflets linear, 2–3 cm long. Flowers axillary, solitary, ±pendulous; pedicel c. 1 cm long, slender, turbinate above. Sepals suborbicular, 2–3 mm long, apiculate, coriaceous. Petals suborbicular, c. 8 mm long, puberulous on adaxial surface, deep pink to red. Disc flat, glabrous. Stamens: filaments glabrous; antisepalous anthers large, c. 1.2 mm long, black, sterile; antipetalous anthers small, c. 0.5 mm long, fertile. Ovary pilose; stigma sessile, thick, massive, cylindrical, c. 2 mm long, sparsely pilose at base, black. *n* = 7, *F. Shan et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Red Boronia*.

Found in SW W.A. between Busselton and Albany, generally growing near streams. Flowers Sept.–Nov.; fruits Nov.

W.A.: Frankland R., *C.A. Gardner* 13006 (PERTH); 10 miles [16 km] N of Albany, *K. Newbey* 2451 (PERTH); Chapman Hill, S of Busselton, *R.D. Royce* 4891 (PERTH).

This species is recorded as hybridising with *B. crassipes* in the Albany area.

**22. *Boronia crassipes* Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 168 (1845)**

T: Near Mt Wuljenup [Willyung Hill], W.A., 14 Oct. 1840, *L. Preiss* 2040; lecto: LD, *fide* P.G. Wilson, *Nuytsia* 12: 123 (1998); isolecto: K (photo seen), MEL.

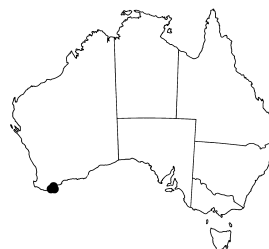
Glabrous shrub to 2 m high; branches slender. Leaves sessile, simple, linear to narrowly elliptic, 10–15 mm long, acute, minutely crenulate. Flowers axillary, solitary; pedicel

clavate, c. 6 mm long. Sepals narrowly triangular, 2–3 mm long, acuminate, glabrous, red. Petals elliptic, c. 7 mm long, subterminally apiculate, glabrous, pale red or pale mauve. Stamens: filaments terete, c. 2.5 mm long, sparsely ciliate, glandular-verrucose towards apex; anthers minutely apiculate. Ovary glabrous; style cylindrical, c. 1 mm long, sparsely pilose; stigma rounded, continuous with style. Fig. 25A–D.

Occurs near Albany on the S coast of W.A.; growing in peaty heath. Flowers July–Jan.; fruits Jan.

W.A.: 10 miles [16 km] N of Albany, *K.Newbey* 2449 (PERTH); 5 km W of Albany, *C.J.Robinson* 1129 (PERTH).

This species is known occasionally to hybridise with *B. heterophylla*.



23. *Boronia clavata* Paul G.Wilson, *Nuytsia* 1: 199 (1971)

T: Bremer R., W.A., 15 Sept. 1969, *K.Newbey* 2876; holo: PERTH.

Erect shrub c. 1.5 m high. Branchlets puberulous. Leaves subsessile, 3–7-foliolate, glabrous; leaflets linear to linear-cuneate, 10–20 mm long, obtuse. Flowers axillary, solitary, erect; pedicel narrowly turbinate, c. 3 mm long, puberulous. Sepals broadly ovate, c. 3 mm long, fleshy in centre, glabrous or puberulous. Petals broadly elliptic, c. 8 mm long, glabrous, pale yellow-green. Disc shortly columnar, glabrous. Stamens: filaments hirsute near base; anti-sepalous anthers c. 0.5 mm long, swollen at apex; antipetalous anthers c. 1 mm long, swollen at apex. Ovary sparsely hirsute; style and stigma together c. 4 mm long, massive, clavate. *n* = 7, F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). Fig. 25K–N.

Found near the S coast of W.A. along the Bremer and Gairdner Rivers. Grows in alluvial sand on the flood flats of the rivers. Flowers Aug.–Oct.; fruits Oct.–Nov.

W.A.: Gairdner R., *K.Newbey* 2883 (PERTH); Bremer R., *C.J.Robinson* 1151 (PERTH).



24. *Boronia pinnata* Sm., *Tracts Nat. Hist.* 290, t. 4 (1798)

T: Port Jackson, N.S.W., 1795, *White s.n.*; lecto: LINN *n.v.* (photo MEL), *vide* M.F.Duretto, *Muelleria* 17: 63 (2003); isolecto: LIV *n.v.* (photo CANB).

B. pinnata var. *alba* Guilfoyle, *Austral. Pl.* 77 (1911). T: North Shore, N.S.W., *Anon.*; possible syn: MEL, *vide* M.F.Duretto, *loc. cit.*

B. pinnata var. *typica* Domin, *Biblioth. Bot.* 21: 283 (1926), *nom. illeg.* (type var.)

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274 (2002); R.Spencer, *Hort. Fl. SE Australia* 4: 10 (2002).

Erect, woody shrub to 1.6 m tall, glabrous apart from flowers. Branchlets not obviously glandular; decurrent leaf bases indistinct. Leaves 1–13-foliolate, 18–60 mm long, 14–54 mm wide; petiole and rachis segments 3–17 mm long; leaflets narrowly elliptic or narrowly oblong, 5–29 mm long, 1–3 (–7) mm wide, entire, concolorous. Inflorescence usually axillary, 3–40-flowered; peduncles 5–20 mm long; pedicels 6–30 mm long. Sepals deltate, 1–1.5 mm long, glabrous or with few hairs. Petals 5–11.5 mm long, ciliate or abaxial surface pubescent along margins, pink. Stamens: filaments densely pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous; style glabrous, rarely pilose; stigma minute. *n* = 11, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 312 (2003).

Occurs in near-coastal areas from Ballina, N.S.W., S to Jervis Bay, A.C.T. Found in dry sclerophyll forest and heath on sandstone. Flowers and fruits mainly Sept.–Jan.



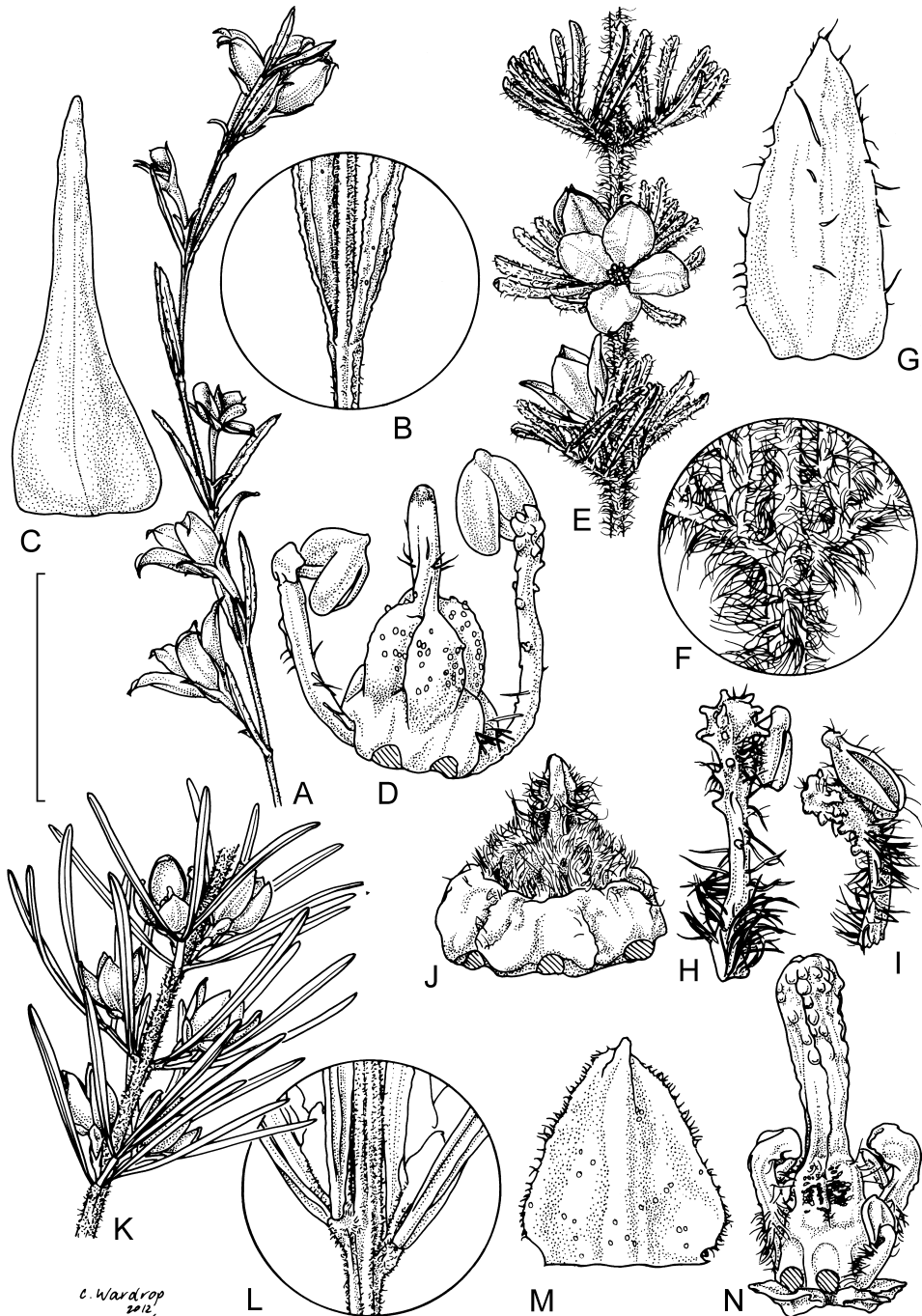


Figure 25. *Boronia*. A–D, *B. crassipes*. A, habit; B, stem detail; C, sepal; D, carpel, disc, antisepalous & antipetalous stamens (6 stamens removed) (A–D, J.W.Wrigley, 12 Oct. 1968, NSW). E–J, *B. albiflora*. E, habit; F, stem detail; G, sepal; H, antisepalous stamen; I, antipetalous stamen; J, carpel & disc (E–J, J.S.Beard 7705, NSW). K–N, *B. clavata*. K, habit; L, stem detail; M, sepal; N, carpel, disc, 2 antisepalous stamens & 1 antipetalous stamen (K–N, K.Newbey 2876, NSW). Scale bar: A, E, K = 2 cm; B, F, M = 5 mm; C, D, G–J, L = 2 mm; N = 4 mm. Drawn by C.Wardrop.

N.S.W.: 1.2 miles (1.9 km) NW of Hat Head, 30 miles (20.9 km) E of Kempsey, *R.Coveny 4956* (CANB, NSW); W of Mt White at Greenmans Valley and Neverfail Rd jctn, *R.Coveny 11212* (CANB, NSW); c. 2 km from Wardell on road to Alstonville, just S of Ballina, *T.A.Halliday 514* (AD, BRI, HO); 21 km from Tomerong on Turpentine Rd, *F.W.Howe 70* (CANB, MEL, NSW). A.C.T.: Jervis Bay, Australian Botanical Gardens annex, near gate, *F.W.Howe 51* (AD, CANB, NSW, PERTH).

A common species that can be distinguished from *B. thujona* by the smooth leaf margins and the indistinct decurrent leaf bases, from *B. muelleri* and *B. imlayensis* by the glabrous stems that are not obviously glandular, from *B. saffrolifera* by the glabrous stems, and from *B. floribunda* by the minute stigma and obvious style.

25. *Boronia thujona* Penf. & Welch, *J. Proc. Roy. Soc. New South Wales* 5: 200 (1922)

T: Narrabeen, N.S.W., *A.R.Penfolds*; syn: *n.v.*; Middle Harbour, N.S.W., *s. coll.*; syn: *n.v.*; Bundanoon N.S.W., *C.F.Laseron*; syn: *n.v.*; Wardell, N.S.W., *W.Bauerlen*; syn: *n.v.*

Illustrations: W.R.Elliott & D.L.Jones, *Encycl. Austral. Pl.* 2nd edn, 351 (1985); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 275 (2002).

Erect, woody shrub or small tree to 4 m tall, glabrous apart from flowers. Branchlets not obviously glandular; decurrent leaf bases distinct. Leaves 3–15-foliolate, 30–80 mm long, 23–70 mm wide; petiole 10–15 mm long; rachis segments 4–8 mm long; leaflets narrowly elliptic to narrowly oblong, 5–35 mm long, 1–7 mm wide, finely glandular-crenate on margins, discolorous. Inflorescence axillary, 1–15-flowered; peduncle 8–30 mm long; pedicels 5–8 mm long. Sepals deltate, 0.75–1.5 mm long, glabrous or ciliate. Petals 5–10 mm long, pubescent along margins on abaxial surface, pink. Stamens: filaments pilose, glandular towards apex; anthers not apiculate. Ovary glabrous; style glabrous or pilose; stigma minute. *n* = 11, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). Fig. 26D–F.

Occurs from the Sydney region to the Budawang Ra., N.S.W. Found in shady situations in wet and dry sclerophyll forest on sandstone. Flowers July–Nov.; fruits Oct.–Dec.

N.S.W.: Warumbul Rd, Royal Natl Park, *R.Coveny 4632* (CANB); Katandra Sanctuary, Mona Vale, *R.Coveny 9695* (NSW); Budderoo Natl Park, 1.15 km at 100 deg. from Budderoo Geodetic Station, *I.Crawford 936* (CBG, MEL, NSW); Little Forest Plateau, 10 km NW of Milton, *I.R.Telford 3813* (CANB, NSW); S ridge of Pigeon House Mtn, 19 km W of Ulladulla, *I.R.Telford 4131* (CANB, NSW).



Distinguished from *B. pinnata* and *B. muelleri* by having distinctly decurrent leaf bases and leaflets with finely serrate margins.

26. *Boronia muelleri* (Benth.) Cheel, *J. Proc. Roy. Soc. New South Wales* 58: 147 (1924)

B. pinnata var. *muelleri* Benth., *Fl. Austral.* 1: 319 (1863). T: Sources of the Bunyip R., Vic., *F.Mueller s.n.*; lecto: MEL; *fide* M.F.Duretto, *Muelleria* 17: 67 (2003); isolecto: MEL (4 sheets).

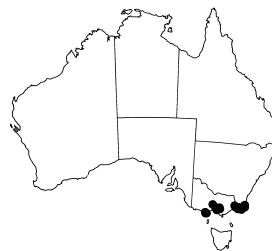
Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29b; after p. 532, pl. 5b (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 275 (2002); R.Spencer, *Hort. Fl. SE Australia* 4: 10 (2002).

Erect, woody shrub or small tree to 7 m tall. Branchlets glandular-verrucose, glabrous or sparsely puberulous only between decurrent leaf bases. Leaves 7–17-foliolate, 45–70 mm long, 20–45 mm wide, glabrous; petiole and rachis segments 4–12 mm long; leaflets narrowly elliptic or oblong, 4–25 mm long, 1–4.5 mm wide, finely serrate, discolorous. Inflorescence axillary, 1–15-flowered; peduncle 4–15 mm long; pedicels 5–15 mm long. Sepals ovate-deltate, 1.5–2 mm long, glabrous. Petals 4.5–7.5 mm long, glabrous or ciliate, white or pink. Stamens: filaments pilose, slightly glandular-verrucose towards apex; anthers not apiculate. Ovary and style glabrous; stigma minute. *n* = 11, H.M.Stace & J.A.Armstrong, *Austral. Syst. Bot.* 5: 502 (1992); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Forest Boronia*, *Pink Boronia*.

Occurs in SE Australia, from Eden, N.S.W., through Vic. to Gisbourne and the Otway Ra. Usually found on moist sandy soil in *Eucalyptus* or *Banksia* forest or woodland, or heath.

Boronia muelleri has sporadically become naturalised in the greater Melbourne area (e.g. Cranbourne South). Flowers and fruits mainly Oct.–Feb.

N.S.W.: Duckhole Rd, c. 0.5 km S of its intersection with the final 5 km track to Saltwater Ck camping ground, *D.E.Albrecht* 774 (CANB, MEL). Vic.: 4 miles [c. 6.4 km] S of Lavers Hill on road to Glen Aire, c. 10 miles [c. 16 km] NW of Cape Otway, *B.G.Briggs* 2962 (MEL, NSW); Upper part of Rysons Ck, N of Labertouche, *D.J.McGillivray* 3204 (MEL, NSW); Croajingalong Natl Park, Karbeethong Rd, 5 km NW of Mallacoota on Mallacoota-Genoa road, 1 km E of turn-off, *J.Ross* 3509 (AD, BRI, CANB, HO, MEL, NSW); Pyrite SF, Hobbs Rd c. 1.2 km from junction with Melton-Gisbourne road, *V.Stajsic* 2864 (AD, HO, CANB, MEL, NSW).



A common species that can be distinguished from *B. pinnata* by the glandular stems, and from *B. imlayensis* by the glabrous or sparsely puberulous branches and larger leaves.

27. *Boronia imlayensis* Duretto, *Muelleria* 17: 69 (2003)

T: Mt Imlay, N.S.W., 2 Nov. 1995, *M.F.Duretto* 715; holo: MEL; iso: AD, BRI, CANB, HO, K, MEL, NSW.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 275 (2002); *M.F.Duretto, op. cit.* 59, fig. 6 F–G.

Erect, woody shrub to 1 m tall. Branchlets glandular-verrucose, puberulous; decurrent leaf bases present. Leaves 7–13-foliolate, 16–29 mm long, 13–30 mm wide, puberulous proximally; petiole 4–8 mm long; rachis segments 2–5.5 mm long; leaflets elliptic to narrowly elliptic or oblong to narrowly oblong, 3.5–16 mm long, 1–4 mm wide, finely serrate, discolorous. Inflorescence axillary, 1–9-flowered; peduncle 2–9 mm long; pedicels 5–10 mm long. Sepals deltate, 1–1.5 mm long, ciliate or glabrous. Petals 5–7.5 mm long, ciliate, pink or white. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary and style glabrous; stigma minute. Fig. 26G–H.

Restricted to Mt Imlay, SE N.S.W. where it is found in *Eucalyptus sieberi* open forest. Flowers mainly Sept.–Nov.; fruits have been collected in Dec.

N.S.W.: Mt Imlay, *K.L.Wilson* 7873 (MEL, NSW).

A rare and vulnerable species that can be distinguished from *B. muelleri* by the smaller leaves and pubescent stems.



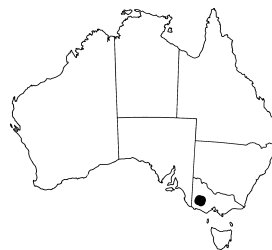
28. *Boronia latipinna* J.H.Willis, *Victorian Naturalist* 73: 192 (1957)

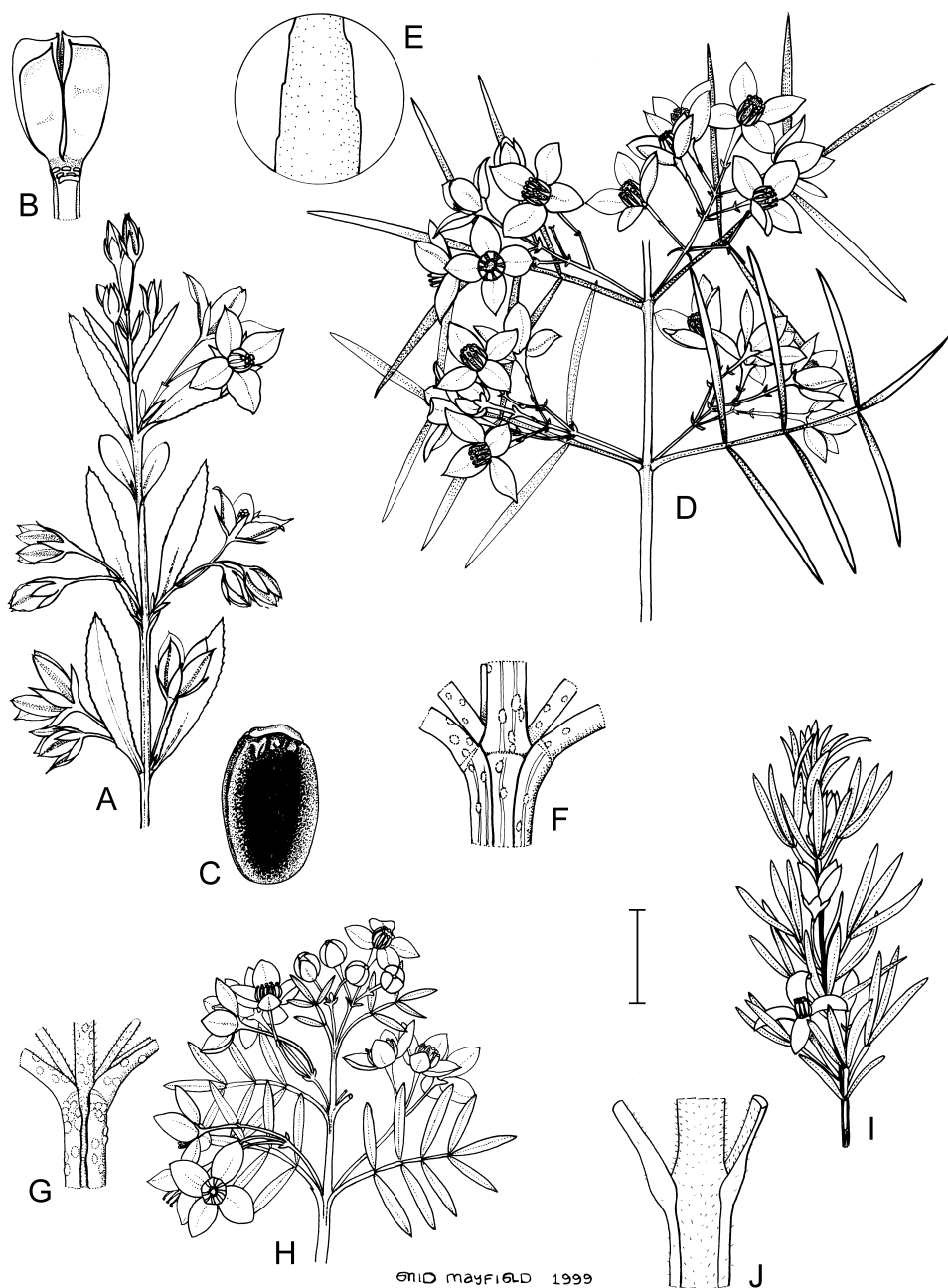
T: Grampians, Summit of Mt William, Vic., 9 Nov. 1900, *H.B.Williamson s.n.*; holo: MEL; probable iso: NSW.

Illustrations: A.J.Ewart, *Fl. Victoria* 701 (1931), as *B. pinnata*; I.R.McCann, *Grampians in Flower* 99 (1994); N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29c (1999).

Erect, woody shrub to 2.5 m tall, glabrous apart from flowers. Branchlets not obviously glandular; decurrent leaf bases faint. Leaves 1–9-foliolate, 20–55 mm long and wide; petiole 6–18 mm long; rachis segments 3–14 mm long; leaflets elliptic to slightly lanceolate or obovate, 4–32 mm long, 2–8 mm wide, entire to barely serrate, discolorous. Inflorescence axillary or terminal, 3–25+-flowered; peduncles and pedicels 5–13 mm long. Sepals ovate-deltate, 1–1.5 mm long, glabrous. Petals 6–8.5 mm long, glabrous or with few hairs on abaxial surface, pink or white. Stamens: filaments sparsely pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous; style glabrous or pilose; stigma minute. *Grampians Boronia*.

Restricted to the Grampian Ra., Vic., where it is not common. Found in forest, woodland and heath on sandstone-derived soils. Flowers Aug.–Dec.; fruits Nov.–Jan.





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Figure 26. *Boronia*. **A–C**, *B. barkeriana* subsp. *angustifolia*. **A**, habit; **B**, fruit; **C**, seed (**A**, M.F.Duretto 695, MEL; **B–C**, I.R.Telford 9608, MEL). **D–F**, *B. thujona*. **D**, habit; **E**, leaflet margin; **F**, stem (**D–F**, B.Barnsley 220, CANB). **G–H**, *B. imlayensis*. **G**, habit; **H**, stem (**G–H**, M.F.Duretto 715, MEL). **I–J**, *B. citriodora* subsp. *citriodora*. **I**, habit; **J**, stem (**I–J**, M.F.Duretto 774a, MEL). Scale bar: **A**, **D**, **G**, **I** = 10 mm; **B** = 3 mm; **C** = 1 mm; **E**, **F**, **H**, **J** = 1.5 mm. Drawn by E.Mayfield.

Vic.: track from Sundial Turntable to the Pinnacle, *P.G.Abell* 475 (MEL, NSW); Mt Rosea, *H.G.Ashby* 8071 (AD); Wallaby Rocks Rd, near lookout point at northernmost point on road, *M.G.Corrick* 6799 (MEL); Victoria Ra., along track to Mt Thackery, *M.G.Corrick* 10113 (CANB, MEL); W slope of Boronia Peak, *T.B.Muir* 820 (AD, CANB, MEL).

29. *Boronia saffrolifera* Cheel, *J. Proc. Roy. Soc. New South Wales* 58: 146 (1924)

T: Broadwater, Richmond R., N.S.W., Nov. 1916, *E.Cheel* s.n.; lecto: NSW (2 sheets), *fide* M.F.Duretto, *Muelleria* 17: 71 (2003).

B. pinnata var. *alba* F.M.Bailey, *Queensland Agric. J.* 27: 250 (Nov. 1911), *nom. illeg. non* Guilfoyle. T: "met with on the Islands of Moreton Bay by Mr. H.Tryon.", Qld; *n.v.*, *fide* M.F.Duretto, *loc. cit.*

Illustrations: B.A.Lebler, *Wildfl. SE Queensland* 1: 27 (1977); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274 (2002).

Erect, woody shrub to 2.5 m tall. Branchlets not obviously glandular, with few hairs or variably puberulous to pilose; decurrent leaf bases present. Leaves (3–) 7–19-foliolate, 12–47 mm long, 14–35 mm wide, variously pubescent; petiole and rachis segments 2–11 mm long; leaflets linear-elliptic to obovate, 2.5–18 mm long, 1–3.5 (–6) mm wide, entire or slightly crenate, discolorous. Inflorescences terminal and axillary, 1–12-flowered; peduncles 1–20 mm long; pedicels 2–4 mm long. Sepals deltate, 1–1.5 mm long, glabrous. Petals 4.5–7 mm long, white to pink; abaxial surface glabrous or minutely pubescent along margins. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous or with few hairs; style glabrous or pilose; stigma minute. *Saffrole Boronia*.

Occurs in coastal areas from Bribie Is., Qld, to Port Stephens, N.S.W. Found in swampy or poorly drained low heath, wallum and *Banksia* woodland on siliceous sand. Flowers mainly Aug.–Oct.; fruits mainly Sept.–Oct.

Qld: between Myora and Point Lookout, North Stradbroke Is., *R.Coveny* 2031 (BRI, NSW); Toorbul Point, 2 miles [c. 3.2 km] from W end of the Bribie Is. bridge, 4 Oct. 1970, *K.Williams* s.n. (BRI, CANB, MEL). N.S.W.: 3 km S Cudgen, *A.R.Bean* 7980 (BRI, MEL); 1.7 miles [c. 2.7 km] NNW of Broomshead, *R.Coveny* 4279 (CANB, NSW); Pindimar, Port Stephens, Oct. 1989, *T.Zoete* s.n. (BRI).



A common species that can be distinguished from *B. pinnata* and *B. rivularis* by the variably pilose stems. Genetic diversity of this species is discussed by Shapcott *et al.* (*Austral. Syst. Bot.* 53: 171–183 (2005)).

30. *Boronia rivularis* C.T.White, *Proc. Roy. Soc. Queensland* 53: 206 (1942)

T: Fraser Is., Qld, May 1925, *C.T.White* 2505; holo: BRI (2 sheets).

Illustrations: B.A.Lebler, *Wildfl. SE Queensland* 1: 26 (1977); W.R.Elliott & D.L.Jones, *Encycl. Austral. Pl.* 2nd edn, 349 (1985); T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 451, fig. 69i (1983).

Erect, woody shrub to 4.5 m tall, glabrous apart from flowers. Branchlets not obviously glandular; decurrent leaf bases absent. Leaves 3–17-foliolate, 17–68 mm long, 15–64 mm wide; petiole and rachis segments 5–15 mm long; leaflets elliptic to narrowly elliptic, 2–32 mm long, 1–9.5 mm wide, entire or slightly crenate, discolorous. Inflorescences terminal and axillary, 1–9-flowered; peduncles and pedicels slender, 3–17 mm long. Sepals deltate, 0.6–0.8 (–1) mm long, glabrous or minutely ciliate. Petals 5–8 mm long, white to pink; abaxial surface glabrous. Stamens: filaments pilose, glandular-verrucose towards apex; anther apiculus minute or absent. Ovary glabrous; style glabrous or pilose; stigma minute. *Wide Bay Boronia*. Fig. 27A, B.

Restricted to Fraser Is. and the Cooloola sand mass, Qld. Found in sheltered positions in moist or swampy areas in heath, open *Banksia* or *Eucalyptus* or *Syncarpia* woodland or open forest. Flowers and fruits mainly Sept.–Dec.



Qld: Kingfisher Bay resort, W coast of Fraser Is., *A.R.Bean* 8100 (BRI, MEL, NSW); c. 16 km N of Noosa, *P.R.Sharpe* 3270 (BRI, CANB); Upper Noosa R., 39 km ENE of Gympie, *I.R.Telford* 3779 (CANB, NSW); Seary's Ck area, N end of Cooloola sandhills, *R.F.Thorne* 21333 (CANB); 1 km S from L. Woonjeel, Fraser Is., *N.G.Walsh* 1395 (MEL).

An uncommon species that can be distinguished from *B. saffrolifera* by the inflorescence being longer than the leaves and by the glabrous stems. Genetic diversity of this species is discussed by Shapcott *et al.* (*Austral. Syst. Bot.* 53: 171–183 (2005)).

31. *Boronia floribunda* Sieber ex Rchb., *Iconogr. Bot. Exot.* 1: 52, t. 71 (1825)

T: Nov. Holl., Port Jackson, N.S.W., *Sieber* 300; lecto: K *n.v.* (photos AD, MEL), *fide* M.F.Duretto, *Muelleria* 17: 74 (2003); isolecto: MEL (4 sheets); probable isolecto: MEL.

B. floribunda Sieber ex Spreng., *Syst. Veg.* 4 (1827), *nom. illeg. non* Sieber ex Rchb. T: Nov. Holl., Port Jackson, N.S.W., *Sieber* 300; syn: K *n.v.* (photos AD, MEL); isosyn: MEL (3 sheets); probable isosyn: MEL, *fide* M.F.Duretto, *loc. cit.*

Illustrations: L.Robinson, *Field Guide Nat. Pl. Sydney* 115 (1991); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 276 (2002).

Erect, woody shrub to 1 m tall, glabrous apart from stamens. Branchlets not obviously glandular; decurrent leaf bases present. Leaves 3–15-foliolate, 13–50 mm long, 6–28 mm wide; petiole and rachis segments 2–11 mm long; leaflets narrowly elliptic, narrowly oblong or narrowly obovate, 4–24 mm long, 1–4 mm wide, entire or serrate, discolorous. Inflorescence axillary, 1–9-flowered; peduncles and pedicels 3–8 mm long. Sepals deltate, 2.5–3.5 mm long. Petals 6–15 mm long, white to pink. Stamens: filaments pilose with a dense tuft of hairs on the glandular tip; anther apiculum present or absent. Ovary glabrous; style vestigial, concealed by massively swollen stigma. *n* = 11, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). *Pale Pink Boronia*. Fig. 271–K.

Confined to the area around Sydney, N.S.W., where it is found in heath and dry sclerophyll forest on sandstone. Flowers mainly Sept.–Jan.; fruits Oct.–Jan.

N.S.W.: Deers Park, Kings Tableland, Wentworth Falls, *R.Ball* 3 (NSW); Du Fours Rock, Mt Wilson, Chinamans Hat walking trail, *P.Beesley* 217 (CANB, MEL); 16.5 km along the army road towards Gaspers Mtn, *F.E.Davies* 1648 (CANB, NSW, PERTH); Cascades Track from Douglas St. E, St Ives, *L.McDougall* 124 (NSW); c. 40 km NNE of Lithgow, Green Gully, 2.5 km SSW of Glen Davis, *I.R.Telford* 5039 (CANB, NSW).



Distinguishable from other species of *Boronia* in eastern Australia by having the following combination of characters: pinnate leaves, a massively swollen stigma and a tuft of hairs at the apex of each staminal filament.

Presumed hybrids between *B. floribunda* and *B. serrulata* have been collected from Dee Why, Manly and French's Forest and are discussed by Duretto (*op. cit.*, and references therein). The horticultural variety, *Boronia* 'Aussie Rose', is apparently a natural hybrid of *B. floribunda* and *B. serrulata* (R.Spencer, *Hort. Fl. SE Australia* 4: 10 (2002)).

32. *Boronia serrulata* Sm., *Tracts Nat. Hist.* 292, t. 5 (1798)

T: Port Jackson, N.S.W., 1795, *Mr White s.n.*; lecto: LINN (photo MEL), *fide* M.F.Duretto, *Muelleria* 17: 76 (2003); isolecto: LINN (photo MEL), LIV *n.v.* (photo CANB).

B. serrulata Paxton, *Paxton's Mag. Bot.* 1: 173, & plate (1834), *nom illeg. non* Sm. T: "was raised from seed by Mr. Colville. It is a native of Port Jackson, whence it was introduced in 1816."; *n.v.*, *fide* M.F.Duretto, *loc. cit.*

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 276 (2002).

Erect, woody shrub to 1.5 m tall. Branchlets not obviously glandular, glabrous to sparsely pilose between decurrent leaf bases. Leaves crowded, appressed, sessile or subsessile, broadly obovate, 6–18 mm long, 1.5–9 mm wide, finely toothed, glabrous or sparsely ciliate, concolorous. Inflorescence terminal, 1–7-flowered; peduncles and pedicels 0–3.5 mm long. Sepals deltate, 2.5–3 mm long, minutely ciliate. Petals 6–11 mm long, pink or white; abaxial

surface glabrous. Stamens: filaments pilose with a dense tuft of hairs on the glandular tip; anthers with antrorse hairs; apiculum absent or minute. Ovary glabrous; style vestigial, concealed by massively swollen stigma. *n* = 11, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954). *Native Rose*, *Rose Boronia*. Fig. 28A, B.

Restricted to near-coastal areas around Sydney, N.S.W., where found growing in heath on sandy soils or sandstone areas. Flowers Aug.–Nov.; fruits Nov.

N.S.W.: 2 miles [c. 3.2 km] E of Kariang Trig., 13 Oct. 1960, *E.H. Constable s.n.* (NSW); Uloola track, Royal Natl Park, 24 Sept. 1966, *R. Coveny s.n.* (NSW); 8 km along dirt track off Cobar Rd, Arcadia, Marramara Natl Park, *J. McCarthy 50* (NSW); Road 10C, N of North Cliff mine, O'Hares Ck, 25 Oct. 1990, *K. Mills s.n.* (NSW).

A rare species that, with its simple, finely toothed leaves and massive stigma, is not easily confused with any other *Boronia*. Leaves of *B. serrulata* are similar to those of the fossil taxon *B. harrisii* (Ettinghausen, *Mem. Geol. Survey New South Wales, Palaeontol.* 2: 1–189 (1888)), which was described from late Eocene subbasaltic deposits from near Tenterfield (Pickett *et al.*, *Austral. J. Earth Sci.* 37: 293–30, 1990). They are also similar to the juvenile leaves of *B. microphylla*.



Presumed hybrids between *B. floribunda* and *B. serrulata* are discussed under *B. floribunda* (see also M.F. Duretto, *op. cit.*).

33. *Boronia citriodora* Gunn ex Hook.f., *Fl. Tasman.* 1: 68 (1855)

B. pinnata var. *citriodora* (Gunn ex Hook.f.) Rodway, *Tasman. Fl.* 22 (1903). T: Black Bluff 4500' high, Tas., *R. Gunn 667*, 15 Feb. 1937; lecto: K n.v. (photos AD, MEL), *fide* M.F. Duretto, *Muelleria* 17: 79 (2003); Tas., *Gunn s.n.*; probable isolecto: TCD.

B. variabilis var. γ Hook., *J. Bot.* 1: 255 (1834), *nom. inval.*

Prostrate to erect, woody shrub to 3 m tall. Branchlets puberulous, not usually glandular-verrucose; decurrent leaf bases faint. Leaves (1–) 3–9-foliate, 7–25 mm long, 7–30 mm wide, with few scattered hairs to puberulous, hairs concentrated proximally; petiole and rachis segments 1.5–6 mm long; leaflets narrowly elliptic to narrowly oblanceolate, flat to semiterete, 3–16 mm long, 0.5–4 mm wide, entire, concolorous. Inflorescences axillary and terminal, 1–7-flowered; peduncles 1–8 mm long; pedicels 1.5–15 mm long. Sepals deltate, 0.75–2.5 mm long, ciliate or abaxial surface sparsely puberulous. Petals 3.5–8.5 mm long, glabrous or abaxial surface sparsely pilose, white to pink. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous; style glabrous or with a few hairs; stigma minute. *n* = 54, F. Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Lemon Plant*, *Lemon Boronia*.

Endemic to Tas. where it is found in the SW, the Central Highlands and on Ben Lomond and Mt Barrow in the NE. Found in heath, woodland, or along rain forest borders, often on slopes and rocky ridges. There are 3 subspecies.

- | | | |
|----|--|---------------------------------|
| 1 | Sepals glabrous abaxially though minutely ciliate | |
| 2 | Leaves < 15 mm long (if to 17 mm then leaves mostly trifoliate); lateral leaflets to 10 mm long, 1–2 mm wide (to 13 × 2.5 mm at Mt Field); pedicels 1.5–4.5 mm long; sepals 0.75–1.5 mm long | 21a. subsp. <i>citriodora</i> |
| 2: | Largest leaves > 15 mm long; largest lateral leaflets > 10 mm long, 1.75–4.5 mm wide; pedicels 5–15 mm long; sepals 1.5–2.5 mm long | 22b. subsp. <i>paulwilsonii</i> |
| 1: | Sepals sparsely puberulous to puberulous abaxially (NE Tas. - Mt Barrow, Ben Lomond) | 22c. subsp. <i>orientalis</i> |

33a. *Boronia citriodora* Gunn ex Hook.f. subsp. *citriodora*

Illustrations: G.R. Cochrane *et al.*, *Fl. & Pl. Victoria & Tasmania* 123, t. 625 (1980); P. Kirkpatrick, *Alpine Tasmania*, 49, fig. 20e (1997); both as *B. citriodora*.

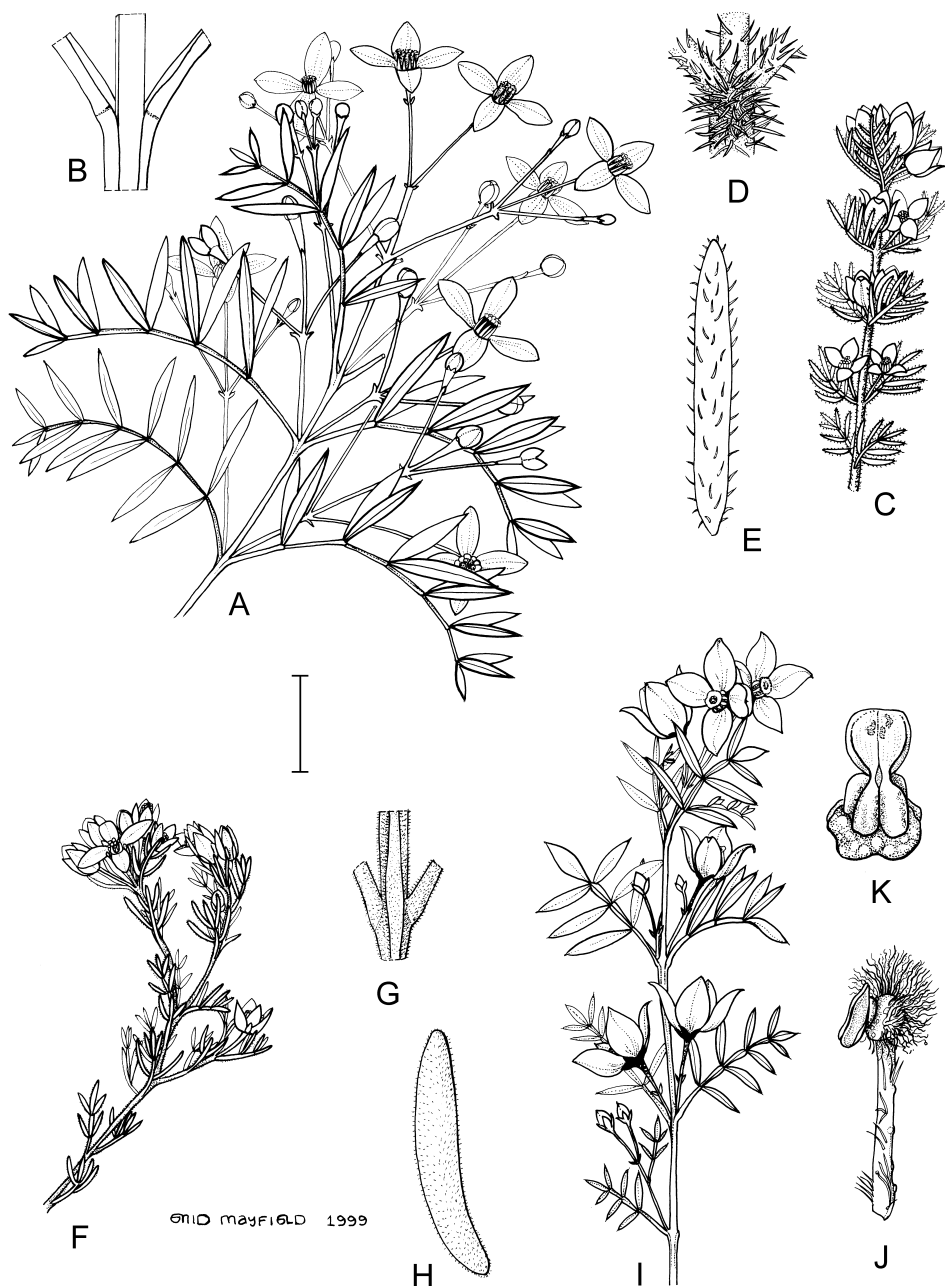


Figure 27. *Boronia*. **A–B**, *B. rivularis*. **A**, habit; **B**, stem (**A–B**, I.R.Telford 3779, CANB). **C–E**, *B. pilosa* subsp. *pilosa*. **C**, habit; **D**, stem; **E**, leaf (**C–E**, T.B.Muir 3779, CANB). **F–H**, *B. elisabethiae*. **F**, habit; **G**, stem; **H**, leaf (**F–H**, M.F.Duretto 834, MEL). **I–K**, *B. floribunda*. **I**, habit; **J**, stamen; **K**, gynoecium (**I–K**, M.F.Duretto 692, MEL). Scale bar: **A**, **C**, **F**, **I** = 10 mm; **B**, **D**, **E**, **G**, **H** = 1.5 mm; **J**, **K** = 1 mm. Drawn by E.Mayfield.

Erect to prostrate shrub to 60 cm tall. Leaves 1–7-foliolate, 7–15 (–17) mm long, 7–22 mm wide; petiole and rachis segments 1.5–4.5 mm long; leaflets 4–10 (–13) mm long, 0.5–2.5 mm wide, flat to semiterete. Inflorescence 1–3-flowered; peduncle and pedicels 1.5–5 mm long. Sepals 0.75–1.5 mm long, minutely ciliate. Petals 3.5–7 mm long. Fig. 26I, J.

Occurs in the Tas. Central Highlands above 900 m, with outlying populations found to the S and SE. Found in peaty and/or rocky soils in alpine and subalpine moors, fjeldmark, meadows, heath and woodland. Flowers Nov.–May; fruits Nov.–Apr.

Tas.: Millers Bluff, 25 km W of Campbell Town, *P. Collier* 4988 (HO); Great Western Tiers, Lake Hwy, 5.7 km N of Breona, *F.E. Davies* 979 (AD, CANB, HO, PERTH); Jubilee Ra., *A. Moscal* 9389 (HO); 500 m SE of L. Dobson, Mt Field Natl Park, *J.M.B. Smith* 234 (HO, NE); Cradle Mountain Natl Park, on Maryland Track, *J.G. West* 4851 (CANB, HO).

Populations from Mt Field, and in particular those from Wombat Moor, have leaves that are larger than the leaves found in other populations and approach the leaves of subsp. *paulwilsonii* in size.



33b. *Boronia citriodora* subsp. *paulwilsonii* Duretto, *Muelleria* 17: 81 (2003)

T: on track to Mt Elisa, Tas., 9 Jan. 1996, *M.F. Duretto* 833 & *P.G. Neish*; holo: MEL; iso: CANB, HO.

Illustration: *M.F. Duretto*, *Muelleria* 17: 59, fig. 6 H–I (2003).

Erect shrub to 3 m tall. Leaves 3–9-foliolate, 15–25 mm long, 10–30 mm wide; petiole and rachis segments 2–6 mm long; leaflets 5–17 mm long, 1.5–4 mm wide, flat. Inflorescences 1–7-flowered; peduncle 1.5–8 mm long; pedicels 5–15 mm long. Sepals 1.5–2.5 mm long, minutely ciliate. Petals 6–8.5 mm long.

Occurs in SW Tas., S from Macquarie Harbour and W from Mt Shea with isolated collections made in the NW near Sheffield and Mole Ck. Found in a variety of usually wet habitats including *Eucalyptus* woodland, along rain forest borders, tall closed or open heath, shrubland on rocky outcrops, heath dominated by rushes and sedges on slopes, ridge tops or near creeks and rivers. Flowers Nov.–May; fruits Nov.–Apr.

Tas.: Kelly Ra. adjacent to Kelly Basin, Macquarie Harbour, *S.J. Berrigan* 204 (HO); Melaleuca, Port Davey, 28 Nov. 1983, *P. Brown* s.n. (HO); Birch's River Plain, *A.M. Buchanan* 1294 (HO); 8 km S of Mt Mueller, *A. Moscal* 11435 (HO, MEL); E edge of Freney Lagoon, Cox Bight, *A.E. Orchard* 5766 (HO, MEL).

A widespread taxon that is easily distinguished from the other subspecies by its large leaves.



33c. *Boronia citriodora* subsp. *orientalis* Duretto, *Muelleria* 17: 83 (2003)

T: Mt Barrow, Tas., 27 Dec. 1959, *T.E. Burns* 244; holo: HO.

Illustration: *M.F. Duretto*, *op. cit.* 59, fig. 6 J–L.

Erect shrub to 1.2 m tall. Leaves 3–7-foliolate, 7–14 mm long, 7–22 mm wide; petiole and rachis segments 1–3 mm long; leaflets 3.5–11 mm long, 1–2 mm wide, flat to semiterete. Flowers solitary; peduncle 1–2 mm long; pedicel 2–3 mm long. Sepals 1.75–2 mm long; abaxial surface sparsely puberulous. Petals 5.5–6 mm long.

Restricted to the plateau tops of Mt Barrow and Ben Lomond, NE Tas., where found in alpine heath. Flowers Dec.–Feb.



Tas.: Mt Barrow, 2.4 km from radio station towards Launceston, *E.M.Canning* 2648 & 2654 (CANB); Mt Barrow plateau, *M.F.Duretto et al.* 2095 (HO, MEL); Mt Barrow, on switchback before plateau top, *M.F.Duretto et al.* 2107 (CANB, HO, MEL); Ben Lomond Natl Park, NW corner of plateau, *M.G.Noble* 29177 (HO).

A rare and poorly collected subspecies.

34. *Boronia citrata* N.G.Walsh in D.E.Albrecht & N.G.Walsh, *Muelleria* 8: 21 (1993)

T: 6.4 km E of Licola, Vic., 21 Oct. 1973, *A.C.Beauglehole* 43385, *E.A.Chesterfield* & *J.H.Willis*; holo: MEL; iso: CANB.

B. sp. aff. *citriodora*, *J.H.Ross*, *Census Vasc. Pl. Victoria*, 4th edn, 98, 120 (1993).

Illustrations: D.E.Albrecht & N.G.Walsh, *Muelleria* 8: 23, fig. 1a–c (1993); N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29g (1999).

Erect, woody, puberulous shrub to 1.5 m tall. Branchlets not obviously glandular; decurrent leaf bases faint or absent. Leaves 5–11-foliolate, 6–22 mm long, 6–20 mm wide; petiole and rachis segments 1–3.5 mm long; leaflets narrowly obovate, 1–10 mm long, 1–3 mm wide, entire or slightly crenate, concolorous. Inflorescences terminal and axillary, 1–5-flowered; peduncles to 5 mm long; pedicels 3–7 mm long. Sepals deltate, 1–1.5 mm long, puberulous abaxially. Petals 4–6.5 mm long, pink. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous to puberulous; style with few hairs; stigma minute. *Lemon Boronia*.

Confined to the catchment area of the Macalister R., near Licola, central Vic. Found in subalpine low open forest, mallee and heath communities on shallow soils. Flowers Apr.–Oct.; fruits Oct.

Vic.: 2.3 km due S of Mt Ronald, headwaters of Stony Ck, *D.E.Albrecht* 4967 (CANB, HO, MEL); Subalpine moors near Mt MacDonald, 21 Mar. 1973, *E.Chesterfield s.n.* (MEL); Headwaters of Stony Ck, Mt Wellington area, 15 July 1973, *E.A.Chesterfield s.n.* (MEL).

A rare and vulnerable species that can be distinguished from *B. citriodora* by the puberulous leaves and from *B. hemichiton* and *B. hippopala* by the eglandular stems and narrowly obovate leaflets.



35. *Boronia hippopala* Duretto, *Muelleria* 17: 84 (2003)

T: Near Horseshoe Marsh, St Pauls R., Tas., 13 Jan. 1996, *M.F.Duretto* 852 & *P.G.Neish*; holo: MEL; iso: HO.

Illustration: *M.F.Duretto*, *op. cit.* 85, fig. 10 A–C.

Erect, woody, puberulous shrub to 1.8 m tall. Branchlets slightly glandular-verrucose, decurrent leaf bases present. Leaves 3–7-foliolate, 6–10 mm long, 6–14 mm wide; petiole and rachis segments 1–3 mm long; leaflets linear to narrowly elliptic to narrowly obovate, 1–8 mm long, 0.75–1.75 mm wide, entire, concolorous. Inflorescence axillary, 1–3-flowered; peduncles and pedicels to 2 mm long. Sepals narrowly triangular to deltate, 1–2 mm long, puberulous abaxially. Petals 3.5–6 mm long, white to pink. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary with few hairs; style puberulous; stigma minute. Cocci puberulous.

Restricted to a few areas in NE Tas., where found in and near open *Eucalyptus* woodland or forest on stony ground. Flowers and fruits have been collected Oct.–Jan.

Tas.: W of Dukes R., *M.F.Duretto* 2033 & *A.Chuter* (HO, NSW); N flanks of Mt Puzzler, S of the Dukes R., Aug. 2003, *R.B.Shahinger* (HO); road to Lost Falls, off the 'M-Road', Nov. 2004, *H. & A.Wapstra* (HO).

A poorly collected species known from few populations over a limited area. Distinguished from *B. citriodora* and *B. pilosa* by its puberulous leaves and cocci. These characters, along with the larger sepals, distinguish it from the closely related *B. hemichiton*.



Some unusual collections that been made in the Jukes and Elizabeth Rivers areas share features with both *B. hemichiton* and *B. hippopala*.

36. *Boronia hemichiton* Duretto, *Muelleria* 17: 87 (2003)

T: Mt Arthur, Tas., 24 Dec. 1983, *A.M.Buchanan* 2135; holo: HO; iso: MEL.

Illustration: M.F.Duretto, *op. cit.* 85, fig. 10 D–F.

Woody shrub to 30 cm tall. Branchlets slightly glandular-verrucose, puberulous; decurrent leaf bases faint. Leaves 3–7-foliolate, 9–12 mm long, 12–16 mm wide, puberulous on proximal areas, with few hairs distally; petiole and rachis segments 1.5–2.5 mm long; leaflets linear to narrowly elliptic to narrowly obovate, 2–9 mm long, 0.5–1 mm wide, entire. Inflorescences axillary, 1–5-flowered; peduncles 1–2 mm long; pedicels 2–4 mm long. Sepals narrowly triangular to deltate, 0.75–1.5 mm long; abaxial surface with few hairs or sparsely puberulous. Petals 4.5–5.5 mm long, white to pink; abaxial surface puberulous. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary and style glabrous; stigma minute. Cocci glabrous or with few hairs.

Known only from the slopes of Mt Arthur, NE Tas. Found in often dense shrubland on the forest edge. Flowers and fruits Sept.–Dec.

Tas.: White Mill Rd [ESE of Lilydale], *M.F.Duretto* 1964 *et al.* (AD, HO); c. 4 km SW of Mt Arthur, *R.Schahinger* (HO).

A poorly known species that can be distinguished from the closely related *B. hippopala* by the leaves not being puberulous all over, and smaller sepals (see discussion above) and from *B. citriodora* and *B. pilosa* by the narrow leaflets and small sepals.



37. *Boronia elisabethiae* Duretto, *Muelleria* 17: 88 (2003)

T: c. 1 km along vehicle track to the expanded L. Pedder; track leaving Scotty Rd just N of Condominium Ck, Tas., 9 Jan. 1996, *M.F.Duretto* 834 & *P.G.Neish*; holo: MEL; iso: CANB, HO.

Illustration: M.F.Duretto, *op. cit.* 85, fig. 10 G–I.

Semi-erect to weakly spreading woody subshrub to 50 cm long. Branchlets not obviously glandular, puberulous; decurrent leaf bases absent. Leaves 3–9-foliolate, 5–11 (–15) mm long, 5–18 mm wide, with few hairs to puberulous; petiole and rachis segments 1–3 mm long; leaflets narrowly elliptic to linear, flat to semiterete, 2–11 mm long, 0.5–1 mm wide, entire, concolorous. Inflorescences terminal or axillary, 1–3-flowered; peduncles and pedicels 1–4 mm long. Sepals deltate, 1.5–3 mm long; abaxial surface puberulous or glabrous. Petals 3.5–6 mm long, white to pink; abaxial surface puberulous. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary and style glabrous; stigma minute. Fig. 27F–H.

Occurs in western Tas. from sea level to 960 m alt. Found in wet and dry conditions in button-grass and sedge moorland, closed or open heath, and in the mats or cushions of other plants. Flowers Nov.–Mar.; fruits Jan.–Mar.

Tas.: 2.5 km W of Granite Tor, *A.M.Buchanan* 5477 (HO); Rocky ridge top, 1/3 of way along track to Mt Elisa, *M.F.Duretto* 828 (HO, MEL); 2 km SE of Federation Peak, *A.Moscal* 2120 (HO); near Franklin R. and Cassiterite Ck, *A.Moscal* 4727 (AD, HO); Sanctuary Bay, N side of Point Hibbs, *A.Moscal* 6054 (HO).

A common species. Distinguishable from other Tas. species by its weak habit, puberulous stems, and the small leaves with very narrow leaflets. The leaves and sepals vary in indumentum density and can be variously puberulous or glabrous. The full range of variation can be present in a single population.



38. *Boronia subulifolia* Cheel, *J. Proc. Royal Soc. New South Wales* 61: 402 (1928)

T: Currockbilly Mtn, near Braidwood, N.S.W., Dec. 1915, *J.L.Boorman s.n.*; lecto: NSW, *fide* M.F.Duretto, *Muelleria* 17: 89 (2003).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274 (2002).

Erect, woody shrub to 1.2 m tall. Branchlets not obviously glandular, pilose; decurrent leaf bases present. Leaves 3–13-foliolate, 6–20 mm long, 4–26 mm wide, glabrous to moderately pilose; petiole 1–4 mm long; rachis segments 2–8 mm long; leaflets linear, flat to subterete, 2.5–15 mm long, 0.5–1 mm wide, entire, concolorous. Inflorescences terminal or axillary, 1–3-flowered; peduncles to 1 mm long; pedicels 1–4 mm long. Sepals narrowly triangular, 2.5–4 mm long; abaxial surface variably pilose and sometimes only with a few hairs. Petals 5–8 mm long, pink; abaxial surface sparsely pilose. Stamens: filaments pilose, glandular-verrucose towards apex; anther apiculum absent or minute. Ovary glabrous; style pilose; stigma minute. $n = 11$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954), as *B. pilosa* N.S.W. *Eden*.

Restricted to a small area centred on the Budawang Ra., SE N.S.W. Found in heath and dry sclerophyll woodland on rocky sandstone slopes. Flowers Sept.–Dec.; fruits Oct.–Dec.

N.S.W.: Small peak just W of Mt Currockbilly, Moreton Natl Park, *M.F.Duretto* 698 (CANB, HO, MEL); Yarraman Fire trail, near Tianjara Falls, *P.Gilmour* 5155 (CANB, NSW); near Crooked Falls, c. 4 km NW of the Castle, *P.Gilmour* 5267 (CANB, MEL); N Budawang Ra., near Camping Rock, c. 13 km SE of Nerriga, *A.Hughes* 3 (AD, CANB, MEL); Budawang Ra., access from Wogwog Station on Braidwood–Nerriga Rd, *J.M.Powell* 348 (CANB, NSW).



Though restricted in range the species is probably secure. Distinguishable from *B. pilosa* by the narrow, subterete leaflets and pilose sepals.

39. *Boronia pilosa* Labill., *Nov. Holl. Pl.* 1: 97, t. 124 (1805)

B. tetrandra var. *pilosa* (Labill.) Hook., *Hook. J. Bot. Kew Gard. Misc.* 2: 419 (1840); *B. pilosa* Labill. var. α , Hook.f., *Fl. Tasman.* 1: 67 (1855); *B. pinnata* var. *pilosa* (Labill.) F.Muell., *Nat. Pl. Victoria* 1: 69 (1879). T: Nova Hollandia, *Labillardière s.n.*; lecto: K n.v. (photos AD, MEL), *fide* M.F.Duretto, *Muelleria*, 17: 91–92 (2003); possible isolecto: MEL, TCD (photo MEL).

Erect, woody shrub to 3 m tall. Branchlets not obviously glandular, puberulous to densely pilose; leaf bases usually decurrent. Leaves 3–9-foliolate, 3–22 mm long, 4–34 mm wide, glabrous to pilose; petiole and rachis segments 0.25–4 mm long; terminal leaflets linear or narrowly obovate or narrowly elliptic, semiterete to flat, 1–17 mm long, 0.5–4 mm wide, entire, discolorous. Inflorescences terminal and/or axillary, 1–10-flowered, with few hairs or sparsely to densely pilose; peduncles and pedicels 0.5–11 mm long. Sepals narrowly triangular to deltate, 1–5 mm long; abaxial surface glabrous to pilose. Petals 3–8 mm long, white to pink; abaxial surface glabrous to pubescent. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous to puberulous; style glabrous to pilose; stigma wider than style, sometimes concealing it. *Hairy Boronia*.

A widespread species found on the Eyre Penin. and SE S.A., in widely scattered populations across southern Vic., and in northern and eastern Tasmania. There are 4 subspecies.

- 1 Leaflets with a few hairs to pilose; branches pilose, hairs > 0.3 mm long, denser between decurrent leaf bases or spread evenly around branch; sepals glabrous or ciliate or variously pilose; ovary glabrous to puberulous
- 2 Sepals 1–3.5 mm long, glabrous or with a few hairs or ciliate or sparsely pilose or rarely pilose or puberulous; widest leaflets 0.5–2 mm wide; style usually pilose (N & E Tas.)
- 2: Sepals 2.5–5 mm long, pilose; widest leaflets 2–4 mm wide; style glabrous or with few hairs (Tas. - Tasman & Forestier Penin.)

39a. subsp. *pilosa*

39b. subsp. *tasmanensis*

- 1: Leaflets glabrous or with a few hairs or rarely puberulous (and then leaves < 10 mm long); branches puberulous, hairs mostly to 0.25 mm long, denser between decurrent leaf bases; sepals glabrous or ciliate; ovary glabrous
- 3 Stigma shorter than glabrous or pilose style, style clearly visible, together > 0.5 mm long (Tas.) **39a. subsp. pilosa**
- 3: Stigma significantly larger than pilose style, style often concealed, together to 0.5 mm long (S.A.; Vic.; Tas.)
- 4 Larger leaves > 10 mm long; larger leaflets > 9 mm long, flat; petiole 1–3 mm long (S.A.; SW Vic.) **39c. subsp. torquata**
- 4: Leaves < 10 mm long; leaflets < 9 mm long, flat to semiterete; petiole to 1 mm long (Vic. - Little Desert; Tas.)
- 5 Sepals narrowly triangular, 0.5–0.75 mm wide; leaflets glabrous (Tas.) **39a. subsp. pilosa**
- 5: Sepals deltate, mostly c. 1 mm wide; leaflets glabrous to puberulous (Vic.) **39d. subsp. parvidaemonis**

39a. *Boronia pilosa* Labill. subsp. *pilosa*

B. tetrandra var. *floribunda* Hook., *Hook. J. Bot. Kew Gard. Misc.* 2: 419 (1840); *B. pilosa* var. *floribunda* (Hook.) Hook.f., *Fl. Tasman.* 1: 67 (1855). T: Hobart, Tas., 20 Nov. 1839, *R. Gunn* 665; lecto: K n.v. (photo MEL), *fide* M.F.Duretto, *Muelleria* 17: 94 (2003); isolecto: CANB, HO; possible isolecto: NSW.

B. tetrandra var. *terminiflora* Hook., *Hook. J. Bot. Kew Gard. Misc.* 2: 419 (1840). T: “Mr. Gunn (n. 790)” Tas.; n.v., *fide* M.F.Duretto, *loc. cit.*

B. tetrandra var. *laricifolia* Hook., *Hook. J. Bot. Kew Gard. Misc.* 2: 419 (1840); *B. pilosa* var. *laricifolia* (Hook.) Hook.f., *Fl. Tasman.* 1: 67 (1855). T: Circular Head, Tas. [16 Nov. 1836], *R. Gunn* 790; lecto: K n.v. (photos AD, MEL), *fide* M.F.Duretto, *loc. cit.*; isolecto: NSW.

B. pilosa subsp. 1, M.F.Duretto, *Fl. Victoria* 4: 162 (1999).

B. pilosa subsp. 1, J.H.Ross, *Census Vasc. Pl. Victoria*, 6th edn, 110, 138 (2000).

Illustrations: P.Collier, *Woodland Wildfl. Tasmania* 28 (1990), as *B. pilosa*; N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29e (1999), as *B. pilosa* subsp. 1; M.F.Duretto, *Muelleria* 17: 85, fig. 10 J–O (2003).

Shrub to 3 m tall. Branchlets puberulous to densely pilose; hairs to 1 mm long. Leaves 3–18 mm long, 4–34 mm wide, with a few hairs or sparsely to densely pilose; leaflets 1–15 mm long, 0.5–2.5 mm wide. Sepals narrowly triangular to deltate, 1–3.5 mm long; abaxial surface glabrous or with a few hairs or sparsely to densely pilose. Petals 3–7 mm long. Ovary glabrous to puberulous; style glabrous to pilose, to 0.6 mm long; stigma slightly wider than style, sometimes concealing it. Fig. 27C–E.

Occurs in the Grampian Ranges and Portland areas, the Bacchus Marsh-Daylesford area, and near Bairnsdale, Vic., and in N and E Tas. Found growing in forest, woodland and heath usually on sandstone or granite, or sandy soils from sea level (Tas.) to over 1100 m alt. (Vic. - The Grampians). Flowers Aug.–Feb.; fruits Nov.–Feb.

Vic.: Nicholson-Mt Alfred State Forest, *A.C.Beaglehole* 77284 (CANB, MEL); c. 0.5 km S of Boroka Lookout on Mt Difficult Rd, Grampians, *B.J.Conn* 3031 (CANB, MEL, NSW); Coimadai, *V.Stajsic* 309 (CANB, MEL, NSW). Tas.: mouth of Marcus R. (between Montagu and Woolnorth), *A.M.Buchanan* 8866 (HO); 2.9 km along Randall Bay Rd from Channel Hwy (0.5 km after Randall Bay), SW of Hobart, *M.F.Duretto* 735 (MEL, HO).

In this subspecies there is some striking variation in the hairiness of various organs and hair length, and in the size of the leaves, leaflets and perianth parts (for detailed discussion see M.F.Duretto, *Muelleria* 17: 96 (2003)). This variation is extreme on the Freycinet Penin., Tas., where the typical pilose, small-leaved, small-flowered plants are found near almost glabrous, large-leaved, large-flowered plants. The latter plants approach *B. rozefeldsii* in appearance.



39b. *Boronia pilosa* subsp. *tasmanensis* Durretto, *Muelleria* 17: 97 (2003)

Tas.: Cape Haüy, Tasman Penin., Tas., 17 Nov. 1979, *G.Kantvilas* 13 & *S.J.Jarman*; holo: HO; iso: AD.

Illustration: M.F.Durretto, *Muelleria* 17: 85, fig. 10 T–V (2003).

Shrub to 1.5 m tall. Branchlets pilose; hairs to 1 mm long; leaf bases not or only faintly decurrent. Leaves 3–9-foliolate, 7–22 mm long, 10–34 mm wide, glabrous to pilose; leaflets 3–17 mm long, 1–4 mm wide. Sepals narrowly triangular, 2.5–5 mm long; abaxial surface pilose. Petals 4–8 mm long. Ovary glabrous; style glabrous or with a few hairs.

Restricted to the Tasman and Forestier Peninsulas, E Tas. Found growing in dense or open, usually wet heath or bushland or woodland. Flowers Sept.–Jan.; fruits Nov.–Jan.

Tas.: Cape Haüy, Tasman Penin., *M.F.Durretto* 751 (AD, HO, MEL); Tasman Penin., track running S from Devils Kitchen, *M.F.Durretto* 753 (AD, HO, MEL); Pirates Bay, near Eaglehawk Neck, *J.H.Hemsley* 6193 (HO, NSW); Cape Haüy – Fortescue Bay track, midway, *A.E.Orchard* 5169 (AD, HO, MEL); Richardsons Rd near Blackman Rivulet, Fazackerley Ra., *A.Strappazon* AM10962 (HO).

Though restricted in distribution this taxon appears secure. Plants from more exposed areas (e.g. Cape Haüy) often have wide, nearly glabrous leaflets while plants in sheltered areas usually have narrow, pilose and/or ciliate leaflets. Populations can contain both ciliate- and nearly glabrous-leaved plants. This subspecies may intergrade with the typical subspecies.



39c. *Boronia pilosa* subsp. *torquata* Durretto, *Muelleria* 17: 98 (2003)

T: Lower Glenelg Natl Park, Nelson North Rd, 5 km N of Nelson township, Vic., 27 Sept. 1991, *N.G.Walsh* 3088; holo: MEL; iso: BRI, CANB.

B. pilosa subsp. 2, M.F.Durretto, *Fl. Victoria* 4: 162 (1999), *p.p.*

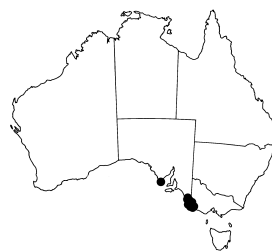
B. pilosa subsp. 2, J.H.Ross, *Census Vasc. Pl. Victoria*, 6th edn, 110, 138 (2000), *p.p.*

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29f (1999), as *B. pilosa* subsp. 2; M.F.Durretto, *Muelleria* 17: 85, fig. 10 P (2003).

Shrub to 50 cm tall. Branchlets puberulous between decurrent leaf bases; hairs to 0.25 mm long. Leaves 5–15 mm long, 10–30 mm wide, with few hairs or sparsely puberulous; leaflets 4–15 mm long, 0.5–2 mm wide. Sepals deltate, 1.25–1.75 mm long, glabrous or ciliate. Petals 3–5 mm long. Ovary glabrous; style pilose or rarely glabrous, often concealed by massive stigma.

Occurs on the Eyre Penin. and in SE S.A., and SW Vic. Found in heath and open woodland on sandy or rocky soils. Flowers July–Nov.; fruits Oct.–Nov.

S.A.: Port Lincoln, Sept. 1927, *Anon.* (AD9630614); Fairview Res. (c. 35 km WNW of Naracoorte), 1977, *G.Gardiner s.n.* (AD); c. 1 km W of Vic. Border on Penola–Dergholm road, *P.J.Lang* 8484 (AD, MEL). Vic.: Tullich Rd, c. 12 km E of Casterton, *M.G.Corrick* 8486 (HO, MEL); Heath Rd, Lower Glenelg Natl Park, *R.J.Fletcher* 187 (MEL).



A rare, though often locally common, subspecies that may intergrade with the typical subspecies in the Portland area, Vic.

39d. *Boronia pilosa* subsp. *parvidaemonis* Durretto, *Muelleria* 17: 100 (2003)

T: Little Desert Natl Park, eastern block, 100 m SE of parking area at Salt Lake, Vic., 7 Aug. 2001, *N.G.Walsh* 5377 & *I.Thompson*; holo: MEL; iso: AD, CANB, HO (2 sheets), MEL.

B. pilosa subsp. 2, M.F.Durretto, *Fl. Victoria* 4: 162 (1999), *p.p.*

B. pilosa subsp. 2, J.H.Ross, *Census Vasc. Pl. Victoria*, 6th edn, 110, 138 (2000), *p.p.*

Illustration: M.F.Durretto, *Muelleria* 17: 85, fig. 10 Q–S (2003).

Shrub to 50 cm tall. Branchlets puberulous; hairs to 0.25 (–0.4) mm long. Leaves 4–10 mm long, 6–18 mm wide, glabrous to sparsely puberulous; leaflets 1.5–7 mm long, 0.75–1.25 mm wide. Sepals deltate, 1–2 mm long, glabrous or ciliate. Petals 3.5–4 mm long. Ovary glabrous; style pilose, concealed by massive stigma.

Confined to the Little Desert Natl Park, W Vic. Found in mallee and heath on white sand. Flowers Sept.–Nov.; fruits Nov.

Vic.: Little Desert, 14 miles [c. 22.4 km] S of Kiata, *A.C.Beaglehole* 7026 (MEL); By main N–S track through Little Desert Natl Park, 23 km S of Kiata, *T.B.Muir* 6310 (MEL); Little Desert, beyond Salt Lake from Kiata, *M.E.Phillips* 90 (CANB).

A rare and poorly collected subspecies that has, in the past, been confused with *B. inornata* which is not found in Vic.



40. *Boronia rozefeldsii* Durretto, *Muelleria* 17: 101 (2003)

T: Top of ridge, NE corner of Schouten Is., Tas., 15 Nov. 2000, *A.C.Rozefelds* 1949; holo: HO; iso MEL.

Illustration: M.F.Durretto, *op. cit.* 102, fig. 12 A–B.

Erect, woody shrub to 50 cm tall. Branchlets not obviously glandular, pilose to puberulous; decurrent leaf bases absent or scarcely visible. Leaves 3–7-foliolate, 10–20 mm long, 22–26 mm wide, puberulous proximally; petiole and rachis segments 1–3 mm long; leaflets narrowly obovate to narrowly elliptic, 7–12 mm long, 2–4 mm wide, entire, discolorous. Inflorescence axillary, 3–7-flowered; peduncles 1–2 mm long; pedicels 3–6 mm long. Sepals deltate, c. 2 mm long, ciliate. Petals 8–10 mm long, pink; abaxial surface pubescent along margins. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous; style with a few hairs; stigma minute. *Schouten Island Boronia*.

Confined to Schouten Is., S of Freycinet Penin., E Tas. Found growing in sparsely vegetated areas or in shallow crevices on bare granitic outcrops and ridgelines. Flowering material collected Nov.; fruiting material Feb.

Tas.: Bear Hill, Schouten Is., *M.F.Durretto* 1469 (HO, MEL); Top of ridge, NE corner of Schouten Is., *A.C.Rozefelds* 1983 (HO).

A rare species that can be distinguished from *B. pilosa*, which is also found on Schouten Is., by the large petals and wide leaflets with few hairs.



41. *Boronia gunnii* Hook.f., *Fl. Tasman.* 1: 68, t. 10 (1855)

B. tetrandra var. *grandiflora* Hook., *Hook. J. Bot. Kew Gard. Misc.* 2: 419 (1840); *B. pinnata* var. *gunnii* (Hook.f.) Benth., *Fl. Austral.* 1: 319 (1863), *nom. illeg.* T: South Esk, Tas., *R.Gunn* 8; lecto: K n.v. (photos AD, MEL), *fide* M.F.Durretto, *Muelleria* 17: 104 (2003); isolecto: K n.v. (photo MEL), NSW (2 sheets).

B. variabilis var. α Hook., *J. Bot.* 1: 255 (1834), *nom. inval.*

Illustration: M.F.Durretto, *op. cit.* 102, fig. 12 C–F.

Erect, woody shrub to 1.2 m tall; glands usually shiny. Branchlets slightly glandular-verrucose (glands shiny), puberulous; decurrent leaf bases faint. Leaves 5–9-foliolate, 12–32 mm long, 16–50 mm wide, with shiny glandular areas, with few scattered hairs except for proximal leaflets which are sparsely puberulous; petiole and rachis segments 1–6 mm long; leaflets narrowly oblanceolate, 5–25 mm long, 0.75–2.5 mm wide, entire, discolorous. Inflorescences axillary, 1–7-flowered; peduncles 1.5–3 mm long; pedicels 5–9 mm long. Sepals deltate, c. 1 mm long, glabrous or minutely ciliate. Petals 5–8 mm long, glabrous or sparsely puberulous along margins, pink. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous; style with a few hairs; stigma minute. *Gunn's Boronia*, *Cataract Gorge Boronia*.



Localised along the Apsley, St Pauls, Jukes and Dennison Rivers, NE Tas. Once common in the Cataract Gorge area near Launceston, Tas., though probably extinct there now. Found in rocky, riverine areas prone to flooding. Flowers Oct.–Jan.; fruiting material collected Jan.

Tas.: Denison Riverlet, *R.Burns* (ANBG 1411) (CANB); Apsley R., *P.Collier* 946 (HO); St Pauls R., *M.F.Duretto* 1651 & *M.Baker* (AD, HO, MEL); Cataract Gorge, Launceston, *C.Stuart* 1 (HO).

A rare and poorly known species that differs from other Tas. species by the long, narrowly obovate leaves, puberulous, slightly glandular-verrucose stems and the shiny, glandular areas that dot the leaves and stems.

42. *Boronia falcifolia* A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837), as *B. paleifolia* (orthographic error)

T: Moreton Bay [Qld], 1824, *A.Cunningham* s.n.; lecto: W n.v. (photo MEL), *fide* M.F.Duretto, *Muelleria* 17: 105 (2003); Peel's Is., Moreton Bay, N.S. Wales [Qld], Oct. 1824, *A.Cunningham* 34; probable isolecto: BRI, CGE n.v. (photo MEL), K n.v. (photos AD, MEL), MEL, TCD.

B. falcifolia A.Cunn. ex Lindl., *Edwards's Bot. Reg.* 27: sub. t. 47 (1841), *nom. illeg. non* A.Cunn. ex Endl. T: Peel's Is., Moreton Bay, N.S. Wales [Qld], Oct. 1824, *A.Cunningham* 34; lecto: CGE n.v. (photo MEL), *fide* M.F.Duretto, *loc. cit.*; isolecto: BRI, K n.v. (photos AD, MEL), MEL, TCD, W n.v. (photo MEL).

B. falcifolia A.Cunn. ex Lindl. 'trifoliolate leaf' form, S.W.L.Jacobs & J.Pickard, *Pl New South Wales* 191 (1981).

B. falcifolia A.Cunn. ex Lindl. 'simple leaf' form, S.W.L.Jacobs & J.Pickard, *Pl New South Wales* 191 (1981).

Illustrations: B.A.Lebler, *Wildfl. SE Queensland* 1: 25 (1977); T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 451, fig. 69h (1983); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 276 (2002).

Erect, woody shrub to 1.5 m tall, glabrous apart from flowers. Branchlets not obviously glandular; decurrent leaf bases absent. Leaves usually 3-foliolate though simple and 5-foliolate leaves also present; petiole 2–15 mm long; pinnate leaves 3–5-foliolate, 6–38 mm long, 5–40 mm wide, with rachis segments 3–15 mm long; simple leaves and leaflets linear to terete, usually falcate, 3–25 mm long, 0.5–1.5 mm wide, entire, channelled above, concolorous. Inflorescences axillary, 1–3-flowered; peduncles and pedicels 2–9 mm long. Sepals narrowly triangular, 3.5–4 mm long, glabrous. Petals 4–8 mm long, pink; abaxial surface pubescent along margins. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary glabrous; style pilose; stigma minute. *Wallum Boronia*.

Occurs from Littabella Natl Park, c. 40 km NW of Bundaberg, Qld, to the Myall Lakes, N.S.W. Found in coastal areas and on sand islands, in seasonally flooded areas of wallum, closed heathland and occasionally in woodland on wet sand. Flowers mainly Aug.–Oct.; fruits mainly Oct.–Nov.

Qld: Littabella Natl Park, c. 40 km NW of Bundaberg, *A.R.Bean* 7009 (BRI, CANB); 7.2 km W of Caloundra, *J.H.Ross* 3161 (BRI, CANB, HO, MEL, NSW). N.S.W.: Crowdy Bay Natl Park (c. 28 km N of Coopers Creek), *J.Armstrong* 1162 (CANB, NSW); 3.2 km S of Yamba, *M.F.Duretto* 665 (HO, MEL, NSW); Red Rock, 3 km from Pacific Hwy, *N.Ollerenshaw* 60 (CANB).

A common species, that is distinguished from other Eastern Australian species by being largely glabrous and usually having ternate leaves with narrow leaflets. The genetic diversity of the species is discussed by Shapcott *et al.* (*Austral. Syst. Bot.* 53: 171–183 (2005)).



43. *Boronia filifolia* F.Muell., *Fragm.* 1: 3 (1858)

T: Sandy plains, near Encounter Bay, S.A., Oct. 1847–Jan. 1849, *F.Mueller* s.n.; lecto: MEL, *fide* M.F.Duretto, *Muelleria* 17: 107 (2003).

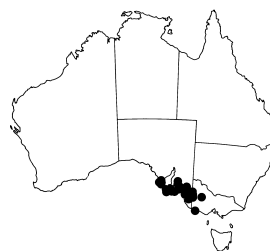
Illustrations: W.R.Elliot & D.L.Jones, *Encycl. Austral. Pl.* 2nd edn, 341 (1985); G.R.M.Dashorst & J.P.Jessop, *Pl. Adelaide Plains Hills* 96, Pl. 41, 3, 3a (1990); N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 163, fig. 29a (1999).

Erect or weak woody shrub to 1 m tall, glabrous apart from flowers. Branchlets not obviously glandular; leaf bases faintly decurrent. Leaves pinnate or simple; pinnate leaves 3–7-

foliolate, 6–23 mm long, 12–30 mm wide, with petiole and rachis segments 1–8 mm long; simple leaves subsessile; simple leaves and leaflets linear to narrowly obovate, 3–30 mm long, 1–1.5 mm wide, flat to terete, entire, discolorous. Inflorescences axillary, 1–5-flowered; peduncles 8–17 mm long; pedicels 2–13 mm long. Sepals narrowly triangular to deltate, 1–3 mm long, glabrous. Petals 3.5–12 mm long, pink; abaxial surface puberulous. Stamens: filaments pilose or glabrous, glandular-verrucose for most of length; anther apiculum absent or minute. Ovary glabrous; style pilose or glabrous; stigma minute. $n = 9$, H.M.Stace & J.A.Armstrong, *Austral. Syst. Bot.* 5: 502 (1992); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Slender Boronia*. Fig. 28E–G.

Occurs in S.A. in the SE and on Kangaroo Is., the Eyre and Fleurieu Peninsulas, and in W Vic. in the Little Desert Natl Park. Found in heath, mallee and woodland on limestone pavements, laterites, and sandy gravels. Flowers July–Feb.; fruits Oct.–Feb.

S.A.: Hundred of Wanilla, c. 25 km NNW of Port Lincoln, *C.R.Alcock* 86 (AD, MEL); 9.2 km NE of bridge over Harriet R. at Vivonne Bay on South Coast Rd, 50 m SW from road intersection, *F.E.Davies* 1505 (AD, CANB, MEL, PERTH); 8.6 km N of Signal Rd junction with Strathalbyn–Goolwa road, *M.F.Duretto* 1250 (AD, CANB, MEL); Gum Lagoon Conservation Park, *P.J.Lang* 1685 (AD, CANB, MEL). Vic.: Telopea Downs, N side of McCrackens Rd, *J.G.Eichler* 83 (MEL).



Though secure on Kangaroo Is., the species appears to be endangered elsewhere. Distinguished from all other eastern Australian species of *Boronia* by being glabrous and having filiform leaves or leaflets.

44. *Boronia deanei* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 31: 731 (1907)

T: Near Clarence Siding, Blue Mtns, N.S.W., Oct. 1906, *H.Dean s.n.*; lecto: NSW, *fide* M.F.Duretto, *Muelleria* 17: 109 (2003); isolecto: K n.v. (photos AD, NSW).

Erect, weak shrub to 1.5 m tall, glabrous. Branchlets slightly glandular-verrucose; decurrent leaf bases present. Leaves sessile, linear to linear-obovate to narrowly elliptic, terete, 2–12 mm long, 0.5–1 mm wide, entire, concolorous; adaxial surface concave, smooth, channelled; abaxial surface prominently glandular-verrucose. Flowers terminal and axillary, mostly solitary; peduncle and pedicel 1–3 mm long. Sepals deltate, 2–3 mm long. Petals 4–5 mm long, white to pink. Stamens: filaments glandular-verrucose towards apex; anthers not apiculate. Stigma minute. $n = 11$, F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Deane's Boronia*.

A rare and endangered species occurring between Lithgow (Blue Mtns) and Nalbaugh Natl Park (W of Eden), N.S.W. Found in wet heath, or rarely in dry open forest, on sandstone. There are 2 subspecies.

Leaf apices obtuse; sepals c. 2 mm long

44a. subsp. *deanei*

Leaf apices acute; sepals 2–3 mm long

44b. subsp. *acutifolia*

44a. *Boronia deanei* Maiden & Betche subsp. *deanei*

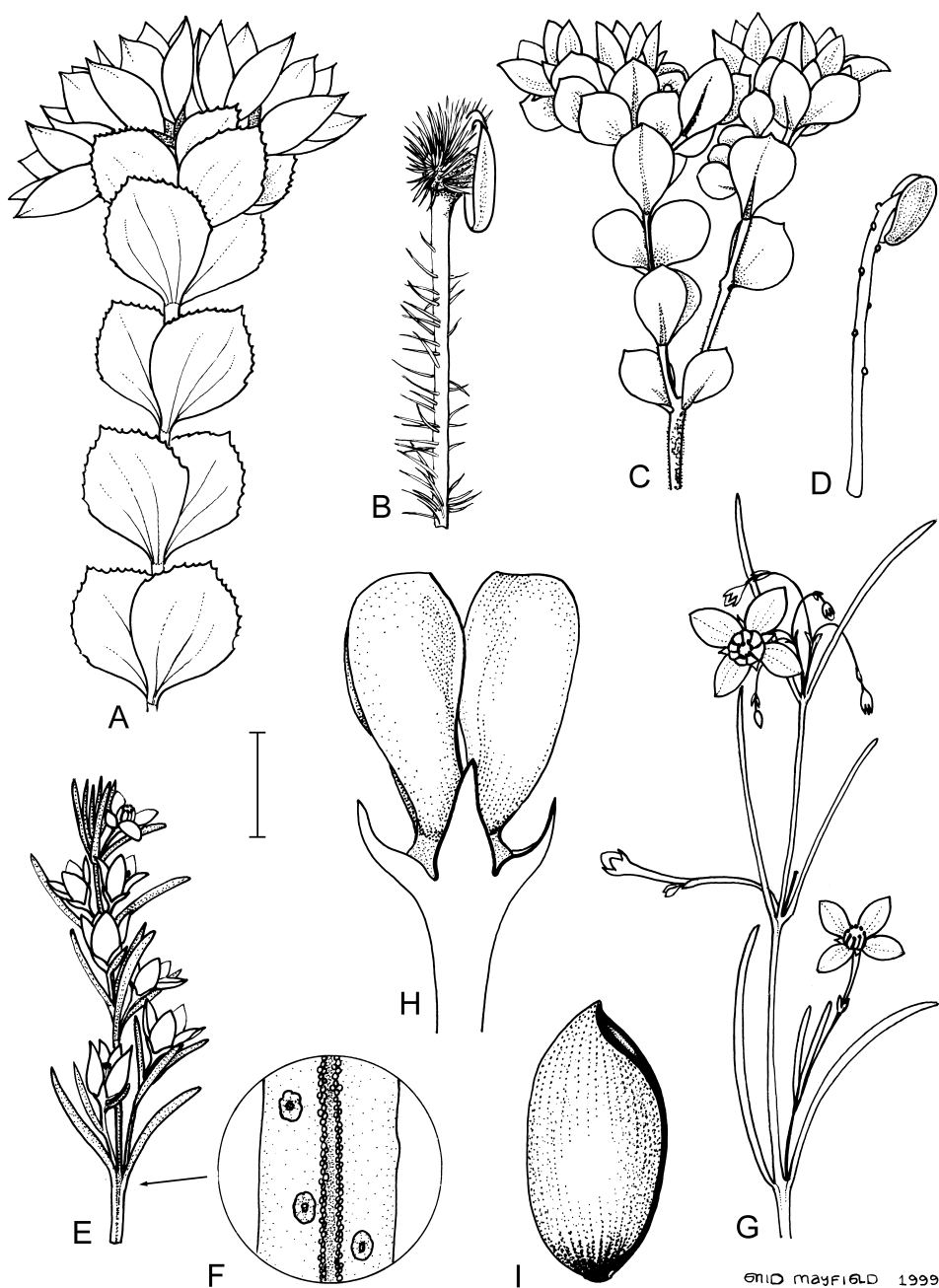
Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 276 (2002).

Branches sparsely glandular-verrucose. Leaves linear to linear-obovate, 2–12 mm long, 0.5–1 mm wide, straight, minutely serrated mostly near tip, obtuse; abaxial surface slightly glandular-verrucose. Sepals c. 2 mm long, c. 1 mm wide, acute.

A rare and endangered subspecies restricted to the Blue Mtns, from Newnes to Kanangra-Boyd Natl Park, N.S.W. Found in swampy areas and woodland. Flowers Sept.–Dec.; fruits Nov.–Dec.

N.S.W.: Paddy's Creek Swamp, Newnes SF, *P.H.Benson* 1333–4 (NSW); Swamp on Farmers Ck, above Lithgow Water Supply, *P.H.Benson* 1341 (CANB, NSW); Newnes SF, *G.D'Aubert* 168 (CANB, NSW); Belarah Swamp, Whalan Heights, Kanangra-Boyd Natl Park, *T.A.James* 1513 (MEL, NSW).





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Figure 28. *Boronia*. A–B, *B. serrulata*. A, habit; B, stamen (A–B, R.H.Hill 995, AD). C–D, *B. rhomboidea*. C, habit; D, stamen (C–D, A.B.Court 1148, HO). E–F, *B. deanei* subsp. *acutifolia*. E, habit; F, stem (E–F, E.F.Constable 6277, MEL). G–I, *B. filifolia*. G, habit; H, fruit; I, seed (E, M.F.Duretto 1250, MEL; F–G, F.E.Davis 1505, MEL). Scale bar: A, C, E, G = 10 mm; B, D, I = 1 mm; F = 0.75 mm; H = 1.5 mm. Drawn by E.Mayfield.

44b. *Boronia deanei* subsp. *acutifolia* Durretto, *Muelleria* 17: 111 (2003)

T: Budderoo Ck, c. 10 miles [c. 16 km] W of Kiama, N.S.W., 15 Oct. 1965, *E.F. Constable* 6277; holo: MEL; iso: NSW.

B. sp. A, S.W.L. Jacobs and J. Pickard, *Pl. New South Wales* 191 (1981).

Illustration: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 276 (2002).

Branchlets glandular-verrucose, especially on decurrent leaf bases. Leaves linear to narrowly elliptic, 5–12 mm long, c. 1 mm wide, arched or straight, minutely serrate along entire length, acute; abaxial surface prominently glandular-verrucose. Sepals narrowly triangular, 2–3 mm long, 1–1.5 mm wide, appearing acuminate because of the incurved margins. Fig. 28H, I.

A rare subspecies found in two disjunct areas centred on Fitzroy Falls and Nalbaugh Natl Park, SE N.S.W. Found in wet heath. Flowers Sept.–Nov.; fruits Nov.

N.S.W.: White Rock Plateau between Mt Wog Wog and White Rock, Nalbaugh Natl Park, *D.E. Albrecht* 1638 (CANB, MEL, NSW); W side of Kangaroo R., 1.5 km upstream from Carrington Falls, Budderoo Natl Park, *J.D. Briggs* 2354 (CANB, MEL, NSW); Fitzroy Falls, 7.4 miles [c. 12.5 km] SE of Moss Vale, *E.M. Canning* 6409 (CANB, MEL, NSW); Endrick R., c. 6 miles [c. 9.6 km] by road ESE of Nerriga, *J.A. McGillivray* 23 (MEL, NSW).

**45. *Boronia microphylla* Sieber ex Rchb., *Iconogr. Bot. Exot.* 1: 53, t. 72 (1825)**

T: Blue Mtns, N.S.W., *Fl. Novae Holl. No. 302 Sieber*; lecto: K n.v. (photos AD, MEL), *fide* M.F. Durretto, *Muelleria* 17: 112 (2003); isolecto: MEL (2 sheets), TCD.

B. microphylla Sieber ex Spreng., *Syst. Veg.* 4 (1827), *nom. illeg. non* Sieber ex Rchb. T: Blue Mtns, N.S.W., *Fl. Novae Holl. No. 302 Sieber*; lecto: K n.v. (photos AD, MEL), *fide* Durretto, *loc. cit.*; isolecto: MEL (2 sheets), TCD.

Illustrations: T.D. Stanley & E.M. Ross (eds), *Fl. SE Queensland* 1: 451, fig. 69j (1983); B. McDonald *et al.*, *Fl. Girraween & Bald Rock* 65 (1995); G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 275 (2002).

Erect, woody shrub to 1 m tall, nearly glabrous to puberulous. Branchlets glandular-verrucose; decurrent leaf bases present. Leaves 3–17-foliolate, 5–30 mm long, 3–16 mm wide; petiole and rachis segments 1.5–6 mm long; leaflets elliptic to obovate to spatulate to broadly spatulate, 1–9.5 mm long, 0.5–3.5 mm wide, entire to minutely crenate, discolorous. Inflorescences terminal and axillary, 1–9-flowered; peduncle and pedicels 2–7 mm long. Sepals deltate to narrowly triangular, 1–3 mm long, ciliate. Petals 4–12 mm long, pink; abaxial surface glabrous or pilose only near margins. Stamens: filaments pilose, glandular-verrucose towards apex; anther-apiculum absent or present, glabrous or with a few hairs. Ovary and style with a few hairs; stigma minute. *n* = 11, S. Smith-White, *Austral. J. Bot.* 2: 292 (1954). *Small-leaved Boronia*.

Occurs on the Great Dividing Ra. from Cottonvale, near Stanthorpe, SE Qld, to Bodalla, near Cooma, N.S.W. Found in heath, woodland and forest on sandstone- and granite-derived soils. Flowers mainly Aug.–Jan.; fruits Sept.–Feb.

Qld: Cottonvale–Pozieres Rd, 0.5 km W of Cottonvale, *K.A.W. Williams* 75159 (BRI). N.S.W.: Dunns Swamp camping area [E of Rylstone], *M.F. Durretto* 690 (BRI, HO, MEL); Boonoo Boonoo State Forest 119, NE of Tenterfield, *P.I. Forster* 15809 (AD, BRI, CANB, MEL, NSW); Watsons Ck Nat. Res., *J.R. Hosking* 1856 (CANB, MEL, NE, NSW); Dampier State Forest, c. 12 km (direct) WSW of Bodalla, 1 km from Nerrigundah settlement on Belowra Rd, *R.O. Makinson* 1221 (CANB).



A common and widespread species. The juvenile leaves are simple with serrate margins: they look remarkably similar to those of *B. serrulata* and the fossil taxon, *B. harristii* (C. von Ettinghausen, *Mem. Geol. Survey New South Wales, Palaeontol.* 2: 1–189 (1888)). The collection from Watsons Creek Nature Reserve is unusual in that it has larger leaves, leaflets, inflorescence parts and petals than other specimens. The species can be distinguished

from all other species of *Boronia* from eastern Australia by having glandular-verrucose stems with the glands having a crown of hairs or tubercles, and the small pinnate leaves with elliptic to obovate to spatulate leaflets.

46. *Boronia galbraithiae* Albr. in D.E.Albrecht & N.G.Walsh, *Muelleria* 8: 24 (1993)

T: S of Cobbannah, Vic., 26 Sept. 1984, *A.C.Beauglehole* 77328; holo: MEL; iso: CANB, HO, MEL, NSW.

B. sp. aff. muelleri, J.H.Ross, *Census Vasc. Pl. Victoria* 4th edn, 98, 120 (1993).

Illustrations: D.E.Albrecht & N.G.Walsh, *op. cit.* 23, fig. 1d–f, N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 163, fig. 29d (1999).

Erect, woody shrub to 2 m tall, glabrous apart from flowers. Branchlets with glandular-verrucose, decurrent leaf bases. Leaves 3–17-foliolate, 12–30 mm long, 5–14 mm wide; petiole and rachis segments 2–9 mm long; leaflets oblanceolate to narrowly obovate, 2–9 (–14) mm long, 0.5–3 mm wide, glandular and serrulate on margins, discolorous. Inflorescences axillary, 1–15-flowered; peduncle 3.5–22 mm long; pedicels 2.5–7 mm long. Sepals ovate-deltate, 1–2 mm long, glabrous. Petals 4.5–8 mm long, 2.5–3.5 mm wide, glabrous or minutely ciliate, white or pink. Stamens: filaments pilose, glandular-verrucose towards apex; anthers not apiculate. Ovary and style glabrous; stigma minute. *Galbraith's Boronia*.

Restricted to a small area near Mt Difficulty in E Gippsland, Vic. Found in dry sclerophyll forest on spurs and upper slopes. Flowers have been collected in Sept. & Apr., and fruits in Apr.

Vic.: Gippsland Lakes hinterland, Mt Difficulty, on the upper SE slopes, *D.E.Albrecht* 1965 (MEL); Gippsland, c. 1 km NE of Mt Difficulty on the Insolvent Track, *D.E.Albrecht* 4968 (CANB, MEL, NSW); Jerry Rd, off Mt Ray Rd, near crossing of unnamed creek, c. 3.5 km c. E from Mt Difficulty, 11 Aug. 1994, *R.J.Fletcher s.n.* (MEL).

A rare species that can be distinguished from *B. microphylla* by the glabrous branches.



47. *Boronia rhomboidea* Hook., *Icon. Pl.* 8: t. 722 (1845)

T: Side of the Western Mountains, Tas., *R.Gunn* 1946; lecto: K *n.v.* (photos AD, MEL), *fide* M.F.Duretto, *Muelleria* 17: 115 (2003).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2: 235 (1991); P.Kirkpatrick, *Alpine Tasmania* 49, fig. 20e (1997); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 275 (2002).

Erect or prostrate, woody shrub to 1 m tall. Branchlets puberulous to pilose, not or slightly glandular-verrucose; decurrent leaf bases absent. Leaves sessile or subsessile, broadly obovate to almost circular or rarely obovate, 3–13 mm long, 1–15 mm wide, entire, glabrous or ciliate, if only proximally, concolorous. Inflorescences terminal or axillary, 1–3-flowered; peduncle 0–2 mm long; pedicels 1–3.5 mm long. Sepals elliptic to oblong, 2.5–4.5 mm long, glabrous or sparsely ciliate. Petals 5–8 mm long, glabrous, white to pink. Stamens: filaments glabrous, slightly glandular-verrucose towards apex; anthers not apiculate. Ovary and style glabrous; stigma minute. *Broad-leaved Boronia*, *Rhomboid Boronia*. Fig. 28C, D.

Occurs disjunctly in the Budawang Ra. and surrounds, N.S.W., and in the highlands of Tas. Found in heath and swamps on sandstone in N.S.W., and alpine and subalpine heath on a variety of substrates in Tas. Flowers Oct.–Jan.; fruits Jan.–Mar.

N.S.W.: N Budawang Ra., Upper Corang R., c. 15 km S of Nerriga, *I.R.Telford* 9536 (CANB, HO, MEL, NSW); Nettleton's Ck, 8.5 km NE of Mangarlowe, *I.R.Telford* 9621 (CANB, HO, NSW). Tas.: Gordon R., *A.M.Buchanan* 12942 (HO, MEL); Cradle Mountain Natl Park, 0.75 km NW of Waldheim on Hounsflow Heath, *S.J.Forbes* 1212 (CANB, HO, MEL, NSW); Longley, *A.Moscal* 8600 (HO).

A rare species with an unusual distributional pattern. The broadly ovate to circular leaves with smooth margins distinguish this species from all other species of *Boronia* in eastern Australia.



Ser. 2. Pedunculatae

Boronia ser. *Pedunculatae* Benth., *Fl. Austral.* 1: 310, 326 (1863)

T: *B. spathulata* Lindl.

Leaves simple. Flowers terminal, rarely also in upper axils, solitary or in small or large cymes. Bracts and bracteoles caducous. Sepals valvate or slightly imbricate in bud, glabrous or rarely woolly abaxially, deep red or rarely green, predominantly caducous. Stamens 8, all fertile, rarely 4 caducous. Seed with an adaxial linear hilum (not in a groove), with the raphe forming a cream-coloured pulpy elaiosome at base.

A series of 11 species, predominantly in W.A., but also in all other States and Territories except N.T.

- | | | |
|-----|--|----------------------------------|
| 1 | Pedicels glandular-aculeate | 48. <i>B. dichotoma</i> |
| 1: | Pedicels smooth | |
| 2 | Staminal filaments glabrous | |
| 3 | Flowers in umbelliform cymes; leaves linear to semiterete, usually caducous; pedicels glabrous or sparsely to densely woolly | 56. <i>B. juncea</i> |
| 3: | Flowers in cymes; leaves linear to elliptic or obovate, persistent; pedicels glabrous | |
| 4 | Inflorescence 3–12 ⁺ -flowered; sepals caducous in fruit (SW W.A.) | 52. <i>B. denticulata</i> |
| 4: | Inflorescence 1 (–3)-flowered; sepals persistent in fruit (S.A.; Qld; N.S.W.; Vic.; Tas.) | 57. <i>B. parviflora</i> |
| 2: | Staminal filaments hairy | |
| 5 | Branchlets flattened and sharply 2-angled | 54. <i>B. anceps</i> |
| 5: | Branchlets ±terete or 4-angled | |
| 6 | Pedicels somewhat woolly | 55. <i>B. exilis</i> |
| 6: | Pedicels glabrous | |
| 7 | Inflorescence 1 (–3)-flowered; petals 3–7 mm long, c. equal in size to sepals; sepals persistent in fruit (S.A.; Qld; N.S.W.; Vic.; Tas.) | 57. <i>B. parviflora</i> |
| 7: | Inflorescence (1–) 3–12 ⁺ -flowered; petals 5–11 mm long, usually at least twice as long as sepals; sepals caducous in fruit (SW W.A.; N.S.W.) | |
| 8 | Flowers in umbelliform cymes; pedicels slender or thick, deep red, with or without minute basal bracteoles | |
| 9 | Branchlets terete, smooth | |
| 10 | Sepals at least twice as long as wide; adaxial surface of petals glabrous; leaf margin entire or nearly so (SW W.A.) | 49. <i>B. fastigiata</i> |
| 10: | Sepals less than twice as long as wide; adaxial surface of petals pubescent or rarely glabrous and then leaves serrate; leaf margin entire to serrate (N.S.W.) | 58. <i>B. barkeriana</i> |
| 9: | Branchlets 4-ribbed or angled | |
| 11. | Branchlet ribs blunt, glandular-undulate | 50. <i>B. tenuior</i> |
| 11: | Branchlet ribs sharp and smooth | 51. <i>B. tetragona</i> |
| 8: | Flowers in cymes; pedicels thickened, at least towards apex, green to pale red, with medial bracteoles | |
| 12 | Leaves mostly longer than internodes; pedicels not glandular-punctate | 52. <i>B. denticulata</i> |
| 12: | Leaves mostly shorter than internodes; pedicels glandular-punctate | 53. <i>B. spathulata</i> |

48. Boronia dichotoma Lindl., *Edward's Bot. Reg.* 27: sub tab. 47 (1841)

T: Vasse R., W.A., *Mrs Molloy*; holo: CGE (photo seen).

B. spathulata var. *elatior* Benth., *Fl. Austral.* 1: 327 (1863). T: Vasse R., W.A., *Mrs Molloy*; syn: K (photo seen); W.A., *J.Drummond* 38; isosyn: PERTH.

B. flexuosa Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 166 (1845). T: Canning R. and Sussex District, W.A., 5 Dec. 1839, *L.Preiss* 2024; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 134 (1998); isolecto: MEL.

B. integrifolia Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přir.* 2: 53 (1923). T: Bridgetown to Kojonup and Slab Hut Gully, 1910, W.A., *A.A.Dorrien-Smith*; lecto: K, *fide* P.G.Wilson, *loc. cit.*

Illustrations: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 482, fig. 188 (1987); J.R.Wheeler *et al.*, *Fl. South West* 2: 868 (2002).

Erect perennial to 70 cm high. Branches slender, terminal ones sometimes compressed, smooth or uppermost glandular-aculeate. Leaves narrowly oblong to elliptic or obovate or upper ones terete, sometimes dilated at base, 1.5–5 cm long, shorter than internodes, entire, glabrous. Flowers in terminal open cymes; bracts and bracteoles small; pedicels slender, ±medially bibracteolate, glandular-aculeate. Sepals ovate to narrowly ovate, c. 3 mm long, acute or acuminate, glabrous or glandular-aculeate at base, red, caducous. Petals elliptic, 7–11 mm long, glabrous, pink. Stamens: filaments narrowly oblong, verrucose and pilose abaxially; anthers minutely apiculate. Ovary pilose; style terete, c. 1 mm long, pilose; stigma small.

Found in SW W.A. from near Perth S to Margaret R. Occurs in seasonally swampy areas. Flowers Aug.–Dec.

W.A.: Forrestdale, *V.Mann* 6 (PERTH); Cowaramup, *R.D.Royce* 2460 (PERTH); Cape Naturaliste, *D.J.E.Whibley* 5011 (PERTH).

This species is noticeable because of the glandular-aculeate branches of the inflorescence. Some variants are similar to variants of *B. spathulata*, except for the presence of aculeate pedicels, and it is possible that the two species occasionally intergrade.



A variant found near Cape Naturaliste has the upper branches, as well as the branches of the inflorescence, glandular-aculeate and has the leaves broad and dilated at their base.

The type of *B. integrifolia* differs from all other material included in *B. dichotoma* in having relatively small glandular-aculeate processes, in having elliptic leaves 6–12 mm long, and in having short internodes. It may be a distinct species or, what is more likely, a hybrid between *B. dichotoma* and *B. fastigiata*.

49. Boronia fastigiata Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 167 (1845)

T: Plantagenet District, W.A., Nov. 1840, *L.Preiss* 2028; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 136 (1998); isolecto: MEL.

B. rutosma T.Moore, *Gard. Companion Florist's Guide* 117 & fig. (1852). T: "We are indebted to Mr. Watson, gardener to Mrs Thredwell of Norwood, for the specimen represented by our figure."; *n.v.*

Erect glabrous perennial to 40 cm high. Branchlets terete. Leaves narrowly to broadly elliptic or obovate, 1–2 (–3) cm long, ±equal to internodes, entire or almost so. Flowers in umbelliform cymes, mostly terminal to long branches; bracts large, ovate, red, caducous; pedicels of lateral flowers slender, 7–20 mm long, dark red, eglandular, articulate at base, seemingly ebracteolate, with a pair of extremely minute bracteoles or incipient buds at base. Sepals triangular-ovate to elliptic, 2.5–5 mm long, glabrous, dark red, caducous. Petals ovate, 6–10 mm long, acute, ±glabrous, pink to mauve (darker in centre). Stamens: filaments slender-terete, glandular-verrucose apically, stiffly ciliate; anthers very minutely apiculate. Disc glabrous. Ovary glabrous; style terete, c. 1 mm long, glabrous; stigma subcapitate. *n* = 9, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954).

Found in SW W.A. from Perth to Collie and from there SE to Kojonup and Albany. Occurs in lateritic gravel. Flowers Sept.–Dec.

W.A.: between Katanning and Kojonup, *W.E.Blackall* 3132 (PERTH); near Albany, Dec. 1927, *W.E.Blackall* (PERTH); Gleneagle State Forest, *T.A.Halliday* 199 (PERTH); 22 km W of Collie, *P.G.Wilson* 6253 (PERTH).

This species is similar in its inflorescence and in its floral characters to *B. barkeriana* from N.S.W.

All recent collections were collected between Perth and Collie suggesting that it no longer occurs further south. Some collections from near Albany are intermediate between this species and *B. denticulata*.



The basal articulation of the pedicels of the lateral flowers of a cyme cause the flowers of the second or third order of branching, when present, to arise in nearly the same position as the flowers of the first order, thus producing an umbel-like affect.

50. *Boronia tenuior* Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přír.* 2: 52 (1923)

T: Yalingup and Cape Naturaliste, W.A., 1910, *A.A.Dorrien-Smith*; holo: K.

B. fastigiata var. *tenuior* Benth., *Fl. Austral.* 1: 327 (1863); *B. fastigiata* subsp. *tenuior* (Benth.) Paul G.Wilson, *Nuytsia* 12:127 (1998). T: Australind, W.A., 1842, *J.Gilbert* 3; syn: K.

Erect glabrous perennial to 1 m high. Branchlets tetragonal with 4 very narrow glandular-undulate wings. Leaves narrowly to broadly elliptic, 10–20 mm long, usually \pm equal to internodes, mostly serrate. Flowers in cymes terminal to main and lateral branchlets; bracts large, ovate, red, caducous; pedicels of lateral flowers slender, 7–20 mm long, dark red, eglandular, articulate at base, seemingly ebracteolate. Sepals narrowly deltate to ovate, c. 2.5 mm long, glabrous, dark red, caducous. Petals ovate, acute, c. 6 mm long, \pm glabrous, pink to mauve (darker in centre). Stamens: filaments slender-terete, glandular-verruccose apically, stiffly ciliate; anthers very minutely apiculate. Disc glabrous. Ovary glabrous; style terete, glabrous, c. 1 mm long; stigma subcapitate.

Found in SW W.A. from Busselton S to Augusta and E to Nannup and Walpole. Occurs along streams and in seasonally damp areas. Flowers (Apr.) Oct.–Jan.

W.A.: Boggy Lake, 27 Dec. 1957, *D.Churchill* (PERTH); 34 km WSW of Manjimup, *S.J.Forbes* 1162 (PERTH); Scott River Natl Park, *C.J.Robinson* 060 (PERTH); Jindong, *R.D.Royce* 3410 (PERTH).

Near the south coast the leaves are narrowly elliptic whereas further north they are elliptic to broadly elliptic.



51. *Boronia tetragona* Paul G.Wilson, *Nuytsia* 12: 140 (1998)

T: Ambergate Reserve, SW of Busselton, W.A., 3 Nov. 1993, *G.J.Keighery* 12938; holo: PERTH.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 869 (2002).

Erect glabrous perennial to 70 cm high. Stems tetragonous with 4 sharp smooth ribs. Leaves sessile, elliptic to ovate or triangular, to 4 cm long, the lower much shorter than internodes, entire, papillose on margin. Flowers in umbels; bracts caducous; pedicels slender, c. 10 mm long, dark red, eglandular; bracteoles caducous. Sepals ovate, c. 3 mm long, glabrous but woolly-ciliate, dark red, caducous. Petals ovate, c. 7 mm long, rounded at apex, glabrous, pink (darker in centre). Stamens: filaments slender-terete, glandular-verruccose at apex, sparsely ciliate; anthers very minutely apiculate. Disc glabrous. Ovary glabrous; style terete or clavate, c. 1 mm long; stigma hemispherical, brown.

Found in the Busselton to Whicher Ra. area of SW W.A. Growing in winter water-logged soil in eucalypt or *Melaleuca* woodland. Flowers Oct.–Dec.

W.A.: Capel Nature Reserve, *G.J.Keighery* 13635 (PERTH); 7 km W of Capel, *R.Pullen* 9845 (PERTH); Whicher Ra., *P.G.Wilson* 11640 (PERTH).



52. Boronia denticulata Sm., *Trans. Linn. Soc. London* 8: 284 (1807)

T: King George Sound [W.A.], 1803, *A.Menzies*; holo: LINN (photo seen).

B. chironiifolia Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 167 (1845). T: 17 miles [27 km] from Albany, W.A., 9 Nov. 1840, *L.Preiss* 2027; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 134 (1998); isolecto: MEL.

?*B. hypericifolia* Regel, *Gartenflora* 147: 152 (1857), ex desc.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 868 (2002).

Slender shrub to 1 m high, glabrous except staminal filaments. Branches slender, terete. Leaves linear to narrowly elliptic, rarely obovate, 2–5 cm long, usually exceeding internodes, denticulate or entire, coriaceous. Flowers in loose cymes, terminal or in axils of uppermost leaves; bracts and bracteoles very small, caducous; pedicels 5–20 mm long, initially bibracteolate just below middle. Sepals ovate-triangular, 1.5–2.5 mm long, green to pale red, caducous. Petals ovate, c. 5 mm long, obtuse, pale pink with darker midrib. Stamens: filaments sub-terete, sparsely ciliate, rarely glabrous; anthers c. 1 mm long, very minutely apiculate. Disc cushion-shaped. Style terete, c. 1 mm long, glabrous. *n* = 9, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003).

Found in SW W.A. from the Stirling Ra. to the S coast at Denmark and E to Cape Arid; usually growing in seasonally waterlogged soil. Flowers July–Feb.

W.A.: Stirling Ra., *A.Ashby* 60 (PERTH); Denmark, *C.A.Gardner* 742 (PERTH); Whoogarup Ra., *A.S.George* 1902 (PERTH); Cape Le Grand Natl Park, *L.Solomon* 141 (PERTH).

Variable in leaf shape and size. Some collections from near Albany suggest intergradation with *B. fastigiata*.



53. Boronia spathulata Lindl., *Sketch Veg. Swan R.* 17 (1839)

T: W.A., *J.Drummond s.n.*; holo: CGE (photo seen).

B. macra Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 167 (1845). T: Near Mahogany Ck, Darling Ra., W.A., 13 Sept. 1839, *L.Preiss* 2026; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 140 (1998).

B. spathulata var. *ramosa* Benth., *Fl. Austral.* 1: 327 (1863). T: Swan R., W.A., *J.Drummond s.n.*; syn: MEL; East Mt Barren, W.A., *G.Maxwell*; syn: MEL.

Erect glabrous perennial to 1 m high. Branchlets terete. Leaves well-spaced, narrowly elliptic to broadly obovate, uppermost (and sometimes medial) semiterete, 1–2 cm long, much shorter than internodes, entire. Flowers in shortly pedunculate open cymes; pedicels of lateral flowers 3–4 (–6) mm long, red, fleshy and glandular-pitted above the medial caducous bracteoles. Sepals ovate-triangular to narrowly triangular, 2.5–4 mm long, glabrous. Petals obovate, 6–9 mm long, glabrous, pink, caducous. Stamens: filaments compressed-terete, smooth or somewhat glandular-verrucose, not swollen at apex, woolly-ciliate or coarsely ciliate; anthers minutely apiculate. Disc narrow. Ovary glabrous or sparsely pilose; style slender-terete, sparsely pilose, c. 2.5 mm long; stigma subcapitate. *n* = 9, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954).

Found from near Perth S to the coast and E to Israelite Bay. Usually growing in sand near swamps or rivers, or on sand dunes near the coast. Flowers Jan.–Dec.

W.A.: 35 km S of Arthur R., *R.J.Cranfield* 4678 (PERTH); Wooroloo, *M.Koch* 1484 (PERTH); Cape Arid Natl Park, *R.D.Royce* 9914 (PERTH); Scott R., *E.Wittwer* 2233 (PERTH).

Boronia spathulata may be readily distinguished from similar species by its open cymose inflorescence, its bracteolate pedicels (of which the upper portion is fleshy and glandular-punctate), and by its slender sparsely pilose style.

The ovary of this species sometimes develops into an erect narrowly ellipsoid gall 2.5–4 cm long.



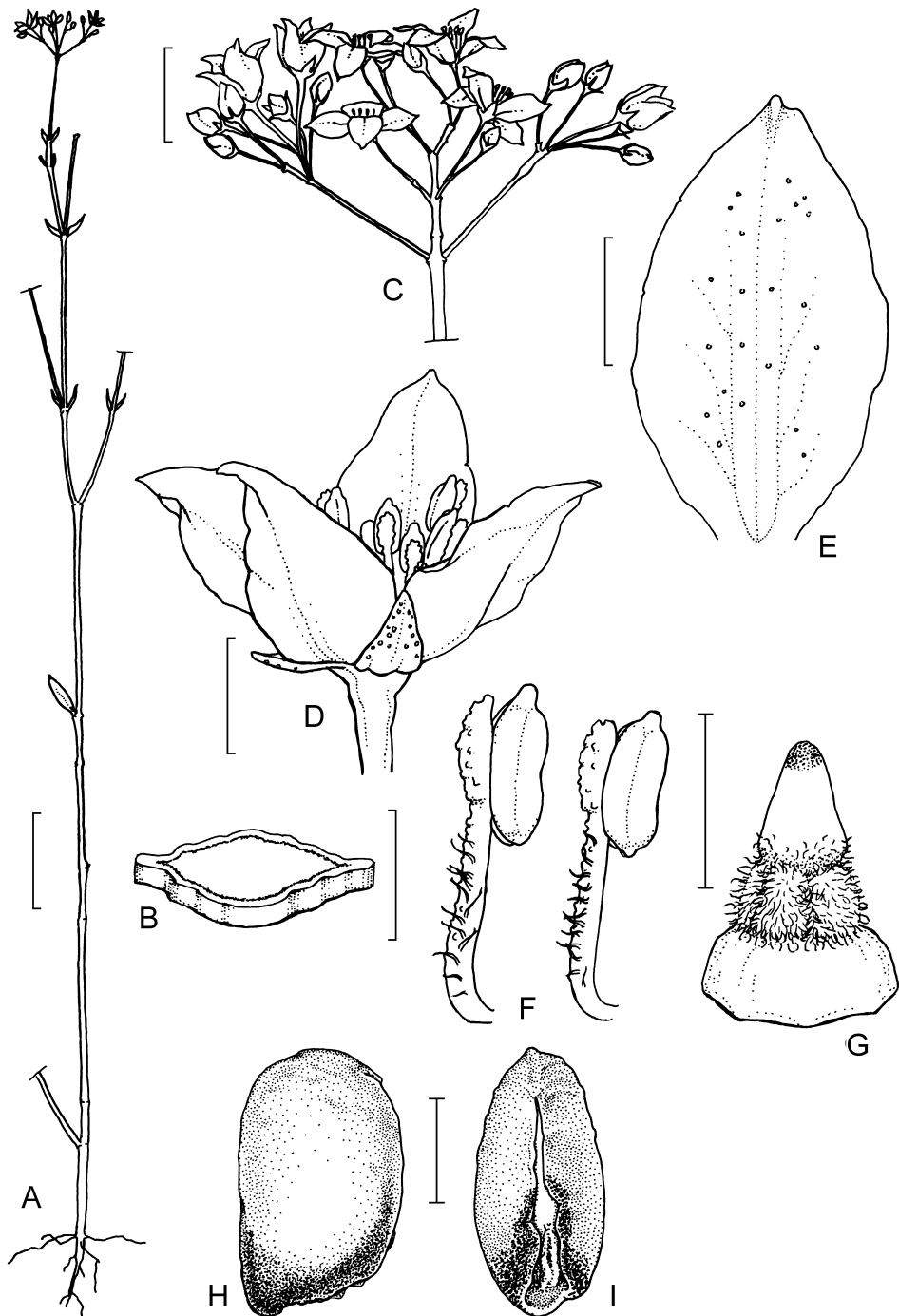


Figure 29. *Boronia anceps*. **A**, whole plant; **B**, stem TS; **C**, inflorescence; **D**, flower; **E**, petal; **F**, antisepalous & antipetalous stamens; **G**, disc and pistil; **H**, seed, lateral view; **I**, seed, adaxial surface (**A–G**, C.J.Robinson 505, PERTH; **H**, **I**, A.Strid 21427, PERTH). Scale bars: **A** = 5 cm; **B**, **E–G** = 2 mm; **C** = 10 mm; **D** = 3 mm; **H**, **I** = 1 mm. Drawn by A.Menadue, reproduced with permission from *Nuytsia* 12: 133, fig. 4 (1998)

54. *Boronia anceps* Paul G.Wilson, *Nuytsia* 12: 132 (1998)

T: 5 km N of Brennans Ford, W.A., 16 Nov. 1982, *A.Strid* 21427; holo: PERTH.

Illustrations: P.G.Wilson, *op. cit.* 133, fig. 4; J.R.Wheeler *et al.*, *Fl. South West* 2: 868 (2002).

Erect glabrous perennial to 60 high. Branches flattened and sharply 2-angled. Leaves well-spaced, narrowly elliptic to broadly obovate, 2–4 cm long, shorter than internodes, much reduced towards apex, entire, sessile by broad base. Flowers in long-pedunculate open terminal cymes; pedicels 5–10 mm long, slender, medially bi-bracteolate. Sepals ovate, 3 mm long, acute, glabrous, caducous. Petals broadly elliptic, c. 10 mm long, glabrous, pink. Stamens: filaments compressed-terete, glandular-verrucose particularly at apex, ciliate; anthers minutely apiculate. Disc narrow. Ovary woolly; style pyramidal or conical, c. 0.5 mm long, glabrous; stigma minute. Fig. 29.

Found in the extreme SW of W.A. between Scott R. and Walpole. Grows in seasonally swampy heaths. Flowers Sept.–Jan.

W.A.: Boggy L., 27 Dec. 1957, *D.Churchill* (PERTH); Scott River Rd, *S.Paust* 265 (PERTH); Scott Natl Park, *C.J.Robinson* 505 (PERTH).

The acute angles of the branches are decurrent from the midvein of the leaves. This situation differs from similar looking plants that come from near Busselton in which the ovary is glabrous and in which the branches have 4 acute angles, one angle decurrent from the midvein of each of the opposite leaves and one angle decurrent from the point where the basal margins of the leaves are in contact. This Busselton plant appears to be a hybrid involving *B. fastigiata* Bartl. *q.v.*

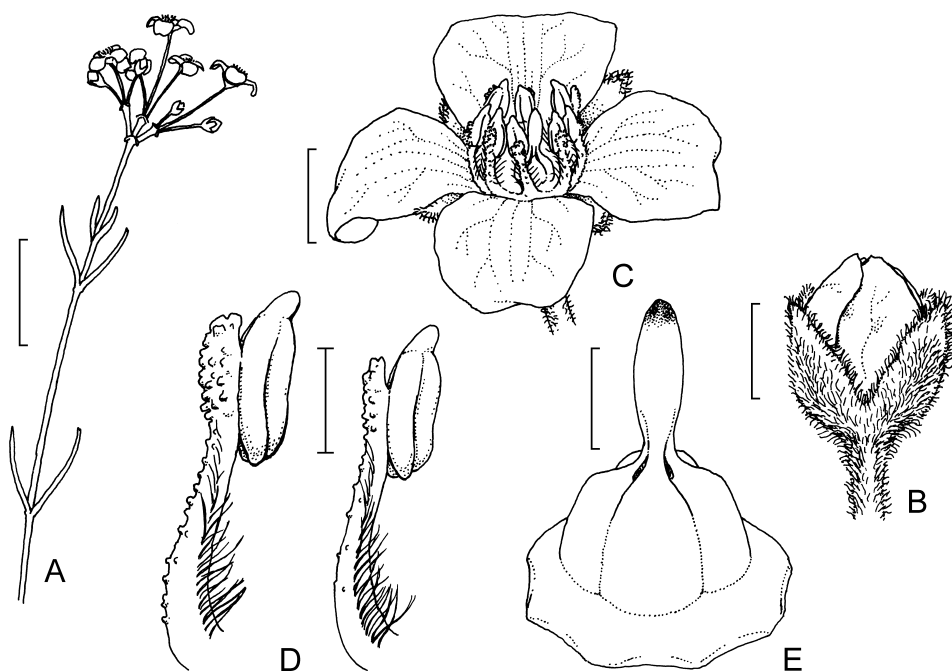


Figure 30. *Boronia exilis*. A, habit; B, bud; C, flower; D, antisepalous & antipetalous stamens; E, disc and pistil (A–E, C.J.Robinson 049, PERTH). Scale bars: A = 20 mm; B, C = 3 mm; D = 0.5 mm; E = 1 mm. Drawn by A.Menadue, reproduced with permission from *Nuytsia* 12: 135, fig. 5 (1998)

55. *Boronia exilis* Paul G. Wilson, *Nuytsia* 12: 134 (1998)

T: Scott Natl Park, W.A., 17 Sept. 1990, *C.J. Robinson 127*; holo: PERTH.

Illustration: P.G. Wilson, *op. cit.* 135, fig. 5.

Erect, slender-stemmed perennial c. 1 m high. Branches glabrous, terete. Leaves caducous, slender, semiterete, channelled above, 1–1.5 cm long, much shorter than internodes, glabrous or sparsely woolly on midrib. Flowers 3–9 in terminal umbelliform cymes; pedicels 5–12 mm long, somewhat woolly; bracts and scarious basal bracteoles small, caducous. Sepals elliptic, c. 4 mm long, acute, woolly, dark red, caducous. Petals broadly obovate, c. 7 mm long, sparsely woolly on midrib abaxially and adaxially, pink. Stamens: filaments terete above, glandular-verrucose at swollen apex, prominently ciliate; anthers shortly apiculate. Disc cushion-shaped, glabrous. Ovary glabrous; style cylindrical, c. 1.5 mm long; stigma minute. Fig. 30.

Known only from the Scott R. area, in the extreme SW of W.A., where found growing in seasonally wet heath. Flowers Sept.

W.A.: 9 miles [14 km] E of Karridale, *A.C. Beauglehole 12564* (PERTH); "Port Augusta near Geographe Bay", 1881, *Miss Bunbury* (MEL); Scott R., *E. Mattiske 370* (PERTH); Scott Natl Park, *C.J. Robinson 127* (PERTH).

Similar to some variants of *B. juncea* and differing most obviously in having strongly ciliate staminal filaments.

**56. *Boronia juncea* Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 166 (1845)**

T: District Wellington, W.A., 5 Dec. 1839, *L. Preiss 2036*; lecto: LD, *fide* P.G. Wilson, *Nuytsia* 12: 137 (1998).

Erect perennial 20–80 cm high. Branches slender, glabrous or sparsely woolly. Leaves usually caducous, shorter than internodes, glabrous or sparsely woolly; lower leaves linear, thick, 2–4 cm long; upper leaves semiterete, 1–4 cm long. Flowers 3–8 in terminal umbelliform cymes; pedicels slender, 1–5 mm long, glabrous to woolly; bracts and scarious basal bracteoles caducous. Sepals narrowly ovate to triangular, 1.5–5 mm long, acute to acuminate, glabrous to densely woolly, dark red, caducous. Petals obovate to broadly obovate, 3–8 (–10) mm long, white to pink. Stamens: filaments slender, terete, glandular-verrucose at apex, glabrous; anthers minutely apiculate. Ovary glabrous or woolly; style slender, 0.5–1.5 long; stigma small.

Found in the far SW of W.A. generally in winter-wet situations. Four subspecies are recognised but these evidently intergrade with neighbouring subspecies.

1 Pedicels and sepals glabrous

56a. subsp. *juncea*

1: Pedicels and sepals sparsely to densely woolly

2 Sepals c. 1.5–3 mm long, acute

56b. subsp. *minima*

2: Sepals 3–5 mm long, acuminate to subulate

3 Petal apex acuminate

56c. subsp. *micrantha*

3: Petal apex rounded and apiculate

56d. subsp. *laniflora*

56a. *Boronia juncea* Bartl. subsp. *juncea*

Illustration: P.G. Wilson, *Nuytsia* 12: 139, fig. 6B (1998).

Plant glabrous, including flowers. Pedicels 3–5 mm long. Sepals narrowly triangular, c. 2.5 mm long, subulate-acuminate. Petals obovate, c. 4 mm long, slender-acuminate.

Found between Bunbury and Mandurah, SW W.A. Growing in low scrub or heath in seasonally wet areas. Flowers Apr.

W.A.: About 27 km N of Bunbury, *E. Holland 304* (PERTH).



The typical subspecies is only known, in the strict sense, from the one locality, however, material of subsp. *minima* from the Pemberton to Donnybrook area is somewhat intermediate between the types of subsp. *juncea* and subsp. *minima*.

56b. *Boronia juncea* subsp. *minima* Paul G. Wilson, *Nuytsia* 12: 138 (1998)

T: Scott R., W.A., 15 Nov. 1978, *E. Wittwer* 2218; holo: PERTH.

Illustrations: P.G. Wilson, *op. cit.* 139, fig. 6D; J.R. Wheeler *et al.*, *Fl. South West* 2: 871 (2002).

Branches and leaves glabrous. Pedicels sparsely woolly, 1–2.5 mm long. Sepals ovate to triangular, 1.5–3 mm long, acute, sparsely woolly. Petals obovate, c. 3 mm long, acuminate or apiculate, glabrous or sparsely woolly along midrib. Ovary glabrous.

Found in SW W.A. between Margaret R. and Augusta and E to Walpole. Growing in seasonally swampy areas. Flowers Nov.–Jan.

W.A.: 4 miles [c. 6.4 km] S of Northcliffe, *T.E.H. Aplin* 1416 (PERTH); 26 miles [42 km] E of Augusta, *E.M. Bennett* 2834 (PERTH); Chudalup, *W.M. McArthur* 7 (PERTH); Scott Natl Park, *C.J. Robinson* 005 (PERTH); 3–5 km from Windy Harbour, *A. Strid* 21459 (PERTH); Donnybrook Sunklands, *P.G. Wilson* 11638 (PERTH).



56c. *Boronia juncea* subsp. *micrantha* (Bartl.) Paul G. Wilson, *Nuytsia* 12: 138 (1998)

B. laniflora var. *micrantha* Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 165 (1845). T: Between Mt Melville and Mt Elphinstone, W.A., 11 Oct. 1840, *L. Preiss* 2030; iso: MEL.

Illustrations: P.G. Wilson, *op. cit.* 139, fig. 6C; J.R. Wheeler *et al.*, *Fl. South West* 2: 871 (2002).

Branches and leaves glabrous or very sparsely woolly. Pedicels sparsely woolly, 2–5 mm long. Sepals narrowly triangular, 3–5 mm long, acuminate, sparsely woolly. Petals obovate, 5–7 (–10) mm long, acuminate, very sparsely woolly along midrib abaxially, sparsely woolly adaxially. Ovary somewhat woolly.

Found near the S coast of W.A. between Walpole and Albany. Growing in seasonally swampy situations. Flowers Oct.–Mar.

W.A.: Broke Inlet, *H. Demarz* 1150 (PERTH); Denmark, *A.R. Fairall* 603 (PERTH); Irwin Inlet, *J.R. Wheeler* 2722 (PERTH).



56d. *Boronia juncea* subsp. *laniflora* (Bartl.) Paul G. Wilson, *Nuytsia* 12: 138 (1998)

B. laniflora Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 165 (1845). T: Sussex District, W.A., Dec. 1839, *L. Preiss* 2037; lecto: LD, *fide* P.G. Wilson, *loc. cit.*

B. laniflora var. *macrantha* Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 165 (1845). T: Sussex District, W.A., Dec. 1839, *L. Preiss* 2037; lecto: LD, *fide* P.G. Wilson, *loc. cit.*

Illustrations: P.G. Wilson, *op. cit.* 139, fig. 6A; J.R. Wheeler *et al.*, *Fl. South West* 2: 871 (2002).

Branches and leaves glabrous or very sparsely woolly. Pedicels woolly, 2–5 mm long. Sepals triangular, c. 4 mm long, acuminate, woolly. Petals broadly obovate, c. 7 mm long, with rounded apiculate apex, very sparsely woolly along midrib abaxially, sparsely woolly adaxially. Ovary glabrous.

Found near the S coast of W.A. between Augusta and Walpole and also near Albany. Growing in seasonally swampy soil. Flowers Oct.–Dec.

W.A.: 11 km ENE of Augusta, *E.N.S. Jackson* 3268 (MEL); West Cape Howe, *G.J. Keighery* 8672 (PERTH); Albany, *R.K. Thomson* 1122a (PERTH).



57. *Boronia parviflora* Sm., *Tracts Nat. Hist.* 295, t. 6 (1798)

T: Port Jackson, N.S.W., 1795, *White s.n.*; lecto: LINN 684.8 n.v., *fide* M.F.Duretto, *Muelleria* 17: 54 (2003).

B. pilonema Labill., *Nov. Holl. Pl.* i. 98. t. 126 (1805). T: in capite Van-Diemen. [Tas.], *J.J.H.de Labillardière*; holo: FI.

B. colorata Lehm. ex Bartl. in *J.G.C.Lehmann, Pl. Preiss.* 2: 226 (1848). T: *Herb. Preiss No.* 2627; lecto: LD, *fide* M.F.Duretto, *loc. cit.*

B. palustris Maiden & J.Black, *Trans. & Proc. R. Soc. S. Australia* 35: 1, pl. 1 (1911). T: Swamp 12 miles [c. 19.2 km] from Cape Border, Kangaroo Is., S.A., Oct. 1908, *H.H.D.Griffith s.n.*; holo: AD; iso: MEL.

Illustrations: J.M.Black, *Fl. S. Australia* 2nd edn, 2: 494 fig. 665 (1948), as *B. palustris*; N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29h (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274 (2002).

Weakly ascending herb or sub-shrub to 50 cm tall, glabrous apart from flowers. Branchlets terete; decurrent leaf bases indistinct. Leaves sessile, linear to elliptic or obovate, 7–28 mm long, 0.5–7.5 mm wide, entire to slightly crenate. Inflorescence 1 (–3)-flowered; bracts at base of pedicels, 1.5–10 mm long; pedicels 2–10 mm long. Sepals deltate to ovate, 2–6 mm long, smaller to just longer than petals, green to purple; abaxial surface glabrous. Petals 3–7 mm long, white to pink; abaxial surface glabrous. Stamens 4–8; filaments glabrous or pilose, eglandular or glandular; anthers minutely apiculate or not. Ovary and style glabrous; stigma minute. *n* = 9, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954). *Small Boronia*, *Tiny Boronia*, *Swamp Boronia*, *Small-flowered Boronia*.

Occurring on the Sunshine Coast, Qld, the Boonoo Boonoo and near coastal areas of N.S.W., southern Vic., SE S.A., and widespread across Tas. Found in seasonally wet wallum, heath, sedgeland and woodland communities on a variety of substrates. Flowers and fruits mainly Aug.–Mar.

Qld: Peregrin Swamp, Peregrin, c. 4 km N of Coolumb Beach, c. 1 km N of Mt Emu Rd, *P.R.Sharpe 4959* (BRI). N.S.W.: La Perouse, *R.G.Coveny 11141* (CANB, MEL, NSW). Vic.: Corangamite, Otways, 5 km SE of Barongaroo, *S.G.Harris 80* (CANB, MEL). S.A.: 'Brookland Park', 10 km N of South Coast Rd, 3 km E of Western Hwy, Kangaroo Is., *P.G.Wilson 808* (AD, BRI, CANB, MEL, NSW). Tas.: South West Cape, between Deadmans Bay and Lousy Bay, *A.M.Buchanan 9617* (HO).



A widespread species that displays some striking morphological variation mainly in leaf size and shape but also in the relative number and size of floral parts. Plants from western Vic. and S.A. may have 4–8 stamens per flower (the stamens are caducous). Plants from this area may also have sepals that are longer than the petals. In western Tas. there is a dwarf form with very narrow leaves. Plants from the Sydney, N.S.W., and Portland, SW Vic., areas sometimes have slightly larger flowers and a cluster of inflorescences (terminal and upper axillary) that are aggregated into a compact head. Some of these individuals have 3 flowers per inflorescence, as opposed to the normal one. See full discussion in Duretto (*op. cit.* 17: 55–57 (2003)).

58. *Boronia barkeriana* F.Muell., *Fragm.* 11: 96 (1880)

T: Blue Mtns, N.S.W., *C.A.Barker s.n.*; lecto: MEL, *fide* M.F.Duretto, *Muelleria* 17: 58 (2003).

Erect, woody perennial to 1 m tall, glabrous apart from flowers. Branchlets terete; decurrent leaf bases faint or absent. Leaves sessile or subsessile, linear to elliptic or obovate or oblanceolate, 7–33 mm long, 1.5–11 mm wide, entire to serrate. Inflorescence 1–12-flowered umbelliform cyme; first pair of bracts 3–7 mm long; bracteoles vestigial, placed proximally on pedicels; pedicels 5–23 mm long, glabrous. Sepals deltate to ovate, 2–8 mm long, purple, caducous; abaxial surface glabrous. Petals 5–11 mm long, pink; abaxial surface glabrous. Stamens: filaments pilose, glandular-verrucose towards apex; anthers minutely apiculate or not. Ovary and style glabrous; stigma minute. *n* = 9, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954). *Barker's Boronia*.

Occurs in Wolloml Natl Park, the Blue Mtns and Sydney areas, Barren Grounds Natl Park, N.S.W. and Jervis Bay, A.C.T. Found in wet heath on sandstone. Flowers and fruits mainly Sept.–Dec.

There are 3 subspecies, one of which, subsp. *gymnopetala*, is assumed to be extinct.

- | | |
|---|--|
| <p>1 Sepals 3.5–6 mm wide, ovate; adaxial surface of petals glabrous; distal end of pedicels c. 1.5–2 mm wide</p> <p>1: Sepals 1.5–3 mm wide, triangular; adaxial surface of petals with few hairs to sparsely and minutely pilose; distal end of pedicels c. 1 mm wide</p> <p>2 Leaves elliptic to oblanceolate to obovate, margins distinctly serrate, larger leaves 2.5–3.8 times as long as wide</p> <p>2: Leaves almost always narrowly elliptic to narrowly oblanceolate to narrowly obovate, margins entire to slightly serrate, larger leaves 4.4–7.7 times as long as wide</p> | <p>58b. subsp. <i>gymnopetala</i></p>
<p>58a. subsp. <i>barkeriana</i></p>
<p>58c. subsp. <i>angustifolia</i></p> |
|---|--|

58a. *Boronia barkeriana* F.Muell. subsp. *barkeriana*

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2: 234 (1991), as *B. barkeriana*; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 273 (2002).

Leaves elliptic to obovate or oblanceolate, (8–) 16–30 mm long, (2.5–) 4–11 mm wide, serrate; larger leaves with length:width ratio of 2.5–3.8. Inflorescence 3–9-flowered; pedicels 8–23 mm long. Sepals 3.5–6.5 mm long, 2–3 mm wide. Petals 6–8 mm long, sparsely and minutely pilose on adaxial surface. Staminal filaments with hairs c. 0.5 mm long.

Occurs between Kekeelbun Mtns and Mt Corieudgy and in the Blue Mtns, N.S.W. Found in heath in damper areas on sandstone. Flowers mainly Sept.–Nov.; fruits mainly Nov.–Dec.

N.S.W.: below Aerodrome, Hat Hill Rd, Blackheath, Blue Mtns, *E.F.Constable* 4664C (NSW); Govetts Leap, Blackheath, Blue Mtns, *E.F.Constable* 5578 (NSW); on fire-trail between Kekeelbun Mtns and Mt Corcudgy, c. 25 miles [c. 40 km] E of Rylstone, *D.J.McGillivray* 1618 (NSW); Kekeelbun Mts, 1.25 miles [c. 2 km] SE of 'Three Ways' on Putty Fire Trail, *T. & J.Whaite* 3291 (NSW).



A rare and poorly collected taxon.

58b. *Boronia barkeriana* subsp. *gymnopetala* Durretto, *Muelleria* 17: 60 (2003)

T: Mosman Bay, N.S.W., Oct. 1891, *anon.*; holo: NSW.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274 (2002); M.F.Durretto, *loc. cit.* 59, fig. 6A–B.

Leaves obovate to oblanceolate, 12–23 mm long, 4–9 mm wide, serrate; larger leaves with length:width ratio of 2.4–3.3. Inflorescence 1–3-flowered; pedicels 11–15 mm long. Sepals 6–7 mm long, 4–6 mm wide. Petals 6–11 mm long; adaxial surface glabrous. Staminal filaments with hairs 0.25–0.5 mm long.

Occurred in and around the Sydney area from Mossman Bay to Waterfall, N.S.W. Presumably it grew in open woodland or heath on sandstone. Flowering material has been collected in Sept. and Oct.

N.S.W.: Sirius [?] Szrius] Cove [= Sirius Cove?], Oct. 1894, *Mr Black s.n.* (NSW); Loftus, Natl Park, 6 Sept. 1898, *Boorman s.n.* (NSW); Port Jackson District, Sept. 1898, *F.[?] (MEL)*; Waterfall, Oct. 1908, *A.A.Hamilton s.n.* (NSW).



The subspecies has not been collected since 1923 and is presumed extinct.

58c. *Boronia barkeriana* subsp. *angustifolia* Duretto, *Muelleria* 17: 61 (2003)

T: Entrance to Budderoo Natl Park on road to Jamberoo from Robertson, N.S.W., 28 Oct. 1995, *M.F.Duretto* 695, *P.G.Neish* & *I.Thompson*; holo: MEL; iso: CANB, HO, MEL, NSW.

Illustrations: L.Robinson, *Field Guide Native Pl. Sydney* 115 (1991), as *B. barkeriana*; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274 (2002); *M.F.Duretto, op. cit.* 59, fig. 6A–B.

Leaves narrowly elliptic to narrowly obovate, (8–) 15–33 mm long, 1.5–6.5 mm wide, entire or slightly serrate; larger leaves with length:width ratio of 4.4–7.7. Inflorescence (1–) 3–12-flowered; pedicels 5–14 mm long. Sepals 3–6 mm long, 1.5–2.5 mm wide. Petals 5–10 mm long; adaxial surface with few hairs to sparsely puberulous. Staminal filaments with hairs c. 0.5 mm long. Fig. 26A–C.

Occurs from Budderoo Natl Park to Budawang Ra., N.S.W., and in the Shoalhaven Heads area, N.S.W., to Jervis Bay, A.C.T. Found in woodland and heath on sand or sandstone derived soils. Flowers and fruits mainly Oct.–Dec.

N.S.W.: c. 2 km W of Mt Corang, N Budawang Ra. and c. 32 km NE of Braidwood, *R.Pullen* & *J.Storey* 4980 (CANB, NSW); Roseby Park, mouth of Shoalhaven R., *R.A.Rodway* 1104 (NSW); The Castle, Budawang Ra., *I.R.Telford* BR201 (CANB); Tianjara Falls, c. 35 km SW of Nowra, *I.R.Telford* 9886 (AD, CANB, MEL). A.C.T.: Caves Beach Rd, Jervis Bay, *T.A.James* 89 (MEL, NSW).



A common and secure taxon.

Sect. 2. Imbricatae

Paul G. Wilson

Boronia sect. *Imbricatae* Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3/4: 136 (1896)

B. sect. Typoboronia Kuntze in T.von Post & O.Kuntze. *Lex. Gen. Phan.* 74 (1903), *nom. illeg.*; *B. ser. Imbricatae* (Engl.) Paul G.Wilson, *Nuytsia* 1: 204 (1971). T: *B. cymosa* Endl.

Plant lacking stellate hairs, glabrous except for staminal filaments. Leaves simple. Flowers in slender-pedunculate terminal cymes. Sepals imbricate, persistent. Petals imbricate in bud, 1-veined at base with spreading lateral nerves; tip neither inflexed nor apiculate. Stamens 8, all fertile; filaments semiterete, verrucose towards apex, hispid, with tip appearing subterminal, inflexed and laterally flattened; anthers equal, white-apiculate; connective not apparent; loculi reflexed after dehiscence. Seed with rugose testa; adaxial surface almost completely composed of a large, broadly ovate, smooth aril scar.

A monotypic section endemic to W.A. The branches develop a visible and distinctive cream-coloured spongy layer as they get older.

59. *Boronia cymosa* Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837)

T: King George Sound, W.A., *C.Huegel*; *n.v.*

B. teretifolia Lindl., *Sketch Veg. Swan R.* 17 (1839). T: W.A., 1839, *J.Drummond s.n.*; holo: CGE (photo seen).

Illustration: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 480, fig. 187 (1987).

Shrub to 50 cm high, glabrous except for staminal filaments. Branches smooth. Leaves frequently clustered in axillary fascicles, \pm erect, subterete to narrowly elliptic with infolded margins, 2–3 cm long. Flowers in loose long-pedunculate cymes, shortly pedicellate. Sepals suborbicular, c. 2 mm long, coriaceous, rugose, persistent. Petals suborbicular, shortly clawed, c. 5 mm long, pink. Disc broad. Stamens: filaments semiterete, verrucose and pilose abaxially; anthers c. 1.3 mm long, shortly apiculate. Style c. 0.5 mm long; stigma capitate. *Granite Boronia*. Fig. 31.



Figure 31. *Boronia cymosa*. A, habit; B, flower; C, antipetalous stamen; D, antisepalous stamen; E, carpel; F, seed (A–E, D.B.Foreman 553, NSW; F, J.Thompson 4579, NSW). Scale bar: A = 3.75 cm; B = 7.5 mm; C–F = 2.25 mm. Drawn by C.Wardrop.

Endemic in SW W.A., in the Darling Ra. near Perth and N to Shark Bay. Growing generally on gravel or granite, often on hillsides. Flowers July–Nov.; fruits Oct.–Nov.

W.A.: 7 km E of Eneabba, *R.Hnatiuk 800003* (PERTH); 14 km NW of Northampton, *N.Hoyle 478* (PERTH); Boya, *P.Sawyer 039* (PERTH).

The King George Sound locality for the type, a *C.Huegel* collection, is presumably an error since this species has not otherwise been recorded much farther south than Perth.



Sect. 3. *Cyanothamnus*

Marco F. Duretto (eastern species)

Paul G. Wilson (western species)

Boronia sect. *Cyanothamnus* (Lindl.) F.Muell., *Fragm.* 9: 113 (1875)

Cyanothamnus Lindl., *Sketch Veg. Swan R.* 18 (1839); *Boronia* ser. *Cyaneae* Benth., *Fl. Austral.* 1: 309, 319 (1863), based on above; *B.* sect. *Cyaneae* (Benth.) De Wild., *Icon. Select.* 2: 67 (1901) *nom. illeg.* T: *B. ramosa* (Lindl.) Benth.

Hairs simple or rarely stellate. Leaves simple, pinnate, bipinnate or tripinnate. Flowers axillary or rarely terminal on short shoots (*B. coerulescens*) or in terminal cymes (*B. defoliata*), solitary or in cymes. Sepals open or imbricate, persistent. Petals imbricate, usually prominently glandular, 1-veined at base with spreading lateral veins, caducous or persistent; tip inflexed in bud. Stamens 8, all fertile; filaments linear to elliptic (rarely slender-terete), with erect tip, verrucose towards apex (rarely smooth), glabrous or hairy; connective usually prominent and dark-coloured, rarely inconspicuous or cream-coloured; anthers scarcely or prominently white-apiculate, inflexed or erect, rarely absent. Seed: sclerotesta predominantly rugose, verrucose; outer testa membranous, dull, often with white deposit; hilum filiform on adaxial surface; raphe basal with brittle cover.

A section of 23 species found in all states and the A.C.T.; absent from the N.T. Eleven species are confined to the east coast and another 11 to south-western W.A. *Boronia coerulescens* is widespread and found in all southern mainland states though only the type subspecies extends to eastern states. The section has six series: three, *Penicillatae*, *Fabianoides*, and *Defoliatae*, are confined to SW W.A., one, *Polygalifoliae*, is confined to eastern Australia, and the two remaining are found in both areas. A key is provided for all species in the section, as well as separate keys for W.A. species and east coast species.

KEY TO SERIES OF SECTION CYANOTHAMNUS

- | | |
|---|---|
| 1 Indumentum of stellate hairs | ser. 4. <i>Penicillatae</i> (p. 211) |
| 1: Indumentum of simple hairs, sometimes only on flowers | |
| 2 Leaves pinnate | ser. 1. <i>Cyanothamnus</i> (p. 194) |
| 2: Leaves simple, sometimes trilobed | |
| 3 Style hairy | |
| 4 Leaves simple; anther apiculum not globular (S.A.; Qld; E N.S.W.; Vic.; Tas.) | ser. 1. <i>Cyanothamnus</i> (p. 194) |
| 4: Leaves simple or trilobed; anther apiculum globular (W.A.; S.A.; SW N.S.W.; W. Vic.) | ser. 3. <i>Coerulescentes</i> (p. 209) |
| 3: Style glabrous | |

- | | | |
|----|---|---------------------------------------|
| 5 | Plant hirsute; leaves alternate or fasciculate | ser. 5 Fabianoides (p. 214) |
| 5: | Plant glabrous apart from flowers; leaves opposite | |
| 6 | Inflorescence bracts minute, scale-like; leaves flat, persistent (N.S.W.; Qld) | ser. 2 Polygalifoliae (p. 208) |
| 6: | Inflorescence bracts large and sepal-like; leaves terete and often deciduous (W.A.) | ser. 6. Defoliatae (p. 217) |

KEY TO SECTION CYANOTHAMNUS (ALL STATES)

- | | | |
|-----|--|------------------------------|
| 1 | Leaves all simple, entire or lobed | |
| 2 | Leaves terete or subterete, sometimes rounded abaxially and flat adaxially | |
| 3 | Leaves subopposite, alternate, or in fascicles, or whorled | |
| 4 | Branchlets spinescent | 77. <i>B. acanthoclada</i> |
| 4: | Branchlets not spinescent | 78. <i>B. fabianoides</i> |
| 3: | Leaves opposite | |
| 5 | Petals stellate-puberulous | 75. <i>B. westringioides</i> |
| 5: | Petals glabrous or puberulous with simple hairs | |
| 6 | Staminal filaments filiform, glabrous | 82. <i>B. busselliana</i> |
| 6: | Staminal filaments neither filiform nor glabrous | |
| 7 | Stigma large, subsessile or on a short thick style; sepals very broadly ovate | 79. <i>B. subsessilis</i> |
| 7: | Stigma small, style slender; sepals narrowly or broadly ovate or triangular or narrowly oblong | |
| 8 | Leaves tridentate, tips acute | 64. <i>B. anemonifolia</i> |
| 8: | Leaves not tridentate, sometimes lobed and then tips obtuse | |
| 9 | Leaves subterete, thick, 2–10 mm long, tip obtuse | 73. <i>B. coerulescens</i> |
| 9: | Leaves filiform, 4–20 mm long, tip acute | |
| 10 | Sepals narrowly ovate or narrowly triangular; flowers axillary, solitary or 2 or 3 together | 80. <i>B. tenuis</i> |
| 10: | Sepals broadly ovate; flowers in pedunculate terminal and axillary cymes | 81. <i>B. defoliata</i> |
| 2: | Leaves narrowly to broadly linear to elliptic, narrowly oblong, ovate or obovate | |
| 11 | Leaves boat-shaped to obovate, sessile, appressed; petals stellate-pubescent | 76. <i>B. baeckeacea</i> |
| 11: | Leaves linear to elliptic, ovate or oblong to obovate or trilobed, petiolate; petals glabrous or with a few simple hairs | |
| 12 | Erect, though sometimes spreading, shrub; leaf tips obtuse | 73. <i>B. coerulescens</i> |
| 12: | Semi-prostrate shrub; leaf tips acute | |
| 13 | Leaves concolorous; branchlets puberulous between decurrent leaf bases (S.A.; N.S.W.; Vic.; Tas.) | 63. <i>B. nana</i> |
| 13: | Leaves discolorous, abaxial surface paler; stems glabrous (Qld; N.S.W.) | 72. <i>B. polygalifolia</i> |
| 1: | At least some leaves compound | |

- 14 Leaves sessile (SW W.A.)
- 15 Leaflets \pm linear to narrowly cuneate, flat or convex above 74. *B. penicillata*
- 15: Leaflets boat-shaped to obovate, concave above 76. *B. baeckeacea*
- 14: Leaves petiolate (SW W.A.; S.A.; Qld; N.S.W.; Vic.; Tas.)
- 16 Petals c. 1.5 mm long; sepals c. 0.6 mm long (SW W.A.) 61. *B. inconspicua*
- 16: Petals 2–7.5 mm long; sepals 1–5 mm long (SW W.A.; S.A.; Qld; N.S.W.; Vic.; Tas.)
- 17 Leaflet tips trilobed, or if not trilobed (N.S.W.; Tas.) then branches with obvious glands but not verrucose and hairs concentrated between decurrent leaf bases and leaflets obovate (Qld; N.S.W.; Vic.; Tas.) 64. *B. anemonifolia*
- 17: Leaflet tips never trilobed; stems without the above combination of characters (SW W.A.; S.A.; Qld; N.S.W.; Vic.; Tas.)
- 18 Petals 3–5 mm long, blue or pale green, rarely white abaxially only (and if so, then petals 5 mm long and glabrous); sepals 1.5–5 mm long (SW W.A.) 60. *B. ramosa*
- 18: Petals 2–7.5 mm long, white to pale pink (if white then 2–4 mm long and/or ciliate); sepals 1–3 mm long (S.A.; Qld; N.S.W.; Vic.; Tas.)
- 19 Stems glabrous, with few hairs or sparsely puberulous between distinct decurrent leaf bases, not obviously glandular to slightly glandular-verrucose (and if so, then stems glabrous)
- 20 Leaves bipinnate and tripinnate; branches glabrous, quadrangular (S Qld; N.S.W.) 66. *B. anethifolia*
- 20: Leaves pinnate or bipinnate; branches with few hairs or sparsely puberulous, or rarely glabrous, not quadrangular (N Qld)
- 21 Inflorescence 5–25⁺-flowered; peduncles 2–2.5 mm long; anther apiculum minutely pilose 70. *B. warangensis*
- 21: Inflorescence 1–3-flowered; peduncles 0.5–1.5 mm long; anther apiculum glabrous 71. *B. montimulliganensis*
- 19: Stems puberulous to pilose, rarely glabrous, not obviously glandular or slightly to distinctly glandular-verrucose; decurrent leaf bases absent or if present, and not faint, stems puberulous to pilose
- 22 Weak decumbent subshrubs; leaves 3 (–5)-foliolate; abaxial surface of leaves without red/brown midrib (S.A.; Vic.; Tas.) 63. *B. nana*
- 22: Woody shrubs, usually erect; leaves 3–11-foliolate; abaxial surface of leaves with or without red/brown midrib (Qld; N.S.W.)
- 23 Adaxial surface of sepals puberulous; leaves 4–12 mm long and wide (central & S N.S.W.) 62. *B. rigens*
- 23: Adaxial surface of sepals glabrous; leaves 8–50 mm long, 7–60 mm wide (Qld; N N.S.W.)
- 24 Petals 5–7.5 mm long (SE Qld; NE N.S.W.) 65. *B. inflexa*
- 24: Petals 2–4 mm long (S.A.; Qld; N.S.W.; Vic.; Tas.)
- 25 Terminal leaflets 5–17 mm long (N Qld) 69. *B. yarrowmerensis*
- 25: Terminal leaflets 0.5–9 mm long (Qld; N.S.W.)
- 26 Branchlets slightly to distinctly glandular-verrucose; inflorescence (1–) 7–21⁺-flowered; peduncles 2–8 mm long; leaflets glabrous or with few hairs at base; leaves bipinnate or tripinnate 68. *B. bipinnata*

26: Branchlets not to slightly glandular-verrucose; inflorescence 1–3 (–9) -flowered; peduncles 0.5–2 mm long (if to 9 mm then leaves pinnate, Granite Belt); leaflets glabrous to puberulous; leaves pinnate or bipinnate

27 Leaves 3–5-foliolate, pinnate (rarely bipinnate and then branch hairs c. 0.5 mm long; N.S.W. - Gibraltar Ra.); branch hairs to 0.5 mm long; sepals > 2 times as long as wide; stem hairs to 0.5 mm long; growing on granite (SE Qld - Granite Belt; NE N.S.W. - Torrington area, Gibraltar Ra.)

65. *B. inflexa*

27: Leaves 3–7-foliolate, usually some leaves bipinnate; sepals < 2 times as long as wide; branch hairs to 0.25 mm long; usually growing on sandstone or sandy soils (Qld - less Granite Belt of SE; N.S.W. - NWS, CWS, NC?)

67. *B. occidentalis*

KEY TO SECTION CYANOTHAMNUS (WESTERN AUSTRALIA)

1 Leaves all simple, entire or lobed

2 Leaves terete or subterete or narrowly elliptic, entire

3 Plant glabrous (except flowers); leaves opposite

4 Staminal filaments filiform, glabrous

82. *B. busselliana*

4: Staminal filaments neither filiform nor glabrous

5 Stigma large, subsessile or on a short thick style; sepals broadly ovate

79. *B. subsessilis*

5: Stigma small, style slender; sepals narrowly or broadly ovate or triangular or broadly oblong

6 Leaves filiform, 4–20 mm long

7 Sepals narrowly ovate or narrowly triangular; flowers axillary, solitary or 2 or 3 flowers together

80. *B. tenuis*

7: Sepals broadly ovate; flowers in pedunculate terminal and axillary cymes

81. *B. defoliata*

6: Leaves subterete, thick, 3–10 mm long

73. *B. coerulescens*

3: Plant glabrous or with puberulous or puberulous branches; leaves opposite or alternate or fasciculate or whorled

8 Petals stellate-pubescent; leaves opposite

75. *B. westringioides*

8: Petals glabrous or puberulous with simple hairs; leaves opposite or alternate or fasciculate or whorled

9 Leaves opposite

73. *B. coerulescens*

9: Leaves subopposite, alternate, or in fascicles

10 Branchlets spinescent

77. *B. acanthoclada*

10: Branchlets not spinescent

78. *B. fabianoides*

2: Leaves narrowly oblong to ovate, obovate, or trilobed

11 Leaves oblong to obovate or trilobed; petals glabrous or with a few simple hairs; petals variably glandular

73. *B. coerulescens*

11: Leaves boat-shaped to obovate, sessile, appressed; petals stellate-puberulous, usually red gland-dotted all over

76. *B. baeckeacea*

1: Some leaves compound

12 Leaves petiolate

13 Leaflets linear to terete, concave or channelled above

60. *B. ramosa*

- 13: Leaflets flat or slightly convex above 61. *B. inconspicua*
 12: Leaves sessile
 14 Leaflets \pm linear to narrowly cuneate, flat or convex above 74. *B. penicillata*
 14: Leaflets boat-shaped to obovate, concave above 76. *B. baeckeacea*

KEY TO SECTION CYANOTHAMNUS (EASTERN AUSTRALIA)

- 1 Leaves simple, sometimes tridentate at tip
 2 Leaves terete to semiterete, sometimes appressed to stems; erect shrubs
 3 Leaf tip acute 64. *B. anemonifolia*
 3: Leaf tip obtuse 73. *B. coerulescens*
 2: Leaves linear to elliptic, rarely ovate or obovate, flat, not appressed to stems; usually decumbent shrubs and herbs
 4 Leaves concolorous; branchlets pilose between decurrent leaf bases (S.A.; N.S.W.; Vic.; Tas.) 63. *B. nana*
 4: Leaves discolorous, abaxial surface paler; stems glabrous (Qld; N.S.W.) 72. *B. polygalifolia*
 1: Some leaves compound
 5 Leaflet tips usually trilobed or if not trilobed (Tas.) then stems with obvious glands and distinct decurrent leaf bases (Qld; N.S.W.; Vic.; Tas.) 64. *B. anemonifolia*
 5: Leaflet tips never trilobed; stems without the above combination of characters (Qld; N.S.W.)
 6 Stems glabrous, with few hairs or sparsely and minutely pilose between distinct decurrent leaf bases, not obviously glandular to slightly glandular-verrucose (and then stems glabrous)
 7 Leaves bipinnate and tripinnate; branches glabrous, quadrangular (S Qld; N.S.W.) 66. *B. anethifolia*
 7: Leaves pinnate or bipinnate; branches with few hairs or sparsely and minutely pilose, or rarely glabrous, not quadrangular (N Qld)
 8 Inflorescence 5–25+ flowered; peduncles 2–2.5 mm long; anther apiculum minutely pilose 70. *B. warangensis*
 8: Inflorescence 1–3 flowered; peduncles 0.5–1.5 mm long; anther apiculum glabrous 71. *B. montimulliganensis*
 6: Stems puberulous to pilose, rarely glabrous, not obviously glandular to glandular-verrucose; decurrent leaf bases absent or if present stems puberulous to pilose
 9 Weak decumbent subshrubs; leaves 3 (–5)-foliolate; abaxial surface of leaves without red/brown midrib (S.A.; Vic.; Tas.) 63. *B. nana*
 9: Woody shrubs, usually erect; leaves 3–11-foliolate; abaxial surface of leaves with or without red/brown midrib (Qld; N.S.W.)
 10 Adaxial surface of sepals puberulous; leaves 4–12 mm long and wide (central & S N.S.W.) 62. *B. rigens*
 10: Adaxial surface of sepals glabrous; leaves 6–50 mm long, 7–60 mm wide (Qld; N N.S.W.)
 11 Petals 5–7 mm long 65. *B. inflexa*
 11: Petals 2–4 mm long
 12 Terminal leaflets 5–17 mm long (N Qld) 69. *B. yarrowmerensis*
 12: Terminal leaflets 0.5–10 mm long (Qld; N.S.W.)

- 13** Branchlets slightly to distinctly glandular-verrucose; inflorescence (1–) 7–20⁺-flowered, peduncles 2–8 mm long; leaflets glabrous or with few hairs at base; leaves bipinnate or tripinnate **68. *B. bipinnata***
- 13:** Branchlets not to slightly glandular-verrucose; inflorescence 1–3 (–9)-flowered, peduncles 0.5–2 mm long (if to 9 mm then leaves pinnate, Granite Belt); leaflets glabrous to puberulous; leaves pinnate or bipinnate
- 14** Leaves 3–5-foliolate, pinnate (rarely bipinnate and then branch hairs c. 0.5 mm long; N.S.W. - Gibraltar Ra.); branch hairs to 0.5 mm long; sepals > 2 times as long as wide; growing on granite (SE Qld - Granite Belt; NE N.S.W. - Torrington area, Gibraltar Ra.) **65. *B. inflexa***
- 14:** Leaves 3–7-foliolate, usually some leaves bipinnate; sepals < 2 times as long as wide; branch hairs to 0.25 mm long; usually growing on sandstone or sandy soils (Qld - less Granite Belt of SE; N.S.W. - NWS, CWS, NC?) **67. *B. occidentalis***

Ser. 1. *Cyanothamnus*

Boronia ser. *Cyanothamnus*

Erect or rarely weakly erect and spreading (*B. nana*) shrubs, variously hirsute; hairs simple. Leaves opposite, persistent, petiolate, pinnate with rhachis present, rarely leaves simple or ternate (*B. anemonifolia*, *B. nana*); leaflets flat, rarely semiterete, c. isobilateral, clearly defined spongy mesophyll absent. Inflorescence a few–many-flowered cyme or flowers solitary; bracts minute. Petal pink or white, rarely blue (*B. ramosa*) or yellow-green (*B. ramosa*). Anther apiculum not globular. Style hirsute or glabrous.

A series of 12 species; occurring in all States. The species found in N Qld, W N.S.W. and Qld (*B. occidentalis* to *B. montimulliganensis*) with *B. anethifolia* form a natural group characterised by leaf anatomical features (large cells in the parenchyma, see M.F.Duretto, *Muelleria* 17: 19–135 (2003)), small cup-shaped corolla and an obtuse petal tip. Relationships between the other species are unclear though *B. inflexa* and *B. anemonifolia*, *B. rigens* and *B. nana* and the two W.A. species, *B. ramosa* and *B. inconspicua* form species pairs.

60. *Boronia ramosa* (Lindl.) Benth., *Fl. Austral.* 1: 320 (1863)

Cyanothamnus ramosus Lindl., *Sketch Veg. Swan R.* 18 (1839). T: Swan River [Colony], W.A., 1839, *J.Drummond*; syn: CGE (photo seen); *Capt. Mangles*; syn: CGE (photo seen).

Slender woody perennial to 30 cm high, glabrous or puberulous. Branches with decurrent leaf bases faint to prominent. Leaves 3–7-foliolate, sometimes lower leaflets ternate, rarely some leaves simple, 10–30 (–40) mm long; petiole and rhachis segments 1–11 mm long; leaflets slender-terete to linear, 5–15 mm long, obtuse to cuspidate, channelled or concave above. Flowers 1–3, axillary; pedicels 2–15 mm long. Sepals broadly ovate and 1.5–2 mm long, to ovate-acuminate and 2.5–5 mm long, thick, glabrous. Petals broadly elliptic, 3–5 mm long, firm, glabrous, prominently glandular all over, white adaxially, blue or pale green abaxially. Stamens: filaments flat, narrowly triangular, ciliate, verrucose apically; anther apiculum flat. Ovary glabrous; style terete, 0.1–0.3 mm long; stigma capitate to fusiform or cylindrical. *n* = 18, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954).

Occurs in SW W.A. from Shark Bay S and E to near Esperance. 3 subspecies are recognised.

- 1** Pedicels 6–15 mm long; stigma fusiform or cylindrical **60a. subsp. *ramosa***
- 1:** Pedicels 2–3 mm long; stigma capitate or depressed-capitate
- 2** Leaflets slender-terete, channelled above **60b. subsp. *anethifolia***
- 2:** Leaflets linear to narrowly oblong, concave above **60c. subsp. *lesueurana***

60a. *Boronia ramosa* (Lindl.) Benth. subsp. *ramosa*

Branches with decurrent leaf bases faint. Leaves bi-ternate or pinnately 3–5-foliolate, 10–15 (–25) mm long, glabrous or puberulous; leaflets slender-terete, channelled above. Pedicel slender, 6–15 mm long. Sepals ovate, 2–5 mm long, obtuse to acute or acuminate. Petals c. 5 mm long, blue. Stigma fusiform to cylindrical, slightly 4-ridged.

Occurs in the Darling Ra., E of Perth N to Dandaragan, and also at Mt Peron, W.A.; growing on laterite. Flowers and fruits Sept.–Nov.

W.A.: Mundaring, *R.J.Cranfield* 884/79 (PERTH); Bindoon, *C.A.Gardner* 7696 (PERTH); Mt Peron, *C.A.Gardner* 9414 (PERTH); Serpentine Falls, *J.W.Green* 2035 (PERTH); Helena Valley, *J.Seabrook* 63 (PERTH).

Some of the more northerly collections appear to intergrade with subsp. *anethifolia*.

**60b. *Boronia ramosa* subsp. *anethifolia* (Bartl.) Paul G.Wilson, *Nuytsia* 1: 201 (1971)**

Cyanothamnus anethifolius Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 170 (1845); *B. ramosa* var. *anethifolia* (Bartl.) Benth., *Fl. Austral.* 1: 320 (1863). T: Near Spitesbrook on Canning R., W.A., 14 July 1841, *L.Preiss* 2035; lecto: LD, *fide* P.G.Wilson, *Nuytsia* 12: 151 (1998); isolecto: MEL (2 sheets).

B. subcoerulea F.Muell., *Fragm.* 2: 100 (1860). T: Murchison R., W.A., *A.Oldfield*, syn: MEL; Gniah, Murchison R., W.A., *A.Oldfield*, syn: MEL.

Illustration: E.M.Bennett, *Bushland Pl. of Kings Park W. Australia* 73, fig. 135 (1988).

Branches with decurrent leaf bases faint. Leaves mostly 3-foliolate, sometimes pinnately 7-foliolate or biternate, rarely simple, 12–30 (–40) mm long; leaflets slender-terete, channelled above. Pedicel slender, 2–3 mm long. Sepals broadly ovate and obtuse (rarely narrowly triangular and acute), 1.5–2 mm long. Petals c. 3 mm long, blue. Stigma capitate or depressed-capitate.

Occurs in SW W.A. from the Murchison R. S to the Stirling Ra. and E to Cape Le Grand. Flowers June–Sept.; fruits Sept.–Nov.

W.A.: Mt Ney, *M.A.Burgman* 3207 (PERTH); 20 km SSW of Ravensthorpe, *G.F.Craig* 2831 (PERTH); Welshpool, Aug. 1925, *C.A.Gardner* s.n. (PERTH); 17 miles [27 km] SE of Pingelly, *A.S.George* 7783 (PERTH); Kalbarri Natl Park, *R.J.Hnatiuk* 760542 (PERTH).

A variable taxon. A puberulous variant appears to co-exist with the more widespread glabrous variant and to occur sporadically throughout the distribution of the subspecies. Near Eneabba is found a variant in which many of the leaves are simple.

**60c. *Boronia ramosa* subsp. *lesueurana* Paul G.Wilson, *Nuytsia* 12: 151 (1998)**

T: S boundary of Mt Lesueur Natl Park, W.A., 1 July 1992, *R.Cranfield & P.Spencer* 8245; holo: PERTH.

Branches with prominent decurrent leaf bases (narrowly 4-winged) when young and puberulous between wings, terete with age. Leaves pinnately 3–5-foliolate, 15–40 mm long; leaflets linear to narrowly oblong, concave above. Pedicels 2–3 mm long. Sepals very broadly ovate, 1.5 mm long. Petals c. 5 mm long, white, green with age. Stamens: filaments broadly triangular-acuminate, ciliate, verrucose at apex; anther apiculum short (0.2 mm long), rounded, white, recurved. Stigma depressed-capitate.

Known only near Mt Lesueur, c. 200 km N of Perth, SW W.A. Growing in sand or gravel over laterite. Flowers and fruits July–Aug.

W.A.: crest of Mt Lesueur, *C.A.Gardner* 9081 (PERTH); Mt Lesueur, *E.A.Griffin* 1838 (PERTH).

This subspecies appears to grade into subsp. *anethifolia*.



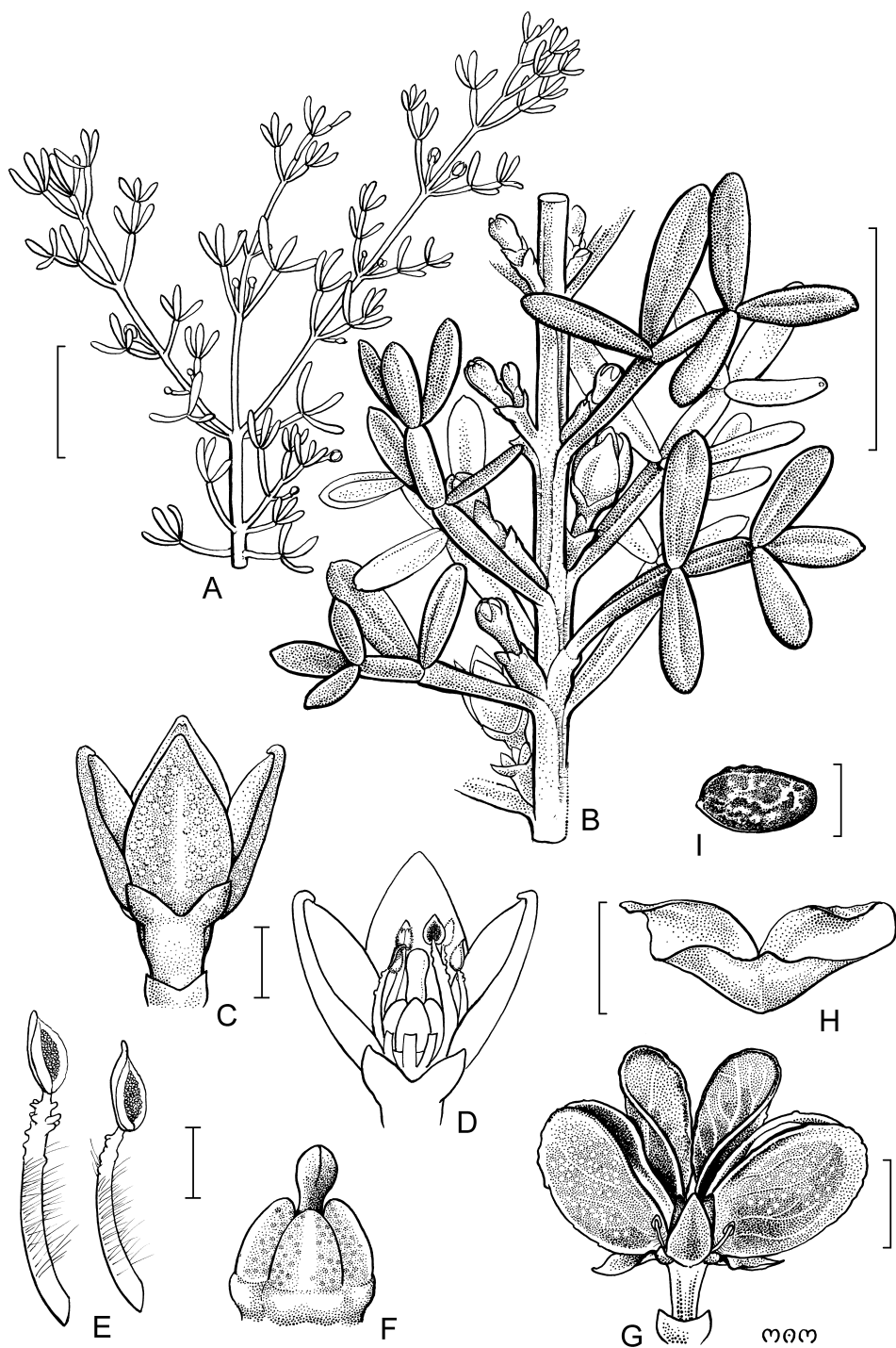


Figure 32. *Boronia inconspicua*. A, habit; B, flowering branch; C, flower; D, flower, 1 petal & 3 stamens removed; E, stamens (left, antisepalous; right, antipetalous); F, pistil; G, cocci (dehiscent); H, endocarp; I, seed (drawn from fresh material, voucher not recorded). Scale bars: A, B = 10 mm; C, D = 1 mm; E, F = 0.5 mm; G–I = 2 mm. Drawn by M. Wilson.

61. *Boronia inconspicua* Benth., *Fl. Austral.* 1: 313 (1863)

T: Swan River Colony, W.A., *J.Drummond* 212; holo: K (photo seen); iso: MEL, TCD.

Rounded compact shrub to 1 m high. Branchlets glabrous or sparsely puberulous; decurrent leaf bases faint. Leaves pinnately 3–7-foliolate, glabrous; petiole and rachis segments 2–5 mm long; leaflets narrowly oblong to narrowly cuneate, 3–10 mm long, flat or slightly recurved, leathery. Flowers axillary, solitary or in few-flowered cymes; pedicels 2–4 mm long, glabrous. Sepals triangular, c. 0.6 mm long, leathery, glabrous. Petals elliptic, c. 1.5 mm long, glabrous, firm, glandular-punctate, green to white. Stamens: filaments narrowly oblong, glandular-verrucose towards apex, sparsely ciliate; anthers extremely minutely apiculate or blunt. Ovary glabrous; style terete, c. 0.15 mm long, glabrous; stigma subcapitate. Fig. 32.

Found in southern W.A. from the Stirling Ra. E to Mt Ragged. Usually growing on rocky outcrops in loam. Flowers and fruits Sept.–Dec. (Mar., May).

W.A.: Ravensthorpe Ra., *J.Armstrong* 7057 (PERTH); Nuytsland Nature Res., *G.F.Craig* 2527 (PERTH); Chillinup, *A.S.George* 6911 (PERTH).

**62. *Boronia rigens* Cheel, *J. Proc. Roy. Soc. New South Wales* 62: 297 (1929)**

Based on *B. polygalifolia* Sm. var. *robusta* Benth., *Fl. Austral.* 1: 321 (1863). T: New Holland [N.S.W.], *Sieber Fl. Novae Holl.* 283; lecto: K n.v., fide P.G.Neish & M.F.Duretto, *Muelleria* 14: 13 (2000); isolecto: MEL (2 sheets).

Illustrations: A.Fairley & P.Moore, *Nat. Pl. Sydney District*, 235, t 816 (1989); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 268 (2002).

Prostrate to erect, woody shrub to 0.3 m tall, with few hairs to pilose. Branches not obviously glandular; decurrent leaf bases present. Leaves pinnate or bipinnate, 3–7-foliolate, 4–12 mm long and wide; petiole and rachis segments 1.5–5 mm long; leaflets linear to narrowly elliptic, 2–12 mm long, 0.5–2 mm wide. Inflorescences axillary, 1–3-flowered; peduncle and pedicels 0.5–2 mm long. Sepals deltate, 1.2–2 mm long; abaxial surface glabrous to pilose; adaxial surface puberulous. Petals 2.5–3.5 mm long, glabrous or ciliate, white or pink. Stamens: filaments pilose, slightly glandular towards apex; anthers glabrous, prominently apiculate. Ovary with few hairs; style pilose; stigma minute. *n* = 18, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954).

Occurs between Bombala and Rylstone, N.S.W., where found in woodland or heath on sandy or stony soils associated with sandstone. Flowers July–Aug.; fruits Aug.–Sept.

N.S.W.: Mt Banks, on N slope, *D.Benson* 2319 (NSW); Bunboori Ck, via Waratah Ridge, Blue Mountains Natl Park, *P.Hind* 6340 (NSW); Endeavour Res., around base of communication tower, c. 1 km S of Bombala, *P.G.Neish* 74 (MEL); 3.8 km along Tevotts Rd, c. 6 km SW of Bundanoon, *P.Ollerenshaw* 1740 (CANB); N Budawang Ra., Wog Wog Ck – Corang Trig track, *I.R.Telford* 9549 (CANB).

Distinguishable from *B. nana* by having leaflets with distinctly raised midribs on the abaxial surface that are usually red and darker than the rest of the leaf.

**63. *Boronia nana* Hook., *Icon. Pl.* 3, t. 270 (1840)**

B. hyssopifolia var. *B* Hook.f., *Fl. Tasman.* 1: 66 (1855); *B. polygalifolia* var. *trifoliolata* Benth., *Fl. Austral.* 1: 321 (1863). T: Rocky Cape, V.D.Land [Tas.], 29 Dec. 1837, *R.Gunn* 894; lecto: K n.v., fide M.F.Duretto, *Muelleria* 17: 45 (2003); isolecto: HO, K n.v.; possible isolecto: TCD.

[*B. polygalifolia* auct. non Sm.: R.Tate, *Fl. S. Australia* 23, 209 (1890); J.M.Black, *Fl. S. Australia* 2nd edn, 2: 491 (1948)]

Weakly erect or spreading, glabrous to pubescent sub-shrub to 1 m long. Branchlets not obviously glandular; decurrent leaf bases present. Leaves simple or pinnate or very rarely bipinnate, 1–5-foliolate; petiole 0.5–5 mm long; leaflets and simple leaves linear to elliptic, ovate or obovate, 2–25 mm long, 0.5–4 mm wide, flat, acute. Inflorescences axillary, 1–7-flowered; peduncle 1–7 mm long; pedicels 2–16 mm long. Sepals deltate to narrowly deltate, 1–3.5 mm long, 0.5–1.5 mm wide. Petals 2.5–6 mm long, not obviously glandular, white to pink. Stamens: filaments pilose, glandular-verrucose towards apex; anther apiculum glabrous or with few hairs. Ovary glabrous; style pilose; stigma minute. *Dwarf Boronia*, *Small Boronia*.

Occurring in SE S.A., SE N.S.W., Vic., and Tas. Growing in heath, woodland and forest on a variety of substrates. There are 3 varieties.

1 Leaves trifoliolate

2 Leaves and abaxial surface of perianth glabrous or with few hairs

63a. var. *nana*

2: Leaves and abaxial surface of perianth sparsely to densely pubescent

63b. var. *pubescens*

1: Leaves simple

63c. var. *hyssopifolia*

63a. *Boronia nana* Hook. var. *nana*

Illustrations: R.Melville & V.S.Summerville, *Kew Bull.* 1954 [9]: 462, figs 1.5–1.8 (1954); G.R.M.Dashorst & J.P.Jessop, *Pl. Adelaide Plains Hills*, 96, pt 41, 4–4a (1990); N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 160, fig. 28f (1999).

Branches and leaves glabrous or with few hairs. Leaves pinnate or very rarely bipinnate, 3 (–5)-foliolate. Perianth abaxial surface glabrous or with few hairs.

Occurring in SE S.A., SW and central Vic., and rare in NE Tas. Growing in heath and open woodland usually on sandy or rocky substrates. Flowers mostly Sept.–Feb.; fruits Nov.–Mar.

S.A.: Big Heath Natl Park, top NW corner, *C.R.Alcock* 3008 (AD, MEL); Marshes Swamp, *N.N.Donner* 8497 (AD, CANB). Vic.: c. 900 m from Torquay–Anglesea road on the road to Point Addis, *M.F.Duretto* 1259 (AD, CANB, HO, MEL); Paradise Falls, on tributary of Stony Ck (into King R.), near Cheshunt, *T.J.Entwisle* 1694 (MEL). Tas.: Sisters Hill, Table Cape, *P.Collier* 108 (HO).



63b. *Boronia nana* var. *pubescens* (Benth.) J.H.Willis, *Victorian Naturalist* 73: 192 (1957)

B. polygalifolia var. (?) *pubescens* Benth., *Fl. Austral.* 1: 321 (1863); *B. hispida* Cheel, *J. Proc. Royal Soc. New South Wales* 61: 403 (1928). T: Mt Sturgeon [Grampians], Vic., *Robertson s.n.*; lecto: K *n.v.*, *fide* M.F.Duretto, *Muelleria* 17: 48 (2003).

B. pubescens Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 2: 227 (1848). T: *Preiss s.n.*; lecto: LD, *fide* M.F.Duretto, *loc. cit.*

Illustration: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 160, fig. 28g (1999).

Branches and leaves sparsely to densely pubescent. Leaves 3 (–5)-foliolate. Perianth abaxial surface sparsely to densely pubescent with hairs concentrated along midribs. *n* = 18, H.M.Stace & J.A.Armstrong, *Austral. Syst. Bot.* 5: 502 (1992).

Occurs in the Grampians Natl Park and Ben Major forest reserve, Vic., and possibly also N of Naracoorte and near Millicent, S.A. Found in open forest, woodland and heath on rocky substrates. Flowers July–Mar.; fruits Nov.–Feb.

S.A.: Rubbish Dump Scrub, Millicent Golfcourse road, *Comalley* 76 (AD); c. 34 km N of Naracoorte along road to Bordertown, *Hj.Eichler* 17677 (AD). Vic.: c. 0.1 km SW along stockyard track from the point where the foot track to Major Mitchell Plateau begins, *D.E.Albrecht* 1282 (MEL); near Mirrantwa Gap, *M.E.Phillips* 479 (CANB, MEL); Ben Major Forest reserve, *R.V.Smith* 76/73 (MEL).



The variety is secure in Vic. The collections from S.A. require confirmation. Partially sympatric with var. *nana* and these varieties may intergrade in Vic.

63c. *Boronia nana* var. *hyssopifolia* Melville in R.Melville & V.S.Summerhayes, *Kew Bull.* 1954 [9]: 463 (1954)

T: Little R., Wulgulmerang, Gippsland, Vic., 20 Jan. 1953, *R.Melville* 3015; holo: K *n.v.* (photo seen); iso: AD, BRI, CANB, HO, L, MEL, NSW, PERTH.

Illustrations: R.Melville & V.S.Summerhayes, *op. cit.* figs 1.1–1.4; N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 160, fig. 28f (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 268 (2002).

Branches sparsely to densely puberulous between decurrent leaf bases, otherwise glabrous or with few hairs. Leaves simple, glabrous, with few hairs or sparsely puberulous. Perianth abaxial surface glabrous.

Occurring on ranges and upper slopes S from Mt Wilson, N.S.W., including in the A.C.T., to central and NE Vic., SE S.A., and E and N Tas. Found in heath, woodland and forest on a variety of substrates. Flowers Oct.–Jan.; fruits Nov.–Apr.

S.A.: Stirling West, Mount Lofty Ra., 11 Dec. 1957, *E.H.Isling s.n.* (AD, CANB). N.S.W.: 30 km from Yass toward Bevendale, between Blakney Ck and Bloomfield HS, *E.M.Canning* 6885 (CANB). A.C.T.: Cribbs Ck, upper Cotter Valley, Namadgi Natl Park, *P.Gilmore* 6404 (CANB). Vic.: Gerangamete area, 19 km SSE of Colac P.O., K26, *A.C.Beauglehole* 63869 (MEL). Tas.: Prosser River Gorge, 4 miles [c. 6.4 km] from Buckland, *R.Melville* 2490 (MEL, NSW).



For an explanation of the complicated nomenclatural history of this taxon, see R.Melville & V.S.Summerhayes, *op. cit.*

64. *Boronia anemonifolia* A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 330 (1825)

B. polygalifolia var. *anemonifolia* (A.Cunn.) C.Moore & E.Betche, *Handb. Fl. New South Wales* 42 (1893). T: Regents Glen, Blue Mtns, N.S.W., Oct. 1822, *A.Cunningham* 43; lecto: K *n.v.*, *fide* P.G.Neish and M.F.Dureto, *Muelleria* 14: 3 (2000); isolecto: K *n.v.*; probable isolecto: K *n.v.*

Erect, woody shrub to 2.5 m tall. Branches with obvious glands, sometimes verrucose, glabrous to pubescent; decurrent leaf bases present. Leaves simple, pinnate or bipinnate, 1–9-foliolate, 4–35 mm long, 2–30 mm wide; petiole 2–16 mm long; rachis segments 3–7 mm long; leaflets narrowly cuneate to cuneate or narrowly elliptic to elliptic or ovate or obovate, 2–13 mm long, 1–6 mm wide, strongly conduplicate or flat, often divided into 3 lobes at apex. Inflorescences axillary, 1–9⁺-flowered; peduncle and pedicels 0.5–8 mm long. Sepals broadly ovate, 1.5–3 mm long, glabrous to densely puberulous. Petals 3.5–6.5 mm long, glabrous to sparsely puberulous, white to pink. Stamens: filaments pilose, glandular-verrucose towards apex; anther apiculum glabrous or with few hairs. Ovary glabrous or with few hairs; style pilose; stigma minute. *n* = 18, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc* 142: 311 (2003).

Occurs from SE Qld to Tas. Usually found growing on and around sandstone and granite outcrops in eucalypt woodland or forest, or heath or shrubland, often in exposed areas. There are 4 subspecies.

- 1 Leaves simple or if trifoliolate then petiole very much longer than leaflets (central Vic.)

64b. subsp. *aurifodina*

- 1: Leaves trifoliolate, pinnate or bipinnate with petiole c. same length as leaflets

- 2 Petals not persistent with mature fruit; inflorescences (1–) 3–6 (–9+)-flowered; bracts simple, to 1.5 mm long; sepals 1–2 mm long, 1/5–1/3 (–1/2) length of petals; leaflets glabrous (rarely with a few hairs) (Qld; N.S.W.; Vic.; Tas.)

64d. subsp. *variabilis*

- 2: Petals persistent with mature fruit; inflorescences 1–3 (–6)-flowered; bracts simple or tridentate, usually 1–8 mm long; sepals 1.5–3 mm long, ($\frac{1}{4}$ –) $\frac{1}{2}$ – $\frac{3}{4}$ length of petals; leaflets pubescent, sometimes with only a few hairs (N.S.W.; Vic.)
- 3 Leaflets strongly conduplicate, 1–2.5 mm wide; lateral leaflets tridentate (N.S.W.; Vic.)
- 3: Leaflets flat, 2–6 mm wide, fleshy; lateral leaflets usually entire or tridentate (Wadbilliga Plateau, N.S.W.)

64a. subsp. *anemonifolia*

64c. subsp. *wadbilligensis*

64a. *Boronia anemonifolia* A.Cunn. subsp. *anemonifolia*

Cyanothamnus tridactylites Bartl. in J.G.C.Lehmann, *Pl. Preiss* 2: 227 (1848). T: *Herb. Preiss* 2628; holo: LD; iso: MEL.

B. dentigera F.Muell., *Trans. Proc. Victorian Inst. Advancem. Sci.* 32 (1855); *B. anemonifolia* a. *dentigera* (F.Muell.) Benth., *Fl. Austral.* 1: 321 (1863); *B. anemonifolia* var. *dentigera* (F.Muell.) Rodway, *Tasman. Fl.* 22 (1903), *nom illeg. non* (F.Muell.) Benth. T: Latrobe R., Vic., 26 Apr. 1853, *F.Mueller s.n.*; lecto: MEL, *fide* P.G.Neish & M.F.Duretto, *Muelleria* 14: 7 (2000).

B. anemonifolia subsp. A (Typical Form), J.H.Ross, *Census Vasc. Pl. Victoria* 5th edn, 105, 129 (1996).

B. anemonifolia subsp. 1, M.F.Duretto, *Fl. Victoria* 4: 157 (1999); J.H.Ross, *Census Vasc. Pl. Victoria* 6th edn, 110 & 137 (2000).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29c (1999), as *B. anemonifolia* subsp. 1; P.G.Neish & M.F.Duretto, *op. cit.* 5, fig. 1A–B; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 269 (2002).

Shrub to 1.5 m tall, glabrous to pubescent apart from flowers. Leaves ternate or bipinnate, 4–20 mm long, 2–19 mm wide; petiole and rachis segments 2–10 mm long; leaflets narrowly cuneate, 2–9 mm long, 1–2.5 mm wide, strongly conduplicate, tridentate at tip. Inflorescence 1–3-flowered; peduncle 1–8 mm long; pedicels 1–5 mm long. Sepals 1.5–2 (–3) mm long, ($\frac{1}{4}$ –) $\frac{1}{2}$ length of petals, glabrous or ciliate to moderately densely pubescent. Petals 3.5–6.5 mm long, glabrous or with few hairs, persistent.

Occurs on the tablelands and in coastal areas S from Rylstone, N.S.W., and through Vic. to the Brisbane Ra. Found on sandy or rocky soils in dry woodlands or heath often on exposed sandstone or granitic outcrops. Flowers mainly Aug.–Feb.; fruits Oct.–Feb.

N.S.W.: 200 m W of Pass, c. 3 km E of Endrick R. on Braidwood–Nerriga road, *P.G.Neish* 40 (MEL, NSW, CANB); Dr Georges Mtn summit, *N.G.Walsh* 1675 (BRI, HO, MEL). Vic.: Holey Plains State Park, Chessum Rd, 0.2 km W of its junction with Kelly track, T18, *M.G.Corrick* 9991 (CANB, MEL); Nunniong Plateau, along saddle running N c. 1 km E of end of Brumby Point track, *M.G.Corrick* 10164 (MEL); Brisbane Ranges Natl Park, 4 km along Reids Rd, going SW along the road from Rowsley, *V.Stajic* 496 (AD, BRI, CANB, MEL, NSW).



A common and secure subspecies that is variable in leaf size and in the number and shape of the leaflets; the various forms appear to intergrade into each other (see Neish & Duretto, *op. cit.* 8–9).

64b. *Boronia anemonifolia* subsp. *aurifodina* P.G.Neish in P.G.Neish & M.F.Duretto, *Muelleria* 14: 9 (2000)

T: Rushworth Forest, W of Bailieston, Vic., 25 Oct. 1981, *M.G.Corrick* 7892; holo: MEL; iso: AD, HO.

B. anemonifolia subsp. C (Rushworth), J.H.Ross, *Census Vasc. Pl. Victoria* 5th edn, 105 & 129 (1996).

B. anemonifolia subsp. 2, M.F.Duretto, *Fl. Victoria* 4: 157 (1999); J.H.Ross, *Census Vasc. Pl. Victoria* 6th edn, 110 & 137 (2000).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 163, fig. 29d (1999), as *B. anemonifolia* subsp. 2; P.G.Neish & M.F.Duretto, *op. cit.* 5, fig. 1 C–D.

Shrub to 1.2 m tall, glabrous to pubescent apart from flowers. Leaves simple with trifid tips, or rarely ternate with leaflets much shorter than petiole; petiole 3–12 mm long; simple leaves 5–15 mm long, 0.5–2.5 mm wide; leaflets very narrowly cuneate, to 3 mm long, 0.5–2 mm wide, strongly conduplicate or flattened. Inflorescence 1–6-flowered; peduncle and pedicels

1–4 mm long. Sepals 1.5–2.5 mm long, c. $\frac{1}{3}$ length of petals, glabrous to densely pubescent. Petals 5–6 mm long, glabrous or with a few hairs, persistent.

Occurs in the goldfields area around Bendigo, the Rushworth State Forest and 'Whipstick Forest', central Vic. Found in low open eucalypt woodland. Flowers mainly Aug.–Feb.; fruits Oct.–Feb.

Vic.: Diamond Hill, 17 km SSW of Bendigo, *A.C.Beauglehole* 50045 (MEL); Rushworth State Forest, *R.J.Fletcher* 4 (MEL, PERTH); Kamarooka S.F., *P.G.Neish* 17 (MEL, NSW); Murderer's Hill, Dunolly, *M.E.Phillips* 424–425 (CANB); Inglewood Flora Res., *N.G.Walsh* 2451 (MEL).

A rare and vulnerable taxon.



64c. *Boronia anemonifolia* subsp. *wadbilligensis* P.G.Neish in P.G.Neish & M.F.Duretto, *Muelleria* 14: 10 (2000)

T: SE of Wadbilliga Trig. 46 km ESE of Cooma, N.S.W., 19 Nov. 1973, *I.R.Telford* 3661; holo: CANB; iso: A, K, L, PERTH, all *n.v.*

Illustrations: P.G.Neish & M.F.Duretto, *op. cit.* 5, fig. 1 E–F; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 269 (2002).

Shrub to 2 m tall. Branches pubescent. Leaves pinnate, 3–5-foliolate, 8–18 mm long, 4–18 mm wide, with few hairs to pubescent; petiole and rachis segments 3–8 mm long; leaflets obovate, oblanceolate or cuneate, 4–9 mm long, 2–6 mm wide, flat, entire or tridentate at tip. Inflorescence 1–3-flowered; peduncle 3–5 mm long; pedicels 2–3.5 mm long. Sepals 2–3 mm long, $\frac{1}{2}$ – $\frac{3}{4}$ length of petals, moderately densely pubescent abaxially. Petals 4–5 (–6) mm long, sparsely pubescent abaxially, persistent.

Restricted to the Wadbilliga Plateau, SE N.S.W. Found in eucalypt woodland or low *Allocasuarina nana* heath on rocky outcrops and ridge tops between 1200 and 1300 m alt. Flowers Oct.–Dec.

N.S.W.: spur SE of Wadbilliga trig., *D.F.Blaxell* 491 (CANB, MEL, NSW); prominent bluff 2.4 km direct N of Wadbilliga trig., *J.D.Briggs* 1818 (CANB, HO, MEL, NSW); Wadbilliga trig. fire trail, 14 km E of Tuross R. crossing, *M.D.Crisp* 1238 (CANB); c. 0.5 km N of Wadbilliga trig., *P.Gilmour* W057 (CANB).



64d. *Boronia anemonifolia* subsp. *variabilis* (Hook.) P.G.Neish in P.G.Neish & M.F.Duretto, *Muelleria* 14: 11 (2000)

B. variabilis Hook., *J. Bot. (Hooker)* 1: 255 (1834); *B. variabilis* var. β Hook., *J. Bot. (Hooker)* 1: 255 (1834); *B. anemonifolia* b. *variabilis* (Hook.) Benth., *Fl. Austral.* 1: 321 (1863). T: Van D. Land [Tas.], *R.Gunn* n. 214; lecto: K *n.v.*, *fide* P.G.Neish & M.F.Duretto, *loc. cit.*

B. dentigeroides Cheel, *J. Roy. Soc. New South Wales* 62: 301 (1929). T: Timbarra [Timbarra, E of Tenterfield, N.S.W.], *C.Stuart s.n.*; lecto: NSW, *fide* P.G.Neish & M.F.Duretto, *loc. cit.*; isolecto: MEL (2 sheets).

B. anemonifolia subsp. *B* (Wilson's Promontory), J.H.Ross, *Census Vasc. Pl. Victoria*, 5th edn 105, 129 (1996).

B. anemonifolia subsp. *3*, M.F.Duretto, *Fl. Victoria* 4: 158 (1999); J.H.Ross, *Census Vasc. Pl. Victoria* 6th edn, 110, 137 (2000).

Illustrations: N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 163, fig. 29e (1999), as *B. anemonifolia* subsp. *3*; P.G.Neish & M.F.Duretto, *op. cit.* 5, fig. 1 G–I; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 269 (2002).

Shrub to 2.5 m tall. Branches glabrous or pubescent. Leaves pinnate or bipinnate, 3–9-foliolate, 13–35 mm long, 9–30 mm wide, glabrous or rarely with few hairs; petiole and rachis segments 4–16 mm long; leaflets broadly cuneate to oblanceolate, 3–13 mm long, 1–4 mm wide, flattened or conduplicate, entire or tridentate. Inflorescences (1–) 3–6 (–9⁺)-flowered; peduncle 2–10 mm long; pedicels 1.5–6 mm long. Sepals 1–2 mm long, $\frac{1}{4}$ – $\frac{1}{3}$ (– $\frac{1}{2}$) length of petals, glabrous. Petals 3–5 mm long, glabrous or with few hairs abaxially, caducous, sometimes tardily so.

A widespread taxon found in SE Qld, along the ranges and coast of N.S.W., on the Bass Strait Islands, and across N and SE Tas. In Vic. the subspecies is known only from Snake and Sunday Islands N of Wilsons Promontory and historically from Portarlington on the Bellarine Penin. Found in heath, open woodland or open forest on sandy and rocky soils sometimes on or near sandstone or granite outcrops. Flowers mainly Aug.–Feb.; fruits Oct.–Feb.

Qld: c. 1 km ENE of Gambubal Forest Station, E of Warwick, *A.R.Bean 10980* (BRI, NSW, MEL). N.S.W.: on slope above Boonoo Boonoo R., c. 100 m upstream from Boonoo Boonoo Falls, *R.G.Coveny 16565* (BRI, CANB, NSW). Vic.: Corner Inlet, Sunday Is., 2–6 Sept. 1952, *C.I.Skewes s.n.* (AD, CANB, MEL). Tas.: track to Seal Rocks, King Is., *M.I.H.Brooker 5855* (CANB, HO); Sensation Gorge, c. 5 km W of Mole Ck, *P.G.Neish 57-62* (MEL).



Mainland populations have 3–5-foliolate or bipinnate leaves with leaflets that usually have 3 rounded teeth at the apex. Plants from Tas. differ in having 3–7-foliolate leaves with entire and often quite narrow leaflets. The population at Sensation Gorge, Tas., consists of plants that are notable in being pubescent over the entire stem, rather than just between the decurrent leaf bases, and in having leaves with few hairs.

65. *Boronia inflexa* Durretto, *Muelleria* 17: 40 (2003)

T: Mt Norman, Girraween Natl Park, Qld, 27 Sept. 1977, *J.Armstrong 1149* & *J.M.Powell*; holo: BRI; iso: CANB, NSW.

Erect, woody shrub to 2 m tall. Branchlets slightly glandular-verrucose, with few hairs to puberulous or pilose; decurrent leaf bases present. Leaves usually pinnate (rarely bipinnate), 3–7-foliolate, 6–25 mm long, 6–35 mm wide, glabrous to minutely pilose; petiole and rachis segments 3–10 mm long; leaflets linear, 1–16 mm long, 0.5–2.5 mm wide. Inflorescences axillary, 1–7-flowered; peduncle 0.5–9 mm long; pedicels 1–3 mm long. Sepals deltate to narrowly triangular, 1.5–3 mm long, glabrous to minutely ciliate. Petals 2.5–7.5 mm long, not obviously glandular, glabrous to minutely ciliate, white to pink. Stamens: filaments pilose, slightly glandular-verrucose towards apex; anthers glabrous; apiculus glabrous or with few hairs. Ovary glabrous; style with few hairs to pilose; stigma minute.

A rare and endangered species found in SE Qld and NE N.S.W. Found in heath, woodland and forest on granite and granite derived soils. There are 4 subspecies.

Boronia inflexa differs from *B. bipinnata* and *B. occidentalis* by the smaller usually pinnate leaves and larger perianth parts.

1 Leaflets minutely pilose

2 Petals 2.5–3.5 mm long; anther apiculus glabrous

65a. subsp. *inflexa*

2: Petals 6–7.5 mm long; anther apiculus with a few hairs

65c. subsp. *grandiflora*

1: Leaflets glabrous or with few hairs

3 Terminal leaflets 3–7 mm long, 0.5–0.75 mm wide

65b. subsp. *montiazura*

3: Terminal leaflets (4–) 10–16 mm long, (0.75–) 1–1.25 mm wide

65d. subsp. *torringtonensis*

65a. *Boronia inflexa* Durretto subsp. *inflexa*

Illustration: M.F.Durretto, *Muelleria* 17: 30, fig. 2 I–K (2003).

Shrub to 0.8 m tall. Branchlets pilose. Leaves usually pinnate (rarely bipinnate), 3–5-foliolate, 8–22 mm long, 8–28 mm wide, minutely pilose; petiole and rachis segments 3.5–9 mm long; leaflets 1–11 mm long, 0.75–1 mm wide. Inflorescence 1–3-flowered; peduncle 0.5–4 mm long; pedicels 1–1.5 mm long. Sepals deltate, 1.5–2.5 mm long, 0.75–1 mm wide, acute to acuminate, glabrous or with a few hairs. Petals 2.5–3.5 mm long, glabrous or with few hairs apically, white to pink. Anther apiculus glabrous. Style pilose.

Occurs between the Amiens/Stanthorpe area and Girraween Natl Park, SE Qld, and disjunctly at Gibraltar Ra., NE N.S.W. Found growing in heaths, shrublands and open woodland on granite. Flowers July–Dec.; fruits Oct.–Dec.

Qld: Poziers, 5 miles [c. 8 km] NNW of Stanthorpe, 26 Oct. 1966, *B.C.Dodd s.n.* (BRI); Portion 123 Broadwater (N side of Girraween), *P.Grimshaw 78* (BRI); Mt Norman, 7 km NE of Wallangarra, *I.R.Telford 3128* (CANB); Amiens, 10 miles [c. 16 km] WNW of Stanthorpe, *G.Ward 347* (BRI). N.S.W.: Gibraltar Range Natl Park, c. 65 km E of Glen Innes on highway, *M.F.Duretto 685* (MEL, NSW).

A poorly collected and probably endangered taxon. Plants at Gibraltar Ra. are the only bipinnate-leaved specimens of the species.



65b. *Boronia inflexa* subsp. *montiazura* Duretto, *Muelleria* 17: 42 (2003)

T: Applethorpe, Blue Mtn, Qld, 20 Nov. 1973, *B.C.Dodd A3-12-1*; holotype: BRI.

Illustration: M.F.Duretto, *op. cit.* 30, fig. 2 L–M.

Shrub to 2 m tall. Branchlets sparsely pilose. Leaves pinnate, 3 (–5)-foliolate, 6–15 mm long and wide, glabrous or with few hairs; petiole and rachis segments 3–7 mm long; leaflets 3–7 mm long, 0.5–0.75 mm wide. Inflorescence 1–7-flowered; peduncle 1–9 mm long; pedicels 1.5–2.5 mm long. Sepals narrowly triangular, 1.5–2 mm long, c. 0.75 mm wide, minutely ciliate. Petals 4–5 mm long, minutely ciliate. Anther apiculus with a few hairs. Style pilose.

Apparently restricted to Blue Mtn, a relatively small hill near Applethorpe, N of Stanthorpe, SE Qld. Found growing on granite amongst boulders, or in fissures on smooth rock faces. Flowers July–Dec.; fruits Aug.–Dec.

Qld: NE of Stanthorpe, July 1904, *Boorman s.n.* (BRI, NSW); Stanthorpe district (Applethorpe), Dec. 1974, *M.P.Fletcher s.n.* (NSW); Blue Mtn, near Stanthorpe, June 1962, *F.D.Hockings s.n.* (BRI).

A poorly collected and endangered subspecies.



65c. *Boronia inflexa* subsp. *grandiflora* Duretto, *Muelleria* 17: 43 (2003)

T: On property of W.McDonagh, Lyra, Qld, 22 Oct. 1962, *K.N.Shea S124*; holotype: BRI.

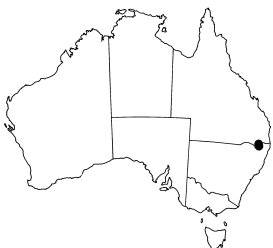
Illustration: M.F.Duretto, *op. cit.* 30, fig. 2 N–O.

Shrub to 1.5 m tall. Branchlets sparsely pilose. Leaves pinnate, 3 (–7)-foliolate, 9–25 mm long, 8–35 mm wide, sparsely and minutely pilose; petiole and rachis segments 3–10 mm long; leaflets 4–15 mm long, 0.75–1.25 mm wide. Inflorescence 1–3-flowered; peduncle 2–7 mm long; pedicels 1.5–3 mm long. Sepals deltate, 2–3 mm long, 1.25–1.5 mm wide, with few hairs along margins and towards apex. Petals 6–7.5 mm long, minutely ciliate, pale pink, tinged with white. Anther apiculus with a few hairs. Style pilose.

Known only from 3 collections from the Amiens, Lyra/Girraween Natl Park areas, SE Qld, which were collected on granite derived soils. Flowers Sept.–Nov.

Qld: NW section of Girraween Natl Park near Lyra, *P.Grimshaw PG2857* & *K.Sparshott* (BRI, NSW); near Amiens, SE Qld, 30 Sept. 1973, *J.Harslett s.n.* (NE).

A poorly known taxon that has been collected from the western edge of the distribution of subsp. *inflexa*. These taxa can be easily distinguished by the size of the flowers (for detailed discussion see Duretto, *op. cit.*, 33–34, and M.F.Duretto *et al.*, *Austrobaileya* 7: 171–173 (2005)).



65d. *Boronia inflexa* subsp. *torringtonensis* Duretto, *Muelleria* 17: 44 (2003)

T: Bismuth Falls, SW of Torrington, N.S.W., 5 Oct. 1990, *J.B. Williams s.n.*; holo: NSW; iso: BRI, MEL.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 270 (right hand specimen) (2002), as *B. bipinnata*; M.F.Duretto, *op. cit.* 30, fig. 2 P–R.

Shrub to 1.5 m tall. Branchlets puberulous. Leaves pinnate, 3 (–5)-foliolate, 9–25 mm long, 8–30 mm wide, glabrous or with few hairs; petiole and rachis segments 4–9 mm long; leaflets (4–) 10–16 mm long, (0.75–) 1–1.25 mm wide. Inflorescence 3-flowered; peduncle 2.5–5 mm long; pedicels 2–3 mm long. Sepals deltate, 1.5–3 mm long, 1–1.5 mm wide, glabrous. Petals 4.5–6 mm long, glabrous or minutely ciliate, white. Anther apiculum with few hairs. Style with few hairs to pilose.

Restricted to the Torrington area, N.S.W., where it is found in dry sclerophyll forest on granite derived soils. Flowers Sept.–Jan.; fruits Sept.–?.

N.S.W.: Torrington, 1 Jan. 1916, *J.L.Boorman s.n.* (BRI, NSW); Torrington District, Sept. 1991, *S.Elliott s.n.* (NE); Bismuth via Deepwater, July 1913, *A.McMutt s.n.* (NSW).

A rare and poorly collected subspecies.

**66. *Boronia anethifolia* A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837)**

B. anemonifolia c. *anethifolia* (A.Cunn. ex Endl.) Benth., *Fl. Austral.* 1: 322 (1863), *p.p.* T: Hunters R., N.S.W., 1825, *A.Cunningham s.n.*; lecto: W *n.v.* (photo seen), *fide* M.F.Duretto, *Muelleria* 17: 26 (2003); probable islecto: K *n.v.* (photo seen), W *n.v.* (photo seen).

B. anethifolia A.Cunn. ex Lindl., *Edwards's Bot. Reg.* 27 (1841), *nom illeg., non* A.Cunn. ex Endl. T: Interior, 28 ? degrees lat, N.S.W., 1827, *A.Cunningham s.n.*; syn: W *n.v.* (photo seen).

Illustrations: B.A.Lebler, *Wildfl. SE Queensland* 1: 29 (1977); L.Robinson, *Field Guide Nat. Pl. Sydney*, 115 (1991); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 269 (2002).

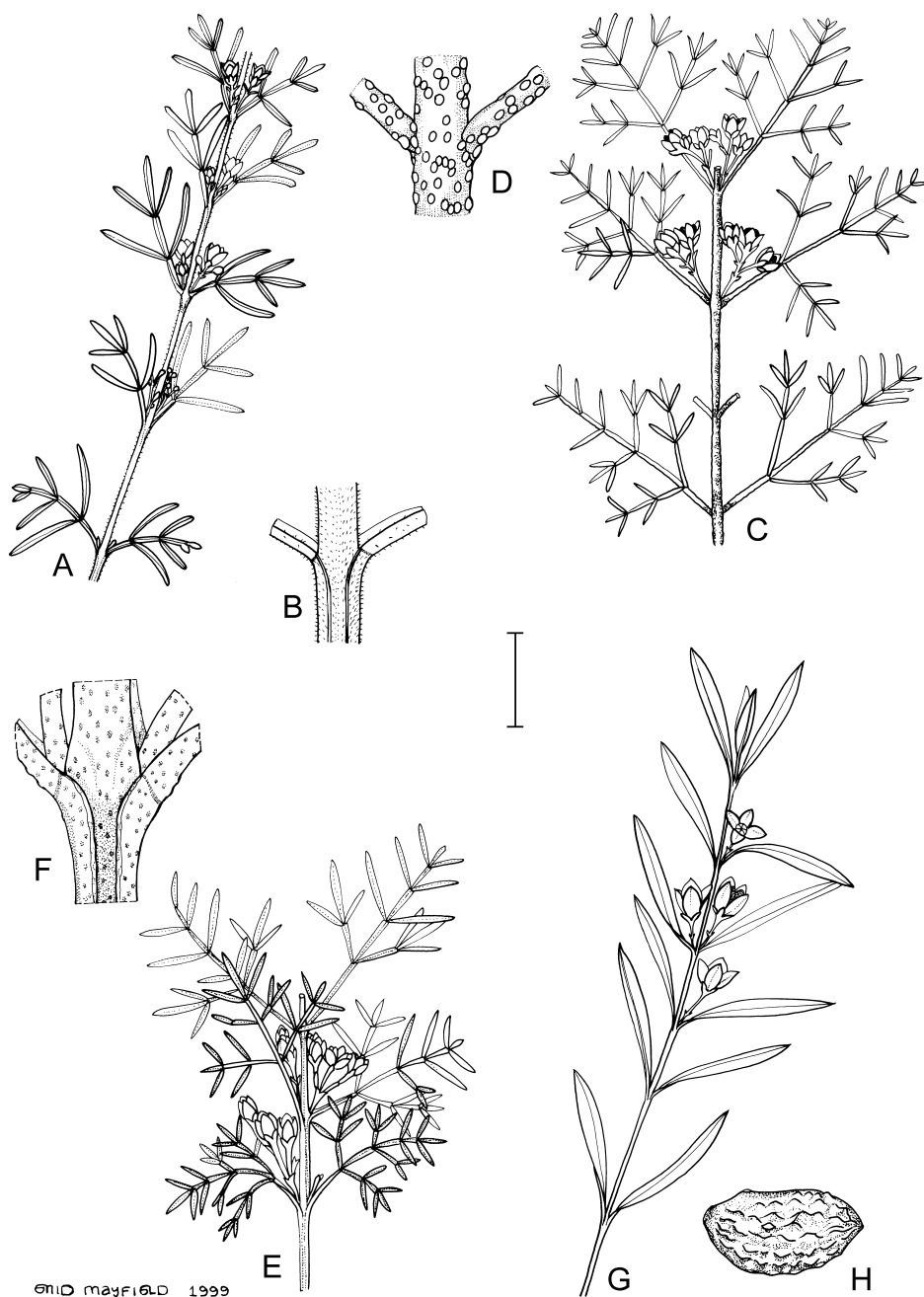
Erect, woody shrub to 1 m tall, ±glabrous apart from flowers. Branchlets slightly glandular-verrucose; decurrent leaf bases prominent. Leaves usually bipinnate, some-times tripinnate, 5–11-foliolate, 11–40 mm long, 5–40 mm wide; petiole and rachis segments 3–16 mm long; leaflets linear to linear-elliptic, rarely elliptic, 1.5–15 mm long, 0.5–2 mm wide. Inflorescences axillary, 3–20⁺-flowered; peduncle and pedicels 2–6 mm long. Sepals deltate to broadly ovate, 1–1.25 mm long, glabrous or minutely ciliate. Petals 3–4 mm long, not obviously glandular, glabrous, white or pink. Stamens: filaments pilose, glandular-verrucose towards apex; anthers glabrous, with erect apiculum. Ovary glabrous; style pilose; stigma minute. *n* = 18, F.Shan *et al.*, *Bot. J. Linn. Soc* 142: 311 (2003). *Narrow-leaved Boronia*. Fig. 33E, F.

Occurs from the Border Ra., Qld, S along the ranges to Wadbilliga Natl Park, N.S.W., and in scattered populations W of the Great Dividing Ra. between Narrabri and Goonoo Goonoo, N.S.W. Found in heath or dry sclerophyll forest or woodland in rocky areas on mountain tops, ridges, rocky slopes and outcrops. Flowers June–Oct.; fruits Sept.–Dec.

Qld: N slopes of Mt Maroon, *P.I.Forster 6833* (BRI, CANB, MEL, PERTH). N.S.W.: Coxs Gap, 6.9 km NNE of the Sandy Hollow–Muswellbrook road via Wybong, *R.Coveny 5625* (CANB, NSW); Dandahra Crags, Gibraltar Range Natl Park, *M.F.Duretto 676* (BRI, MEL, NSW); Willala Hills, 55 km S of Narrabri, 12 Dec. 1973, *H.Steimann s.n.* (BRI, CANB); prominence 1.9 km N from Coondella trig. point, c. 16 km WSW of Moruya, *N.G.Walsh 1886* (CANB, MEL, NSW).



A common species that differs from other east coast members of *B.* sect. *Cyanothamnus* by being glabrous (apart from the flowers), by having distinctively raised decurrent leaf bases giving the branches a sharply angular appearance, flat leaflets, and broadly deltate sepals. Populations at Gibraltar Ra., NE N.S.W., have relatively wide elliptic leaflets while most other populations have linear or narrowly elliptic leaflets. Intermediate specimens do exist.



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Figure 33. *Boronia*. **A–B**, *B. occidentalis*. **A**, habit; **B**, stem (**A–B**, M.F.Duretto 335, MEL). **C–D**, *B. bipinnata*. **C**, habit; **D**, stem (**C–D**, N.H.Speck 1925, CANB). **E–F**, *B. anethifolia*. **E**, habit; **F**, stem (**E**, I.R.Telford 5040, CANB; **F**, M.F.Duretto 676, MEL). **G–H**, *B. polygalifolia*. **G**, habit; **H**, seed (**G**, A.R.Bean 6044, BRI; **H**, C.Burgess, 29 Dec. 1961, NSW). Scale bar: **A**, **C**, **E**, **G** = 10 mm; **B**, **D**, **F** = 2 mm; **H** = 1 mm. Drawn by E.Mayfield.

67. *Boronia occidentalis* Durretto, *Muelleria* 17: 36 (2003)

T: Head of Pariagara Ck, Wondul Ra., Qld, 12 Apr. 1992, *P.I.Forster* 9795 & *P.Machin*; holo: BRI; iso: MEL, PERTH.

B. bipinnata var. *pubescens* Domin, *Biblioth. Bot.* 89: 285 (1926). T: Qld, Pentland, Feb. 1910, *K.Domin*; n.v., fide M.F.Durretto, *loc. cit.*

Illustrations: T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 451, fig. 69F (1983); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 270 (left hand specimen) (2002); both as *B. bipinnata*.

Erect, woody shrub to 1 m tall, glabrous or puberulous apart from flowers. Branchlets sometimes slightly glandular-verrucose; decurrent leaf bases faint or absent. Leaves: usually some leaves bipinnate, pinnate leaves sometimes also present, 3–7-foliolate, 9–25 mm long, 7–25 mm wide; petiole and rachis segments 2–7 mm long; leaflets narrowly elliptic to narrowly oblanceolate to linear, 1–9 (–13) mm long, 0.5–1.5 mm wide. Inflorescences axillary, 1–3 (–9)-flowered; peduncle and pedicels 0.5–2 mm long. Sepals deltate, 1–2.5 mm long; abaxial surface glabrous to puberulous. Petals 2–4 mm long, not obviously glandular, glabrous, white. Stamens: filaments pilose, slightly glandular towards apex; anthers glabrous, minutely apiculate. Ovary glabrous; style pilose; stigma minute. *Rock Boronia*. Fig. 33A, B.

Extends from near Mt Emerald, N Qld along the Great Divide to Inverell, Qld, and S to Goonoo Goonoo, N.S.W. Also collected from Blackdown Tablelands, Shoalhaven Bay, Great Keppel and Fraser Islands, Qld, and near Grafton, NE N.S.W., which require confirmation. Growing on sandstone or sandy soils, in heath, woodland or forest. Flowers and fruits Feb.–Oct.



Qld: between Monkey Point and Long Beach, Great Keppel Is., *G.N.Batianoff* 9750 (BRI, CANB, NSW); Isla Gorge, about 18 miles [c. 28.8 km] SW of Theodore, *S.L.Everist* 8036 (AD, BRI, CANB, MEL); Pear Rock, Mt Stewart Ra., 'Allandale', *P.I.Forster* 16619 (BRI, NSW); Barakula S.F., 5 km SE of Auburn Rd crossing of Hellhole Ck, *I.R.Telford* 1186 (CANB, MEL, NSW, PERTH). N.S.W.: Pilliga S.F., c. 8 km N of Break Rd, 5 Nov. 1985, *G.J.White* (MEL, NE, NSW).

A widespread species that is variable in the density of the indumentum on the stems, leaves and sepals, and in sepal, leaf and leaflet size (see Durretto, *op. cit.* 37–40). The species may intergrade with *B. bipinnata* in the Rolleston area, Qld (see Durretto, *op. cit.*, 38). Distinguished from *B. bipinnata* by the smaller and less dissected leaves and the smaller number of flowers per inflorescence.

68. *Boronia bipinnata* Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 225 (1848)

B. bipinnata var. *typica* Domin, *Biblioth. Bot.* 89: 285 (1926), *nom. illeg.* (type var.). T: Sub Tropical New Holland [near Mt Playfair, Qld], 11 Sept. 1846, *T.L.Mitchell* 283 [or 311]; lecto: CGE n.v (photo MEL), fide M.F.Durretto, *Muelleria* 17: 33 (2003).

B. sp. (Nathan Gorge N.H.Specht 1925), E.M.Ross, *Rutaceae* In R.J.F.Henderson (ed.) *Queensland Vasc. Pl.: Names Distrib.* 303 (1994); P.I.Forster, *Rutaceae* in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Illustration: S.Pearson & A.Pearson, *Pl. Central Queensland* 73 (1989).

Erect, woody shrub to 1.5 m tall. Branchlets slightly to distinctly glandular-verrucose, glabrous to puberulous between faintly decurrent leaf bases. Leaves bipinnate or tripinnate, 3–11-foliolate, 13–50 mm long, 10–60 mm wide, glabrous or with few hairs; petiole and rachis segments 2–15 mm long; leaflets linear, 1.5–15 mm long, 0.5–1 mm wide. Inflorescences axillary, (1–) 7–21⁺-flowered; peduncle 2–8 mm long, with few hairs; pedicels 1–3 mm long, with few hairs. Sepals circular to elliptic, 1–1.25 mm long, glabrous. Petals 2.5–4 mm long, not obviously glandular, glabrous or minutely ciliate, white. Stamens: filaments pilose, glandular-verrucose towards apex; anthers glabrous, with reflexed apiculum. Ovary glabrous; style pilose; stigma minute. Fig. 33C, D.

Occurs disjunctly in the Central Highlands, Nathan Gorge, Callide Ra., the Blackdown Tableland, and St George areas, Qld. Found in *Eucalyptus* forest or woodland on sandstone. Flowers Sept.–June; fruits Oct.–June.

Qld: Salvator Rosa Natl Park, Sentinel Mtn, *M.E.Ballingall* 2650 (BRI, CANB); Blackdown Tableland, c. 9 km SW of campsite at old stockyard on Mimosa Ck, *R.J.Henderson* 1096 (BRI, CANB, MEL); Nathan Gorge, 12 miles [c. 19.2 km] SSW of Cracow on the Dawson R., *N.H.Speck* 1925 (BRI, AD, CANB); 15 km NE of Biloela, 3 km N of Callide Dam in range, *E.J.Thompson* BIL37 (BRI); N of St George, Waroo Shire, *C.M.Warrian* 981 (BRI).



A relatively common species that can be distinguished from other east coast members of section *Cyanothamnus* by a combination of characters including the larger and more dissected leaves, distinctly glandular-verrucose stems, and many-flowered inflorescences. Plants from Salvator Rosa and Carnarvon Natl Parks (the type form) have stems that are less glandular-verrucose than plants from the Blackdown Tableland and Nathan Gorge. Plants from Blackdown Tableland have smaller leaves and inflorescence parts while these organs are larger in plants from Nathan Gorge. In the Rolleston/Springsure areas this species may intergrade with *B. occidentalis* (see Duretto, *op. cit.*, 35).

69. *Boronia yarrowmerensis* Duretto, *Muelleria* 17: 32 (2003)

T: About 21 km NNW of Yarrowmere Station HS on Great Dividing Ra., Qld, 15 Oct. 1983, *R.J.Henderson* H2853, *G.P.Guymer* & *H.A.Dillewaard*; holo: BRI; iso: AD, CANB, HO, K, MEL, NSW.

B. sp. (Yarrowmere R.J.Henderson H2853), *E.M.Ross*, *Rutaceae* in R.J.F.Henderson (ed.), *Queensland Vasc. Pl.: Names Distrib.* 303 (1994).

Illustration: M.F.Duretto, *op. cit.* 30, fig. 2 G–H.

Erect, woody shrub to 0.5 m tall. Branchlets slightly glandular-verrucose, sparsely puberulous between faint decurrent leaf bases. Leaves pinnate or bipinnate, 3–7-foliolate, 21–35 mm long, 24–44 mm wide, glabrous; petiole and rachis segments 5.5–13 mm long; leaflets linear, 4–17 mm long, 1–1.5 mm wide. Inflorescences axillary, 1–7-flowered, glabrous; peduncle and pedicels 1–1.25 mm long. Sepals circular, c. 1.5 mm diam., glabrous or minutely ciliate. Petals 2–2.5 mm long, not obviously glandular, glabrous or minutely ciliate, white. Stamens: filaments pilose, glandular-verrucose towards apex; anthers glabrous, minutely apiculate. Ovary glabrous; style pilose; stigma minute.

Occurs around Yarrowmere Stn, N Qld, where found in *Eucalyptus* forest or woodland on sandy soils in sandstone country. Flowering and fruiting material has been collected in Oct.

Qld: about 22.5 km NNW of Yarrowmere Stn HS, *R.J.Henderson* H2847 (BRI, MEL); 24 km SE of Torrens Ck, *E.J.Thompson* HUG514 (BRI).

A poorly collected species that can be distinguished from *B. bipinnata* by the slightly glandular-verrucose branchlets and longer leaflets, and from *B. warangensis* and *B. montimulliganensis* by the very faint (on newer shoots) or absent decurrent leaf bases.



70. *Boronia warangensis* Duretto, *Muelleria* 17: 31 (2003)

T: edge of the White Mountains at 'Warang' Station, Qld, 15 May 1993, *M.F.Duretto* 371 & *A.Vadala*; holo: MEL; iso: BRI, CANB, MEL.

B. sp. (Warang R.J.Cumming 9671), *P.I.Forster*, *Rutaceae* in R.J.F.Henderson, *Queensland Pl.: Names Distrib.* 185 (1997).

Illustration: M.F.Duretto, *op. cit.* 30, fig. 2 D–F.

Erect, woody shrub to 2 m tall. Branchlets not or slightly glandular-verrucose, glabrous, with few hairs, or sparsely puberulous between slightly decurrent leaf bases. Leaves bipinnate, 3–7-foliolate, 15–56 mm long, 18–90 mm wide, glabrous; petiole and rachis segments 7–18 mm long; leaflets linear, 4.5–30 mm long, 0.5–1.25 mm wide. Inflorescences axillary,

5–25⁺-flowered, glabrous; peduncles 2–2.5 mm long; pedicels 1–1.5 mm long. Sepals ovate, 1–1.25 mm long, ciliate or glabrous. Petals c. 2 mm long, not obviously glandular, glabrous or minutely ciliate, white. Stamens: filaments pilose, slightly glandular-verrucose towards apex; anther apiculum minutely pilose. Ovary and style glabrous; stigma minute.

Occurs in Warang Natl Park (White Mtns) with a disjunct population to the E in the Just Ra., N Qld. Found in dissected sandstone country in scrub or woodland dominated by *Eucalyptus*, *Angophora*, *Lophostemon* or *Acacia*. Flowers Mar.–Sept.; fruiting material has been collected in April.

Qld: Wall Ck Gorge, White Mtns, *M.Godwin* C2744 (BRI); 5 km SW of Clyde Park HS (new), *E.J.Thompson* HUG52 (AD, BRI, DNA); Just Ra. area, 6 km NNW of 'Liontown', *E.J.Thompson* 400 (BRI, CANB, MEL); White Mountains Natl Park, E of Warang, *B.S.Wannan* 1667 (MEL).

A rare species that can be distinguished from *B. montimulliganensis* by the many-flowered inflorescences and minutely pilose anther appendages, and from the nearby *B. yarrowmerensis* by the distinctive decurrent leaf bases that persist on older branches. The collection from Just Ra. differs from the typical variant in having smaller, usually trifoliate leaves with narrower leaflets. Mature flowers and fruits are required to resolve the taxonomic status of this collection.



71. *Boronia montimulliganensis* Durretto, *Muelleria* 17: 29 (2003)

T: Mt Mulligan, c. 40 km NW of Dimbulah, Qld, 18 Apr. 1985, *J.R.Clarkson* 5917; holo: BRI; iso: BRI, CANB, MEL (2 sheets).

Illustration: M.F.Durretto, *op. cit.* 30, fig. 2A–C.

Erect, woody shrub to 0.35 m tall. Branchlets not glandular-verrucose, sparsely puberulous between decurrent leaf bases. Leaves pinnate or bipinnate, 3–7-foliate, 15–40 mm long, 15–34 mm wide, glabrous or with few hairs; petiole and rachis segments 5–12 mm long; leaflets linear, 5–17 mm long, 1–1.25 mm wide. Inflorescences axillary, 1 (–3)-flowered; peduncle and pedicels 0.5–1.5 mm long, glabrous. Sepals circular, 1–1.25 mm diam., glabrous. Petals 2–2.5 mm long, not obviously glandular, glabrous, white. Stamens: filaments pilose, glandular-verrucose towards apex; anthers glabrous; apiculum minute. Ovary glabrous; style pilose; stigma minute.

Known from the type material only, from Mt Mulligan, NE Qld. Found in eucalypt woodland on sandstone. Flowers and fruits have been collected in June.

This species can be distinguished from *B. warangensis* by having 1 (–3) flower(s) per inflorescence and glabrous anther appendages.



Ser. 2. *Polygalifoliae*

Boronia ser. *Polygalifoliae* Durretto, *Fl. Australia* 26: 582 (2013)

Type: *B. polygalifolia* Sm.

Spreading, decumbent shrub, glabrous apart from flowers; hairs simple. Leaves opposite, persistent, sessile or petiolate, simple, flat, distinctly dorsiventral, with clearly defined palisade and spongy mesophyll layers. Inflorescence a few flowered cyme or flowers solitary; bracts minute. Petals pink or white. Anther apiculum not globular. Style glabrous.

A monotypic series in SE Qld and N.S.W.

72. *Boronia polygalifolia* Sm., *Tracts Nat. Hist.* 297, t. 7 (1798)

T: Port Jackson, N.S.W., 1795, *White s.n.*; lecto: LINN 684.9 n.v., *fide* M.F.Duretto, *Muelleria* 17: 51 (2003); isolecto: LIV n.v.

Tetratheca oppositifolia Pers., *Syn. Pl.* 1: 419 (1805); *B. tetrathecoides* DC., *Prodr.* 1: 722 (1824), *nom illeg.*, based on *T. oppositifolia*; *B. oppositifolia* (Pers.) Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 408 (1928); *B. polygalifolia* var. *oppositifolia* (Pers.) J.Black, *Fl. S. Australia* 2nd edn, 2: 493 (1948). T: *Herb. Tribauld*, 1815; holo: G-DC, *fide* M.F.Duretto, *loc. cit.*

B. hyssopifolia Sieber, *Flora Beil.* 4: 137 (1825), *nom. nud.*, *fide* R.Melville & V.S.Summerhayes *Kew Bull.* 1954 [9]: 463 (1954).

Illustrations: R.Melville & V.S.Summerhayes, *op. cit.*, 462, figs 1.9–1.12; T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 451, fig. 69G1–3 (1983); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 268 (2002).

Spreading, decumbent, sub-shrub to 30 cm long, glabrous apart from flowers. Branchlets not obviously glandular; decurrent leaf bases present. Leaves sessile or with petiole to 1 mm long, linear to elliptic, rarely ovate or obovate, 8–30 mm long, 0.8–5 mm wide, acute, flat. Inflorescences axillary, 1–3-flowered; peduncles and pedicels 0.5–11 mm long. Sepals ovate-deltate, 1.5–2 mm long, glabrous. Petals 4.5–6.5 mm long, not obviously or slightly glandular, glabrous or sometimes minutely ciliate, white or pink. Stamens: filaments shortly pilose, sometimes slightly glandular-verrucose towards apex; anthers glabrous, prominently apiculate. Ovary and style glabrous; stigma minute. *n* = 18, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954). *Milkwort-leaved Boronia*. Fig. 33G, H.

Extends from Blackdown Tablelands and Kroombit Tops, Qld, to near Moruya and Geehi, N.S.W. Found in open forest or woodland or heath on sandy or rocky soils. Flowers and fruits mainly Sept.–Jan.

Qld: Mt Tunbubudla, W of Beerburrum, *A.R.Bean 6044* (BRI); Kroombit Tops, approx. 65 km SSW of Gladstone, *W.J.F.McDonald 1015* (BRI). N.S.W.: 9.6 km from Torrington on road to Silent Grove, *J.Armstrong 653* (NSW); Picton Lakes, 5 miles [c. 8 km] W of Picton, *I.Keats & R.Coveny 3449* (NSW); Vacant Crown Land W of Kalaru–Merimbula road, *M.Parris 9893* (CANB).



A widespread species readily distinguished from *B. nana* by the glabrous stems and discolorous leaves.

Ser. 3. *Coerulescentes*

Boronia ser. *Coerulescentes* Duretto, *Fl. Australia* 26: 582 (2013)

Type: *B. coerulescens* F.Muell.

Erect shrubs, variously hirsute; hairs simple. Leaves opposite, persistent, sessile or petiolate, simple (though sometimes trilobed), flat, \pm isobilateral, without clearly defined spongy mesophyll. Flowers usually solitary; bracts minute. Petals pink, white or bluish. Anther apiculum large and globular. Style hairy.

A monotypic series in southern Australia from W.A. (with the greatest diversity at subspecies level) to SW N.S.W. and W Vic.

73. *Boronia coerulescens* F.Muell., *Trans. Philos. Soc. Victoria* 1: 11 (1854)

T: Mallee scrub near the entrance of the Murray, S.A., Sept. 1848, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 12: 149 (1998).

B. coerulescens var. *glabrescens* F.Muell., *Trans. Philos. Soc. Victoria* 1: 11 (1854). T: Mallee scrub near the entrance of the Murray, S.A., Sept. 1848, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *loc. cit.*

Erect, woody perennial to 0.5 m high. Branchlets puberulous or with few hairs; decurrent leaf bases absent or faint. Leaves simple, sessile or with petiole to 0.5 mm long, entire and subterete to elliptic or obovate and trilobed, 2–10 mm long, concave to conduplicate above,

glabrous or puberulous. Flowers mostly solitary, axillary or terminal to short shoots, sometimes looking like leafy racemes; pedicel 2–8 mm long. Sepals narrowly triangular to obovate, 2–5 mm long, glabrous or puberulous. Petals broadly elliptic, 3.5–10 mm long, glabrous, or puberulous on midrib, white to blue or pink. Stamens: filaments linear-attenuate, glandular-verrucose towards apex, sparsely ciliate; anther apiculum often inflated. Ovary glabrous or pubescent; style slender-terete, 0.5–1 mm long; stigma minute to capitate.

Found in SW W.A. through southern S.A. to western Vic. and SW N.S.W. There are 3 subspecies, of which 2 are confined to W.A. and the other is found across the range of the species.

- | | | |
|----|--|---------------------------------|
| 1 | Leaves entire, subterete to narrowly elliptic and boat-shaped; branchlets not divaricate and spinescent | |
| 2 | Leaves mostly subterete and tightly incurved; branchlets glabrous or puberulous with curved or straight hairs principally between decurrent leaf bases | 73a. subsp. coerulescens |
| 2: | Leaves narrowly oblong to narrowly elliptic, concave above; branchlets densely pubescent all round with short straight spreading hairs | 73b. subsp. spicata |
| 1: | Leaves entire or lobed, somewhat flattened or concave; branchlets often divaricate and spinescent | 73c. subsp. spinescens |

73a. *Boronia coerulescens* F.Muell. subsp. **coerulescens**

B. coerulescens var. *pubescens* F.Muell., *Trans. Philos. Soc. Victoria* 1: 11 (1854). T: Morro Morro, Grampians, Vic., Nov. 1853, *F. Mueller*; lecto: MEL, *fide* P.G. Wilson, *Nuytsia* 12: 149 (1998).

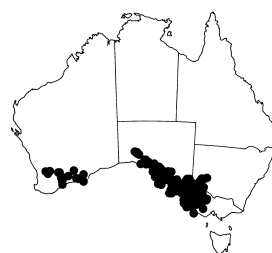
Illustration: N.G. Walsh & T.J. Entwisle (eds), *Fl. Victoria* 4: 160, fig. 28b (1999).

Shrub with ascending branches, glabrous to puberulous with curved or straight hairs on branchlets (principally between decurrent leaf bases), leaves, and pedicels. Leaves not congested, subterete and ±tightly incurved, 3–10 mm long, entire, obtuse, glandular-verrucose or smooth. Flowers axillary or terminal on short shoots, scattered; pedicel c. 5 mm long; bracteoles foliaceous, c. 1 mm long, near base of pedicel. Sepals triangular to ovate (or narrowly oblong), 2–5 mm long, sparsely puberulous to glabrous. Petals obovate, 3.5–6 mm long, glabrous to sparsely puberulous. *n* = 9, 18, S. Smith-White, *Austral. J. Bot.* 2: 291 (1954); *n* = 36, F. Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003).

Occurs in far SW N.S.W., western Vic. and westwards to southern W.A. Flowers July–Feb.; fruits Sept.–Feb.

W.A.: Lake King, *B. & B. Backhouse* H/22 (PERTH). S.A.: 48 km NNW of Bordertown, *D.N. Kraehenbuehl* 1069 (AD); 27 miles [43 km] W of Kimba, *T. & J. Whaithe* 4003 (PERTH). N.S.W.: 'Top Hut', NE of Mildura, 14 Oct. 1987, *D.R. Green* (NSW). Vic.: Grampians, *F. Mueller* (MEL).

A very variable taxon in which there is no clear separation between the different forms. In the Fraser Ra. area of SE W.A. and in the Gawler Ra. in S.A. is found a variant with narrowly oblong to narrowly triangular sepals, 3–6 mm long. The variant named var. *pubescens* by Mueller, which differs from the typical variant (with few hairs) in having puberulous branches, leaves and sepals, has been recorded from eastern Vic., far SE S.A. as well as Kangaroo Is and Eyre Penin. it evidently grades into the typical variant. In W.A. this subspecies grades into the other subspecies.



73b. *Boronia coerulescens* subsp. **spicata** Paul G. Wilson, *Nuytsia* 1: 200 (1971)

T: 2 miles [3.2 km] S of Wubin, W.A., 22 Aug. 1957, *J.W. Green* 1500; holo: PERTH.

Shrub with ascending branches, densely pubescent with short straight spreading hairs on branchlets, leaves, and pedicels. Leaves congested, mostly ascending, narrowly oblong to narrowly elliptic, 5–10 mm long, entire, obtuse, concave above, smooth to slightly glandular-verrucose. Flowers axillary, towards apex of branches; pedicel 2–5 mm long; bracteoles small,

near base of pedicel. Sepals narrowly ovate to ovate, 3.5–5 mm long, pubescent, usually prominently red glandular-punctate. Petals broadly obovate, 7–10 mm long, sparsely pubescent adaxially and abaxially, principally around midvein.

Occurs in SW W.A. from N of Kalbarri SE to near Norseman. Recorded as growing principally on sandplains. Flowers and fruits July–Oct.

W.A.: 21 km ESE of Carrabin, *R.J.Cranfield* 4820 (PERTH); Bronti, *C.A.Gardner* 13496 (PERTH); Paynes Find, Oct. 1958, *P.R.Jefferies* (PERTH); Muntadgin, *J.W.Stone* 83 (PERTH).



73c. *Boronia coerulescens* subsp. *spinescens* (Benth.) Paul G.Wilson, *Nuytsia* 1: 200 (1971)

B. spinescens Benth., *Fl. Austral.* 1: 319 (1863). T: Swan River Colony, W.A., *J.Drummond* 87 [sphalm. '78']; holo: K; iso: MEL.

Shrub with spreading and ascending branches, the former often slender, spinescent and leafless, glabrous to closely pubescent. Leaves not crowded, broadly elliptic to circular or obovate, 1–5 mm long, some or all bluntly 2- or 3-lobed, somewhat flattened or concave, fleshy, smooth. Flowers axillary, scattered; pedicel slender, c. 5 mm long; bracteoles foliaceous, medial or submedial. Sepals narrowly ovate to oblong, 2–3 mm long, with fleshy rounded apex, glabrous. Petals obovate, 4–6 mm long, glabrous or sparsely puberulous on narrow midrib, variably glandular.

Occurs in SW W.A. from Kalbarri S to Wongan Hills and Lake King and E to Queen Victoria Springs on the W edge of the Great Victoria Desert. The typical spinescent variant is often found growing on hills or rocky outcrops. Flowers and fruits July–Oct.

W.A.: Queen Victoria Springs, 26 Jan. 1959, *W.H.Butler* (PERTH); Walling Rock Stn, *R.J.Cranfield* 7468 (PERTH); Wongan Hills, *R.D.Royce* 2191 (PERTH); Billyacatting Ra., *E.Wittwer* 1235 (PERTH).

An extremely variable taxon. Much of this variability is apparently dependent on environmental conditions since different parts of the same plant may vary greatly in branching habit and in size and shape of leaves.



This subspecies may be distinguished by the fleshy \pm oblong sepals and by the presence of lobed almost flat leaves.

The variant found in the Kalbarri to Eneabba area is puberulous with spreading hairs, it has mostly narrowly elliptic leaves concave above while the sepals are narrowly ovate and the petals are very broadly obovate. This variant appears to be intermediate in morphology between subsp. *spinescens* and subsp. *spicata*.

Ser. 4. *Penicillatae*

Boronia ser. *Penicillatae* Durretto, *Fl. Australia* 26: 583 (2013)

Type: *B. penicillata* Benth.

Erect shrubs, variously hirsute; hairs stellate. Leaves opposite, persistent, sessile, simple or ternate or pinnate. Flowers solitary; bracts minute. Petals pink or white. Anther apiculum not inflated. Style hairy.

A series of 3 species from SW W.A. Stellate hairs, a defining character of the series, in *Boronia*, are also found in section *Valvatae* though the hairs in each taxon are morphologically quite different.

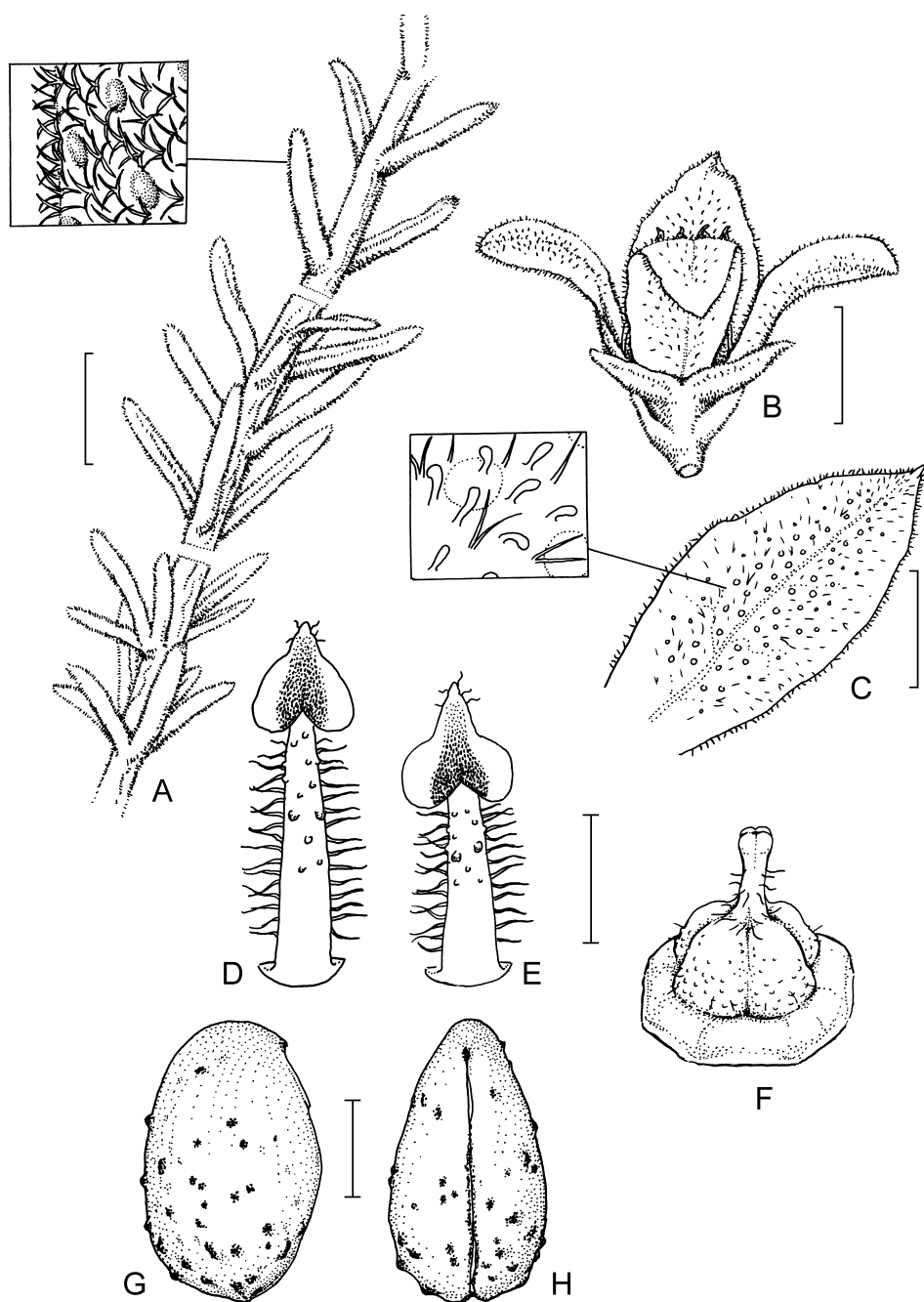


Figure 34. *Boronia westringioides*. **A**, habit; **B**, flower; **C**, petal, abaxial surface; **D**, anti-sepalous stamen; **E**, antipetalous stamen; **F**, disc and pistil; **G**, seed, lateral surface; **H**, seed, adaxial surface (**A–H**, D.Papenfus 494, PERTH). Scale bars: **A** = 5 mm; **B** = 3 mm; **C** = 2 mm; **D–H** = 1 mm. Drawn by A.Menadue, reproduced with permission from *Nuytsia* 12: 153, fig. 12 (1998).

74. *Boronia penicillata* Benth., *Fl. Austral.* 1: 322 (1863)

T: Between Swan R. and King George Sound, W.A., *J.Drummond* '86' [=98]; lecto: K (photo seen), *fide* P.G.Wilson, *Nuytsia* 12: 151 (1998); isolecto: MEL.

Branched woody perennial to 30 cm high, glabrous to puberulous with simple and stellate hairs. Branches with decurrent leaf bases faint. Leaves sessile, 3–5-foliolate or rarely unifoliolate; leaflets linear to narrowly cuneate, 5–12 mm long, flat or convex above, thick. Flowers solitary, axillary; pedicel 1–2 mm long. Sepals narrowly to broadly ovate, 1.5–2 mm long, glabrous or puberulous. Petals elliptic, 2–3.5 mm long, somewhat conduplicate, thickened in broad glandular central area with membranous margin, glabrous to puberulous, white. Stamens: filaments narrowly oblong, glandular-verrucose towards apex, sparsely ciliate; anther apiculum very short, sparsely pilose. Ovary sparsely hairy; style terete, pilose; stigma minute to subcapitate.

Occurs in SW W.A. from Toodyay S to the Fitzgerald R., but with a disjunct distribution. Flowers and fruits Oct.–Nov.

W.A.: 5 km W of Tarin Rock Siding, *D.Goble-Garret* 621 (PERTH); 18 km E of Toodyay, 5 Aug. 1984, *G.J.Keighery s.n.* (PERTH); 13 miles [21 km] W of Lake King, *K.Newbey* 2747 (PERTH); 14 miles [22 km] SE of Jerramungup, *K.Newbey* 2778 (PERTH).

This species is seldom collected, possibly because of its insignificant flowers. It shows considerable regional variability in the size of the leaves and flowers and in the density of the indumentum.

**75. *Boronia westringioides* Paul G.Wilson, *Nuytsia* 12: 152 (1998)**

T: 8 km W of Forrestania - Southern Cross road on Hyden–Norseman road, W.A., 12 Oct. 1995, *G.F.Craig* 3318; holo: PERTH; iso: CANB, K, MEL.

Illustration: P.G.Wilson, *op. cit.* 153, fig. 12.

Erect shrub to 75 cm high. Branches ascending, stellate-puberulous; decurrent leaf bases faint. Leaves opposite or whorled, often congested, ascending, sessile, semiterete or narrowly elliptic, 5–10 mm long, acute, concave or channelled above, glabrous or stellate-puberulous. Flowers solitary in uppermost leaf-axils; pedicel turbinate, 1–3 mm long, stellate-puberulous; bracteoles foliaceous, c. 1.5 mm long. Sepals triangular to ovate-acuminate, 2–3 mm long, thick, prominently glandular, sparsely stellate-pubescent. Petals elliptic, 5–6 mm long, thin, prominently glandular all over, moderately stellate-pubescent, pale pink. Stamens: filaments compressed-terete, glandular-verrucose towards apex, ciliate; anthers minutely apiculate. Ovary pubescent; style terete, 0.5 mm long, sparsely pilose; stigma subcapitate. Fig. 34.

Known from a small area in southern inland W.A. c. 70 km N of Lake King township and c. 65 km E of Hyden, where it grows on loamy sand plains. Flowers July–Oct; fruits Oct.

W.A.: 6 km W of junction of Forrestania Rd and road from Hyden, *B. & B.Backhouse* H/9 (PERTH); Far inland from King George's Sound, 1882, *A.Y.Hassell* (MEL); 7 km W of L. Cronin, *K.Newbey* 5199 (CANB, PERTH); c. 65 km E of Hyden, *K.Newbey* 9169 (PERTH).

This species differs from its closest relative, *B. baeckeacea*, principally in its leaf shape. Both species have petals with stellate hairs and short clavate glandular hairs.

**76. *Boronia baeckeacea* F.Muell., *Fragm.* 4: 28 (1863)**

T: Point Malcolm, W.A., *G.Maxwell* 7; holo: MEL; iso: K (photo seen).

Shrub to 0.6 m high. Branchlets stellate-pubescent; decurrent leaf bases absent. Leaves sessile, simple (or rarely trifoliolate), appressed to \pm spreading, broadly boat-shaped, 2–3 mm long (rarely obovate, concave, to 7 mm long), slightly reflexed at apex, thick, glabrous

(rarely stellate-pubescent). Flowers solitary in upper axils; pedicels 2 (–4) mm long, pubescent. Sepals triangular to broadly ovate, c. 2 mm long, glabrous or stellate-pubescent, sometimes dark red. Petals broadly elliptic, 3–5 mm long, sparsely stellate-pubescent, pink, dotted all over with usually red glands. Stamens: filaments narrowly oblong, glandular-verrucose towards apex, ciliate; anthers shortly apiculate. Ovary glabrous or stellate-puberulous; style terete, 0.5 mm long, pilose; stigma subcapitate.

Found in southern W.A. from Pingrup E to Mt Ragged. Two subspecies are recognised.

In addition to the stellate hairs, short clavate glandular hairs are present on the flowers; characters it shares with its closest relative, *B. westringioides*. These species are distinguished on leaf shape.

Leaves simple, suborbicular, ±appressed to branch, 2–3 mm long

76a. subsp. *baeckeacea*

Leaves simple or trifoliolate, broadly circular to obovate, 4–7 mm long

76b. subsp. *patula*

76a. *Boronia baeckeacea* F.Muell. subsp. *baeckeacea*

Leaves ±appressed to branch, simple, suborbicular, c. 2–3 mm long, concave.

Found in southern W.A. from Pingrup E to Mt Ragged; growing in a variety of situations, over granite or limestone or in heavy soil. Flowers June–Sept.; fruits Aug.–Sept.

W.A.: Wittenoom Hills, 11 Nov. 1971, *T.C.Daniell* (PERTH); 80 km SSW of Balladonia Motel, *K.Newbey* 7314 (PERTH); 28 km S of Lake King, *P.G.Wilson* 6894 (PERTH).



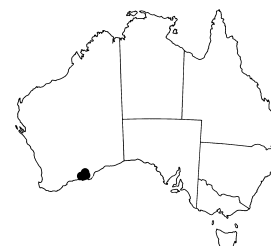
76b. *Boronia baeckeacea* subsp. *patula* Paul G.Wilson, *Nuytsia* 12: 148 (1998)

T: About 45 km NW of Clyde Hill, W.A., 21 May 1993, *G.F.Craig* & *B.Haberley* 2773; holo: PERTH.

Leaves ±spreading, sessile, simple and entire or 3-lobed, or trifoliolate; lamina circular and c. 3.5 mm long, or boat-shaped to obovate and 4–7 mm long, somewhat recurved at apex.

Found in the vicinity of Mt Ney and Mt Heywood, c. 90 km NE of Esperance in SE W.A.; growing on clay-loam in mallee. Flowers and fruits Aug.–Sept.

W.A.: 26.5 km NE of Mt Heywood, *W.R.Archer* 1708912 (PERTH); SW of Mt Ney, *A.S.George* 15905 (PERTH); 1 km W of Mt Heywood, *K.Newbey* 8279 (PERTH).



This subspecies has circular or obovate leaves to 7 mm long and occasionally some of these leaves are divided into 3 sessile leaflets; variation in leaf-form is found on the same branch. It grades to the S and W into the typical subspecies.

Ser. 5. *Fabianoides*

Boronia ser. *Fabianoides* Durretto, *Fl. Australia* 26: 583 (2013)

Type: *B. fabianoides* (Diels) Paul. G.Wilson

Erect shrubs, variously hirsute; hairs simple. Leaves alternate or fasciculate, persistent, sessile or petiolate, simple, flat to semiterete, c. isobilateral, clearly defined spongy mesophyll absent. Flowers solitary; bracts minute. Petals pink or white or blue. Anther apiculum not large and globular. Style glabrous.

A series of 2 species in SW W.A.

77. *Boronia acanthoclada* Paul G. Wilson, *Nuytsia* 12: 146 (1998)

T: Frank Hann Natl Park, W.A., 29 Sept. 1984, *J.M. Brown 4051555*; holo: PERTH.

Illustration: P.G. Wilson, *op. cit.* 147, fig. 11.

Spreading divaricately-branched shrub, c. 30 cm high. Branchlets spinescent, smooth, extremely minutely puberulous. Leaves alternate, fasciculate on older wood, sessile, very narrowly obovate, terete or subterete, 3–6 mm long, rounded below, concave above, thickened, glabrous. Flowers solitary, terminal to short shoots; pedicel 2–3 mm long, slender above the small bracteoles. Sepals narrowly triangular, 1.5–2 mm long, fleshy, glabrous. Petals elliptic, c. 4 mm long, glabrous, glandular-punctate around midvein, white. Stamens: filaments narrowly oblong, glandular-verrucose in upper half, ciliate; anthers c. 0.5 mm long, shortly and bluntly apiculate. Ovary glabrous; style slender-terete, c. 1.2 mm long, glabrous; stigma minute. Fruit not seen. Fig. 35.

Known only from the type; growing in sand over gravel. Flowers Sept.

The presence of alternate leaves, although not unique, is unusual in the genus, as are spinescent branchlets. This species is similar in appearance to some variants of *B. coerulescens* subsp. *spinescens* but it differs from these in the shape of the leaves and in their alternate phyllotaxy.

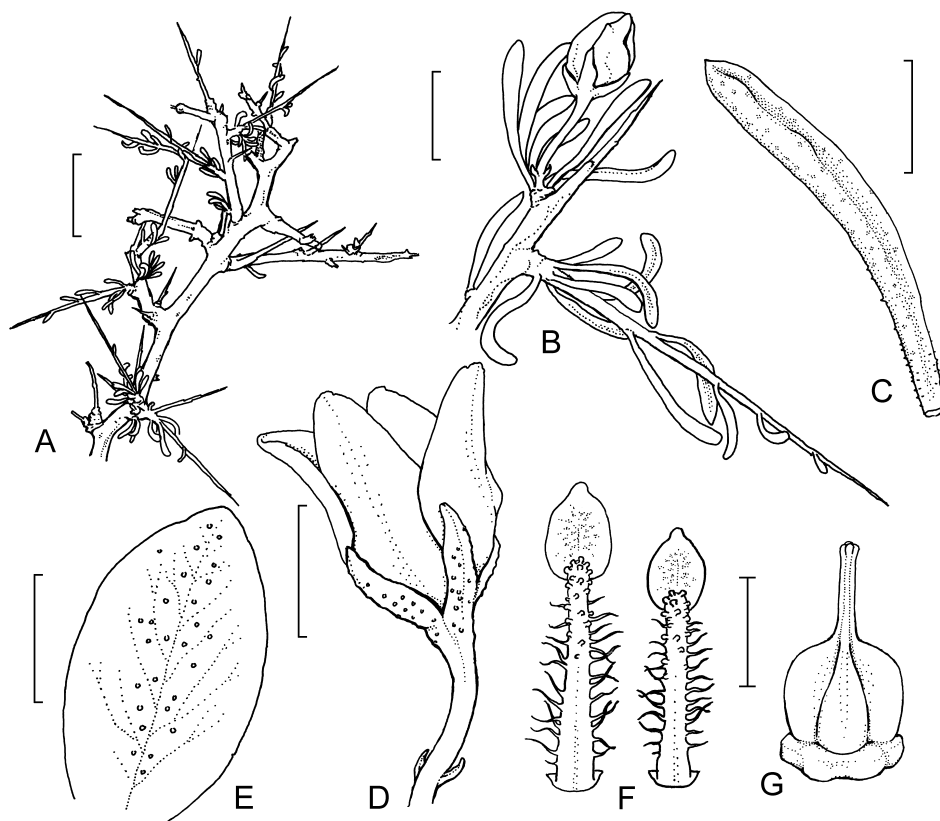


Figure 35. *Boronia acanthoclada*. A, branch; B, flowering branch; C, leaf adaxial surface; D, flower; E, petal; F, antisepalous & antipetalous stamens; G, disc and pistil (A–G, *J.M. Brown 4051555*, PERTH). Scale bars: A = 10 mm; B, D = 3 mm; C, E = 2 mm; F, G = 1 mm. Drawn by A. Menadue, reproduced with permission from *Nuytsia* 12: 147, fig. 11 (1998).

78. *Boronia fabianoides* (Diels) Paul G. Wilson, *Nuytsia* 1: 119 (1970)

Eriostemon fabianoides Diels, *Bot. Jahrb. Syst.* 35: 322, tab. 39 K–L (1904). T: N of Grasspatch, W.A., 2 Nov. 1901, *L. Diels* 5289; iso: PERTH.

Much branched shrub to 50 cm high. Branchlets glabrous or puberulous; decurrent leaf bases absent. Leaves subopposite to alternate, frequently fasciculate, sessile or with petiole to 0.5 mm long, slender, terete, 5–15 mm long, channelled above, glabrous or sparsely puberulous. Flowers axillary, solitary; pedicel fleshy, 1–2 mm long. Sepals narrowly triangular to triangular or ovate, 1–3 mm long, fleshy with scarious margin, glabrous. Petals broadly elliptic, 3–7 mm long, glabrous, thickened and glandular in medial strip, white, pink or pale blue. Stamens: filaments narrowly oblong, ciliate, sparsely verrucose towards apex; anther c. 1 mm long, usually minutely apiculate. Ovary glabrous; style c. 0.5 mm long, terete, glabrous; stigma barely differentiated to subcapitate.

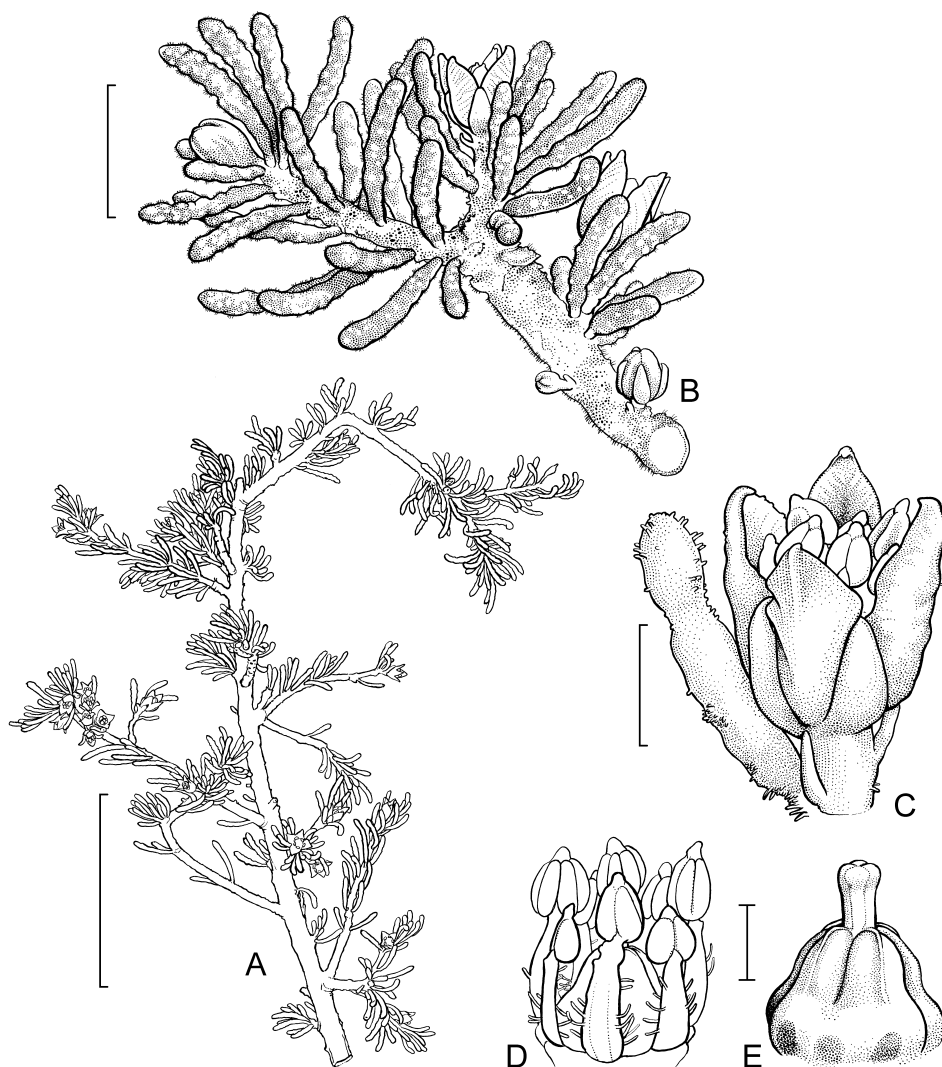


Figure 36. *Boronia fabianoides* subsp. *fabianoides*. **A–B**, flowering branch. **C**, flower. **D**, flower with sepals and petals removed. **E**, pistil (drawn from fresh material, voucher not recorded). Scale bars: **A** = 20 mm; **B** = 5 mm; **C** = 1 mm; **D** = 0.5 mm; **E** = 0.4 mm. Drawn by M. Wilson.

Occurs in southern W.A., near Cowcowing and from Lake King E to the Fraser Ra. Two subspecies are recognised.

Petals c. 3 mm long, white with green midrib

78a. subsp. **fabianoides**

Petals 5–7 mm long, white with pink midrib

78b. subsp. **rosea**

78a. *Boronia fabianoides* (Diels) Paul G. Wilson subsp. *fabianoides*

Low spreading shrub with ascending or divaricate branches, 10–30 cm high. Sepals triangular, c. 1 mm long. Petals broadly elliptic, c. 3 mm long, 2 mm wide, white with thickened green midrib. Fig. 36.

Occurs in the Norseman to Esperance area of southern W.A.; growing in eucalypt woodland on loam, sometimes calcareous. Flowers Oct.–Nov.; fruits Nov.–Dec.

W.A.: 9.5 km NE of Mt Heywood, *W.R. Archer 2411906* (PERTH); 27 km ENE of Salmon Gums, *M.A. Burgman 2837* (PERTH); 10 km NE of Scaddan, *P. van der Moezel 203* (PERTH); 97 miles [155 km] E of Norseman, *E. Wittwer 1966* (PERTH).

This subspecies generally has puberulous branchlets but a glabrous variant is found c. 70 km E of Norseman along the Eyre Hwy (*G.F. Craig 3064*; *R.J. Cranfield 9384*, both PERTH).



78b. *Boronia fabianoides* subsp. *rosea* Paul G. Wilson, *Nuytsia* 12: 150 (1998)

T: Woodline, c. 95 km ENE of Norseman, W.A., 7 Aug. 1980, *G.J. Keighery 2998*; holo: PERTH.

Erect shrub with ascending branches, to 60 cm high. Sepals triangular, 2 (–3) mm long. Petals very broadly elliptic, 5–7 mm long, 4–6 mm wide, white with a thickened narrow pink midrib.

Occurs in inland southern W.A. from Lake King to the Fraser Ra. with an early record from Cowcowing; Growing in clay-loam often over greenstone or granite. Flowers July–Oct.; fruits Sept.–Oct.

W.A.: 10 km E of Norseman, *D.E. Albrecht 4035* (PERTH); 13 miles [21 km] S of Mt Holland, *A.S. George 9440* (PERTH); Cowcowing, *M. Koch 1231* (MEL); 3 km NW of L. Cronin, *K. Newbey 8801* (PERTH).

This plant is pungently aromatic when crushed.

The specimen cited above from near Cowcowing, which was collected in 1904, differs from plants collected to the east in having narrowly triangular sepals c. 3 mm long and prominent anther apicula.



Ser. 6. Defoliatae

Boronia ser. *Defoliatae* Durretto, *Fl. Australia* 26: 583 (2013)

Type: *B. defoliata* F. Muell.

Weakly erect to decumbent shrubs, glabrous apart from flowers; hairs simple. Leaves opposite, often early deciduous, sessile, simple, terete, with pallsade mesophyll encircling leaf. Inflorescence a few-flowered cyme or flowers solitary; bracts large and sepal like. Petals blue. Anther apiculum present and globular or absent. Style glabrous.

A series of 4 species in SW W.A.

79. *Boronia subsessilis* Benth., *Fl. Austral.* 1: 322 (1863)

T: Swan River Colony, W.A., *J.Drummond* 11; holo: K.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 872 (2002).

Woody perennial to 0.3 m high, glabrous except stamens. Branches with decurrent leaf bases faint. Leaves sessile, slender-terete, 10–25 mm long, usually exceeding internodes, blunt or acuminate, channelled above. Flowers axillary, solitary or paired; pedicels 1–3 mm long. Sepals very broadly ovate, c. 2 mm long, thick. Petals broadly ovate, c. 6 mm long, obtuse, firm, white adaxially, green to blue abaxially with narrow white margin, prominently glandular. Stamens: filaments flat, somewhat verrucose towards apex, stiffly ciliate; anthers c. 0.5 mm long; apiculum recurved, broadly obovate, to 1 mm long. Stigma large, globular to narrowly ellipsoid, subsessile or on a short thick style.

Occurs in SW W.A. from Toodyay S to Denmark and Ravensthorpe. Generally found growing in gravel, often on rocky hills, but also in sand. Flowers June–Aug.; fruits Aug.

W.A.: Tarin Rock, *A.M.Ashby* 1607 (PERTH); Ravensthorpe Ra., Sept. 1980, *E.M.Bennett* s.n. (PERTH); Mt Lindesay, *B.G.Hammersley* 303 (PERTH); 18 km E of Toodyay, *G.J.Keighery* 7107 (PERTH).

A variant found near the S coast has a subsessile globular stigma as does a variant found near Narrogin; some of the more northerly variants have shortly stipitate stigmas which vary from being globular to narrowly ellipsoid. The type, which matches material collected from near Ongerup, has a shortly stipitate broadly ellipsoid stigma.



80. *Boronia tenuis* (Lindl.) Benth., *Fl. Austral.* 1: 320 (1863)

Cyanothamnus tenuis Lindl., *Sketch Veg. Swan R.* 18 (1839). T: Swan River [Colony], W.A., 1839, *J.Drummond*; syn: CGE (photo seen); *Capt. Mangles*; syn: CGE (photo seen).

Illustrations: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 485, fig. 192 (1987); J.R.Wheeler *et al.*, *Fl. South West* 2: 872 (2002).

Woody perennial to 0.6 m high, glabrous except stamens. Branchlets slender; decurrent leaf bases faint or absent. Leaves sessile, filiform, terete, 5–20 mm long, shorter than internodes, acute, channelled above. Flowers axillary, solitary or in groups of 2 or 3; pedicels slender, 7–15 mm long. Sepals narrowly ovate or narrowly triangular, c. 3 mm long. Petals elliptic, 6–7 mm long, thin, white to pink adaxially, pale blue with darker narrow keel abaxially. Stamens: filaments narrowly elliptic, ciliate, glandular-verrucose towards apex; anthers 0.7 mm long, with a swollen rounded apiculum c. 0.5 mm long. Style slender, c. 1 mm long; stigma minute. *n* = 16, H.M.Stace & S.J.Patrick, *Nuytsia* 9: 131 (1993). *Blue Boronia*.

Occurs in SW W.A. from near Wannamal to S of Dwellingup on the Darling Scarp, with an outlier near Cape Naturaliste; generally growing on laterite. Flowers Aug.–Dec.; fruits Nov.–Dec.

W.A.: 1 km E of Eagle Bay, *N.Gibson & M.Lyons* 995 (PERTH); Wannamal, *E.A.Griffin* 6099 (PERTH); Kalamunda, *R.D.Royce* 4300 (PERTH); Upper Helena Valley, *J.Seabrook* 262 (PERTH).



81. *Boronia defoliata* F.Muell., *Fragm.* 9: 113 (1875)

T: W.A., *J.Drummond* 114; holo: MEL.

Illustration: J.R.Wheeler *et al.*, *Fl. South West* 2: 871 (2002).

Woody perennial to 0.6 m high, glabrous except on flowers. Branchlets slender; decurrent leaf bases faint. Leaves caducous, sessile, filiform, terete or subterete, c. 5 mm long, shorter than internodes, acute, rounded abaxially and flat adaxially. Flowers in terminal and axillary shortly pedunculate cymes; pedicels slender, 3–5 mm long. Sepals broadly ovate, c. 2 mm

long, leathery with scarious margins, glabrous. Petals elliptic, c. 5–7 mm long, thin, glabrous, white to pink adaxially, pale blue with darker medial strip abaxially. Stamens: filaments linear, sparsely woolly-ciliate, glandular-verrucose at apex; anthers 1 mm long; apiculum acute to obtuse, c. 0.3 mm long. Ovary glabrous; style slender, c. 1 mm long; stigma minute.

Occurs in far SW W.A. from Capel to Manjimup; found in gravelly soil, often on fringes of swamps. Flowers Sept.–Oct.; fruits Oct.

W.A.: Near Margaret R., *C.A.Gardner 5582* (PERTH); 5 miles [8 km] S of Nannup, *V.Mann 64* (PERTH); Yoongarillup, *R.D.Royce 3894* (PERTH).

This species differs from *B. tenuis* in having predominantly terminal cymes, broadly ovate sepals, and caducous leaves.



82. *Boronia busselliana* F.Muell., *Fragm.* 9: 113 (1875)

T: “? Geographe Bay”, W.A., 1874, *Miss Bussell*; holo: MEL.

Slender erect, glabrous, perennial to 40 cm high. Branches with decurrent leaf bases faint. Leaves frequently caducous, few, well-spaced, sessile, slender-terete, to 12 mm long, channelled above. Flowers axillary, solitary or in 3-flowered cymes; pedicels 5–10 mm long, somewhat thickened. Sepals narrowly to broadly ovate, 2–2.5 mm long, fleshy in centre. Petals elliptic, 8–12 mm long, obtuse, firm, prominently glandular-punctate, white adaxially, green or pink abaxial particularly in median strip, drying blue. Stamens: filaments filiform, smooth; anthers c. 0.6–1.5 mm long, obtuse, not apiculate. Style slender, 3–4 mm long; stigma subcapitate.

Found in SW W.A. from Eneabba S to Ongerup, usually growing on gravel or over laterite. Flowers Sept.–Oct.

W.A.: 4.8 km SSE of Narrogin, *T.E.H.Aplin 3192* (PERTH); S Eneabba, Sept. 1968, *C.Chapman* (PERTH); Ongerup townsite, *K.Newbey 1850* (PERTH); Mt Dale, *E.Wittwer 679* (PERTH).

This species is unusual in sect. *Cyanothamnus*, and in the genus *Boronia*, in having slender smooth staminal filaments, however it is otherwise similar to *B. tenuis* and *B. defoliata*. The variation in the size of the flowers, particularly of the anthers, suggests that infraspecific taxa could be recognised, but this is not at present practicable because of the relatively few collections available.



Sect. 4. *Alatae*

Marco F.Duretto & Pauline Y.Ladiges

Boronia sect. *Alatae* Duretto, *Muelleria* 12: 13 (1999)

Type: *B. alata* Sm.

Hairs simple. Leaves pinnate or bipinnate. Flowers in large terminal cymose panicles, smaller units in upper leaf axils; bracts persistent. Sepals open or imbricate, persistent. Petals valvate (reduplicate) in bud, not inflexed at apex, persistent; 1 prominent vein with steeply ascending, faint lateral nerves. Stamens 8, all fertile; filaments semiterete, swollen and verrucose towards apex, pilose, with erect tip; anthers equal, white-apiculate; connective tissue not prominent. Seeds elliptic, dull, usually brown; adaxial surface with a linear hilum, raphe basal; sclerotesta minutely verrucose.

A monotypic section confined to SW W.A.

Boronia alata, and the species of sections *Algidae* and *Valvatae*, were the subject of a cladistic analysis of morphological characters (M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 11: 636–665 (1999)).

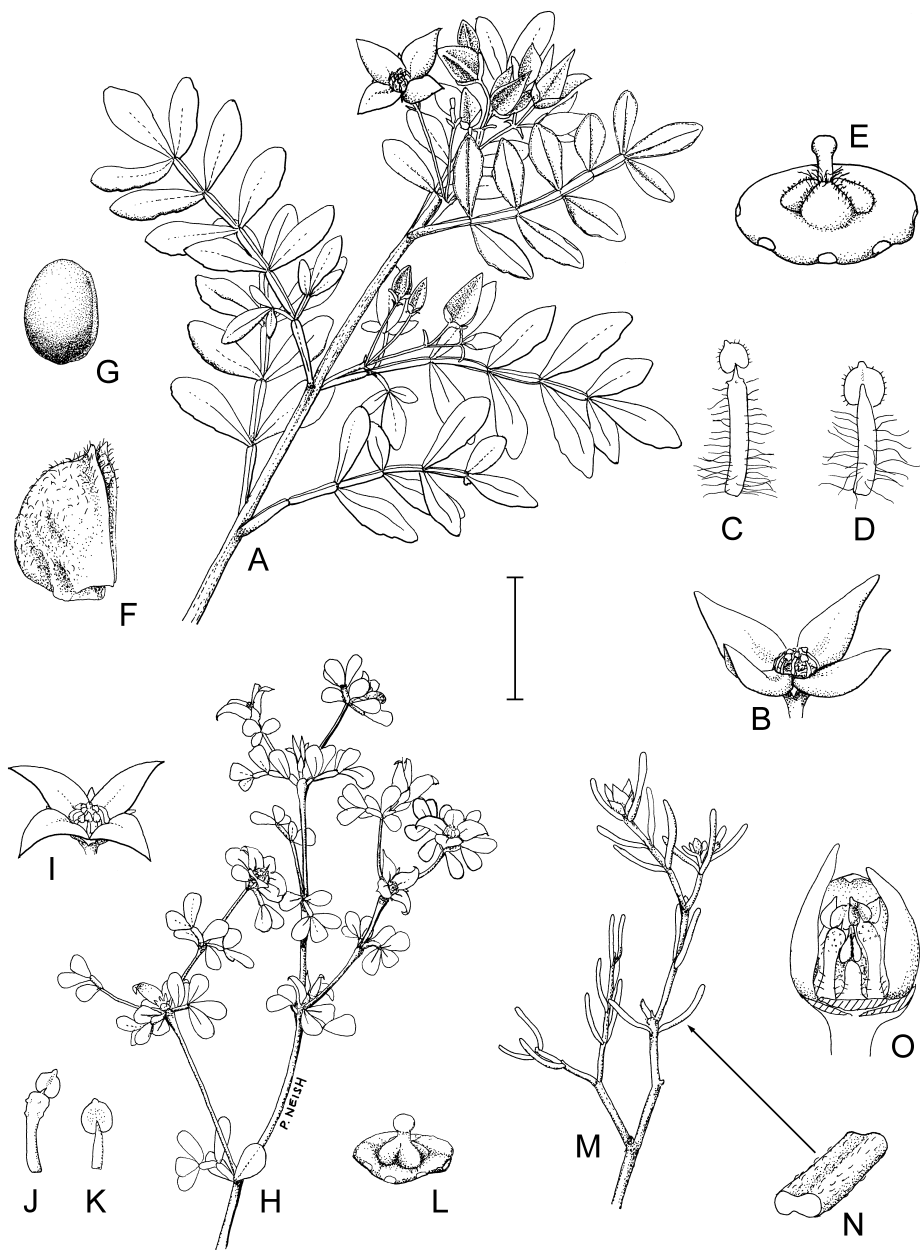


Figure 37. *Boronia*. A–G, *B. alata*. A, habit; B, flower; C, antisepalous stamen; D, antisepalous stamen, abaxial view; E, disc and gynoecium; F, coccus; G, seed (A–E, A.Lea, Oct. 1898, PERTH; F–G, E.M.Scrymgeour 1619, PERTH). H–L, *B. algida*. H, habit; I, flower; J, antisepalous stamen; K, antisepalous stamen, abaxial view; L, disc and gynoecium (H–L, M.Duretto 672A, MEL). M–O, *B. corynophylla*. M, habit; N, leaf detail; O, flower with 1 petal and 2 sepals removed (M–O, K.Newbey 6477, PERTH). Scale bar: A, H, M = 16 mm; B, I = 8 mm; F, G, N = 4 mm; C–E, J–L, O = 2 mm. Drawn by P.Neish.

83. *Boronia alata* Sm., *Trans. Linn. Soc. London* 8: 283 (1807)

T: King George's Sound [W.A.], 1803, *A.Menzies s.n.*; lecto: LINN 684.3 n.v., *fide* M.F.Duretto, *Muelleria* 12: 14 (1999); isolecto: LIV n.v.

Zanthoxylum oppositifolium DC., *Prodr.* 1: 728 (1824); *B. candollei* G.Don, *Gen. Hist.* 1: 793 (1831), as *B. candollii*, *nom. illeg.* T: "in Novâ-Hollandiâ. (v.s. in siné fl. ex Mus. Par.)"; n.v., *fide* G.Bentham, *Fl. Austral.* 1: 312 (1863).

B. alata var. *bipinnata* F.Muell., *Fragm.* 9: 111 (1875). T: W.A., *J.Drummond 89*; holo: MEL.

B. vilhelmii Domin, *Věstn. Král. České Společn. Nauk, Tř. Mat.-Přír.* 2: 51 (1923). T: Yallingup and Cape Naturaliste, W.A., *A.A.Dorrien-Smith*; syn: PR (2 sheets, photos MEL).

Illustrations: H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 19A: 251, fig. 107E–H (1931); N.G.Marchant *et al.*, *Fl. Perth Region* 1: 478, fig. 185 (1987); M.F.Duretto, *Austral. Pl.* 23 (182): 45 (2005).

Erect, rarely prostrate, shrub to 2.5 m tall, glabrous to sparsely puberulous on vegetative parts. Leaves pinnate or bipinnate, (3–) 7–13-foliolate (lower pinnae often 3–7-foliolate), 15–65 mm long, 10–40 mm wide; petiole 4–18 mm long; rachis segments 3–15 mm long; leaflets elliptic to oblanceolate, 2–22 mm long, 1–9 mm wide, acute to obtuse, discolorous. Peduncle 2–24 mm long; pedicels 3–13 mm long. Sepals narrowly triangular, 2.5–3.5 mm long, 0.5–1 mm wide, acute, ciliate. Petals 7–12 mm long, pink; abaxial surface glabrous or with few hairs. Ovary and style densely puberulous; stigma globular, wider than style. Cocci pilose. *Winged Boronia*. Fig. 37A–G.

Occurs in near coastal areas and adjacent islands from Perth to the Recherche Archipelago, W.A. Grows on calcareous substrates in eucalypt woodland, and tall and short heath. Often prostrate in exposed areas. Flowers and fruits Sept.–Feb.

W.A.: Cape Leeuwin, *A.C.Beauglehole 12490* (AD, CANB, DNA, MEL, PERTH); Eclipse Is., 18 Jan. 1975, *R.Boden & J.Forshaw* (CANB); sandhills behind Hamelin Bay, *E.M.Scrymgeour 1619* (PERTH); Rottneest Is., Nancy Cove, *I.R.Telford 6733* (CANB).

**Sect. 5. Algidae**

Marco F.Duretto & Pauline Y.Ladiges

Boronia sect. *Algidae* Duretto, *Muelleria* 12: 16 (1999)

Type: *B. algida* F.Muell.

Hairs simple. Leaves pinnate or simple. Flowers in terminal 1 (–3)-flowered cymes; bracts persistent. Sepals imbricate, brown, persistent. Petals valvate, multiveined from base, persistent or caducous; tip not inflexed. Stamens 8, all fertile; filaments semiterete, swollen and verrucose towards apex, glabrous or pilose, with tip appearing subterminal; anthers equal, white-apiculate, with connective not visible. Seeds elliptic, slightly flattened on adaxial side, dull, grey to black; tubercles present or absent; adaxial surface with linear hilum; raphe basal; sclerotesta sometimes minutely verrucose.

A section of 3 species; one in SW W.A., another in S.A. and the third in N.S.W., A.C.T. and Vic.

Boronia algida, *B. edwardsii* and the species of sections *Alatae* and *Valvatae* were the subject of a cladistic analysis of morphological characters (M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 11: 636–665 (1999)).

1 Leaves simple, terete (SW W.A.)

86. *B. corynophylla*

1: Leaves pinnate, leaflets flat (S.A.; Vic.; N.S.W.; A.C.T.)

2 Leaves (3–) 5–9-foliolate, petiolate; petals persistent (Vic.; N.S.W.; A.C.T.)

84. *B. algida*

2: Leaves 3 (–5)-foliolate, usually sessile (rarely petiolate); petals caducous (S.A.)

85. *B. edwardsii*

84. *Boronia algida* F.Muell., *Trans. Philos. Soc. Victoria* 1: 100 (1855)

T: Australian Alps: Near the summits of Mt Hotham and Mt Latrobe [= Mt Loch] at the height of about 5 or 6000 ft, Vic., Dec. 1854, *F.Mueller s.n.*; lecto: MEL, *fide* M.F.Duretto, *Muelleria* 12: 16 (1999); probable isolecto: BM *n.v.* (photos MEL, NSW), K *n.v.* (photos AD, MEL), MEL, TCD.

Illustrations: G.R.Colchrane *et al.*, *Fl. Pl. Victoria* 161, t 508 (1968); N.T.Burbidge & M.Gray, *Fl. Austral. Cap. Terr.* 241, fig. 235 (1970); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 270 (2002).

Erect shrub to 1 m tall. Branches glandular-verrucose, puberulous. Leaves (3–) 5–9-foliolate, 8–15 mm long, 4–5 mm wide, glabrous or with a few hairs on midrib; petiole 0.5–1 mm long; rachis segments 1–4 mm long; leaflets oblanceolate, 2–9 mm long, 1–4.5 mm wide, obtuse to obovate, with terminal leaflets shortest. Pedicels 0.5–5 mm long. Sepals broadly ovate-deltate, 1–2.5 mm long, 0.5–1.5 mm wide. Petals 4–7 mm long, pink or white, persistent; abaxial surface glabrous. Filaments glabrous. Ovary glabrous; stigma globular, much wider than style. Cocci glabrous. Seed verrucose. *n* = 10, H.M.Stace & J.A.Armstrong, *Austral. Syst. Bot.* 5: 502 (1992). *Alpine Boronia*. Fig. 37H–L.

Found at higher altitudes from Gibraltar Ra. and Emmaville, N.S.W., to the Bogong High Plains, Vic. Also occurs near the coast near Batemans Bay, N.S.W. Found on soils derived from granite or sandstone in heath or open eucalypt woodland communities. Flowers Aug.–May; fruits Oct.–May.

N.S.W.: 0.55 km from Rangers Station along Mulligan Hut track, Gibraltar Range Natl Park, *M.F.Duretto 672A* (MEL, NSW); N Budawang Ra., Styles Ck, c. 13 km SE of Nerriga, *I.R.Telford 9568* (CANB, MEL). A.C.T.: Slopes near lower Gibraltar Ck, *P.Gilmour 5940* (CANB, HO). Vic.: Nunniong Plateau, along Brumby Point Tract, 5 km from jctn of Diggers Hole Track, W7, *A.M.Lyne* (MEL); Mt Buffalo, (R43), *C. & D.Woodcock 1678* (MEL).



The only species of *Boronia* found in alpine communities on the Australian mainland, and one of the few found in subalpine communities. The chromosome number (*n* = 10) has not been recorded elsewhere in *Boronia*.

85. *Boronia edwardsii* Benth., *Fl. Austral.* 1: 312 (1863)

T: Heaths of Mt Barker, S.A., Sept. 1860, *H.Edwards s.n.*; lecto: MEL, *fide* M.F.Duretto, *Muelleria* 12: 18 (1999).

Illustrations: J.P.Jessop (ed.), *Fl. S. Australia* 4th edn, 2: 772, fig. 413A (1986); A.Prescott, *It's Blue with Five Petals* 217, fig. 2 (1988); G.R.M.Dashorst & J.P.Jessop, *Pl. Adelaide Plains & Hills* 96, pl. 41.2–2a (1990).

Erect shrub to 1 m tall. Branches eglandular, sparsely to densely puberulous. Leaves sessile, rarely petiolate, (1–) 3 (–5)-foliolate, 3–16 mm long, 3–15 mm wide, glabrous or puberulous; rachis segments 1–3 mm long; leaflets oblanceolate, 1.5–14 mm long, 0.5–5 mm wide, obtuse, with terminal leaflets longest. Pedicel 2–7 mm long. Sepals broadly ovate-deltate, 1–1.5 mm long, 0.5–0.75 mm wide, glabrous or ciliate. Petals 5–8 mm long, pink or white, caducous; abaxial surface glabrous. Filaments glabrous. Ovary glabrous or puberulous; stigma globular, much wider than style. Cocci puberulous. *Island Boronia*.

Occurs in S.A., in the southern Mt Lofty Ra. from Adelaide to the Fleurieu Penin. and on Kangaroo Is. Found in heath or open woodland communities. Flowers Aug.–Dec.; fruits Sept.–Jan.

S.A.: Fleurieu Penin., near Tunkalilla Beach, c. 25 km W of Victor Harbour or 25 km WSW of Myaponga, *J.B.Cleland 29c* (AD); near Tandanya, South Coast Rd, 3.7 km E of Flinders Chase Natl Park, Kangaroo Is., *P.C.Heylingers 80096* (AD, CANB); Fisell Hill near Forest Ra., *A.G.Spooner 5278* (AD); W boundary of Kelly Hill Res., c. 12 km ENE of Cape du Couedic, SW Kangaroo Is., *P.G.Wilson 724* (AD).



Though this species is common on Kangaroo Is., it is rare on the mainland. Distinguishable from other species of *Boronia* by having terminal inflorescences, and valvate and caducous petals.

86. *Boronia corynophylla* Paul G. Wilson, *Nuytsia* 12: 142 (1998)

T: 13 km SW of 90 Mile Tank, Frank Hann Natl Park, W.A., 27 Oct. 1980, *K.R.Newbey* 7827; holo: PERTH.

Illustration: P.G.Wilson, *op. cit.* 145, fig. 9.

Spreading shrub to 30 cm high. Branches eglandular, sparsely puberulous; cuticle exfoliating and forming a grey scurfy covering. Leaves sessile, slender-terete to narrowly fusiform or narrowly clavate, 7–10 mm long, c. 1 mm wide, minutely puberulous. Pedicel 1–2 mm long. Sepals ovate, 2.5–3 mm long, 0.5–1.5 mm wide, glandular, glabrous to sparsely puberulous. Petals c. 5 mm long, pale red; abaxial surface glabrous to sparsely puberulous. Filaments pilose. Ovary minutely puberulous; style pilose; stigma scarcely wider than style. Fruit and seed not seen. Fig. 37M–O.

Known from 2 collections made in Frank Hann Natl Park, c. 90 km NE of Lake King township, SW W.A. Found growing in *Eucalyptus salmonophloia* open woodland on clayey sand. Flowering material collected in Oct.

W.A.: 13 km SW of 90 Mile Tank, Frank Hann Natl Park, W.A., *K.R.Newbey* 6477 (PERTH).

A distinctive and probably endangered species that is distinguishable from the other members of the section by having simple leaves, and from other local/sympatric species by having the following combination of characters: simple leaves, imbricate sepals and valvate petals. The exfoliating cuticle on the branches gives the plant a glaucous appearance.

**Sect. 6. Valvatae**

Marco F.Duretto & Pauline Y.Ladiges

Boronia sect. *Valvatae* (Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3 (4): 135 (1896)

B. ser. Valvatae Benth., *Fl. Austral.* 1: 308, 311 (1863); *B. sect. Valvoboronia* Kuntze in T.von Post & O.Kuntze, *Lex. Gen. Phan.* 74 (1903), *nom. illeg.* T: *B. alulata* Sol. ex Benth.

B. subg. Robonia Rehb., *Iconogr. Bot. Exot.* 1: 54 (1827). T: *B. ledifolia* (Vent.) J.Gay ex DC.

Hairs stellate (except *B. anomala*) and simple, the stellate hairs sometimes present only on flowers. Leaves simple or pinnate. Flowers axillary, solitary or in cymes; bracts persistent. Sepals valvate (unknown for *B. anomala*), persistent. Petals valvate, multiveined at base with a prominent midvein and several much fainter lateral veins, persistent (except *B. anomala*); tip not inflexed. Stamens 8, all fertile; filaments subterete, usually pilose, sometimes glabrous or with just a few hairs (*B. fraseri*, *B. lanceolata*, *B. mollis*), usually swollen and verrucose towards apex, sometimes the antipetalous filaments smooth, with tip usually terminal and erect; anthers equal or unequal, white-apiculate or not, with connective not visible. Seeds black or rarely mottled or grey, shiny or rarely dull, elliptic to reniform; adaxial side flattened, with linear hilum; raphe basal with brittle cover; sclerotesta minutely verrucose to colliculate, rarely reticulate-foveate (*B. viridiflora*).

A section of 62 species found in all States and Territories except S.A. and Tas.; the only section of *Boronia* found in the Kimberley Region of W.A., the N.T., and NW Qld. There are 5 subsections.

Section *Valvatae*, along with sections *Algidae* and *Alatae*, was the subject of a cladistic analysis of morphological characters (M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 11: 636–665 (1999)). Results of this analysis formed the basis of the infrageneric classification published by Duretto (*Muelleria* 12: 1–131 (1999)).

KEY TO SECTION VALVATAE - SUBSECTIONS, SERIES AND SUBSERIES

- 1 Stellate hairs absent; leaves pinnate; leaflets linear, involute, < 1 mm wide; petals caducous **subject. 1. Anomalae** (p. 232)
- 1: Stellate hairs present, if only on flowers; leaves simple or pinnate; leaflet shape variable, flat to revolute, usually > 1 mm wide; petals persistent
- 2 Leaves 1–3-foliolate, with scattered wax platelets on surface; seeds reniform, dull (SW W.A.) **subject. 2. Ternatae** (p. 234)
- 3 Leaflets elliptic to oblanceolate, concolorous, flat **ser. 1. Ternatae** (p. 234)
- 3: Leaflets linear-elliptic, discolorous; margins revolute **ser. 2. Ericifoliae** (p. 238)
- 2: Leaves 1–55-foliolate, with wax platelets absent or rarely dense and forming a waxy bloom; seeds elliptic in outline with dorsal side flattened, shiny (rarely dull) (N.W.A.; N.T.; Qld; N.S.W.; Vic.)
- 4 Sepals usually c. equal to (in length and width) or larger than petals, rarely slightly smaller; filaments distinctly clavate, narrowing suddenly at apex; antipetalous anthers much larger than antisepalous anthers; inflorescence 1 (–3)-flowered (W.A.; N.T.; NW Qld) **subject. 5. Grandisepalae** (p. 267)
- 5 Plants glabrous apart from flowers, glaucous; stems, at least when young, distinctly quadrangular; seeds dull and without ridge on dorsal side; leaves simple **ser. 1. Quadrilatae** (p. 267)
- 5: Plants variously hairy, not glaucous; stems terete to slightly quadrangular; seeds shiny, with prominent dorsal ridge; leaves simple or pinnate
- 6 Leaves simple; sepals much larger than petals; seeds black **ser. 2. Grandisepalae** (p. 268)
- 7 Stellate hairs on prominent stalks (to 1 mm long), rays 0.5–1 mm long; fruits glabrous **subser. 1. Verecundae** (p. 269)
- 7: Stellate hairs without stalks, or stalks minute, rays minute or to 0.5 mm long; fruits hairy **subser. 2. Grandisepalae** (p. 270)
- 6: Leaves pinnate, or if simple then sepals c. equal to or slightly smaller than petals and seeds mottled **ser. 3. Lanuginosae** (p. 274)
- 8 Leaves 1–3- or 15–55-foliolate; leaflets or leaves elliptic, lanceolate or rhombic; leaves and branches glabrous or with a sparse to moderately dense stellate indumentum; seeds mottled **subser. 3. Filicifoliae** (p. 278)
- 8: Leaves 3–27 (–35) -foliolate; leaflets linear to narrowly elliptic; leaves and branchlets sparsely to densely hairy; seeds usually black
- 9 Leaves petiolate; leaflets strongly recurved to revolute, with midrib raised prominently on abaxial surface; plant sparsely to densely hairy **subser. 1. Lanuginosae** (p. 275)
- 9: Leaves sessile; leaflets flat or slightly recurved along margins, with midrib not raised prominently on abaxial surface; plant with few hairs or with a sparse to moderately dense indumentum **subser. 2. Jucundae** (p. 276)
- 4: Sepals much smaller than petals or if as long then much narrower; filaments tapering at apex; anthers equal; inflorescence 1–many-flowered (N.T.; Qld; N.S.W.; Vic.)
- 10 Petals without raised midrib; rays of stellate hairs fused, especially on petals (N Qld) **subject. 3. Bowmaniorum** (p. 240)
- 10: Petals with raised midrib; rays of stellate hairs free (N.T.; Qld; N.S.W.; Vic.) **subject. 4. Valvatae** (p. 241)
- 11 Leaves slightly discolorous, glabrous or sparsely hairy; rays of hairs to 0.5 mm long; simple leaves petiolate
- 12 Pendulous shrubs growing on vertical cliff faces; petals 2–3 mm long (N.T.) **ser. 3. Rupicola** (p. 250)

- 12: Erect shrubs; petals > 3 mm long (Qld; N.S.W.)
- 13 Leaves or leaflets without prominently raised midribs abaxially, narrowly to broadly elliptic, or oblanceolate or spatulate **ser. 1. Erianthae** (p. 243)
- 13: Leaves or leaflets with prominently raised midrib abaxially, elliptic to lanceolate **ser. 2. Fraserorum** (p. 248)
- 11: Leaves strongly discoloured, with a moderately dense to dense indumentum on abaxial surface; rays of hairs to 1 mm long; simple leaves sessile or petiolate
- 14 Pendulous shrubs growing on vertical cliff faces; petals 2–3 mm long; leaves or leaflets flat, with midrib not raised prominently on abaxial surface (N.T.) **ser. 3. Rupicola** (p. 250)
- 14: Erect or rarely pendulous shrubs; petals > 3 mm long; leaves or leaflets flat or with a recurved to revolute margin, with midrib usually raised on abaxial surface (N.T.; Qld; N.S.W.; Vic.) **ser. 4. Valvatae** (p. 251)
- 15 Sepals narrowly deltate or rarely ovate-deltate (then leaflets flat, adaxial surface with a few scattered hairs and the terminal leaflet > 8 mm wide), moderately densely to densely hairy on abaxial surface; leaves pinnate **subser. 1. Valvatae** (p. 251)
- 15: Sepals ovate-deltate to broadly ovate-deltate or elliptic, with a dense indumentum on abaxial surface; leaves simple or pinnate; if leaflets > 8 mm wide then adaxial surface sparsely to densely hairy
- 16 Leaves simple, with a sparse to moderately dense, stellate indumentum; sepals acuminate, (4–) 5–10 mm long, 3–7 mm wide **128. B. hapalophylla (subser. incertae sedis)** (p. 266)
- 16: Leaves simple or pinnate, glabrous adaxially, or if hairy then sepals 1–4.5 mm long; sepals acute to acuminate, 1–6 mm long
- 17 Leaves simple, sessile; adaxial surface of petals with a moderate simple indumentum; adaxial surface of petals sparsely pilose; inflorescences 1 (–3)-flowered **subser. 3. Rosmarinifoliae** (p. 262)
- 17: Leaves simple or pinnate, petiolate or rarely sessile (then adaxial surface of petals glabrous); inflorescences 1–many-flowered
- 18 Sepals acuminate, rarely acute (then anther apiculum large and reflexed and leaf length:width ratio < 5) **subser. 2. Lanceolatae** (p. 257)
- 18: Sepals acute; anther apiculum absent or minute (if present then leaf length:width ratio > 5.5)
- 19 Leaves simple or pinnate, firm, smooth on margin (?Qld; N.S.W.; Vic.) **126. B. ledifolia (subser. incertae sedis)** (p. 265)
- 19: Leaves simple, papery on drying, finely glandular-warty on margin (N coast N.S.W.) **127. B. chartacea (subser. incertae sedis)** (p. 266)

KEY TO SPECIES OF SECTION VALVATAE (ALL STATES)

- 1 Sepals c. same size as or longer than petals
- 2 Leaves 1–3-foliolate (rachis absent)
- 3 Plants, apart from flowers, glabrous; stems purple and distinctly quadrangular, at least when young; leaves simple, glaucous
- 4 Erect shrubs growing on ridge tops and gullies; leaves sessile; sepals 5.5–13 mm long; petals 4–5 mm long **129. B. quadrilata**
- 4: Horizontal shrubs growing on cliff faces; leaves petiolate; sepals and petals 2.5–4 mm long **130. B. viridiflora**

- 3: Plants sparsely to densely hairy, rarely almost glabrous; stems brown, terete to slightly quadrangular; leaves 1–3-foliolate, not glaucous
- 5 Leaves 3-foliolate; leaflets elliptic to oblanceolate, densely tomentose (epidermis not visible); anthers \pm equal (SW W.A.) **89. *B. adamsiana***
- 5: Leaves 1–3-foliolate; leaves or leaflets ovate or lanceolate or elliptic or linear, glabrous or with a sparse to moderately-dense indumentum (epidermis visible), or densely tomentose and then leaves simple; antipetalous anthers much larger than antisepalous anthers (N W.A.; N.T.)
- 6 Young stems glandular-verrucose; leaves 3-foliolate; leaflets linear (NE W.A.; W N.T.) **143. *B. jucunda***
- 6: Young stems not obviously glandular; leaves 1–3-foliolate; leaves or leaflets lanceolate, elliptic to ovate (W.A.; N.T.)
- 7 Leaves glabrous or with a few scattered hairs (NW W.A.) **144. *B. pauciflora***
- 7: Leaves with a sparse to dense stellate indumentum (sometimes minute) (W.A.; N.T.)
- 8 Leaves 1–3-foliolate; sepals c. as large as petals, 2.5–3.75 mm long, 1–1.5 mm wide (NW W.A.) **145. *B. barrettiorum***
- 8: Leaves simple; sepals larger than petals, 3–12 mm long, 1–7.5 mm wide (N.T.)
- 9 Stellate hairs prominently stalked, rays 0.5–1 mm long; cocci glabrous
- 10 Hairs white and flexuous making new shoots appear pinkish to white; leaves narrowly elliptic to narrowly lanceolate; adaxial surface of petal glabrous or hairy **131. *B. verecunda***
- 10: Hairs yellow and straight making new shoots appear yellow to white; leaves lanceolate or elliptic to narrowly elliptic; adaxial surface of petal hairy **132. *B. xanthastrum***
- 9: Stellate hairs without prominent stalks, rays to 0.5 mm long; cocci hirsute
- 11 Older stems with massively developed cork; rays of hairs to 0.1 (–0.3) mm long **133. *B. suberosa***
- 11: Older stems not corky; rays of hairs 0.1–0.5 mm long
- 12 Plants erect (rarely spreading or sprawling but then with a hoary, dense indumentum), with a moderately dense to dense indumentum; sepals > 7 mm long at anthesis (rarely < 7 mm long but then plant with a hoary, dense indumentum) **134. *B. grandisepala***
- 12: Plants sprawling, sparsely to moderately hairy (rarely densely hairy on abaxial leaf surface only); sepals < 8 mm long at anthesis, sometimes enlarging to 11 mm long as fruit matures
- 13 Leaves elliptic, lanceolate to ovate, most leaves > 5 mm wide
- 14 At anthesis flowers stalks (peduncle & pedicel) 2–7 mm long, not bent at bracts; leaves elliptic to lanceolate to sublanceolate **135. *B. laxa***
- 14: At anthesis at least some flowers stalks (peduncle & pedicel) > 10 mm long, often bent at bracts; leaves ovate to lanceolate **136. *B. prolixa***
- 13: Leaves narrowly elliptic, 1–4 mm wide
- 15 Leaves: indumentum of abaxial and adaxial surfaces markedly different; that of the abaxial surface dense; that of the adaxial surface moderately dense; hairs multiangular, rays not appressed **137. *B. zeteticorum***

- 15: Leaves: indumentum of both abaxial and adaxial surfaces similar, sparse; rays of hairs appressed **138. *B. amplectens***
- 2: Leaves mostly 5–55⁺-foliolate (rachis present)
- 16 Sepals narrower than petals; inflorescence (1–) 3–9-flowered; peduncle to 23 mm long; plants densely hairy (NE & NW Qld)
- 17 Leaflets elliptic to oblanceolate, (1–) 3–7 mm wide (NE Qld) **111. *B. quinkanensis***
- 17: Leaflets linear to narrowly elliptic, 0.5–1 mm wide (NW Qld) **112. *B. hoipolloi***
- 16: Sepals as wide as or wider than petals (if narrower then plants not densely hairy); flowers usually solitary; peduncle absent or minute; plants sparsely to densely hairy (W.A.; N.T.; NW Qld)
- 18 At least some leaves with > 30 leaflets; lateral leaflets elliptic to rhombic to circular; petiole 0–2 mm long
- 19 Terminal leaflets (1–) 3–8 mm long; lateral leaflets 0.5–7 mm long; pedicel (2–) 6–22 mm long **147. *B. filicifolia***
- 19: Terminal leaflets 1–3 mm long; lateral leaflets 0.5–2 mm long; pedicel 1–6 mm long **148. *B. minutipinna***
- 18: Leaves with < 30 leaflets (if > 30 leaflets then some petioles > 2.5 mm long); lateral leaflets linear to elliptic; petiole 0–7 mm long
- 20 Leaves sessile; leaflets linear to narrowly elliptic, flat or slightly recurved along margins; lamina very sparsely hairy
- 21 Plants decumbent, with a sparse to moderately dense, simple indumentum, stellate hairs rare **141. *B. decumbens***
- 21: Plants erect, with a sparse to moderately dense simple/stellate indumentum **142. *B. tolerans***
- 20: Leaves petiolate, with petioles 0.5–7 mm long; leaflets linear-elliptic to elliptic, flat or recurved to revolute at margins; lamina very sparsely to densely hairy
- 22 Sepals 3.5–6 mm long, equal to or slightly larger than petals, abaxial surface glabrous or with a sparse indumentum; petals 2.5–4 mm long; pedicel 7–24 mm long **146. *B. kalumburuensis***
- 22: Sepals (4–) 5–15 mm long, usually much larger than petals, abaxial surface glabrous or with a sparse to dense indumentum; petals 3–10 mm long; pedicel 3–6 (–10) mm long
- 23 Leaflets linear to narrowly elliptic, so revolute that abaxial surface not usually visible; sepals (4–) 7–15 mm long, abaxial surface glabrous or sparsely to densely hairy (N W.A., E of Ord R.; N.T.; Qld) **139. *B. lanuginosa***
- 23: Leaflets elliptic to lanceolate, abaxial surface visible; sepals 5–10 mm long, abaxial surface densely hairy (N W.A., W of Ord R.; W N.T. - Victoria R.) **140. *B. wilsonii***
- 1: Sepals shorter than petals
- 24 Stellate hairs, especially on petals, with fused rays and often appearing peltate; leaves pinnate (N Qld)
- 25 Leaflets linear; branches glandular-verrucose **92. *B. bowmanii***
- 25: Leaflets elliptic; branches not obviously glandular **93. *B. squamipetala***
- 24: Stellate hairs with distinct rays or absent; leaves simple or pinnate (SW W.A.; N.T.; Qld; N.S.W.; Vic.)
- 26 Pendulous shrubs growing on cliff faces; petals 2–3 mm long; leaves or leaflets flat (N.T.) **104. *B. rupicola***

- 26: Erect (rarely pendulous) shrubs; petals > 3 mm long (if shorter then leaves with a prominently raised midrib on abaxial surface or with 15 or more leaflets); leaflets flat or with a recurved to revolute margins (SW W.A.; N.T.; Qld; N.S.W.; Vic.)
- 27 Pinnate leaves present
- 28 Both surfaces of adult leaves with a dense indumentum (epidermis not visible)
- 29 Leaves 3-foliolate; leaflets concolorous, flat (SW W.A.) **88. *B. ternata***
- 29: Leaves (1–) 5–25⁺-foliolate; leaflets discolorous, margins slightly recurved to strongly revolute (Qld)
- 30 Sepals ovate-deltate, 1.5–2 times as long as wide, apex acuminate (central Qld) **113. *B. duiganiae***
- 30: Sepals narrowly triangular, at least 2.5 times as long as wide, apex acute to acuminate (NE & NW Qld)
- 31 Leaflets elliptic to oblanceolate, (1–) 3–7 mm wide (NE Qld) **111. *B. quinkanensis***
- 31: Leaflets linear to narrowly elliptic, 0.5–1 mm wide (NW Qld) **112. *B. hoipolloi***
- 28: Adaxial surface of leaves without a dense indumentum (epidermis visible); abaxial surface of leaves glabrous or with a sparse to dense indumentum
- 32 Leaflets strongly discolorous, abaxial surface densely tomentose (epidermis not visible) or rarely moderately densely hairy (with two different types of stellate hairs: large multiangular stellate hairs and smaller planar hairs)
- 33 Sepals narrowly triangular to narrowly ovate-deltate, at least 2.5 times as long as wide, apex acute
- 34 Leaves 3-foliolate (SW W.A.; Qld - Blackdown Tablelands)
- 35 Leaflets elliptic to oblanceolate, margins recurved to slightly revolute, the abaxial surface visible (Qld) **109. *B. obovata***
- 35: Leaflets linear to narrowly elliptic, margins revolute concealing abaxial surface (SW W.A.)
- 36 Leaves sessile **90. *B. ericifolia***
- 36: Leaves petiolate **91. *B. revoluta***
- 34: Leaves (1–3) 5–17-foliolate (N & SE Qld; N.S.W.)
- 37 Leaflets 8–15 mm wide; largest terminal leaflet > 20 mm long; largest lateral leaflet > 18 mm long (N.S.W.) **106. *B. umbellata***
- 37: Leaflets 1–9 mm wide; largest terminal leaflet usually < 20 (–25) mm long; largest lateral leaflet < 18 mm long (Qld; N.S.W.)
- 38 Leaflets < 5 mm wide; petals 3–9 mm long; abaxial surface of perianth often glabrous; anther apiculum absent (N Qld) **110. *B. alulata***
- 38: Widest leaflets > 5 mm wide; petals (6–) 8–12 mm long; abaxial surface of perianth never glabrous; anther apiculum present, sometimes minute (SE Qld; N.S.W.)
- 39 Largest leaflet > 15 mm long; largest pedicel usually 10–13 mm long; cocci glabrous or hairy; inflorescence 1–3-flowered (N.S.W.) **105. *B. angustisepala***
- 39: Largest leaflet usually < 15 mm long; pedicels 3–6 (–10) mm long; cocci glabrous; inflorescence 1–7-flowered (SE Qld) **108. *B. amabilis***
- 33: Sepals ovate-deltate to elliptic, 1.5–2 times as long as wide, apex acute or acuminate
- 40 Leaves 3-foliolate; leaflets narrowly elliptic to linear, the margins strongly revolute, concealing the abaxial surface (SW W.A.)

- 41 Leaves sessile 90. *B. ericifolia*
- 41: Leaves petiolate 91. *B. revoluta*
- 40: Leaves 3–11-foliolate (if 3-foliolate then leaflets elliptic), flat or margin recurved to revolute, with abaxial surface visible (Qld; N.S.W.; Vic.)
- 42 Leaves mostly simple, 3-foliolate for several nodes only, flat or margin slightly recurved; peduncle 1–2 mm long; pedicel 1–7 mm long (Qld) 114. *B. odorata*
- 42: Leaves 3–11-foliolate (simple leaves rare), flat or margin recurved to revolute; peduncle (0.5–) 2–10 mm long; pedicel 1–15 mm long (Qld; N.S.W.; Vic.)
- 43 Adaxial surface of leaves with scattered hairs only along midrib (N.S.W.; Vic.)
- 44 Leaflets 8–15 mm wide; sepals acuminate 106. *B. umbellata*
- 44: Leaflets 1–5 mm wide; sepals acute 126. *B. ledifolia*
- 43: Adaxial surface of leaves with a sparse to dense stellate indumentum (Qld; N.S.W.; Vic.)
- 45 Stems, pedicels and abaxial surface of leaves and sepals stellate-hairy, larger rays of most multiangular stellate hairs 0.5–1 mm long; adaxial surface of leaves sparsely to densely hairy; sepals acuminate or acute (Qld) 113. *B. duiganiae*
- 45: Stems, pedicels and abaxial surface of leaves and sepals stellate-tomentose, rays of multiangular stellate hairs almost always < 0.25 mm long; adaxial surface of leaves sparsely hairy; sepals acute (N.S.W.; Vic.) 126. *B. ledifolia*
- 32: Leaflets slightly discoloured or concolorous, indumentum of abaxial surface not dense and not concealing epidermis; one type of stellate hair present
- 46 Plant glabrous apart from stamens and adaxial surface of petals; leaflets < 1 mm wide; sepals c. 1.25 mm long (W.A.) 87. *B. anomala*
- 46: Indumentum present, sometimes only on inflorescence and perianth parts; leaflets usually > 1 mm wide; sepals 2–5 mm long (W.A.; N.T.; Qld; N.S.W.)
- 47 Antipetalous anthers much larger than antisealous anthers; petals 2.5–5 mm long; leaves (5–) 11–55-foliolate, sessile or petiole rarely to 2 mm long (N.W.A.; N.T.) 147. *B. filicifolia*
- 47: Anthers all \pm equal in length; petals 4–12 mm long; leaves 1–15-foliolate (or to 25-foliolate and then leaves densely hairy), petiole 1–30 mm long (or rarely absent and then leaves ternate) (SW W.A.; Qld; N.S.W.)
- 48 Midrib not raised on abaxial surface of leaflets
- 49 Leaves concolorous, isobilateral, 1–3-foliolate, sessile or petiole 1–3 mm long; leaflets flat (even after drying) (SW W.A.; N.S.W.)
- 50 Cocci with a sparse to dense simple/stellate indumentum; seed dull, reniform (SW W.A.) 88. *B. ternata*
- 50: Cocci glabrous; seed shiny, elliptic in outline, dorsal side flattened (N.S.W.) 95. *B. ruppii*
- 49: Leaves slightly discoloured, dorsiventral, 1–15-foliolate; petiole 1–12 mm long; leaflets flat or margin recurved to recurved (Qld; N.S.W.)
- 51 Sepals narrowly triangular to narrowly ovate-deltate, at least twice as long as wide

- 52 Leaves with a few scattered hairs or with a sparse indumentum; stellate hairs unstalked, yellowish; rays of stellate hairs < 0.25 mm long, ±straight, shiny 99. *B. boliviensis*
- 52: Leaves with a sparse to moderately dense indumentum; stellate hairs sometimes stalked, grey-white; rays of stellate hairs to 0.5 mm long, flexuous and dull 100. *B. granitica*
- 51: Sepals ovate-deltate, < twice as long as wide
- 53 Branchlets glandular-verrucose (Qld) 96. *B. eriantha*
- 53: Branchlets not obviously glandular (N.S.W.)
- 54 Widest leaflets > 3 mm wide; peduncle 2–8.5 mm long; rachis segments 4–20 mm long (N.S.W. - Lees Pinch to Berrima) 94. *B. rubiginosa*
- 54: Widest leaflets not more than 3 mm wide; peduncle 0.5–1.5 mm long; rachis segments 3.5–5 mm long (N.S.W. - Warrumbungle Ra. area) 98. *B. warrumbunglensis*
- 48: Midrib raised on abaxial surface of leaflets
- 55 Leaves with a sparse to moderately dense indumentum; rays of multiangular stellate hairs 0.1–0.75 (–1.25) mm long (N.S.W.)
- 56 Sepals ovate-deltate, acuminate, 2.5–3 mm long, 1.5–2 mm wide; rachis segments 8–20 mm long 106. *B. umbellata*
- 56: Sepals narrowly triangular, acute, 3–5 mm long, c. 1 mm wide; rachis segments 2.5–7 mm long 107. *B. mollis*
- 55: Leaves glabrous or with a few scattered hairs; rays of multiangular stellate hairs to 0.25 mm long (Qld; N.S.W.)
- 57 Stems sharply quadrangular, glabrous or with a few scattered hairs (N.S.W.) 102. *B. fraseri*
- 57: Stems terete to slightly quadrangular, moderately to densely stellate-tomentose (Qld) 103. *B. keysii*
- 27: Leaves simple or unifoliate
- 58 Lamina flat (even on drying), concolorous, midrib not raised on abaxial surface; petiole 0–3 mm long (SW W.A.; N.S.W.)
- 59 Cocci with a sparse to dense simple/stellate indumentum; seed dull, reniform (SW W.A.) 88. *B. ternata*
- 59: Cocci glabrous; seed shiny, elliptic in outline, dorsal side flattened (N.S.W.) 95. *B. ruppii*
- 58: Lamina flat or with margin recurved to revolute, discolorous, midrib not to prominently raised on abaxial surface; petiole 0–16 mm long (N.T.; Qld; N.S.W.; Vic.)
- 60 Stems glandular-verrucose 97. *B. grimshawii*
- 60: Stems smooth
- 61 Leaf margins glandular-punctate 101. *B. repanda*
- 61: Leaf margins smooth
- 62 Leaves sessile
- 63 Adaxial surface of leaves with a sparse to dense indumentum
- 64 Sepals acute, 2.5–3 mm long; petals 4–7 mm long (–10 mm with fruit) (western slopes of N.S.W.) 125. *B. glabra*
- 64: Sepals acuminate, 5–10 mm long; petals (6–) 8–10 mm long (–15 with fruit) (NE N.S.W.) 128. *B. hapalophylla*
- 63: Adaxial surface of leaves glabrous or with a few hairs

- 65** Leaves slightly discoloured, with a few hairs only; fruit hairy (inland Qld, western slopes of N.S.W.) **125. *B. glabra***
- 65:** Leaves strongly discoloured, abaxial surface with a dense, stellate indumentum; fruits glabrous or hairy (Qld; NE N.S.W.)
- 66** Style pilose
- 67** Cocci glabrous; leaves 9–50 mm long, 1–2.5 mm wide; petals (before fruit set) 6–10.5 mm long, 3.5–4 mm wide; sepals 2.5–4.5 mm long, 1.75–2.5 mm wide **121. *B. splendida***
- 67:** Cocci pilose; leaves 10–33 mm long, 2–4 mm wide; petals (before fruit set) 8–15 mm long, (4.5–) 7–8 mm wide; sepals 4.5–6 mm long, 3–4 mm wide **122. *B. beeronensis***
- 66:** Style glabrous
- 68** Petals 6–10.5 mm long; sepals 2.5–6 mm long, 1.75–4 mm wide
- 69** Leaves 1–2.5 mm wide, the margins strictly revolute; anther apiculum usually large and reflexed; rays of stellate hairs to 0.1 mm long **121. *B. splendida***
- 69:** Leaves 2–6 mm wide, flat or margin recurved (sometimes revolute on drying); anther apiculum absent or minute; rays of stellate hairs to 0.5 mm long **123. *B. palasepala***
- 68:** Petals 4–7.5 mm long (sometimes longer in fruit); sepals 2–4 mm long, 1–2.5 mm wide
- 70** Adaxial surface of petals glabrous or with a few hairs; mature leaves 14–60 mm long **117. *B. excelsa***
- 70:** Adaxial surface of petals with a sparse to moderately dense simple indumentum; mature leaves (with hairy abaxial surface) 6–30 mm long
- 71** Fruit glabrous or with a sparse indumentum, very rarely densely hairy; anther apiculum reflexed; stems terete to slightly quadrangular; sepals 2–4 mm long; petals 5–7.5 mm long (–10 mm with fruit) (sub coastal SE Qld; N.S.W.) **120. *B. rosmarinifolia***
- 71:** Fruit densely hairy; anther apiculum erect; stems quadrangular; sepals 2–3 mm long; petals 4–6 mm long (–8 mm with fruit) (inland Qld) **124. *B. forsteri***
- 62:** Leaves petiolate or base so attenuate so as to appear petiolate
- 72** Adult leaves slightly discoloured, glabrous or with a few scattered hairs on abaxial surface **103. *B. keysii***
- 72:** Adult leaves strongly discoloured, tomentose on abaxial surface (epidermis not visible)
- 73** Leaves not firm, papery when dry, margins finely glandular-warty, adaxial surface glandular-warty **127. *B. chartacea***
- 73:** Leaves firm, margins and adaxial surface smooth
- 74** Staminal filaments glabrous or with 1–3 hairs; petals 2–5.5 mm long (–7 mm with fruit) (N.T.; NW Qld) **115. *B. lanceolata***
- 74:** Staminal filaments pilose; petals 4–15 mm long (E Qld; N.S.W.; Vic.)
- 75** Adaxial surface of petals glabrous or with a few hairs
- 76** Leaves narrowly elliptic, 2–6 mm wide (N Qld) **117. *B. excelsa***
- 76:** Leaves elliptic to ±lanceolate, 3.5–14 mm wide (SE Qld)

- 77 Sepals 2–4 mm long (< 3 mm long before fruit development); petals 6–7 mm long (–8 mm in fruit); peduncles 2–2.5 mm long 118. *B. foetida*
- 77: Sepals 4.5–5.5 mm long; petals 7–8 mm long (–12 mm in fruit); peduncles to 0.5–2 mm long 119. *B. bella*
- 75: Adaxial surface of petals with a sparse to moderately dense indumentum of simple hairs
- 78 Adaxial surface of leaves glabrous or with few hairs along midrib; petals 5.5–7 mm long (–8.5 mm with fruit); leaf base strongly attenuate (Hinchinbrook Is., N Qld) 116. *B. jensziae*
- 78: Adaxial surface of leaves with a very sparse to dense stellate indumentum; petals (4–) 6–15 mm long; leaf base strongly attenuate or obtuse (central Qld; N.S.W.; Vic.)
- 79 Sepals acuminate, (4–) 5–10 mm long, 3–4.5 mm wide (–7 mm with fruit); leaf base strongly attenuate (N coast of N.S.W.) 128. *B. hapalophylla*
- 79: Sepals acute, sometimes acuminate, 2–4.5 mm long, 1–2.5 mm wide (–3.5 mm with fruit); leaf base usually obtuse (central Qld; N.S.W.; Vic.)
- 80 Anther apiculum large and reflexed; leaves elliptic, flat or margin slightly recurved (becoming revolute on drying); peduncle less than 2 mm long; pedicel 1–7 mm long (central inland Qld) 114. *B. odorata*
- 80: Anther apiculum absent to minute; leaves narrowly elliptic to elliptic, flat or margin recurved to revolute; peduncle (1–) 2–10 mm long; pedicel (4–) 6–11 mm long (N.S.W.; Vic.) 126. *B. ledifolia*

Subsect. 1. *Anomalae*

Boronia subsect. *Anomalae* Durretto, *Austrobaileya* 7: 666 (2008)

Type: *B. anomala* Durretto

Stellate hairs absent. Leaves pinnate; rachis segments linear; midrib not raised abaxially; tightly packed parenchyma between midvein and abaxial epidermis. Inflorescence 1–3-flowered. Sepals much smaller than petals; aestivation unknown. Petals glabrous abaxially, caducous; midrib not prominently raised abaxially. Stamens: filaments clavate, narrowing suddenly to anther connective; antipetalous anthers much larger than antisepalous anthers. Seed (mature not seen) black, shiny, possibly slightly rugulose; adaxial side flattened and without ridge.

A monotypic subsection.

Subsection *Anomalae* is placed in section *Valvatae* on the basis of having valvate petals, axillary inflorescences and a staminal structure akin to that of subsection *Grandisepalae*, although it differs from other species of the section in having caducous petals and lacking stellate hairs.

87. *Boronia anomala* Durretto, *Muelleria* 12: 22 (1999)

T: 10 km ENE Kalumburu, Kimberley, W.A., 20 June 1997, *R.K. Harwood 169 & J. Russell-Smith*; holo: MEL; iso: DNA.

Erect shrub to 60 cm tall, glabrous except for petals and stamens. Leaves 3–5-foliolate, 40–55 mm long, 35–100 mm wide; petiole 8–14 mm long; rachis segments 8–10 mm long; leaflets linear, involute; terminal leaflet 17–42 mm long, 0.5–0.75 mm wide; lateral leaflets (8–) 17–50 mm long, 0.5–0.75 mm wide, slightly discoloured. Inflorescence 1–3-flowered;

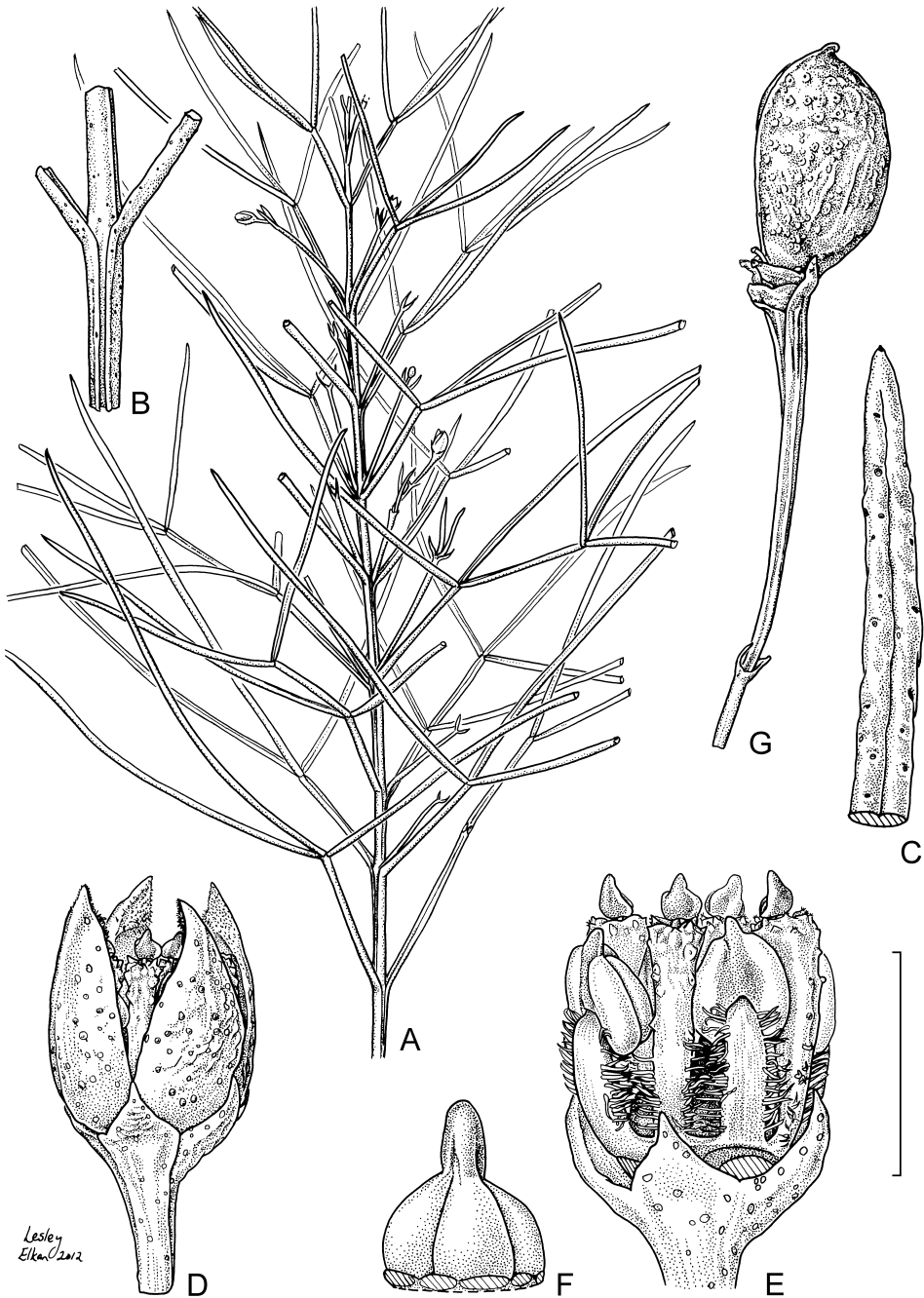


Figure 38. *Boronia anomala*. A, habit; B, stem detail; C, leaflet tip detail; D, flower, lateral view; E, stamens & calyx, petals removed; F, pistil, lateral view; G, fruit (A–G, R.J.Harwood 169 & J.Russel-Smith, MEL). Scale bar: A = 2 cm; B, G = 5 mm; C, D = 3 mm; E, F = 2 mm. Drawn by L.Elkan.

peduncle 4–10 mm long; pedicels 8–10 mm long. Sepals deltate, c. 1.25 mm long, c. 0.5 mm wide, persistent. Petals 3.5–4.5 mm long, colour unknown; adaxial surface with a narrow band of hairs along margin; abaxial surface glabrous, without a raised midrib. Stamens: filaments pilose, clavate, suddenly narrowing at apex; antipetalous anthers larger than antisealous anthers. Fig. 38.

Known only from the type collection. Found growing under an overhang in a sand-stone gorge. Flowering and fruiting material collected in June.

The phylogenetic position of *B. anomala* is uncertain and immature buds and mature seeds are required to elucidate relationships. It is similar to *B.* subsect. *Grandisepalae* (into which all other species of *Boronia* from the Kimberley Region are placed) in having distinctly clavate staminal filaments and large antipetalous anthers (as compared to the antisealous ones), but it lacks the relatively large sepals and the prominent ridge on the dorsal side of the seed typical of that subsection.



Subsect. 2. Ternatae

Boronia subsect. *Ternatae* Durretto, *Muelleria* 12: 24 (1999)

Type: *B. ternata* Endl.

Stellate hairs with appressed, unfused rays. Leaves trifoliolate or simple; midrib not raised abaxially; spongy mesophyll continuous under midvein or absent. Inflorescence 1 (–3)-flowered. Sepals inrolled at tip, smaller than or same size as petals. Petals pink or white, persistent; midrib sometimes raised abaxially. Stamens: filaments tapering to anther connective; anthers equal in size. Seeds reniform, dull; dorsal ridge absent; tubercles roughly textured, unfused.

A subsection of 4 species divided into 2 series; confined to SW W.A.

The subsection is notable in having what appears to be scattered wax platelets on the leaf surface. Elsewhere in the section wax on leaves has only been observed in subsection *Grandisepalae* series *Quadrilatae*.

Ser. 1. Ternatae

Boronia ser. *Ternatae*

Erect shrubs. Leaves simple or trifoliolate; leaflets elliptic to oblanceolate, flat, obtuse or acute, concolorous, isobilateral, glabrous to tomentose to woolly.

A series of 2 species.

88. *Boronia ternata* Endl. in S.L. Endlicher & E. Fenzl, *Nov. Stirp. Dec.* 1: 6 (1839)

T: N.H.a.O. [Novae-Hollandiae austro-occidentalis], W.A., *Roe s.n.*; holo: W *n.v.* (photos MEL, NSW, PERTH).

Erect shrub to 2 m tall, glabrous to densely stellate-tomentose on branches and leaves. Stellate hairs with rays 0.05–0.5 mm long. Leaves sessile or petiolate, 1–3-foliolate; leaflets elliptic to oblanceolate, 2–15 mm long, 1–5.5 mm wide, attenuate at base, obtuse or rarely acute (juvenile foliage). Inflorescence 1 (–3)-flowered, densely stellate-tomentose; peduncle 0.5–4 mm long; pedicels 0.5–10 mm long. Sepals much smaller than petals, elliptic or ovate-deltate or lanceolate, 2–3.5 mm long, 1–2.5 mm wide, acute to slightly acuminate. Petals 4–11 mm long, pink or white; abaxial surface with moderately dense to dense stellate indumentum. Cocci with sparse to dense simple/stellate indumentum.

Occurs in the wheat-belt of SW W.A. in an area bound by Eneabba, Albany, Esperance and Kalgoorlie. Found in mallee and heath on sand, granite, laterite or spongolite. Flowers Apr.–Oct.; fruits May–Jan.

There are 6 named varieties. Specimens not easily assigned to a variety have been collected to the N and E of Fitzgerald River Natl Park, and around Kondinin and Burracoppin.

- 1 Leaves stellate-tomentose (sometimes hairs minute; juvenile foliage sometimes with a sparse indumentum)
- 2 Pedicel 0.5–1 mm long; mature leaves densely tomentose all over, with epidermis not visible at magnification **88a. var. ternata**
- 2: Pedicel > 2 mm long; leaves not densely tomentose, with epidermis visible at magnification, often glabrous at margins
- 3 Leaves obviously tomentose including margins; staminal filaments with simple hairs only; styles pilose **88b. var. promiscua**
- 3: Leaves appearing glabrous but minutely tomentose, margins often glabrous and appearing slightly glaucous; staminal filaments with simple and bifid hairs; styles glabrous **88f. var. austrofoliosa**
- 1: Leaves glabrous or with few scattered hairs
- 4 Petals glabrous (Yellowdine) **88a. var. ternata**
- 4: Petals variously hairy
- 5 Pedicels 4–10 mm long, at least $\frac{1}{2}$ length of leaves; petals 6–11 mm long; style pilose **88c. var. elongata**
- 5: Pedicels 1.5–2 (–5) mm long, usually < $\frac{1}{2}$ length of leaves; petals 4–6 mm long; style glabrous
- 6 Leaflet tip usually obcordate; leaves predominantly trifoliolate; sepals 1.5–2 mm long **88d. var. glabrifolia**
- 6: Leaflet tip always obtuse; leaves predominantly simple; sepals 2.5–3 mm long **88e. var. foliosa**

88a. *Boronia ternata* Endl. var. *ternata*

Illustration: M.G.Corrick *et al.*, *Wildfl. SW Australia* 192, 652 (1996).

Shrub to 2 m tall. Branches and leaves densely stellate-tomentose (epidermis not visible), very rarely glabrous; juvenile foliage may be sparsely to densely tomentose. Leaves sessile, 1–3-foliolate; leaflets and simple leaves elliptic to oblanceolate, 2–12 mm long, 1–4 mm wide, with terminal leaflets usually slightly longer than laterals. Peduncle and pedicel both 0.5–1 mm long. Sepals elliptic, 2–3 mm long, acute; abaxial surface stellate-tomentose. Petals 4–5 mm long, 2–3 mm wide. Filaments pilose. Style glabrous or pilose. Plate 33.

Occurs from Mukinbudin and Bonnie Rock to Kalgoorlie and Frank Hann Natl Park, W.A. Found in heath and mallee woodland on sand.

W.A.: Frank Hann Natl Park, *D.Butcher* 330 (CANB, MEL, NSW, PERTH); 3 km W of Bodallin, *R.J.Cranfield* 1517 (AD, BRI, CANB, MEL, NSW, PERTH); 43.9 km SE of turn off to Nevoria Gold Mine on the Banker–Mt Day road, *F.H.Mollemans* 2661 (AD, MEL); c. 50 km SW of Coolgardie, 5 km SW of Queen Victoria Rock, *J.Taylor* 591 (CANB, PERTH); 25 km by road W of Southern Cross, *P.G.Wilson* 13071 (CANB, PERTH).

The most common and widespread variety of *B. ternata*, inhabiting more arid areas than the other varieties. It can be distinguished from other varieties by the dense tomentum on mature foliage, and shorter peduncles and pedicels and smaller flowers. Completely glabrous plants (alongside densely hairy plants) of var. *ternata* have been collected in the Yellowdine area (e.g. *L.Craven* 7460, MEL, PERTH).



88b. *Boronia ternata* var. *promiscua* Duretto, *Muelleria* 12: 28 (1999)

T: 13.8 km N from Hyden turnoff along Hatters Hill–Southern Cross road, W.A., 22 Aug. 1992, *M.F.Duretto* 223 & *M.Bayly*; holo: MEL; iso: CANB, K, MEL, NSW, PERTH.

Shrub to 1.5 m tall. Branches and leaves moderately densely stellate-tomentose (epidermis visible). Leaves sessile, unifoliate, oblanceolate, 5–14 mm long, 2–3 mm wide, obtuse. Peduncle to 1 mm long; pedicel 2–5 mm long. Sepals lanceolate, 2–3.5 mm long, acute to acuminate; abaxial surface stellate-tomentose. Petals 5–6 mm long, 2.5–3 mm wide. Filaments pilose. Style pilose. Fig. 39A–D.

Occurs in a small area S of Southern Cross near Mt Holland, W.A. Found growing on sand and laterites in disturbed areas in woodland.

W.A.: near Mine Camp, Bounty Mine, N of Mt Holland, *G.Barrett* 642 (PERTH); 9 miles [c. 15 km] S of Mt Holland, *K.Newbey* 1121 (PERTH); 15.4 km N of Mt Holland turn off on Southern Cross–Forrestania road and 1.5 km along the gridline, *F.H.Mollemans* 2670 (PERTH); ENE of Parker Ra. S, a track junction on way to Southern Cross–Forrestania road, *F.H.* & *M.P.Mollemans* 2760 (PERTH).

A poorly collected variety that can be distinguished from var. *ternata* by the smaller and less dense hairs on the leaves, narrower leaflets, and longer pedicels.



88c. *Boronia ternata* var. *elongata* Paul G.Wilson, *Nuytsia* 1: 201 (1971)

T: N side of Mt Short, 14 km NNW of Ravensthorpe, W.A., 8 Aug. 1968, *P.G.Wilson* 6932; holo: PERTH; iso: B n.v., K n.v., MEL.

Illustration: M.G.Corrick *et al.*, *Wildfl. S W. Australia* 192, 653 (1996).

Shrub to 2 m tall. Branches sparsely to densely stellate-hairy. Leaves sessile or petiolate, 1–3-foliate; petiole to 2 mm long; simple leaves and leaflets oblanceolate, 3–12 mm long, 1.5–5.5 mm wide, obtuse or rarely obcordate, glabrous or with a few scattered hairs; terminal leaflets same size or longer than laterals. Peduncle 0.5–4 mm long; pedicel 4–10 mm long. Sepals ovate-deltate, 2–3 mm long, acute; abaxial surface stellate-tomentose. Petals 6–11 mm long, 3–6 mm wide. Filaments pilose. Style pilose.

Restricted to small populations N and S of Ravensthorpe, mainly around Mt Short and Mt Drummond, W.A. Found on laterites in open woodland or heath.

W.A.: Mt Desmond, 2.3 km along Everton Rd towards Esperance from Ravensthorpe–Hopetoun road, *M.F.Duretto* 194 (CANB, MEL, PERTH) 8 miles [c. 13 km] N of Ravensthorpe on the way to Lake King, *S.Paust* 790 (PERTH).

A rare variety that is often locally common. Distinguished from the other varieties by the longer peduncles and pedicels. Not all specimens have a long pedicel, and this variety may intergrade with var. *foliosa* and var. *glabrifolia*.



88d. *Boronia ternata* var. *glabrifolia* F.Muell., *Fragm.* 11: 111 (1875)

T: Coast ranges, Middle and East Mount Barren, W.A., *G.Maxwell* s.n.; holo: MEL.

B. calophylla Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 2: 138–181 (1852). T: W.A., *J.Drummond* 5th colln 205; isosyn: K n.v. (photo AD), MEL, TCD.

Shrub to 1 m tall. Branches stellate-tomentose. Leaves (1–) 3-foliate; petiole 0.5–1 mm long; leaflets and simple leaves oblanceolate, 2–6 mm long, 1–3 mm wide, usually obcordate, glabrous or with a few scattered hairs; terminal leaflets shorter than laterals. Peduncle 0.5–1 mm long; pedicel 1.5–3.5 mm long. Sepals ovate-deltate, 1.5–2 mm long, acute; abaxial surface stellate-tomentose, with hairs concentrated in top half. Petals 4–6 mm long, 2–3 mm wide. Filaments with few stiff simple hairs. Style glabrous.

Restricted to the Fitzgerald River Natl Park area between Bremer Bay and Hopetoun, W.A. Found in heath and woodland on spongolite or granite.

W.A.: near Fitzgerald R., Fitzgerald River Natl Park, *K.Newbey 3309* (PERTH); near Mt Bland in Fitzgerald River Res., *P.G.Wilson 10154* (AD, CANB, PERTH).

A poorly collected variety that may intergrade with var. *elongata*. Distinguished from the other varieties by the obcordate and smaller leaflets, and the smaller peduncles, pedicels and flowers.



88e. *Boronia ternata* var. *foliosa* (S.Moore) Paul G.Wilson, *Nuytsia* 1: 201 (1971)

B. foliosa S.Moore, *J. Linn. Soc., Bot.* 45: 165 (1920). T: Bruce Rock, W.A., *F.Stoward 334*; isosyn: MEL.

Shrub to 1 m tall. Branches sparsely to densely stellate-tomentose. Leaves sessile or petiolate, 1 (–3)-foliolate; petiole to 1 mm long; leaflets and simple leaves elliptic to oblanceolate, 3–15 mm long, 1–5 mm wide, obtuse, glabrous or with a few scattered hairs; terminal leaflets same size as laterals. Peduncle 1–1.5 (–5) mm long; pedicel 1.5–2 (–5) mm long. Sepals ovate-deltate to lanceolate, 2.5–3 mm long, acute to slightly acuminate; abaxial surface moderately to densely stellate-tomentose. Petals 4–6 mm long, 3–4 mm wide. Filaments pilose. Style glabrous.

Occurs in the Merredin and Bruce Rock areas, with disjunct populations near Winchester and Borden, W.A. Found growing in heath and low woodland on sand or laterite.

W.A.: S of Merredin on Narrembeen Rd, *A.M.Ashby 1801* (AD, BRI); 14 miles [22.4 km] W of Windsor, 13 Aug. 1972, *Mr Chapman s.n.* (CANB, MEL, PERTH); c. 8 km SW of Merredin on road to Bruce Rock, *N.N.Donner 4587* (AD, CANB, PERTH); Bending Res. A 20338, 23 km NNE of Kondinin, *B.G.Muir 425* (PERTH).

A well-collected but possibly threatened variety. Distinguished from var. *elongata* by the smaller pedicels and petals. Plants from Bending Reserve have larger pedicels than the typical form, but smaller petals than typical var. *elongata*.



88f. *Boronia ternata* var. *austrofoliosa* Duretto, *Muelleria* 12: 32 (1999)

T: Tarin Rock Reserve, along the fenceline on the western side, W.A., 31 Aug. 1990, *D.E.Albrecht 4134* & *B.A.Fuhrer*; holo: MEL; iso: PERTH.

Illustrations: M.G.Corrick *et al.*, *Wildfl. S W. Australia* 192, 654 (1996), as *B. ternata* var. *foliosa*; M.F.Duretto, *Austral. Pl.* 23 (183): 89 (2005).

Shrub to 1 m tall. Branches stellate-tomentose. Leaves sessile or petiolate, unifoliate; petiole to 0.5 mm long; lamina elliptic to oblanceolate, 5–10 mm long, 3–4 mm wide, obtuse, minutely and moderately densely to densely stellate-tomentose though appearing glabrous and glaucous to the unaided eye, often glabrous along margins. Peduncle 0.5–1 mm long; pedicel 2–3 mm long. Sepals elliptic, 2–2.5 mm long, acute; abaxial surface stellate-tomentose with hairs concentrated in top half. Petals 4–6.5 mm long, 2.5–4.5 mm wide. Filaments with simple and bifid hairs. Style glabrous.

Occurs in an area bound approximately by L. Grace, Tarin Rock, Gnowangerup and Ongerup, W.A. Found on sand and laterites often on ridge tops in heath and mallee woodland.

W.A.: 4 miles [6.5 km] N of Nyabing, *K.Newbey 428* (PERTH); 14 miles [22.5 km] NE of Gnowangerup, *K.Newbey 3437* (PERTH).

A poorly collected variety.



89. *Boronia adamsiana* F.Muell., *Proc. Linn. Soc. New South Wales* 5: 15 (1890)

T: Mangowine, W.A., 1889, *A.Adams s.n.*; lecto: MEL, *fide* M.F.Duretto, *Muelleria* 12: 33 (1999); isolecto: K *n.v.* (photos AD, MEL, NSW, PERTH).

Illustrations: S.Hopper *et al.*, *W Australia's Endangered Fl.* 90 (1990); M.F.Duretto, *Austral. Pl.* 23 (183): 89 (2005).

Erect shrub to 1 m tall, stellate-tomentose to woolly on branches and leaves. Stellate hairs with rays 0.5–2 mm long. Leaves sessile, trifoliolate; leaflets elliptic to oblanceolate, 4–17 mm long, 1–5 mm wide, obtuse. Inflorescence 1-flowered; peduncle and pedicel both 0.5–1 mm long. Sepals c. same size as petals, ovate-deltate, 3–6 mm long, 1.5–2 mm wide, acute. Petals 4–5 mm long, pink or white; abaxial surface with a moderately dense stellate indumentum. Cocci stellate-hairy. *Barbalin Boronia*. Fig. 39E–I.

Occurs in the Muckinbudin–Wialki–Wubin area, SW W.A. Found in scrub and heath on sand, sometimes near granite outcrops. Flowers and fruits June–Oct.

W.A.: Kuser Rd/Burakin–Bonnie Rock road between 3.8 & 4.8 km N of jctn with Bonnie Rock–Muckinbudin road, *P.H.Brown* 98 & *J.Carter* (PERTH); Allotment CG4052, *M.F.Duretto* 172 (MEL, NSW, WAU); 175 mile peg on Wubin–Paynes Find road, *A.Fairall* 1765 (CANB, PERTH); N Wialki, 13 miles [21 km] from Beacon to Wialki road, *B.H.Smith* 597 (CANB, MEL, PERTH).

A rare and possibly vulnerable species that was once thought to be extinct. Can be distinguished from *B. ternata* by the sepals and petals being roughly equal and by having long hairs (rays 0.5–2 mm long).



Ser. 2. *Ericifoliae*

Boronia ser. *Ericifoliae* Duretto, *Muelleria* 12: 34 (1999)

Type: *B. ericifolia* Benth.

Erect shrubs. Leaves trifoliolate; leaflets narrowly elliptic to linear, strongly revolute, acute, strongly discolorous (paler beneath), dorsiventral, glabrous to sparsely hairy on adaxial surface, tomentose on abaxial surface.

A series of 2 species.

90. *Boronia ericifolia* Benth., *Fl. Austral.* 1: 313 (1863)

T: Swan R., W.A., *J.Drummond* 46, *coll.* 1843; lecto: K *n.v.* (photos AD, MEL), *fide* M.F.Duretto, *Muelleria* 12: 35 (1999); isolecto: BM *n.v.* (photos MEL, PERTH), K *n.v.* (photo MEL), MEL.

Erect shrub to 1.5 m tall. Branches, peduncles and pedicels stellate-tomentose. Leaves sessile, trifoliolate; leaflets 3–11 mm long, 0.5–1.5 mm wide. Peduncle 0.5–1 mm long; pedicel 1–2 mm long. Sepals narrowly triangular, 2.5–3 mm long, acute; abaxial surface densely stellate-tomentose. Petals 5–7 mm long, pink or white; abaxial surface moderately to densely stellate-tomentose. Cocci glabrous. *Wongan Hills Boronia*. Fig. 39J–N.

Restricted to the Wongan Hills and Moora areas, SW W.A. Growing in heath and woodland on laterites. Flowers June–Oct.; fruits Aug.–Oct.

W.A.: Wongan Hills, exactly 10 km along Wilding Rd from jctn with Wongan Hills–Piawanning road, *M.F.Duretto* 154 (MEL, NSW, WAU); Fowlers Gully, 2 km S of Wongan–Piawanning road, Wongan Hills, *K.F.Kenneally* 2334 (MEL, PERTH); 8 miles [13 km] W of Moora, *K.R.Newbey* 2305 (PERTH); Wongan Hills, Pistol club, *B.H.Smith* 669 (CANB, MEL, NSW).

A restricted and vulnerable species. Distinguishable from *B. revoluta* by having sessile leaves.



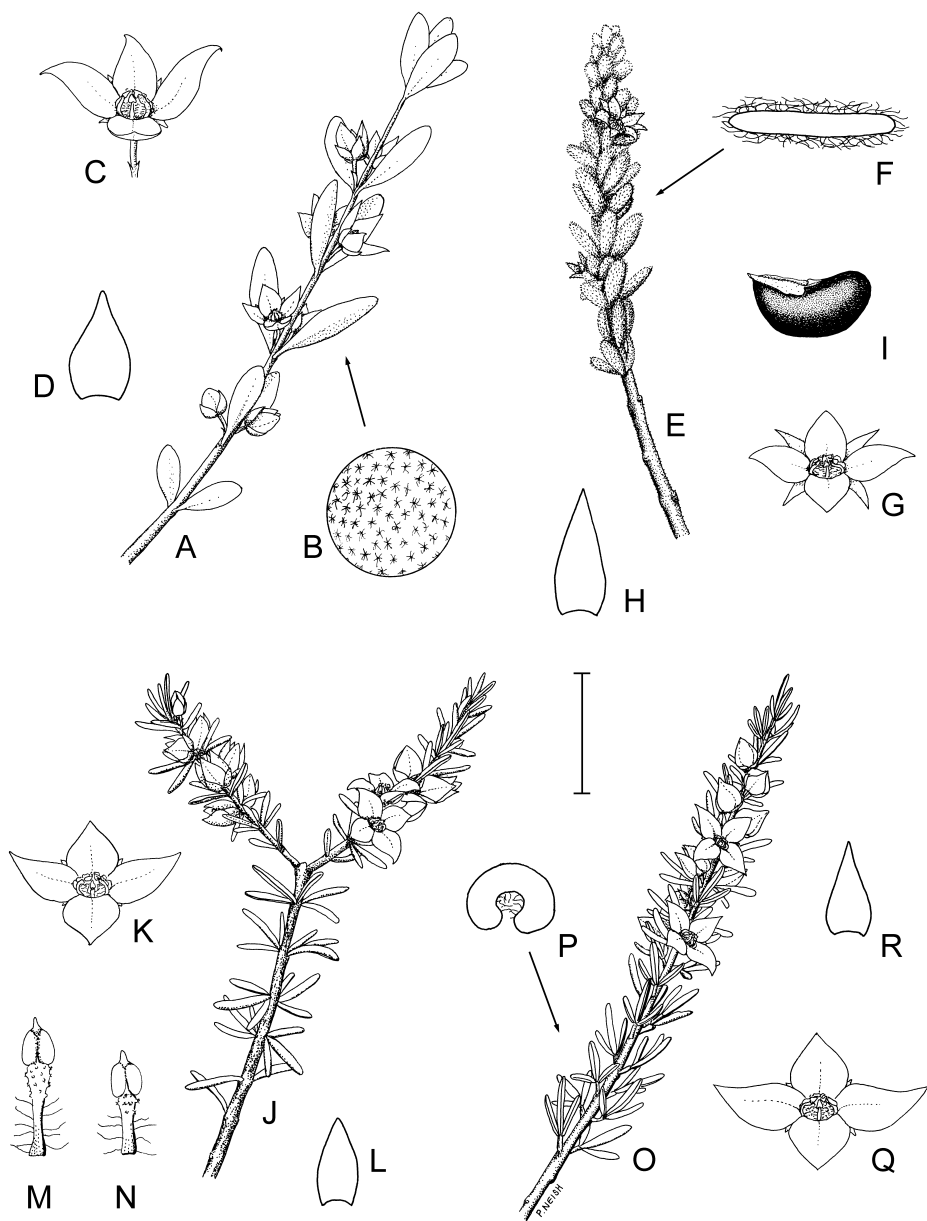


Figure 39. *Boronia*. A–D, *B. ternata* var. *promiscua*. A, habit; B, leaf surface detail; C, flower; D, sepal (A–D, M.Duretto 223, MEL). E–I, *B. adamsiana*. E, habit; F, leaf TS; G, flower; H, sepal; I, seed (E–I, M.Duretto 172, MEL). J–N, *B. ericifolia*. J, habit; K, flower; L, sepal; M, antisepalous stamen, abaxial view; N, antipetalous stamen, abaxial view (J–N, M.Duretto 154, MEL). O–R, *B. revoluta*. O, habit; P, leaf TS; Q, flower; R, sepal (O–R, M.Duretto 210, MEL). Scale bar: A, E, J, O = 16 mm; C, G, K, Q = 8 mm; D, H, L, R = 4 mm; I = 3 mm; M, N = 2 mm. Drawn by P.Neish.

91. *Boronia revoluta* Paul G. Wilson, *Nuytsia* 1: 201 (1971)

T: South Ironcap (c. 45 km NNE of Lake King township), W.A., 4 Sept. 1970, *K.R.Newbey* 3288; holo: PERTH; iso: K *n.v.*

Illustrations: S.Hopper *et al.*, *W Australia's Endangered Fl.* 90 (1990); M.F.Duretto, *Austral. Pl.* 23 (183): 89 (2005).

Erect shrub to 1 m tall. Branches sparsely to densely stellate-hairy. Leaves trifoliolate; petiole 1–2 mm long; leaflets 2.5–8 mm long, 0.5–1 mm wide, with terminal leaflets longer than laterals. Inflorescence glabrous to sparsely stellate-hairy; peduncle 2–3 mm long; pedicel 0.5–1 mm long. Sepals narrowly triangular, 3–3.5 mm long, acute; abaxial surface with a sparse to moderate stellate indumentum. Petals 6–7 mm long, pink or white; abaxial surface with a moderate stellate indumentum. Cocci glabrous. *Ironcap Boronia*. Fig. 390–R.

Restricted to South Ironcap and Hatters Hill, NE of Lake King, SW W.A. Found in heath and woodland on laterites. Flowers July–Oct.; fruits Sept.–Dec.

W.A.: near summit of South Ironcap, 2.3 km N along Forresteria (Hatters Hill)–Southern Cross road from junction with Carstairs Rd (from Varley), *M.F.Duretto* 209 (AD, BRI, HO, MEL); c. 50–150 m N and NNE of Hatter Hill Trig. and survey mark, 90 km N of Ravensthorpe, *F.H. & M.P.Mollemans* 3187 (PERTH); South Ironcap, 45 km NNE of Lake King township, *K.R.Newbey* 5228 (CANB, PERTH).

A rare, possibly endangered, and poorly collected species known from 2 small populations. Can be distinguished from *B. ericifolia* by having petiolate leaves.



Subsect. 3. Bowmaniorum

Boronia subsect. *Bowmaniorum* Duretto, *Muelleria* 12: 37 (1999), as *Bowmaniae*

Type: *B. bowmanii* F.Muell.

Stellate hairs with appressed, fused rays (especially noticeable on petals). Leaves pinnate; rachis segments triangular; midrib not or slightly raised abaxially; tightly packed parenchyma between midvein and abaxial epidermis with secondary thickening. Inflorescence (1–) 3–7-flowered. Sepals smaller than petals. Petals green to white, persistent; midrib not raised abaxially. Stamens: filaments tapering to anther connective; anthers equal. Seeds elliptic, flattened on adaxial side, without ridge, shiny, black; tubercles smooth.

A subsection of 2 species confined to N Qld.

92. *Boronia bowmanii* F.Muell., *Fragm.* 4: 135 (1864), as *Bowmani*

T: Ad flumen Cape R., Qld, *E.Bowman*; lecto: MEL, *vide* M.F.Duretto, *Muelleria* 12: 37 (1999); probable isolecto: BRI, MEL.

B. platyrrhachis F.Muell., *Fragm.* 7: 37 (1869). T: Main Gilbert R. near the junction of the Percy R., Qld, *R.Daintree*; holo: MEL.

Illustration: M.F.Duretto, *Austral. Pl.* 23 (183): 89 (2005).

Erect shrub to 1 m tall, with a few scattered hairs or a sparse stellate indumentum on branches and leaves. Branches quadrangular, glandular-verrucose. Leaves 3–9-foliolate, 40–95 mm long, 20–70 mm wide; petiole 5–23 mm long; rachis segments 5.5–15 mm long; leaflets linear, 5–60 mm long, 1–4 mm wide. Peduncle 1–11 mm long; pedicels 3–10 mm long. Sepals ovate-deltate, 1.5–2.5 mm long, 1–2 mm wide, glabrous. Petals 3–6 mm long, green to white; abaxial surface with a sparse stellate indumentum. Cocci glabrous. Seed sclerotesta with irregularly fused tubercles. Fig. 40A–F.

Occurs between Bamaga and Charters Towers, mainly along the Great Dividing Ra., though absent from the Humid Wet Tropics, N Qld. Found in open forest, woodland and heath communities, mainly on sand or sandstone. Flowers and fruits Jan.–Oct.

Qld: 14.7 km S of Mutee Heads turnoff on the new road from Bamaga to Jardine R. crossing, c. 10 km N of crossing, *J.R.Clarkson 6136A* (BRI, CANB, DNA, MBA, PERTH, QRS); 4.3 km along the Maytown Track travelling S from the Jowalbinna turn off, SW of Laura, *M.F.Duretto 400* (BRI, MEL); Cabbage Tree Ck, c. 17 km ENE of the Ranger Stn, Rokeby Natl Park, *D.G.Fell 2289* (BRI, QRS); 8.5 miles [c. 13.6 km] W of Pentland Township, *M.Lazarides 3550* (CANB, DNA); 40 km N of Georgetown, *B.L.Rice 2413* (BRI, CANB, NSW).



Common and widespread from Bamaga to just S of Coen, but S of Laura the species appears to have a patchy distribution. Northern populations have narrower leaflets (on average) and less hairy petals than the southern populations.

93. *Boronia squamipetala* Duretto, *Austrobaileya* 5: 295 (1999)

T: 19 km from Peninsula Development Rd on a track to Wolverton via the Cook Tin Mine, Qld, June 1993, *J.R.Clarkson 10112* & *V.J.Nelder*; holotype: MEL; isotype: BRI, DNA, K n.v., L, MBA, MEL.

B. sp. 'Massy Creek, Rocky River' (R.Coveny 7174), M.B.Thomas & W.J.F.McDonald, *Rare Threatened Pl. Queensland* 46 (1989).

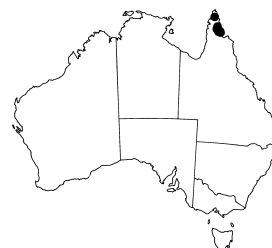
B. sp. 3 (Massey Creek, Rocky River; R.Coveny 7174), J.D.Briggs & J.H.Leigh, *Rare Threatened Austral. Pl.* 167 (1996).

B. sp. (Massey Creek R.G.Coveny+ 7174), P.I.Forster in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Erect shrub to 1 m tall. Branches quadrangular, not glandular-verrucose, with a sparse to moderately dense stellate indumentum. Leaves 5–13-foliolate, 33–55 mm long, 12–20 mm wide, with a few scattered hairs or a sparse stellate indumentum concentrated on midrib; petiole 6–15 mm long; rachis segments 2–10 mm long; leaflets elliptic, 3–20 mm long, 1–6 mm wide. Peduncle 1–2 mm long; pedicels 2–6 mm long. Sepals ovate-deltate, c. 2 mm long, c. 1 mm wide; abaxial surface with a sparse to moderately dense stellate indumentum. Petals 4–7 mm long, green to white; abaxial surface with a moderately dense stellate indumentum. Cocci glabrous. Seed sclerotesta with unfused tubercles. Fig. 40G–M.

Occurs on Cape York, mainly in the Iron and McIlwraith Ranges, N Qld. Found in open woodland, forest and heath on loams, sand, or rocky pavements. Flowers and fruits May–Oct.

Qld: 4.2 km by road E of Wenlock R. towards Pascoe R. on Iron Range Rd, *R.G.Coveny 7174* (BRI, MELU, NSW, PERTH); 13 km along road to Leo Ck mine, McIlwraith Ra., *P.I.Forster 10098* (BRI, MEL); Between Massy Ck & Rocky R. on Cape York Rd, *B.Hyland 5515* (BRI, MEL, QRS); Bacon Ck, Archer R., *B.Hyland 6239* (BRI, CANB, NSW, QRS); 10 miles [16 km] N of Archer R. on Kennedy Rd, *B.Hyland 7014* (BRI, QRS).



A poorly collected species that can be distinguished from *B. bowmanii* by having wide leaflets, and petals with a moderately dense stellate indumentum abaxially.

Subsect. 4. *Valvatae*

Boronia subsect. *Valvatae*

Stellate hairs multiangular; rays not fused or appressed. Leaves simple or pinnate; rachis segments usually oval; midrib usually raised abaxially. Inflorescence 1–many-flowered, umbel-like. Sepals usually smaller than petals, rarely (in *B. hoipolloi* and *B. quinkanensis* only) as long. Petals pink or white, rarely (in *B. rupicola* only) yellow-green, persistent; abaxial surface with prominently raised midrib, usually with weak, white, flexuous, stellate hairs. Stamens: filaments tapering to anther connective; anthers equal. Seeds black, shiny

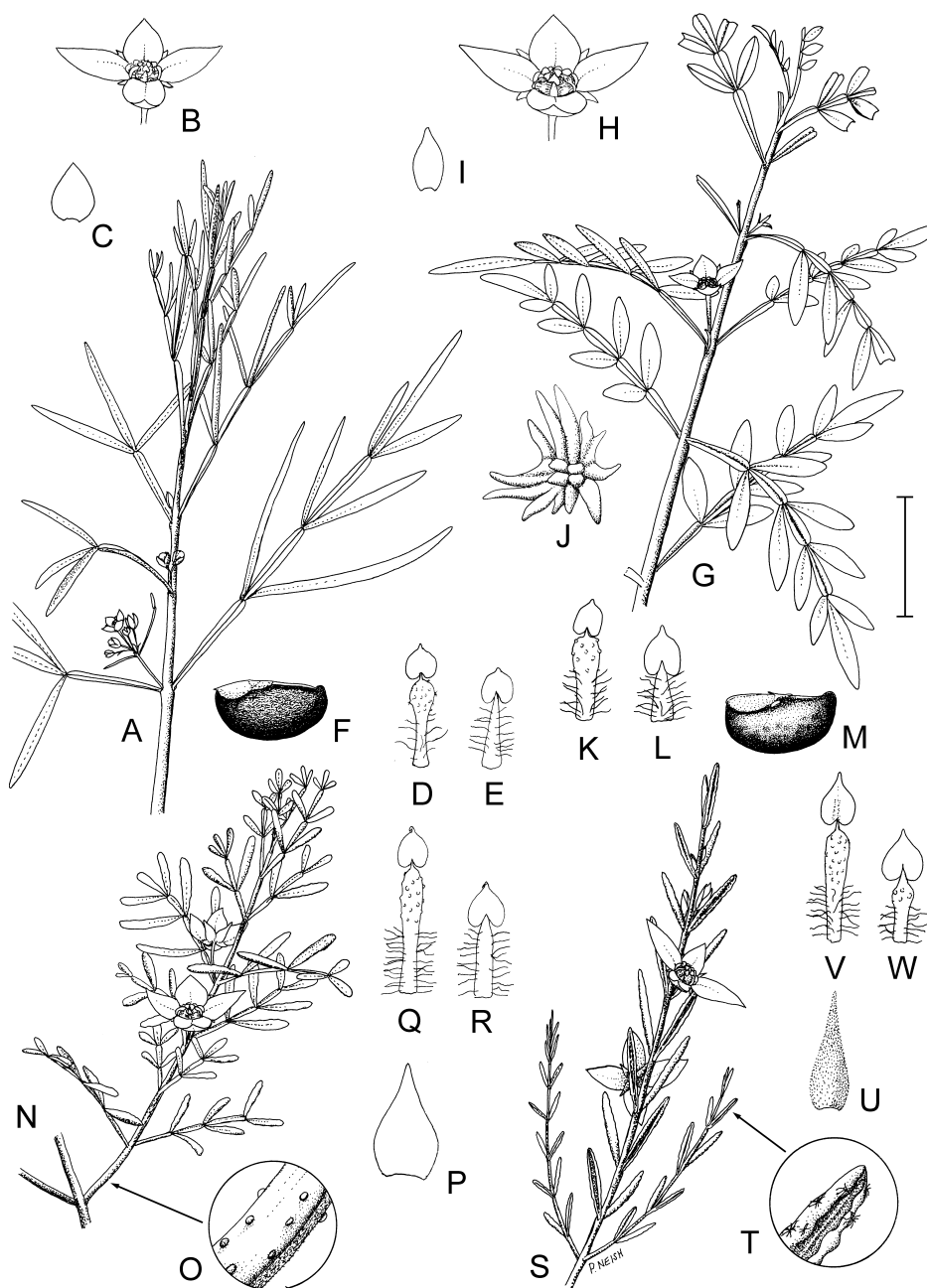


Figure 40. *Boronia*. **A–F**, *B. bowmanii*. **A**, habit; **B**, flower; **C**, sepal; **D**, antisepalous stamen, abaxial view; **E**, antipetalous stamen, abaxial view; **F**, seed (**A–F**, M.Duretto 400, MEL). **G–M**, *B. squamipetala*. **G**, habit; **H**, flower; **I**, sepal; **J**, detail of stellate hair of abaxial petal surface; **K**, antisepalous stamen, abaxial view; **L**, antipetalous stamen, abaxial view; **M**, seed (**G–M**, J.Clarkson 10112, MEL). **N–R**, *B. eriantha*. **N**, habit; **O**, branchlet detail; **P**, sepal; **Q**, antisepalous stamen, abaxial view; **R**, antipetalous stamen, abaxial view (**N–P**, M.Ballingall 2655, MEL; **Q–R**, M.Duretto 369, MEL). **S–W**, *B. repanda*. **S**, habit; **T**, leaf apex; **U**, sepal; **V**, antisepalous stamen, abaxial view; **W**, antipetalous stamen, abaxial view (**S–W**, M.Duretto 345, MEL). Scale bar: **A**, **G**, **N**, **S** = 16 mm; **B**, **H** = 8 mm; **C**, **F**, **I**, **M**, **P**, **U** = 4 mm; **D–E**, **K**, **L**, **Q**, **R**, **V**, **W** = 2 mm; **J** = 100 μ m. Drawn by P.Neish.

(rarely dull), elliptic in outline, flattened and without prominent ridge on adaxial side; tubercles smooth, not fused.

A subsection of 35 species occurring in the 'Top End' of N.T., Qld, N.S.W. and eastern Vic. There are 4 series.

Ser. 1. Erianthae

Boronia ser. *Erianthae* Duretto, *Muelleria* 12: 42 (1999)

Type: *B. eriantha* Lindl.

Erect shrubs. Leaves slightly discolourous, paler beneath, rarely concolorous (*B. ruppii*), glabrous or sparsely stellate-hairy, flat to recurved; abaxial surface with multiangular stellate hairs, without planar stellate hairs; midrib not or slightly raised abaxially without secondary thickening between midvein and epidermis. Seed sclerotesta shiny.

A series of 8 species found in inland areas of Qld and N.S.W.

94. *Boronia rubiginosa* A.Cunn. ex. Endl. in S.F.L. Endlicher *et al.*, *Enum. Pl.* 16 (1837)

B. ledifolia var. ? *rubiginosa* (A.Cunn. ex Endl.) Benth., *Fl. Austral.* 1: 314 (1863). T: N.S.W., hills on Hunter R., 1827, *A. Cunningham s.n.*; lecto: W n.v. (photo MEL), *fide* M.F. Duretto, *Muelleria* 17: 120 (2003); isolecto: K n.v. (photo MEL), W n.v. (photo MEL); probable isolecto: K n.v. (photo MEL).

B. sp. F (aff. *ruppii*), S.W.L. Jacobs & J. Pickard, *Pl. New South Wales* 191 (1981).

[*B. ruppii* auct. non Cheel: A. Fairley & P. Moore, *Nat. Pl. Sydney Distr.* 203, pl. 806 (1989); L. Robinson, *Field Guide Nat. Pl. Sydney* 116 (1990)]

Illustrations: A. Fairley & P. Moore, *Nat. Pl. Sydney Distr.* 203, pl. 806 (1989), as *B. ruppii*; L. Robinson, *Field Guide Nat. Pl. Sydney* 116 (1990), as *B. ruppii*; G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 273 (2002).

Shrub to 2 m tall. Branches eglandular, stellate-tomentose. Stellate hairs sessile; rays firm, ±straight, shiny. Leaves 1–5 (–7)-foliolate, 8–46 (–61) mm long, 4–35 mm wide, discolourous; petiole 1–12 mm long; rachis segments 4–20 mm long; leaflets narrowly to broadly elliptic or spatulate, 4–30 mm long, 3–12 mm wide, obtuse, glabrous or with a few scattered hairs. Inflorescence 1–3-flowered, stellate-tomentose; peduncle 2–8.5 mm long; pedicels 3–10 mm long. Sepals ovate-deltate, 2–3 mm long, 1–1.5 mm wide, acute; abaxial surface glabrous or with a sparse to dense stellate indumentum. Petals 6–10 mm long, white to pink. Cocci glabrous or densely hairy.

Occurs in widely spaced populations from Lees Pinch to Berrima, N.S.W. Found in dry woodland on sandstone. Flowers July–Nov.; fruits Oct.–Dec.

N.S.W.: Genowlan Mtn, 7 miles [c. 11.2 km] NE of Capertee, *E.F. Constable* 5042 (CANB, NSW, PERTH); Mt Penang, Berrima District, 16 Nov. 1981, *J. Cosh* (NSW); Wollemi Natl Park, Glen Davis, track on E side of Green Gully below cliff c. 1.8 km SSW of Glen Davis P.O., *F.E. Davis* 285 (CANB); above Roberts Falls, Bulls Ridge, E Kurrajong, *T.A. James* 1205 (NSW); S of Lee's Pinch Lookout area, 5.6 km N of Wollar–Sandy Hollow road, *J.M. Powell* 2960 (BRI, CANB, NSW).



A rare species that is variable in leaf and flower size and indumentum density of the sepals and petals (variation discussed under *B. ruppii* by P.H. Weston, *Telopea* 4: 121–128 (1990)). Can be distinguished from *B. ruppii* by the discolourous leaves.

95. *Boronia ruppii* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 404 (1928)

T: Barraba, N.S.W., Nov. 1912, *H.M.R. Rupp s.n.*; lecto: NSW, *fide* M.F. Duretto, *Muelleria* 12: 43 (1999).

Illustration: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 273 (2002).

Shrub to 2 m. tall. Branches stellate-tomentose, eglandular. Stellate hairs sessile; rays firm, ±straight, shiny. Leaves 1–3-foliolate, first few leaves of a branch usually 3-foliolate and

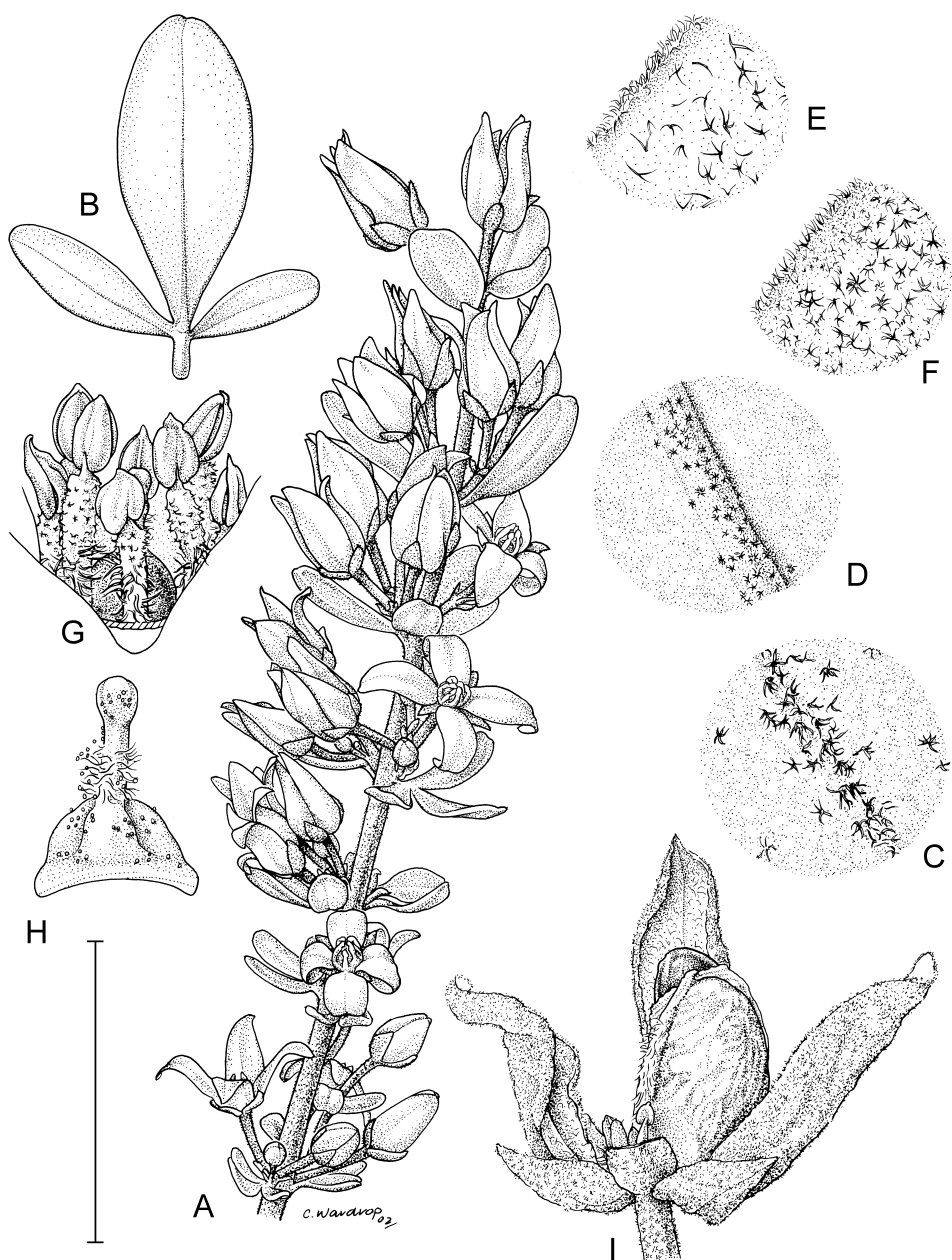


Figure 41. *Boronia ruppia*. A, habit; B, trifoliate leaf; C, midvein, adaxial leaflet surface; D, midvein, abaxial leaflet surface; E, adaxial petal indumentum & margin; F, abaxial petal indumentum & margin; G, stamens & carpel; H, carpel & pollen; I, fruit (A, voucher not recorded; B, N.G.Walsh 2644, NSW; C–F, I, A.J.Spencer, 1924, NSW; G, H = J.R.Hosking 1508, NSW). Scale bar: A = 25 mm; B = 15 mm; C–F = 2.5 mm; G = 5 mm; H = 3.3 mm; I = 7.5 mm. Drawn by C.Wardrop.

then only unifoliolate ones produced; petiole 1–3 mm long; pinnate leaves 8–21 mm long, 6–26 mm wide; unifoliolate leaves and leaflets elliptic to broadly elliptic or spatulate, 4–18 mm long, 3–8 mm wide, obtuse, glabrous or with a few scattered hairs. Inflorescence 1–3-flowered, stellate-tomentose; peduncle 1–6 mm long; pedicels 3–8 mm long. Sepals ovate-deltate, 3.5–5 mm long, 2–3 mm wide, acute; abaxial surface densely stellate-tomentose. Petals 5–9 mm long, white to pink. Cocci glabrous. *Rupp's Boronia*. Fig. 41.

Apparently confined to Woods Reef near Barraba, N.S.W. Found growing in dry woodland on serpentine. Flowers chiefly July–Dec.; fruits Oct.–Dec.

N.S.W.: Woods Reef, 20 km E of Bundarra, *D.B.Foreman 1025* (CANB, MEL); E side of Woods Reef mine, *J.R.Hosking 503* (MEL, NSW); Woods Reef, above Barraba Rd, *N.G.Walsh 2644* (MEL, NSW).

An endangered species that can be distinguished from other species in the series by the isobilateral and concolorous leaves.



96. *Boronia eriantha* Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 298 (1848)

T: Sub-Tropical New Holland [near Mt Playfair, Warrego District, Qld], 11 Sept. 1846, *T.L.Mitchell 301*; lecto: CGE *n.v.* (photo MEL), *fide* M.F.Duretto, *Muelleria* 12: 45 (1999).

Shrub to 2 m tall. Branches stellate-tomentose, more densely so between decurrent leaf bases, glandular-verrucose. Stellate hairs sessile; rays firm, \pm straight, shiny. Leaves 3–11-foliolate, (5–) 10–24 mm long, (2–) 6–16 mm wide; petiole 2–6 mm long; rachis segments 3–7 mm long; leaflets \pm oblanceolate, 2–9 mm long, 1–3.5 mm wide, obtuse, with a few scattered hairs. Inflorescence 1 (–3)-flowered, with a few scattered hairs; peduncle 0.5–2.5 mm long; pedicel 3–6 mm long. Sepals ovate-deltate, 2–5 mm long, 1.5–3 mm wide, acuminate; abaxial surface glabrous or stellate-tomentose. Petals 6–12 mm long, white to pink. Cocci sparsely to moderately densely hairy. Fig. 40N–R.

Occurs disjunctly in the White Mtns (Warang), N Qld, and around the Carnarvon Ra., central Qld. Found in eucalypt open woodland or forest on sandstone. Flowers Apr.–Sept.; fruits May–Dec.

Qld: near Louisa Bore, Mt Playfair Stn, *J.Armstrong 1004* (NSW); Salvator Rosa Natl Park, on Sentinel Mtn, *M.E.Ballingall 2655* (AD, BRI); Edge of White Mtns at 'Warang' Stn, *M.F.Duretto 369* (MEL); head of Torrens Ck, White Mtns, 'Warang', c. 37 km NNW of Torrens Creek township, *D.Fell & M.R.Swain 1340* (BRI, NSW); Mount Mobil Holding, 15–20 km W of Umbervill HS, *P.Grimshaw CHR19* (BRI).

A rare and poorly collected species. Specimens from the White Mtns may be glabrous on the abaxial surface of the sepals like the type and Carnarvon Range form, or stellate-tomentose.



97. *Boronia grimshawii* Duretto, *Muelleria* 17: 118 (2003)

T: Aranbanga Ck catchment area, 'Bronte Stn', Qld, 14 Sept. 1999, *M.F.Duretto 1316*, *P.I.Forster & P.Grimshaw*; holo: MEL; iso: BRI.

B. sp. Aranbanga Creek (P.Grimshaw PG2597), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pl., Algae Lichens* 178 (2002).

Illustrations: M.F.Duretto, *Muelleria* 17: 102, fig. 12 G–H (2003); M.F.Duretto, *Austral. Pl.* 23 (183): 92 (2005).

Shrub to 2.5 m tall. Branches sparsely to densely stellate-tomentose, glandular-verrucose. Stellate hairs sessile; rays firm, \pm straight, shiny. Leaves simple; petiole 1–2 mm long; lamina \pm lanceolate to elliptic to \pm oblanceolate, 10–26 mm long, 4–10 mm wide, glandular and crenulate on margins, sometimes obviously glandular elsewhere; new leaves with a sparse stellate indumentum, soon becoming glabrous. Inflorescence 1–3 (–7)-flowered; peduncle 0.5–2 mm long, with a few scattered hairs; pedicels 3–7 mm long, stellate-tomentose. Sepals

ovate-deltate, 2.5–3 mm long, 1.25–2 mm wide, acute; abaxial surface stellate-tomentose. Petals 6–10 mm long, white to pink. Cocci glabrous or with a few hairs.

Known only from an isolated ‘jumpup’ near Gayndah, Qld. Found in *Lysicarpus* and *Eucalyptus* woodland on laterised duricrust. Flowers June–Oct.; fruiting material collected in Sept.

Qld: Bronte, 9 km SW of Gayndah, *P.I.Forster* 24855 (AD, BRI, MEL, NSW); Head of Aranbanga Ck tributary in W side catchment, *P.Grimshaw* 2597 (BRI, CANB, MEL).



A rare species that can be distinguished from other species in the series by the simple leaves and glandular-verrucose stems.

98. *Boronia warrumbunglensis* P.H.Weston, *Telopea* 4: 125 (1990)

T: North West Slopes, Oxley Hwy, 10 km S of Coonabarabran, N.S.W., 319 Sept. 1977, *M.G.Corrick* 58083; holo: NSW; iso: MEL.

B. sp. G (aff. *granitica*), S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 191 (1981).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 272 (2002).

Shrub to 1 m tall. Branches stellate-tomentose, not obviously glandular. Stellate hairs sessile; rays firm, ±straight, shiny. Leaves 3–7-foliolate, 6–32 mm long, 2–27 mm wide; petiole 3–6 mm long; rachis segments 3.5–5 mm long; leaflets elliptic to oblanceolate, 4–16 mm long, 1–3 mm wide, obtuse, with a few scattered hairs. Inflorescence 1-flowered, stellate-tomentose; peduncle 0.5–1.5 mm long; pedicel 2–7 mm long. Sepals ovate-deltate, 2.5–3.5 mm long, 1.5–2 mm wide, acute; abaxial surface stellate-tomentose. Petals 5–8 mm long, pink. Cocci glabrous or hairy.

Restricted to the Warrumbungle Ra. and Coonabarabran area, N.S.W. Found in dry sclerophyll woodland on sandstone. Flowers Aug.–Dec.; fruits Sept.–Dec.

N.S.W.: Mendoran Rd near Coonabarabran, *G.W.Altwofer* 50 (MEL); Warrumbungle Ra., 19 km WSW of Coonabarabran, 2 km E of Burrumbuckle Rock, *M.D.Crisp* 4355 (CANB, NSW); ridge near Mt Weoh, *G.Harden* 15 (NSW); Timor Rock, *G.Harden* 16 (NSW); Siding Springs, Coonabarabran District, Nov. 1961, *H.J.R.Overall* s.n. (NSW).



A rare species that can be distinguished from *B. granitica* by having smaller hairs and glabrous younger leaves; and from *B. ruppii* and *B. rubiginosa* by having narrower leaflets and shorter peduncles.

99. *Boronia boliviensis* J.B.Williams & J.T.Hunter, *Telopea* 11: 261 (2006)

T: Bolivia Hill, c. 33 km S of Tenterfield, N.S.W., 2 Oct 1989, *J.B.Williams* 89556; holo: NSW; iso: BRI, CANB, HO, MEL, NE.

B. sp. J, F.C.Quinn *et al.*, *Rep. Rare Threatened Pl. NE New South Wales* 72 (1995).

B. aff. granitica (Bolivia Hill), M.F.Duretto, *Muelleria* 12: 47 (1999).

B. boliviensis J.B.Williams *ms.* (*Williams* 89556), P.H.Weston & M.F.Duretto in G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 272 (2002).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 272 (2002); J.B.Williams & J.T.Hunter, *op. cit.* 262, fig. 1 (2006).

Shrub to 1.5 m. tall. Branches sparsely to densely stellate-tomentose, not obviously glandular. Stellate hairs sessile; rays firm, ±straight, shiny. Leaves (1–) 7–11-foliolate, 8–20 mm long, 8–16 mm wide; petiole 1–3 mm long; rachis segments 2–4 mm long; leaflets elliptic to oblong, 4–6 mm long, 0.5–1.5 mm wide, entire, recurved to revolute, acute to obtuse, with few scattered hairs or a sparse stellate indumentum. Inflorescence 1–3-flowered, stellate-tomentose; peduncle 1–3 mm long; pedicels 2–3 mm long. Sepals narrowly ovate-deltate, 3.5–4 mm long, c. 1 mm wide, acute; abaxial surface stellate-tomentose. Petals 5–7 mm long, pink. Cocci glabrous. *Bolivia Hill Boronia*.

A rare species restricted to Bolivia Hill, near Tenterfield, N.S.W. Found growing on granite-derived soils. Flowers and fruits July–Dec.

N.S.W.: Bolivia Hill c. 35 km S of Tenterfield, 2 Dec. 1996, *S.Falconer & R.Morsley* (MEL, NE).

Distinguished from other members of the series by the very narrow and usually revolute leaflets that have only a few sessile hairs.



100. *Boronia granitica* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 30: 357 (1905)

T: Howell, N.S.W., Aug. 1905, *J.H.Maiden & J.L.Boorman s.n.*; lecto: NSW, *fide* M.F.Duretto, *Muelleria* 12: 48 (1999); isolecto: K *n.v.* (photo AD), MEL.

Illustrations: K.A.W.Williams, *Nat. Pl. Queensland* 1: 33 (1979); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 272 (2002).

Shrub to 1.5 m tall. Branches not obviously glandular, with a moderately dense stellate indumentum. Stellate hairs often stalked, grey-white; rays weak, flexuose, dull. Leaves 3–15-foliolate, 8–20 mm long, 2.5–15 mm wide, with a sparse to moderately dense stellate indumentum; petiole 1–3 mm long; rachis segments 1–4 mm long; leaflets elliptic, 1–11 mm long, 0.5–2.5 mm wide, acute to obtuse. Inflorescence 1–3-flowered, stellate-tomentose; peduncle 1–3 mm long; pedicels 2–3 mm long. Sepals narrowly triangular, 3.5–6 mm long, 1–2 mm wide, acute; abaxial surface stellate-tomentose. Petals 6–9 mm long (–12 mm when in fruit), pink. Cocci glabrous. *Granite Boronia*.

Occurs from Stanthorpe, Qld, to near Howell and Inverell, N.S.W. Grows in open eucalypt forest or woodland and heath on granite-derived soils. Flowers and fruits July–Dec.

Qld: Jolly's Falls, 2 miles [c. 3.2 km] W of the Summit, *W.E.Fischer* 226 (CANB, NSW); Amiens, 10 miles [c. 16 km] NW of Stanthorpe, at foot of 'Sow and Pigs', *L.Pedley* 1483 (BRI). N.S.W.: Torrington, *R.Coveny* 2263 (BRI, NSW); the Gorge, Kangaroo Ck, c. 10 miles [c. 16 km] E of Inverell, 31 Mar. 1933, *E.N.Mckie s.n.* (NSW); 6.9 km along Breakfast Ck track from the Gulf Rd, *A.L.Quirico* 49 (NSW).

A rare and endangered species that can be distinguished from *B. repanda* by having pinnate leaves, and from the remainder of the series by the sparse indumentum of usually stalked hairs and the narrowly triangular sepals.



101. *Boronia repanda* (F.Muell. ex Maiden & Betche) Maiden & Betche, *Proc. Linn. Soc. New South Wales* 31: 732 (1906)

B. ledifolia var. *repanda* F.Muell. ex Maiden & Betche, *Proc. Linn. Soc. New South Wales* 29: 735 (1905). T: Stanthorpe, Qld, on the borders of N.S.W., *J.L.Boorman*, July 1904; lecto: NSW, *fide* M.F.Duretto, *Muelleria* 12: 49 (1999); isolecto: BRI, MEL (2 specimens).

B. ledifolia var. *repanda* F.Muell. ex Domin, *Biblioth. Bot.* 89: 284 (1926); *nom. illeg., non* F.Muell. ex Maiden & Betche. T: Stanthorpe, Qld, 1904, *J.L.Boorman*; lecto: PR 528073, *fide* M.F.Duretto, *Muelleria* 17: 120 (2003).

B. repanda var. *alba* C.T.White, *Proc. Roy. Soc. Queensland* 53: 206 (1942). T: Darling Downs, Thulimbah (obtained at the Wild Flower Show, Queensland Naturalists' Club), Qld, 9 Sept. 1933, *C.T.White* 9234; holo: BRI.

Illustrations: K.A.W.Williams, *Nat. Pl. Queensland* 1: 37 (1979); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 272 (2002).

Erect shrub to 1 m tall. Branches stellate-tomentose, not obviously glandular. Stellate hairs usually stalked; rays weak, dull, flexuose. Leaves simple, with a sparse to moderately dense stellate indumentum; petiole 0.5–1 mm long; lamina elliptic, 4–18 mm long, 1.5–3 mm wide, recurved to revolute, acute to obtuse, glandular-punctate on margins. Flowers solitary; peduncle 0.5–2 mm long; pedicel 2–4 mm long. Sepals narrowly triangular, 3–4.5 mm long,

1–1.5 mm wide, acute; abaxial surface with a moderately dense stellate indumentum. Petals 6–10 mm long, white to pink. Cocci hirsute. *Border Boronia*. Fig. 40S–W.

Restricted to a very limited area near Stanthorpe, SE Qld, including a few small populations nearby in N.S.W. Found in heath and woodland on granite. Flowers July–Nov.; fruits Oct.–Nov.

Qld: Cottonvale School yard, *M.F.Duretto* 347–349 (BRI, MEL); 2 km NW of Thulinbah, *R.W.Johnson* 2915 (BRI, CANB, MEL); Stanthorpe, *W.T.Jones* 3236 (CANB, MEL). N.S.W.: Stanthorpe to Armosfield road, *R.Johnson* 1922 & *A.E.Orme* (HO, K, NSW).

An endangered species that is not easily confused with any other species of *Boronia* except *B. glabra*, from which it can be distinguished by the glandular leaf margins, the stalked hairs with long and flexuous rays, and the narrowly triangular sepals. Only recently collected in N.S.W.



Ser. 2. Fraserorum

Boronia ser. *Fraserorum* Duretto, *Muelleria* 12: 51 (1999), as *Fraseriae*

Type: *B. fraseri* Hook.

Erect shrubs. Leaves slightly discolorous, paler beneath, with a few scattered hairs, flat to slightly recurved; abaxial surface with multiangular stellate hairs, without planar stellate hairs; midrib raised abaxially with secondary thickening. Seeds shiny.

A series of 2 rare species, one each from Qld and N.S.W.

102. *Boronia fraseri* Hook., *Bot. Mag.* 27, t. 4052 (1843)

T: ravines on the banks of the Nepean R., N.S.W., *C.Fraser s.n.*; lecto: K *n.v.* (photos AD, MEL), *fide* M.F.Duretto, *Muelleria* 12: 51 (1999); isolecto: MEL; possible isolecto: K *n.v.* (2 specimens, photos MEL).

B. anemonifolia Paxton, *Paxton's Mag. Bot.* 9: 123 & pl. (1842), *nom. illeg. non* A.Cunn. T: "Seeds of this pretty New Holland plant were imported by Messrs. Lodiges many years ago. We had our drawings made from the collection of these gentlemen in the month of May or June, 1841"; *n.v.*, *fide* M.F.Duretto, *loc. cit.*

Illustrations: A.Fairley & P.Moore, *Nat. Pl. Sydney District* 234, t. 809 (1989); L.Robinson, *Field Guide Nat. Pl. Sydney* 115 (1991); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 273 (2002).

Erect shrub to 2 m tall. Branches sharply quadrangular, glabrous or with a few scattered hairs. Leaves 3–7-foliolate, 40–105 mm long, 35–70 mm wide; petiole 8–30 mm long; rachis segments 7–18 mm long; leaflets elliptic, acute to obtuse; terminal leaflets 25–63 mm long, 8–16 mm wide; lateral leaflets 14–40 mm long, 3–13 mm wide. Inflorescence 3–7-flowered; peduncle 3–15 mm long; pedicels 6–17 mm long. Sepals ovate-deltate, 2.5–3 mm long, acute; abaxial surface stellate-tomentose. Petals 6–10 mm long, pink. Filaments usually glabrous. *n* = 16, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Fraser's Boronia*. Fig. 42A–F.

Confined to the Sydney area, N.S.W. Found growing in wet sclerophyll forest and rain forest in gullies on sandstone. Flowers July–Oct.; fruits Oct.–Nov.

N.S.W.: ¾ km E of Campfire Ck & Glenbrook Ck, Blue Mountains Natl Park, *G.D'Aubert* 590 (NSW); Somersby Falls, Brisbane Water Natl Park, *W.Bishop* 795 (CANB); Mullett Ck, Wondabyne, c. 5 miles [8 km] W of Woy Woy, 13 Oct. 1960, *E.F.Constable s.n.* (AD, NSW); Ku-ring-gai Chase Natl Park, near Cowan Ck, *H.S.McKee* 6646 (NSW).

A rare and poorly collected species. The sharply quadrangular stems, and usually glabrous staminal filaments distinguish it from *B. keysii*.



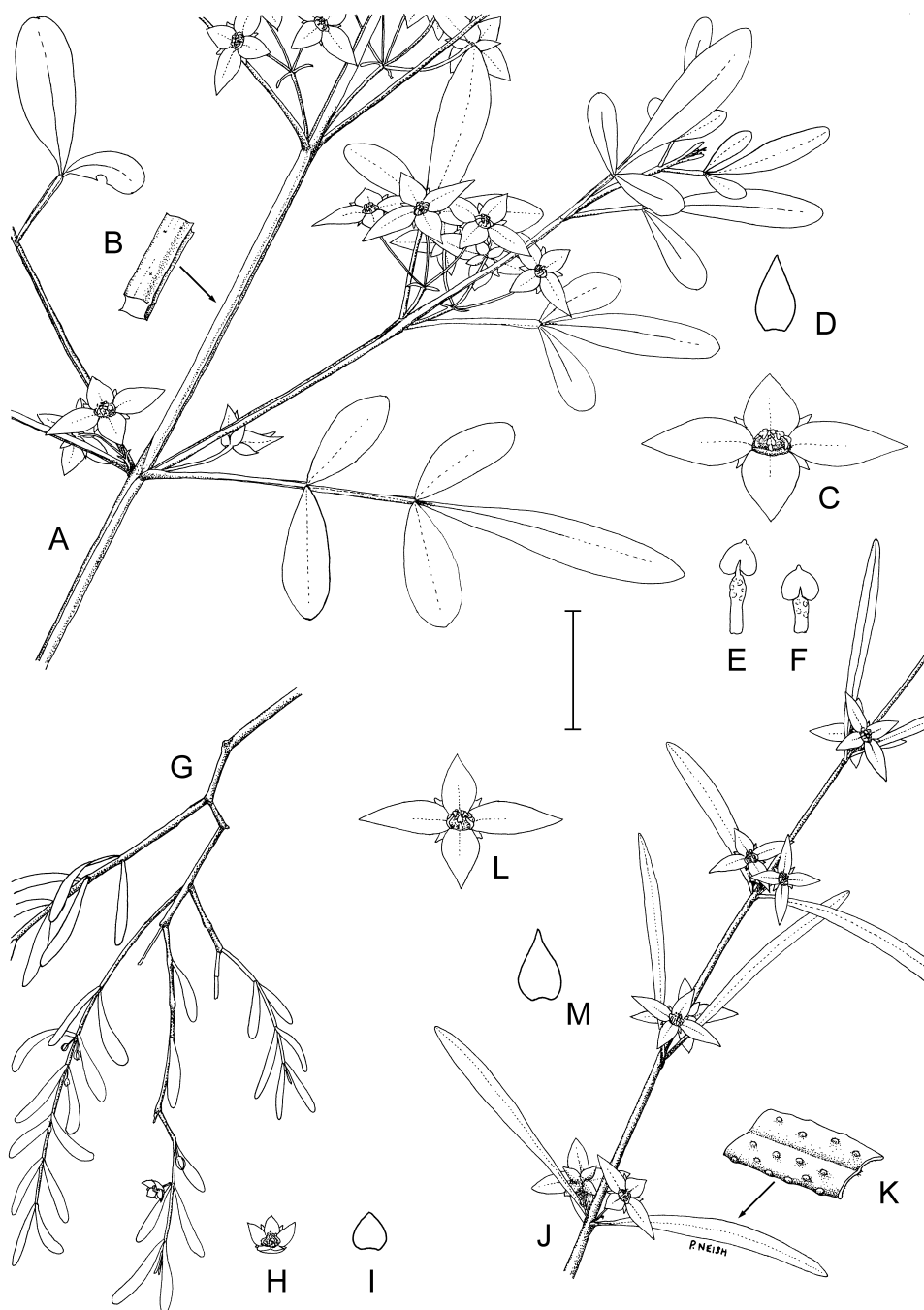


Figure 42. *Boronia*. A–F, *B. fraseri*. A, habit; B, branchlet detail; C, flower; D, sepal; E, antisepalous stamen, abaxial view; F, antipetalous stamen, abaxial view (A–F, E.Constable, 13 Oct. 1960, NSW). G–I, *B. rupicola*. G, habit; H, flower; I, sepal (G, L.Craven 6646, CANB; H–I, K.Brennan 2356, MEL). J–M, *B. chartacea*. J, habit; K, leaf adaxial surface; L, flower; M, sepal (J–M, R.Coveny 4603, BRI). Scale bar: A, G, J = 16 mm; C, H, L = 8 mm; D, I, M = 4 mm. Drawn by P.Neish.

103. *Boronia keysii* Domin, *Biblioth. Bot.* 89: 284 (1926)

T: L. Cootharabra, Qld, 1909, *J. Keys s.n.*; lecto: PR, *fide* M.F. Duretto, *Muelleria* 17: 121 (2003); isolecto: BRI. Illustrations: B.A. Lebler, *Queensland Agric. J.* 98: 619 (1972); K.A.W. Williams, *Nat. Pl. Queensland* 1: 33 (1979); J. Leigh *et al.*, *Extinct & Endangered Pl. Australia* 321 (1984).

Erect shrub to 2 m tall. Branches slightly quadrangular to terete; young shoots moderately to densely stellate-tomentose. Leaves 1–7-foliolate, 8–75 mm long, 4–40 mm wide; petiole 5–12 mm long; rachis segments 9–11 mm long; leaflets elliptic to lanceolate, attenuate, acute; terminal leaflets 15–51 mm long, 3–12 mm wide; lateral leaflets 7–23 mm long, 4–10 mm wide. Inflorescence 3–7-flowered, stellate-tomentose; peduncle 3–5 mm long; pedicels 5–15 mm long. Sepals ovate-deltate, 2.5–3.5 mm long, acuminate to acute; abaxial surface stellate-tomentose. Petals 5.5–8 mm long, pink. Filaments pilose. *n* = 16, Shan, *et al.*, *Bot. J. Linn. Soc* 142: 311 (2003). *Key's Boronia*.

Confined to the L. Cootharabra area, Cooloola sand mass, SE Qld. Found in wet sclerophyll forest, sometimes with *Agathis*, and often in recently disturbed sites. Flowers Apr.–Dec.; fruits July–Dec.

Qld: Como logging area, SF1004, *P. Beesley 951A* (CANB, MEL); Kin Kin Ck, 19 km NNW of Tewantin, *I.R. Telford 4326* (BRI, CANB, NSW).

A rare species once thought to be extinct. Can be distinguished from *B. fraseri* by the slightly quadrangular stems and pilose staminal filaments, and from other species in the area by the large, nearly glabrous, elliptic to lanceolate leaves or leaflets. Genetic diversity of this species is discussed by Shapcott *et al.* (*Austral. Syst. Bot.* 53: 171–183 (2005)).



Ser. 3. *Rupicola*

Boronia ser. *Rupicola* Duretto, *Muelleria* 12: 54 (1999), as *Rupicolae*

Type: *B. rupicola* Duretto

Pendulous shrubs. Leaves slightly or strongly discolourous, flat, paler beneath; adaxial surface glabrous or with a sparse simple and stellate indumentum; abaxial surface glabrous or with a dense, heterogenous indumentum of 2 stellate hair types: a moderately dense layer of multi-angular stellate hairs, and a dense layer of smaller planar stellate hairs; midrib not raised significantly abaxially; secondary thickening between midvein abaxial epidermis. Seeds shiny or dull.

A monotypic series confined to the N.T.

104. *Boronia rupicola* Duretto, *Nuytsia* 11: 336 (1997)

T: 18 km SE of Jabiru, outlier of main Plateau, N.T., 30 Mar. 1981, *L.A. Craven 6646*; holo: CANB; iso: A, AD, BRI, CANB, DNA, E, L, MEL.

B. A44419 (Nabarlek), G.J. Leach *et al.*, *N. Terr. Pl. Sp. of Conservation Significance*, *N. Terr. Bot. Bull.* 13: 35 (1992); C.R. Dunlop *et al.*, *Checklist Vasc. Pl. N. Terr., Australia* 100 (1995).

B. DNA17279 (Radon Gorge), G.J. Leach *et al.*, *loc. cit.*; C.R. Dunlop *et al.*, *loc. cit.*

B. sp. 5 (Nabarlek; *T.G. Hartley 13819*), J.D. Briggs & J.H. Leigh, *Rare Threatened Austral. Pl.* 167 (1996).

B. sp. 6 (Radon Gorge; *C.R. Dunlop 5455*), J.D. Briggs & J.H. Leigh, *loc. cit.*

Illustration: M.F. Duretto, *op. cit.* 338, fig. 13 A–G.

Pendulous subshrub to 70 cm long. Branches densely stellate-tomentose or glabrous. Leaves 1–7-foliolate, 5–15 mm long, 1–4 mm wide; petiole 1.5–7 mm long; rachis segments 4–7 mm long; leaflets and simple leaves elliptic to oblanceolate, 4–10 mm long, 1–3 mm wide, attenuate to obtuse. Inflorescence 1 (–3)-flowered; peduncle 0.5–1 mm long; pedicels 0.5–3 mm long. Sepals ovate-deltate, 1–1.5 mm long, acute to acuminate. Petals 2–3 mm long, white to yellow-green. Cocci glabrous or hairy. Fig. 42G–I.

Occurs S of the Nabarlek mining lease (Arnhem Land) and in the Mt Brockman area (Kakadu Natl Park), N.T. Found exclusively on sandstone cliff-faces. Flowers and fruits Mar.–July.

N.T.: 11.5 km ESE of Nabarlek, *K.Brennan 2365* (CANB, DNA, MEL); c. 17 km SE of Jabiru, *L.A.Craven 6581* (CANB); Radon Gorge, Mt Brockman, *C.R.Dunlop 5455* (DNA, NSW); Tin Can Ck, c. 20 miles [c. 32 km] S of Nabarlek Mining Camp, *T.G.Hartley 13819* (CANB, DNA).

An unusual and poorly collected species that shares with *Boronia* series *Valvatae* the planar stellate hairs on the abaxial surface of the leaves. The two known populations have both glabrous and hairy individuals. The pendulous habit, 1–7-foliolate leaves, and sepals that are much smaller than the petals distinguish it from sympatric species of *Boronia*.



Ser. 4. Valvatae

Boronia ser. *Valvatae*

Usually erect shrubs. Leaves strongly discolorous (rarely slightly discolorous, *B. mollis* and *B. glabra*), paler beneath, flat to revolute; adaxial surface glabrous or tomentose; abaxial surface with a dense, heterogenous indumentum of 2 hair types: a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs (planar hairs absent in *B. mollis* and usually in *B. glabra*); midrib raised abaxially (sometimes barely), with or without secondary thickening. Seeds shiny or rarely dull (sometimes in *B. lanceolata*).

A series of 24 closely related species occurring in the 'Top End' of the N.T., Qld, N.S.W., and eastern Vic. The series is divided here into 3 subseries, plus 3 additional species (*B. ledifolia*, *B. chartacea* and *B. hapalophylla*) which are probably related based on morphological similarities though apomorphies to define them as a group are wanting.

Subser. 1. Valvatae

Boronia subser. *Valvatae*

B. alulata species-group, M.F.Duretto, *Muelleria* 12: 63 (1999).

Leaves petiolate, pinnate; leaflets slightly recurved to revolute, with midribs raised abaxially, with secondary thickening; adaxial surface glabrous or sparsely to densely stellate-tomentose; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Inflorescence 1–9-flowered. Sepals usually narrowly deltate (ovate-deltate in *B. umbellata*), acute; abaxial surface usually with a moderately dense stellate indumentum, often dark red-brown to dark brown in colour, with epidermis usually visible (densely tan, stellate-tomentose and epidermis not visible in *B. umbellata*). Filaments usually pilose, sometimes glabrous (*B. mollis*).

A subseries of 8 species found in Qld and N.S.W.

105. *Boronia angustisepala* Duretto, *Muelleria* 12: 63 (1999)

T: Murrumbidgee Cascades, Gibraltar Range Natl Park, N.S.W., 25 Oct. 1995, *M.F.Duretto 673*, *P.G.Neish & I.Thompson*; holo: MEL; iso: BRI, CANB, MEL, NSW, PERTH.

B. sp. D (aff. *rubiginosa*), S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 191 (1981).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2: pl. 16, 231 (1991), as *B. rubiginosa*; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 271 (2002).

Erect shrub to 1.5 m tall. Branches stellate-tomentose. Stellate hairs white to red-brown, especially noticeable on new foliage; rays to 1 mm long. Leaves 3–11-foliolate, 10–55 mm long, 3–30 mm wide; petiole 2–5 mm long; rachis segments 3–9 mm long; leaflets elliptic to

spathulate, 5–25 mm long, 2–9 mm wide, obtuse; adaxial surface with a sparse stellate indumentum; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Inflorescence 1–3-flowered; peduncle 2–5 mm long; pedicels 4–13 mm long. Sepals narrowly triangular, 3–6 mm long, 1–2 mm wide, acute; abaxial surface with a moderately dense stellate indumentum (epidermis visible). Petals (6–) 9–11 mm long, pink; abaxial surface with sparse stellate indumentum. Stamens: filaments pilose; anther apiculum erect. Cocci c. 6 mm long, glabrous or hirsute.

Occurs in 3 widely spaced areas in N.S.W.: the Nandewar and Gibraltar Ranges and the Sandy Hollow–Bylong district. Grows in dry sclerophyll forest on sandstone or granite. Flowers June–Nov.; fruits Oct.–Dec.

N.S.W.: NW slope of Waa Mtn, above Waa Gorge, N section of Mt Kaputar Natl Park, 1 Oct. 1978, *G.H.Harden s.n.* (NSW); Sandy Hollow–Bylong, July 1979, *T.Tame s.n.* (NSW); Goulburn R. valley, 5 km S of Mt Kerrabee, *I.R.Telford 1923* (CANB); Murrumbidgee Cascade via Mulligans Hut, Gibraltar Range Natl Park, 8 Oct. 1988, *J.B.Williams s.n.* (NSW).

A rare and poorly collected species. Populations near Sandy Hollow have smaller flowers and wider sepals than plants from the other, more northern, populations, and may intergrade with *B. ledifolia*. The species can be distinguished from *B. ledifolia* by having narrowly triangular sepals, from *B. amabilis* by having petals that are sparsely hairy abaxially, and from *B. umbellata* by narrower leaflets and narrowly triangular sepals.



106. *Boronia umbellata* P.H.Weston, *Telopea* 4: 123 (1990)

T: Sherwood Ck, 28 km NW of Coffs Harbour, N.S.W., 11 Oct. 1978, *H.Streimann 8124*; holotype: CANB; isotype: K n.v., MEL, NSW (2 specimens), PERTH.

B. sp. E (aff. *mollis*), S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 191 (1981).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 272 (2002).

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs white to red-brown; rays 0.1–0.5 mm long. Leaves 3–7-foliolate, 20–95 mm long, 10–55 mm wide; petiole 6–20 mm long; rachis segments 8–20 mm long; leaflets elliptic to broadly elliptic, 15–43 mm long, 8–15 mm wide, flat, obtuse; adaxial surface with a few scattered hairs; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Inflorescence 3–10-flowered; peduncle 4–12 mm long; pedicels 4–15 mm long. Sepals ovate-deltate, 2.5–3 mm long, 1.5–2 mm wide, acuminate; abaxial surface densely stellate-tomentose, with epidermis not visible. Petals 7–10 mm long, pink; abaxial surface with sparse to moderately dense stellate indumentum. Stamens: filaments pilose; anther apiculum minute. Fruit not seen.

Occurs between Athol Glen and Coramba, N of Coffs Harbour, N.S.W. Found in wet sclerophyll forest on sandstone. Flowers June–Nov.; fruits Oct.–Dec.

N.S.W.: Caledonian Knob road, Bagawa State Forest, 12 km S of Glenreagh, *A.R.Bean 2438* (BRI); Waihou Trig., 25 Aug. 1973, *C.Burgess* (NSW); Wedding Bells State Forest, Coffs Harbour district, 8 Sept. 1953, *K.Gray* (NSW).

A rare species that can be distinguished from *B. mollis* by the dense indumentum on the abaxial surface of the leaf, and from all other members of the subseries by the ovate-deltate sepals.



107. *Boronia mollis* A.Cunn. ex Lindl., *Edward's Bot. Reg.* 27 (1841)

T: Nepean R., N.S.W., 1825, *A.Cunningham s.n.*; lectotype: CGE n.v. (photos MEL, NSW), *fide* M.F.Duretto, *Muelleria* 12: 66 (1999); isotype: BRI, K n.v. (2 specimens, photos AD, MEL, NSW).

Illustrations: A.Fairley & P.Moore, *Nat. Pl. Sydney District* 234, t. 808 (1989); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 271 (2002).

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs with rays to 1 mm long. Leaves 3–9-foliolate, 10–60 mm long, 6–30 mm wide; petiole 2–28 mm long; rachis segments (2.5–) 5–7 mm long; leaflets broadly elliptic, 5–35 mm long, 3–9 mm wide, flat, obtuse; adaxial surface glabrous or with a sparse stellate indumentum; abaxial surface with a sparse to moderately dense indumentum of multiangular stellate hairs (planar stellate hairs absent). Inflorescence 3-flowered; peduncle 2–3 mm long; pedicels 6–12 mm long. Sepals narrowly triangular, 3–5 mm long, c. 1 mm wide, acute; abaxial surface with moderately dense stellate indumentum, but epidermis visible. Petals 4.5–10 mm long, pink; abaxial surface with moderately dense stellate indumentum. Stamens: filaments glabrous or with a few hairs; anther apiculum absent. Cocci glabrous. *n* = 16, S. Smith-White, *Austral. J. Bot.* 2: 291 (1954); F. Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Soft Boronia*.

Occurs from the Kendall district to Wollemi and Blue Mountains Natl Parks, N.S.W. Found growing in dry eucalypt forests in gullies on sandstone. Flowers June–Nov.; fruits Oct.–Dec.

N.S.W.: Comboyne State Forest 698, 15 miles [24 km] SW of Kendall, 27 Oct. 1956, *E.F. Constable* (NSW); Norton's Basin 3 km WNW of Wallacia, *R. Convey* 11178 (NSW); Lansdowne State Forest, Newbys Creek Rd, *P. Gilmour* 5872 (CANB); 3 km E along Big Nellie Rd towards Burrawong Rd, near Coopernook, *Landowne St. P. Hind* 4664 (NSW); Erskine Ck, Jack Even Track, Blue Mountains Natl Park, *P.H. Weston* 1056 (NSW).



A rare species that can be distinguished from other members of the subseries by having narrowly triangular and dark coloured sepals and a sparse indumentum on the abaxial surface of the leaves.

108. *Boronia amabilis* S.T. Blake, *Proc. Roy. Soc. Queensland* 73: 74 (1963)

T: Lyra, Qld, 3 Oct. 1959, *S.T. Blake* 21094; holo: BRI; iso: BRI (2 specimens), CANB, MO *n.v.*, NSW.

Illustrations: J. Galbraith, *Field Guide Wild Fl. SE Australia* t. 17.1 (1977); B. McDonald *et al.*, *Fl. Girraween & Bald Rock Natl Parks* 65 (1995); M.F. Duretto, *Austral. Pl.* 23 (183): 92 (2005).

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs with rays 0.1–1 mm long. Leaves 3–15-foliolate, 10–55 mm long, 6–28 mm wide; petiole 3–5 mm long; rachis segments 2–7 mm long; leaflets elliptic, 3–18 mm long, 1.5–6 mm wide, recurved (rarely flat), obtuse; adaxial surface with a sparse to dense stellate indumentum; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Inflorescence (1–) 3–7-flowered; peduncle 2–5 mm long; pedicels 3–10 mm long. Sepals narrowly triangular to narrowly ovate-deltate, 3.5–6 mm long, 1–2.5 mm wide, acute; abaxial surface with a moderately dense to dense stellate indumentum, but epidermis visible. Petals 8–12 mm long (–15 mm when in fruit), pink; abaxial surface with a moderately dense stellate indumentum. Stamens: filaments pilose; anther apiculum minute or large. Style glabrous. Cocci glabrous. *Wyberba Boronia*.

Restricted to the Wyberba–Girraween Natl Park area, S of Stanthorpe, SE Qld. Found growing in open eucalypt forest or woodland over granite. Flowers Aug.–Nov.; fruits Oct.–Nov.

QLD: 2 miles [c. 3.2 km] E of Ballandean, *W.E. Fischer* 198 (BRI, CANB, NSW); Girraween Natl Park, Bald Rock Ck, 5.6 km downstream from Forestry Office, *T.L. Ryan* 65 (BRI); Castle Rock–Mt Norman saddle, 6 km NNE of Wallangarra, *I.R. Telford* 9848 (AD, CANB, MEL).



A spectacular and rare species that can be distinguished from the other local endemics, *B. granitica* and *B. repanda*, by the tomentum of sessile hairs on the abaxial surface of the leaves, from *B. ledifolia* by the narrowly triangular sepals, and from *B. angustisepala* by the petals having a moderately dense to dense indumentum on the abaxial surface.

109. *Boronia obovata* C.T.White, *Proc. Roy. Soc. Queensland* 53: 206 (1942)

T: Blackdown Tableland, Qld, Sept. 1937, *H.G.Simmons* 3; holo: BRI (2 specimens).

Illustrations: K.A.W.Williams, *Nat. Pl. Queensland* 2: 58 (1984); S. & A.Pearson, *Pl. Central Queensland* 73 (1988); J.W.Wrigley & M.Fagg, *Austral. Nat. Pl.* 222 (1988).

Erect shrub to 2 m tall. Branches with a sparse to dense stellate indumentum. Stellate hairs with rays 0.1–1 mm long. Leaves 3-foliolate; petiole 1–5 mm long; leaflets elliptic to oblanceolate, 4–42 mm long, 1.5–11 mm wide, revolute to slightly recurved (though never covering abaxial surface), acute to obtuse; adaxial surface with sparse to moderately dense stellate indumentum; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Inflorescence 1–3-flowered; peduncle 0.5–4 mm long; pedicels 2–9 mm long. Sepals narrowly triangular, 3–5.5 mm long, 0.5–1.5 mm wide, acute; abaxial surface with moderately dense or rarely dense stellate indumentum, but epidermis usually visible. Petals 4.5–8 mm long, pink; abaxial surface with moderately dense stellate indumentum. Stamens: filaments pilose; anther apiculum reflexed. Cocci glabrous or with sparse to moderately dense indumentum. Fig. 43A–F.

Restricted to the Blackdown Tableland area, SE of Blackwater, Qld. Found in eucalypt woodland and forest on sandstone. Flowers Jan.–Sept.; fruits Apr.–Oct.

Qld: on track between Rainbow Falls and the car park, Blackdown Tableland Natl Park, *M.F.Duretto* 302 (BRI, CANB, MEL, NSW, PERTH); Spring Hill, Expedition Ra., *P.I.Forster* 29620 (BRI, HO); Westbrook Stn, *C.H.Gittens* 251 (BRI); Blackdown Tableland, c. 35 km SE of Blackwater, *R.J.Henderson* 961 (BRI, CANB, MEL, NSW); Blackdown Tableland, car park near Rainbow Falls, *P.H.Weston* 1543 (CANB, NSW).

Distinguishable from the remaining members of the subsection by having the following combination of characters: trifoliolate leaves with a dense indumentum abaxially, and dark and narrowly triangular sepals.

**110. *Boronia alulata* Sol. ex Benth., *Fl. Austral.* 1: 313 (1863)**

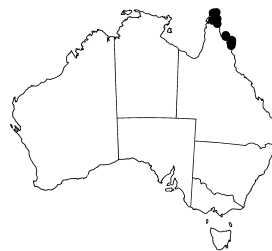
T: Endeavour R. [Qld], 1770, *J.Banks* & *D.Solander s.n.*; lecto: BM *n.v.* (photos BRI, MEL), *fide* M.F.Duretto, *Muelleria* 12: 70 (1999); isolecto: BM *n.v.* (photo MEL), K *n.v.* (photos AD, MEL), MEL, NSW.

Illustrations: W.R.Elliott & D.L.Jones, *Encycl. Austral. Pl.* 2nd edn. 345 (1985); H.Ebes, *The Florilegium of Captain Cook's First Voyage to Australia, 1768–1771*, 56, t. 28 (1988).

Erect shrub to 1.5 m tall. Branches stellate-tomentose. Stellate hairs with rays 0.1–0.5 mm long. Leaves 5–17-foliolate, 8–40 mm long, 7–25 mm wide; petiole 1–5 mm long; rachis segments 1.5–5 mm long; leaflets narrowly elliptic to elliptic, 3–13 mm long, 1–4 mm wide, revolute to recurved, acute; adaxial surface with few hairs; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Inflorescence 3–7-flowered; peduncle 1–30 mm long; pedicels 1–6 mm long. Perianth glabrous or abaxial surface with sparse to dense stellate indumentum. Sepals narrowly triangular, 2–5 mm long, 1–1.5 mm wide, acute. Petals 3–9 mm long, pink or occasionally white. Stamens: filaments pilose; anther apiculum absent. Cocci glabrous. *Balabal-balgah* (indigenous people of Endeavour R. area, *fide* F.M.Bailey, *Compreh. Cat. Queensland Pl.* (1913)).

Occurs in N Qld, from Bamaga to just N of Mossman, mainly in coastal areas and nearby tablelands. Found in woodlands and heaths on sand and silts. Flowers Feb.–Nov.; fruits May–Nov.

Qld: Tozer Gap, Tozer Ra., *L.J.Brass* 19428 (BRI, CANB); beach dunes S of Cape Bedford, c. 23 km NNE of Cooktown, *J.Clarkson* 3302 (BRI, CANB, DNA, MBA, NSW, QRS); 6.7 km from Cooktown–Lakedowns road, on road to Archer Point, *J.Clarkson* 5456 (BRI, CANB, DNA, MBA, QRS); Bathurst Bay (Muck R.), *B.Hyland* 6311 (BRI, QRS); Cape York Rd between Heathlands and Captain Billy Heath, *A.G.Moreton* 584 (BRI, MEL).



A variable species in terms of the size of the leaf, inflorescence and floral parts. Specimens from the top of Mt Tozer and other exposed areas are smaller than those from more sheltered positions. Indumentum density on the abaxial surfaces of the perianth is also variable, being glabrous or having a sparse to dense indumentum. The different forms are sympatric. Closely related to *B. quinkanensis* and *B. hoipolloi* from which it can be distinguished by having just a few hairs on the adaxial surface of the leaves.

111. *Boronia quinkanensis* Duretto, *Austrobaileya* 5: 291 (1999)

T: 22.4 km from Kennedy R. on the Jedda Creek Track to King River Stn, Qld, 24 June 1981, *J.R.Clarkson* 3712; holo: BRI; iso: CANB (2 specimens), DNA *n.v.*, K *n.v.*, MO *n.v.*, NSW.

B. sp. 'Jedda Creek' (*J.R.Clarkson* 3712), M.B.Thomas & W.J.F.McDonald, *Rare Threatened Pl. Queensland* 46 (1989).

B. sp. 'Mt Mulligan' (*J.R.Clarkson* 5769), M.B.Thomas & W.J.F.McDonald, *loc. cit.*

B. sp. (Mt Mulligan, *J.R.Clarkson* 5301), E.M.Ross in R.J.F.Henderson (ed.), *Queensland Vasc. Pl.: Names Distrib.* 303 (1994); P.I.Forster in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

B. sp. 4 (Mt Mulligan; *J.R.Clarkson* 5301), J.D.Briggs & J.H.Leigh, *Rare Threatened Austral. Pl.* 167 (1996).

Illustration: M.F.Duretto, *Austrobaileya* 5: 290, fig. 14 F–K (1999).

Erect shrub to 2.5 m tall, stellate-tomentose throughout apart from adaxial surface of flowers. Stellate hairs with white rays 0.1–0.5 mm long. Leaves 3–11-foliolate, 6–25 mm long, 4–15 mm wide; petiole 1–5 mm long; rachis segments 1.5–6 mm long; leaflets elliptic to oblanceolate, (1–) 6–15 mm long, (1–) 3–7 mm wide, recurved at margins, obtuse; abaxial surface densely stellate-tomentose with both multiangular and planar stellate hairs. Inflorescence 1–9-flowered; peduncle 1–23 mm long; pedicels 1–10 mm long. Sepals narrowly triangular, 3–5 mm long, 1–1.5 mm wide, acute to acuminate; abaxial surface with moderately dense to dense stellate indumentum. Petals 4–5.5 mm long (–7 mm when in fruit), pink to white. Stamens: filaments pilose; anther apiculum minute. Cocci with few hairs. Fig. 43G–L.

Occurs in N Qld, in the Quinkan sandstone country S of Laura, and disjunctly on Mt Mulligan near Dimbulah. Found in heath and open woodland. Flowers and fruits Apr.–Dec.

Qld: Sandy Ck area N of Jowalbinna, *A.R.Bean* 1710 (BRI, NSW); Mt Mulligan, on the S plateau, *J.R.Clarkson* 5301 (BRI, CANB, DNA, MBA, NSW, PERTH, QRS); 4 km S of crossing of Shepherd Ck on Maytown Track, *J.R.Clarkson* 9619 (BRI, DNA, K, L, M, MBA, MEL, NSW, PERTH, QRS); 35 km directly SW of Laura, just below escarpment of Pine Tree Ck, *M.Parris* 9198 (BRI, CANB).

Distinguishable from other species of *Boronia* by the following combination of characters: a dense stellate indumentum on the vegetative parts, elliptic leaflets, and sepals that are narrower than the petals and approximately the same length.



112. *Boronia hoipolloi* Duretto, *Austrobaileya* 5: 288 (1999)

T: Amphitheatre, a sandstone escarpment c. 27 km N of Musselbrook mining Camp, Qld, *J.R.Clarkson* 10473; holo: BRI; iso: MEL (2 specimens).

B. aff. alulata (NW Qld, *Clarkson* 10473), M.F.Duretto, *Nuytsia* 11: 302, 315 (1997).

Illustration: M.F.Duretto, *Austrobaileya* 5: 290, fig. 14 A–E (1999).

Pendulous or erect shrub to 50 cm long, stellate-tomentose throughout apart from flowers. Stellate hairs with white rays to 0.2 mm long. Leaves 7–25-foliolate, 15–35 mm long, 5–13 mm wide; petiole 2–5 mm long; rachis segments 1.5–6 mm long; leaflets narrowly elliptic to linear, 1–8 mm long, 0.5–1 mm wide, recurved, obtuse; abaxial surface densely stellate-tomentose with both multiangular and planar stellate hairs. Inflorescence 1–5-flowered; peduncle to 2 mm long; pedicels 1–4 mm long. Sepals narrowly triangular, 2–3.5 mm long, 0.75–1.25 mm wide, acute or slightly acuminate; abaxial surface with a moderately dense to dense stellate indumentum. Petals 3.5–5.0 mm long, pink. Stamens: filaments pilose; anther apiculum absent or minute. Cocci glabrous or with few hairs.

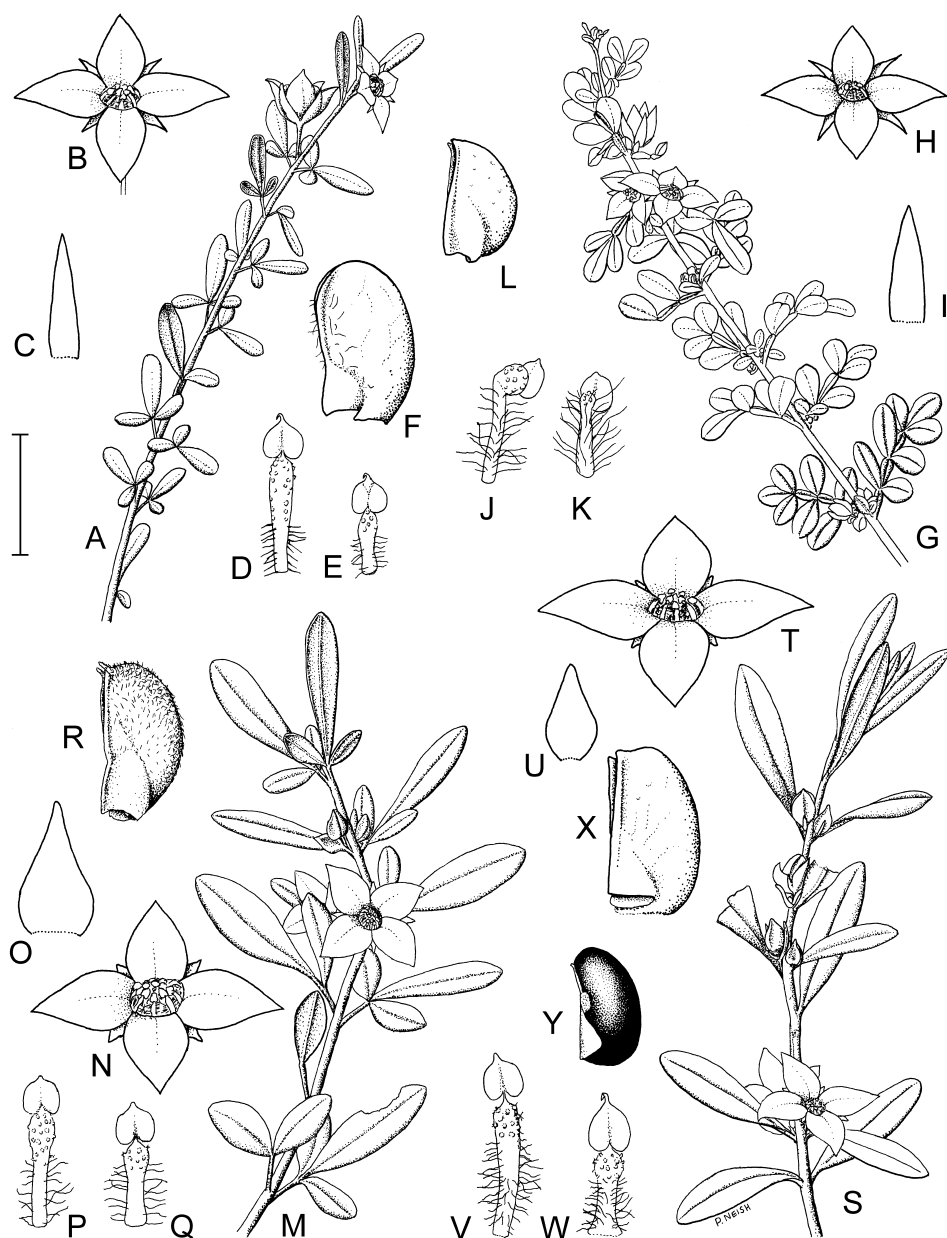


Figure 43. *Boronia*. A–F, *B. obovata*. A, habit; B, flower; C, sepal; D, antisepalous stamen, abaxial view; E, antipetalous stamen, abaxial view; F, coccus, lateral view (A, R.Henderson 961, BRI; B–F, M.Duretto 301, MEL). G–L, *B. quinkanensis*. G, habit; H, flower; I, sepal; J, antisepalous stamen, abaxial view; K, antipetalous stamen, abaxial view; L, coccus, lateral view (G, L, J.Clarkson 3712, BRI; H–K, J.Clarkson 9619, MEL). M–R, *B. duiganiae*. M, habit; N, flower; O, sepal; P, antisepalous stamen, abaxial view; Q, antipetalous stamen, abaxial view; R, coccus, lateral view (M, M.Thomas 137, BRI; N–Q, M.Duretto 319, MEL; R, R.Storey & G.Yapp 211, NSW). S–Y, *B. odorata*. S, habit; T, flower; U, sepal; V, antisepalous stamen, abaxial view; W, antipetalous stamen, abaxial view; X, coccus, lateral view; Y, seed (S, A.Bean 2194, BRI; T–W, M.Duretto 280, MEL; X–Y, S.Everist 8033, CANB). Scale bar: A, G, M, S = 16 mm; B, H, N, T = 8 mm; C, F, I, L, O, R, U, X, Y = 4 mm; D, E, J, K, P, Q, V, W = 2 mm. Drawn by P.Neish.

Known from a few collections from the type locality N of Mt Isa, NW Qld. Found in crevices on vertical sandstone cliff faces and scree slopes. Flowers May–June; fruits June.

Qld: Amphitheatre, 40 km (by road) N of Musselbrook Mining Camp, *R.W.Johnson 779* & *M.B.Thomas* (BRI).

A poorly known species distinguishable from other species in the section (as well as all other species of *Boronia*) by the following combination of characters: a dense stellate indumentum on the vegetative parts, the very narrow leaflets, and the sepals being $\frac{1}{2}$ – $\frac{3}{4}$ the length of the petals.



Subser. 2. Lanceolatae

Boronia subser. *Lanceolatae* Durretto, *Austrobaileya* 7: 667 (2008)

Type: *B. lanceolata* F.Muell.

B. lanceolata species-group, M.F.Durretto, *Muelleria* 12: 74 (1999).

B. foetida species-group, M.F.Durretto, *Muelleria* 12: 84 (1999).

Leaves petiolate or sessile, pinnate or simple; leaflets or simple leaves elliptic to narrowly elliptic, flat to slightly recurved (sometimes revolute when dry); midrib raised prominently abaxially, with secondary thickening; adaxial surface glabrous or sparsely to densely stellate-tomentose. Inflorescence 1–many-flowered. Sepals ovate-deltate or broadly so, acuminate to acute; abaxial surface stellate-tomentose. Filaments usually pilose, rarely glabrous (*B. lanceolata*).

A subseries of 7 species: 6 in central and E Qld and one in NW Qld and the ‘Top End’ of the N.T.

113. *Boronia duiganiae* Durretto, *Austrobaileya* 5: 292 (1999)

T: Consuelo, 16 miles SW of Rolleston Township, Qld, 1 Sept. 1961, *M.Lazarides* & *R.Storey 116*; holo: CANB; iso: AD, BRI, MEL, NSW.

Illustration: M.F.Durretto, *op. cit.* 290, fig. 14 L–Q.

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs with rays to 1 mm long. Leaves 1–5-foliolate, (6–) 13–45 mm long, (3–) 6–35 mm wide; petiole 2–8 mm long; rachis segments oval or triangular, 4–10 mm long, 1–2 mm wide; leaflets elliptic to oblanceolate, 5–31 mm long (terminal leaflets longer), 2.5–12 mm wide, obtuse at base, acute; adaxial surface with sparse to dense stellate indumentum. Inflorescence 1–3-flowered; peduncle 0.5–1 mm long; pedicels 1–2 mm long. Sepals 3.5–5 mm long, 2–3 mm wide, acuminate to acute. Petals 6–11 mm long, pink to white; adaxial surface with sparse to dense indumentum. Stamens: filaments pilose; anther apiculum large, reflexed. Cocci sparsely to moderately hairy. Fig. 43M–R.

Restricted to an area S and SE of Springsure and Rolleston on the Great Dividing, Carnarvon and Expedition Ranges, Qld. Found growing in open woodland or forest on sandstone. Flowers Feb.–Nov.; fruits Sept.–Nov.

Qld: 20 km from Springsure towards Rolleston, *M.F.Durretto 314* (BRI, CANB, MEL, NSW, PERTH); Ceres holding, 10.8 km (by road) W of Rolleston–Injune road at Christmas Ck Crossing, *P.N.Martensz 1082A* (CANB); near Dawson Hwy on Expedition Ra., 3 Aug. 1988, *R.E.Phillips* (BRI); Rolleston Rd, c. 13 miles [c. 20.8 km] from Springsure township, *R.Storey* & *G.Yapp 211* (AD, BRI, CANB, MEL, NSW); Mt Moffatt section of Carnarvon Natl Park, behind Tambo Bluff, *M.B.Thomas 137* (BRI).



A rare and poorly collected species. Distinguishable from *B. odorata* and *B. lanceolata* by having pinnate leaves that are sparsely to densely hairy on the adaxial surface, and from *B. obovata* by the 1–5-foliolate leaves and the ovate-deltate sepals that are tomentose on the abaxial surface.

114. *Boronia odorata* Durretto, *Austrobaileya* 5: 294 (1999)

T: Bull Creek Gorge, 15 km W of 'Castlevale', Qld, 3 Sept. 1990, *A.R.Bean* 2194; holo; BRI; iso: NSW.

Illustration: M.F.Durretto, *op. cit.* 290, fig. 14 R–X.

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs with rays to 0.05 (–0.1) mm long. Leaves usually simple (juvenile leaves trifoliolate); petiole 1–8 mm long; simple leaves and terminal leaflets elliptic, (5–) 12–40 mm long, 2–8 mm wide, obtuse at base, acute, with a very sparse to sparse stellate indumentum on adaxial surface (sometimes becoming glabrous); lateral leaflets 10–15 mm long. Inflorescence 1–7-flowered; peduncle 1–2 mm long; pedicels 1–7 mm long. Sepals 2–4.5 mm long, 1–2.5 mm wide, acute to slightly acuminate. Petals (4–) 6–11 mm long, pink to white; adaxial surface with a moderately dense indumentum. Stamens: filaments pilose; anther apiculum large, reflexed. Cocci glabrous or sparsely hairy. Fig. 43S–Y.

Restricted to an area approximately bounded by Springsure, Theodore, Surat, Mitchell and Tambo, central Qld. Found in open woodland on sandstone. Flowers Feb.–Oct.; fruits Apr.–Nov.

Qld: 6 miles [10 km] W of Mt Playfair Stn, Warrego District, *L.G.Adams* 1356 (AD, BRI, CANB); SE of Surat, Thomby Ra., *S.T.Blake* 21293 (BRI, CANB, NSW); E of car park and camping area, Isla Gorge Natl Park, *M.F.Durretto* 282 (BRI, CANB, MEL); Isla Gorge, c. 18 miles [c. 29 km] SW of Theodore, *S.L.Everist* 8033 (AD, BRI, CANB, NSW); Watershed 23 miles [37 km] ESE of Rolleston Township, *M.Lazarides* & *R.Storey* 112 (BRI, CANB, MEL, NSW).



The leaves of *B. odorata* have a strong tar-like odour. The majority of collections have only simple leaves and the trifoliolate juvenile leaves are produced for only a few nodes.

115. *Boronia lanceolata* F.Muell., *Fragm.* 1: 66 (1859)

T: M'Adam Ranges [Macadam Ra., N.T.], Oct. 1855, *F.Mueller s.n.*; lecto: K *n.v.* (photos AD, BRI, DNA, MEL, NSW), *fide* M.F.Durretto, *Nuytsia* 11: 341 (1997); isolecto: MEL.

Illustration: K.Brennan, *Wildfl. Kakadu* 34 (1986).

Erect shrub to 2.5 (–4) m tall. Branches stellate-tomentose. Stellate hairs with rays to 0.1 mm long. Leaves simple; petiole 3–16 mm long; lamina narrowly elliptic to elliptic or lanceolate, 8–90 mm long, 3–27 mm wide, cuneate to obtuse at base, acute, ±mucronate; adaxial surface nearly glabrous or stellate-tomentose. Inflorescence 3–15-flowered; peduncle 0.5–9 mm long; pedicels 0.5–5 mm long. Sepals 1–3 mm long, 1–2 mm wide, acuminate. Petals 2–5.5 mm long (–7 mm when in fruit), pink to white; adaxial surface with a sparse to moderately dense indumentum. Stamens: filaments glabrous or with 1–3 hairs; anther apiculum absent or minute. Cocci with a few hairs. Seeds shiny or dull.

Occurs from the Macadam Ra. N.T., eastwards across the 'Top End' including off-shore islands, to Mornington Is. and Westmoreland, NW Qld. Found on sandstone, sand or rarely limestone in monsoon forest, open woodland and heath communities. Flowers and fruits May–Feb.

N.T.: Vicinity of Woolanang HS, *L.A.Craven* & *C.Dunlop* 6686 (CANB, DNA); E end of Melville Is., 1.5 km N of Soldier Point, *P.A.Fryxell et al.* 4916 (CANB, DNA, MEL); Katherine Gorge, 15 miles [c. 24 km] E of Katherine, *M.Lazarides* 7031 (AD, BRI, DNA, MEL); Angyowmandja Ck, Groote Eylandt, *J.Russell-Smith* 2867 (DNA). Qld: Hells Gate, *S.Jacobs* 1525 (BRI, CANB, NSW).



The most common and widespread *Boronia* in the N.T. Considerable variation in the size of the leaves, flowers, fruit and seed exists. Leaves also vary in shape, from broadly lanceolate-elliptic to narrowly elliptic. The variation in size and shape appears to be continuous. The adaxial leaf surface may be densely hairy or glabrous and these two forms are broadly sympatric but rarely have been collected from the same population.

116. *Boronia jensziae* Durretto, *Austrobaileya* 5: 292 (1999)

T: c. 300 m S of Banksia Bay turn off along the East Coast Trail between Little Ramsey and Zoe Bays, Hinchinbrook Is., Qld, 29 May 1993, *M.F.Durretto* 406; holo: MEL; iso: AD, BRI, CANB, DNA, K, MEL, NSW.

B. sp. 'Hinchinbrook Is.', M.B.Thomas & W.J.F.McDonald, *Rare Threatened Pl. Queensland* 46 (1989).

B. sp. 1 (Hinchinbrook Island; S.L.Everist 7786), J.D.Briggs & J.H.Leigh, *Rare Threatened Austral. Pl.* 167 (1996).

B. sp. (Hinchinbrook Is. S.L.Everist 7786), P.I.Forster in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Illustrations: K.A.W.Williams, *Nat. Pl. Queensland* 2: 58 (1984), as *Boronia sp.*; M.F.Durretto, *op. cit.* 283, fig. 11 A–F.

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs with rays to 0.1 (–0.25) mm long. Leaves simple; petiole 2–4 mm long; lamina elliptic, (10–) 15–45 mm long, (4–) 6–11.5 mm wide, strongly attenuate at base, acute; adaxial surface glabrous or with few hairs along midrib. Inflorescence 1 (–3)-flowered; peduncle 0.5–1 mm long; pedicel 2–5 mm long. Sepals 4 mm long, 2.5 mm wide, acuminate. Petals 5.5–7 mm long (–8.5 mm when in fruit), pink to white; adaxial surface with sparse indumentum of simple hairs. Stamens: filaments pilose; anther apiculum minute to large, reflexed. Style glabrous. Cocci glabrous. Fig. 44A–F.

Restricted to Hinchinbrook Is., NE Qld. Found in open and closed woodland and heath, often near soaks amongst sedges, from sea level to over 800 m. Flowers Feb.–Sept.; fruits Aug.–Sept.

Qld: Zoe Bay, Hinchinbrook Is., *S.T.Blake* 18857 (BRI, CANB); Mt Bowen, Hinchinbrook Is., *R.J.Cumming* 11217 (BRI); Mt Diamantina, *R.J.Cumming* 11273 (BRI); on the East Coast Trail between Banksia and Zoe Bays, Hinchinbrook Is., *M.F.Durretto* 402 (BRI, CANB, MEL, NSW, PERTH); S end of Missionary Bay, N end of Hinchinbrook Is., *S.L.Everist* 7786 (BRI, CANB, MELU, NSW).

Can be distinguished from the closely related *B. excelsa*, *B. foetida* and *B. bella* by being pilose on the adaxial surface of the petals. A restricted and poorly collected species that appears to be widespread on Hinchinbrook Is.

**117. *Boronia excelsa* Durretto, *Austrobaileya* 5: 284 (1999)**

T: State Forest 144, Mt Windsor Tableland, Qld, 11 July 1995, *P.I.Forster* 17248 & *S.J.Figg*; holo: BRI; iso: AD, BRI (2 specimens), CANB, DNA, K, L, MEL (4 specimens), MO, NSW, PERTH, QRS.

B. sp. (Mt Windsor Tableland P.I.Forster+ PIF15225), P.I.Forster, in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Illustration: M.F.Durretto, *op. cit.* 283, fig. 11 G–L.

Erect shrub to 3 m tall. Branches stellate-tomentose. Stellate hairs with rays to 0.1 (–0.25) mm long. Leaves sessile, narrowly elliptic, 14–60 mm long, 2–6 mm wide, strongly attenuate at base, acute; adaxial surface glabrous or with few hairs along midrib. Inflorescence 1 (–3)-flowered; peduncle 0.5 mm long; pedicel 2–4 mm long. Sepals 3 mm long, 1.5 mm wide, acuminate to acute. Petals 4.5–5 mm long, pink to white; adaxial surface glabrous or with few simple hairs. Stamens: filaments pilose; anthers apiculum absent. Style glabrous. Cocci glabrous. Fig. 44G–L.

Restricted to the Mt Windsor Tableland, NE Qld. Found growing on granite in wet sclerophyll forest, and along rain forest edges above 1000 m. Flowers July–Aug.

Qld: Spencers Ck, downstream c. 2 km from Forestry Camp, Mt Windsor Tableland, Whypalla State Forest, *P.Hind* 56791 (NSW); SFR144 (Mt Windsor Tablelands), *B.Hyland* 4784 (BRI, QRS).

A rare species that is known only from a few collections. Distinguished from the other members of the subseries by having sessile, narrow leaves.



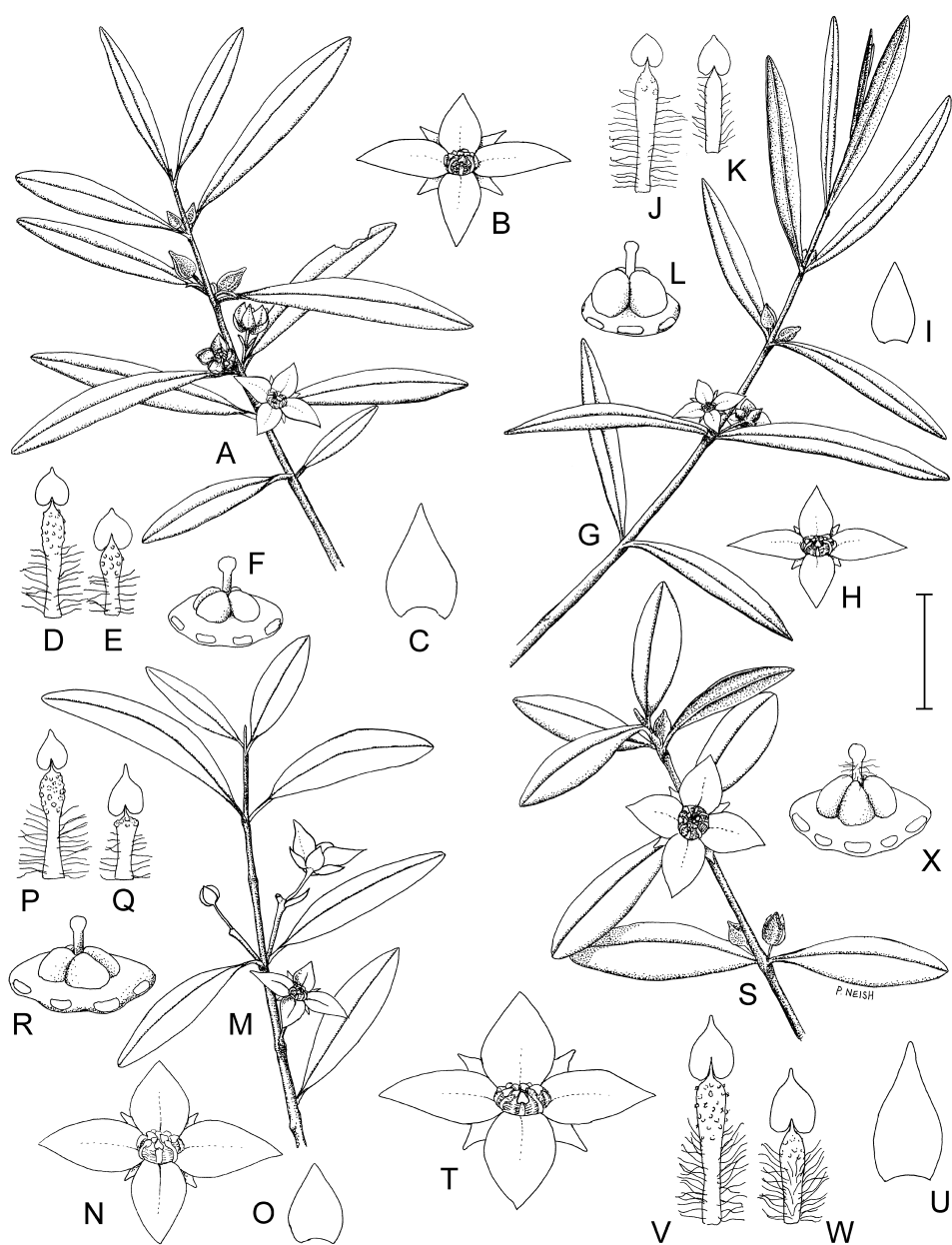


Figure 44. *Boronia*. A–F, *B. jensziae*. A, habit; B, flower; C, sepal; D, antisepalous stamen, abaxial view; E, antipetalous stamen, abaxial view; F, disc and gynoecium (A–F, M.Durette 406, MEL). G–L, *B. excelsa*. G, habit; H, flower; I, sepal; J, antisepalous stamen, abaxial view; K, antipetalous stamen, abaxial view; L, disc and gynoecium (G–L, P.Forster 17248, MEL). M–R, *B. foetida*. M, habit; N, flower; O, sepal; P, antisepalous stamen, abaxial view; Q, antipetalous stamen, abaxial view; R, disc and gynoecium (M, P.Forster 7483, MEL; N–R, M.Durette 263, MEL). S–X, *B. bella*. S, habit; T, flower; U, sepal; V, antisepalous stamen, abaxial view; W, antipetalous stamen, abaxial view; X, disc and gynoecium (S–X, M.Durette 269, MEL). Scale bar: A, G, M, S = 16 mm; B, H, N, T = 8 mm; C, I, O, U = 4 mm; D–F, J–L, P–R, V–X = 2 mm. Drawn by P.Neish.

118. *Boronia foetida* Durretto, *Austrobaileya* 5: 285 (1999)

T: Mt Walsh, 7 km S of Biggenden, Qld, 28 Sept. 1990, *P.I.Forster* 7483; holo: MEL; iso: AD, BRI, CANB, K n.v., NSW, PERTH n.v.

B. sp. (Mt Walsh P.I.Forster+ PIF17253), P.I.Forster, in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Illustration: M.F.Durretto, *op. cit.* 283, fig. 11 M–R.

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hairs with rays to 0.1 (–0.25) mm long. Leaves simple; petiole 2–7 mm long; lamina elliptic to ±lanceolate, 20–52 mm long, 7–14 mm wide, attenuate at base, acute; adaxial surface glabrous or with few hairs along midrib. Inflorescence 1 (–3)-flowered; peduncle 2–2.5 mm long; pedicel 7–13 mm long. Sepals 2–4 mm long, 1.5–3 mm wide, acuminate. Petals 6–7 mm long (–8 mm when in fruit), pink to white; adaxial surface glabrous or with few simple hairs. Stamens: filaments pilose; anther apiculum large, reflexed. Style glabrous. Cocci glabrous. Fig. 44M–R.

Restricted to Mt Walsh, S of Biggenden, SE Qld. Found in a variety of habitats including montane heath and densely forested gullies. Flowers and fruits May–Sept.

Qld: gully just below saddle between Mt Walsh and The Bluff, Mt Walsh Natl Park, *M.F.Durretto* 263 (BRI, MEL); Mount Walsh Natl Park, c. 15 km SW of Biggenden, 3 Sept. 1973, *J.W.Randell s.n.* (BRI); Mt Walsh, c. 6.5 km S of Biggenden, *I.R.Telford* 5316 (BRI, CANB).

Leaves, when crushed, give off a foul odour that has been likened to dead possum. Distinguishable from *B. bella* by the smaller flowers and hairs, and glabrous styles.

**119. *Boronia bella* Durretto, *Austrobaileya* 5: 287 (1999)**

T: Upper Oaky Ck, Many Peaks Ra., Qld, 5 Sept. 1992, *M.Durretto* 269, *M.Bayly & N.Marsh*; holo: MEL; iso: AD, BRI, CANB, DNA, K, MEL, NSW.

B. sp. (Many Peaks Range I.R.Telford CBG 7702560), P.I.Forster, in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Illustrations: M.F.Durretto, *Austrobaileya* 5: 283, fig. 11 S–X (1999); M.F.Durretto, *Austral. Pl.* 23 (183): 92 (2005).

Erect shrub to 2 m tall. Branches stellate-tomentose. Stellate hair rays (0.1–) 0.25–0.5 mm long. Leaves simple; petiole 2–4 mm long; lamina elliptic, 18–35 mm long, 3.5–10 mm wide, attenuate at base, acute; adaxial surface glabrous or with few hairs along midrib. Inflorescence 1 (–3)-flowered; peduncle 0.5–2 mm long; pedicel 2–7 mm long. Sepals 4.5–5.5 mm long, 2–2.5 mm wide, acuminate. Petals 7–8 mm long (–12 mm when in fruit), pink to white; adaxial surface glabrous or nearly so. Stamens: filaments pilose; anther apiculum large, erect or reflexed. Style hairy. Cocci glabrous or with a few scattered hairs. Fig. 44S–Y.

Restricted to Many Peaks Ra., near Gladstone, Qld. Grows in eucalypt forest and woodland on granite derived soils. Flowers May–Sept.; fruits Sept.

Qld: SF521, Many Peaks Ra., *P.I.Forster* 16255 (MEL); Many Peaks Ra., Mt Castletower, *I.R.Telford* 5479 (BRI, CANB).

A rare and poorly collected species that is closely related to *B. foetida* from which it can be distinguished by the larger flowers and hairs, and the hirsute styles. Like *B. foetida*, the leaves give off a foul odour when crushed.



Subser. 3. Rosmarinifoliae

Boronia subser. *Rosmarinifoliae* Duretto, *Austrobaileya* 7: 668 (2008)

Type: *B. rosmarinifolia* A.Cunn. ex Endl.

B. rosmarinifolia species-group, M.F.Duretto, *Muelleria* 12: 78 (1999).

Leaves sessile, simple, elliptic to linear, flat to revolute; midvein raised slightly abaxially, without secondary thickening; adaxial surface glabrous or with few hairs (*B. glabra* very rarely densely hairy). Inflorescence 1 (–3)-flowered. Sepals ovate-deltate to broadly ovate-deltate, acute or rarely acuminate; abaxial surface stellate-tomentose. Staminal filaments pilose.

A subseries of 6 species native to southern Qld and N.S.W. The subseries (except *B. glabra*) was the subject of a phenetic analysis of morphological characters (M.F.Duretto, *Austrobaileya* 5: 263–298 (1999)).

120. *Boronia rosmarinifolia* A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837)

B. ledifolia var. *rosmarinifolia* (A.Cunn. ex Endl.) Benth., *Fl. Austral.* 1: 314 (1863). T: Peels Is., Moreton-bay [Qld], 1824, *A.Cunningham s.n.*; lecto: W n.v. (photo MEL), *fide* M.F.Duretto, *Muelleria* 17: 121 (2003).

Illustrations: L.Cronin, *Concise Austral. Fl.* 80 (1989); M.F.Duretto, *Austrobaileya* 5: 276, fig. 9 A–F (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 271 (2002).

Erect or spreading shrub to 1 m tall. Branches terete to slightly quadrangular, stellate-tomentose. Stellate hairs with rays to 0.1 mm long. Leaves elliptic to obovate, 6–30 mm long, 1–4.5 mm wide, obtuse; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs; juvenile leaves to 48 mm long and 10 mm wide. Peduncle to 0.5 mm long; pedicel 1–6 mm long. Sepals ovate-deltate, 2–4 mm long, 1.5–2.5 mm wide, acute. Petals 5–7.5 mm long (–10 mm when in fruit), 3–4 mm wide (–6 mm when in fruit), pink to white; abaxial surface with sparse to moderately dense simple indumentum. Anther apiculum large, reflexed. Style glabrous. Cocci glabrous or very rarely densely hairy. *Rosemary Boronia*, *Forest Boronia*, *Possum Boronia*.

Found in near-coastal areas from Bundaburg, Qld, to Grafton, N.S.W. Common in heath and woodland communities on well drained sand and sandstone-derived soils. Flowers and fruits May–Dec.

Qld: W side of highway, Sunshine Beach, 2 miles [c. 3 km] S of Noosa, *P.Baxter & B.Lebler 1132* (CANB, MEL, NSW); Mt Gravatt University, Brisbane, *T.J.McDonald 233* (BRI, CANB); Elliot R., near Bundaberg, *I.Olsen 330* (NSW); 2.8 km S of Rainbow Beach, Cooloola Natl Park, *J.H.Ross 3196* (AD, MEL). N.S.W.: 9 km from Grafton–Coaldale road on Stockyard Ck Rd, *K.Hill 2757* (NSW).



Most specimens of *B. rosmarinifolia* have glabrous fruit but very rarely the fruit is densely hairy as it is in *B. forsteri* and *B. glabra*.

121. *Boronia splendida* Duretto, *Austrobaileya* 5: 278 (1999)

T: Falls Ck, 4 km NW of Haldon, Qld, 2 Oct. 1988, *P.I.Forster 4762 & L.H.Bird*; holotype: MEL; isotype: AD, BISH n.v., BRI, CANB, K n.v., MO n.v.

Illustration: M.F.Duretto, *op. cit.* 276, fig. 9 G–L.

Erect shrub to 2.5 m tall. Branches slightly quadrangular, stellate-tomentose. Stellate hairs with rays to 0.1 mm long. Leaves linear to narrowly elliptic, 9–50 mm long, 1–2.5 mm wide, attenuate at base, revolute, obtuse; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Peduncle to 0.5 mm long; pedicel 2–6 mm long. Sepals ovate-deltate, 2.5–4.5 mm long, 1.75–2.5 mm wide, acute. Petals 6–10.5 mm long, 3–4 mm wide, pink to white; abaxial surface with a moderately dense simple indumentum. Anther apiculum usually large, reflexed. Style pilose or glabrous. Cocci glabrous. *Splendid Boronia*.

Occurring in Qld between Chinchilla and Dalby, with most collections originating from the Kogan area and isolated collections from the Gatton/Helidon and Mundubbera areas. Usually found on sandstone-derived soils in eucalypt and acacia woodland. Flowers Mar.–Nov.; fruits Nov.

Qld: Stalworth Rd, N of Proston, *T.Bean* 10670 (MEL); Mundubbera, 1.5 km W of Mimosa HS, *M.F.Duretto* 1322 (BRI, CANB, MEL); 4.8 km E of Tara turn off, and 5.3 km E of Kogan on Condamine Hwy, near dog fence, *M.F.Duretto* 337 (AD, BRI, CANB, MEL, NSW, PERTH); 8 km W of Manor HS, Boondooma, *P.I.Forster* 4647 (BRI, CANB).

A rare and poorly collected species, distinguishable from *B. palasepala* and *B. beeronensis* by the long, narrow leaves with strictly revolute margins, and from *B. rosmarinifolia* by the larger flowers.



122. *Boronia beeronensis* Duretto, *Muelleria* 17: 122 (2003)

T: Beeron Holding, Qld, 15 Aug. 1999, *M.F.Duretto* 1330, *P.I.Forster* & *P.Grimshaw*; holo: MEL; iso: BRI, CANB, K, MEL.

Illustrations: *M.F.Duretto, Muelleria* 17: 102 fig. 12 I–J (2003); *M.F.Duretto, Austral. Pl.* 23 (183): 92 (2005).

Erect shrub to 1 m tall. Branches slightly quadrangular, stellate-tomentose. Stellate hairs with rays to 0.25 (–0.5) mm long. Leaves linear to narrowly elliptic, 10–33 mm long, 2–4 mm wide, attenuate at base, recurved to revolute, acute; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Peduncle to 0.5 mm long; pedicel 3–4 mm long. Sepals broadly ovate-deltate, 4.5–6 mm long, 3–4 mm wide, acute to slightly acuminate. Petals 8–15 mm long, (4.5–) 7–8 mm wide, pink, occasionally white; abaxial surface with moderately dense simple pubescence. Anther apiculum recurved. Style pilose. Cocci densely pilose (not seen at maturity). *Beeron Boronia*.

Restricted to a granite range at ‘Beeron’ Holding, Qld. Found growing on granite-derived soils in *Eucalyptus/Corymbia* woodland at the base of hills to granite pavements with *Triodia* at the summit. Flowers and fruits Aug.–Oct.

Qld: Beeron Holding, 5 km W of Toondahra HS, *P.I.Forster* 11202 (BRI, MEL); Beeron Holding, *P.I.Forster* 19603 (BRI, MEL).

This rare species can be distinguished from *B. splendida* by the wider leaves, larger sepals and pilose fruits; from *B. rosmarinifolia* by the larger flowers and pilose fruits; and from *B. palasepala* and *B. forsteri* by the pilose style, larger flowers and narrower leaves.



123. *Boronia palasepala* Duretto, *Austrobaileya* 5: 280 (1999)

T: Coomlinglah State Forest 28, Qld, 6 Sept. 1992, *M.F.Duretto* 277, *M.Bayly* & *N.Marsh*; holo: MEL; iso: AD, BRI, CANB, HO, K, MEL (2 specimens), NSW, PERTH.

Illustration: *M.F.Duretto, op. cit.* 276, fig. 9 M–R.

Erect shrub to 2 m tall. Branches slightly quadrangular, stellate-tomentose. Stellate hairs with rays to 0.25–0.5 mm long. Leaves elliptic to obovate, 14–42 mm long, 2–6 mm wide, attenuate at base, flat or recurved (sometimes revolute on drying), obtuse; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Peduncle to 0.5 mm long; pedicel 1–5 mm long. Sepals broadly ovate-deltate, (3–) 4–6 mm long, (2–) 3–4 mm wide, acuminate to acute. Petals (6–) 8–10.5 mm long, (3.5–) 4.5–6 mm wide, pink to white; abaxial surface with a moderately dense simple indumentum. Anther apiculum absent or minute. Style glabrous. Fruit not seen.

Occurs from Biloela to SW of Monto, Qld. Found growing on sandstone in eucalypt open forest or woodland. Flowers July–Sept.

Qld: Coomanglah State Forest 28, *P.I.Forster 6906* (BRI, CANB, MEL, NSW); Coomanglah State Forest 28, boundary between compartments 18 & 33, 14 km SW of Monto, *P.Martensz 1014* (CANB); 15 km NE of Biloela, 3 km N of Callide dam, *E.J.Thompson BIL10* (AD, PERTH).

A poorly collected and rare species. Can be distinguished from other members of the subseries by the large flowers and hairs, the wide and recurved leaves (becoming revolute upon drying), the broad sepals, and by the minute or absent anther apiculum.



124. *Boronia forsteri* Durretto, *Austrobaileya* 5: 280 (1999)

T: 7 km past Glenhaughton HS on Mapala Rd, SF46, Qld, 10 Sept. 1992, *P.I.Forster 11235* & *P.R.Sharpe*; holotype: MEL; isotype: BRI, CANB, NSW.

B. sp. (Robinson Gorge *P.I.Forster*+ *PIF11235*), *P.I.Forster* in R.J.F.Henderson (ed.), *Queensland Pl.: Names Distrib.* 185 (1997).

Illustration: M.F.Durretto, *op. cit.* 276, fig. 9 S–X.

Erect shrub to 1 (–2) m tall. Branches quadrangular, stellate-tomentose. Stellate hairs with rays to 0.1 mm long. Leaves elliptic to obovate, 6–21 mm long, 0.5–4.5 mm wide, attenuate at base, flat or slightly recurved, obtuse; abaxial surface with a sparse to moderately dense layer of multiangular stellate hairs and a dense layer of smaller planar stellate hairs. Peduncle to 0.5 mm long; pedicel 1.5–3 mm long. Sepals ovate-deltate, 2–2.5 (–3) mm long, 1–1.5 mm wide, acute. Petals 4–6 mm long (–8 mm when in fruit), 2–3 mm wide (–5 mm in fruit), pink; abaxial surface with sparse simple indumentum. Anther apiculum large, erect. Style glabrous. Cocci densely hairy. *Forster's Boronia*.

Occurs in the Chesterton, Carnarvon and Expedition Ranges, Central Highlands, Qld. Found in dissected sandstone country in eucalypt open woodland and forest. Flowers and fruits Sept.–Oct.

Qld: Robinson Gorge Natl Park, N end in headwaters of Glenhaughton Ck in Murphy Ra., *P.I.Forster 11429* (BRI, MEL); 11.8 km N of 'Yoothapinna', Injune District, *C.Gittens 2745* (BRI, NSW); Mt Moffatt section of Carnarvon Natl Park, behind Tombs Bluff, *M.B.Thomas 138* (CANB).

A rare and poorly collected species. Distinguished from *B. glabra* (Qld specimens) by the dense indumentum on the abaxial surface of the leaves, and from other members of the subseries by the combination of smaller leaves and flowers, erect anther apiculum, and the hairy fruit.



125. *Boronia glabra* (Maiden & Betche) Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 411 (1928)

B. ledifolia var. *glabra* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 23: 773 (1898). T: Harvey Ranges near Peak Hill, N.S.W., Sept. 1898, *J.H.Maiden s.n.*; lectotype: NSW, *fide* M.F.Durretto, *Muelleria* 12: 83 (1999); isotype: K n.v., MEL.

B. sp. B (aff. rosmarinifolia), S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 191 (1981).

Illustrations: K.A.W.Williams, *Nat. Pl. Queensland* 1: 33 (1979); G.M.Cunningham *et al.*, *Pl. Western New South Wales* 444 (1981); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 271 (2002).

Erect shrub to 1.5 (–3) m tall. Branches terete to slightly quadrangular, stellate-tomentose. Stellate hairs with rays to 0.1 mm long. Leaves elliptic to obovate, (2.5–) 5–35 mm long, 0.5–7 mm wide, attenuate at base, flat to revolute, obtuse, glabrous or with a few scattered hairs (rarely with dense minute planar stellate hairs). Peduncle 0.5–2 mm long; pedicel 1.5–6 mm long. Sepals ovate-deltate, 2.5–3 mm long, 1–2 mm wide, acute. Petals 4–7 mm long (–10 mm in fruit), 2.5–4 mm wide, pink to white; abaxial surface with moderately dense to dense simple indumentum. Anther apiculum large, erect or reflexed. Style glabrous. Cocci densely hairy. *Sandstone Boronia*, *Smooth Boronia*, *Blotched Boronia*.

Common from Eidsvold, Qld, to Cowra and Grenfell, N.S.W. Found in open forest and woodland on sandstone, granite or sand. Flowers May–Dec.; fruits Sept.–Dec.

Qld: Wondul Ra., N of Inglewood, *P.I. Forster* 9784 (MEL); 16 miles [c. 25.6 km] SSW of Cracow Township, *M. Lazarides* 6945 (AD, CANB, MEL); Barakula State Forest, 50 km N of Chinchilla on Auburn Rd, 1 km N of Little Hellhole Ck, *J.H. Ross* 3081 (BRI, CANB, MEL). N.S.W.: SW corner of Weddin Range [Mountains] Natl Park, W of Grenfell, *A.D. Chapman* 1382 (CANB); 76 km SSW of Narrabri by road towards Coonabarrabran, *R. Coveny* 9037 (CANB, MELU, NSW).

A rare pubescent-leaved form (called *B. sp. aff. rosmarinifolia* B by Jacobs & Pickard, *op. cit.*) is found in the Pilliga Scrub near Coonabarabran. This form is sympatric with the typical (glabrous) form but the two apparently occupy different local habitats (see Duretto *op. cit.*, and citations therein).



Subser. Incertae cedis

126. *Boronia ledifolia* (Vent.) DC., *Prodr.* 1: 722 (1824)

Lasioptalum ledifolium Vent., *Jard. Malmaison* 1: 59 (1804). T: not designated.

Eriostemon paradoxus Sm. in A. Rees, *Cycl.* 13 No. 6 (1809); *B. ? paradoxa* (Sm.) DC., *Prodr.* 1: 722 (1824). T: N.S.W., 1791, *White s.n.*; syn: LINN *n.v.* (photo MEL); Port Jackson, N.S.W., 1795, *White s.n.*; syn: LINN *n.v.* (2 specimens, photos MEL).

B. triphylla Sieber ex Rchb., *Iconogr. Bot. Exot.* 1: 53 t. 73 (1825); *B. triflora* Paxton, *Paxton's Mag. Bot.* 14: 68 (1848), *orth. var.*; *B. ledifolia* var. ? *triphylla* (Sieber ex Rchb.) Benth., *Fl. Austral.* 1: 314 (1863). T: Sieb. Fl. Nov. Holl. exsicc. no. 297; isosyn: MEL 258131, MEL 258134 right hand spec., MEL 258364 left hand spec., TCD.

B. triphylla Sieber ex Spreng., *Syst. Veg.* 4, *Cur. Post.* 148 (1827); *nom. illeg. non* Sieber ex Rchb. T: Nova Hollandia, Sieber 297; isosyn: MEL 258131, MEL 258134 right hand spec., MEL 258364 left hand spec., TCD; *ibid.*, Sieber 531; isosyn: MEL 258134 left hand spec., MEL 258364 right hand spec.

B. triphylla var. *latifolia* Lindl., *Edward's Bot. Reg.* 27 t. 47 (1841). T: "New Holland shrub. The accompanying drawing was made in the Nursery of Messrs. Loddiges"; *n.v.*, *fide* M.F. Duretto, *Muelleria* 12: 57 (1999).

B. ledophylla F. Muell., *Fragm.* 1: 67 (1859); based on *B. ledifolia sensu* F.G. Bartling in J.G.C. Lehmann, *Pl. Preiss.* 2: 226 (1848). T: L. Preiss *s.n.*; syn: LUND *n.v.*, *fide* M.F. Duretto, *loc. cit.*

B. ledifolia var. *pinnata* Domin, *Biblioth. Bot.* 89: 284 (1926). T: Emmaville, N.S.W., June 1904, J.L. Boorman *s.n.*; isosyn: MEL.

B. ledifolia var. *normalis* Domin, *Biblioth. Bot.* 89: 838 (1926), *nom. inval.* (type var.).

B. whitei Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 405 (1928). T: Tent Hill, New England, N.S.W., 1903, E.C. Andrews *s.n.*; syn: NSW; Emmaville, N.S.W., June 1904, J.L. Boorman *s.n.*; syn: MEL; Torrington, N.S.W., July 1907, R.H. Cambage 1609; syn: *n.v.*; Torrington, N.S.W., 29 Sept. 1907, R.H. Cambage 1715; syn: BRI, MEL, NSW; Bismuth, via Torrington, N.S.W., Aug. 1912, A. McNutt *s.n.*; syn: BRI, NSW.

B. rosmarinifolia var. *albiflora* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 412 (1928). T: Hill Top, N.S.W., 20 July 1914, E. Cheel *s.n.*; syn: NSW; Bell, N.S.W., Sept. 1914, H. Gregson *s.n.*; syn: NSW; Mt Wilson (halfway from Bell), N.S.W., 19 Dec. 1914, J.H. Maiden *s.n.*; syn: NSW; 2 miles NW of Cowan Station, N.S.W., 8 Sept. 1919, W.F. Blakely & D.W.G. Shiress *s.n.*; syn: NSW.

B. triphylla var. *flore-plena* Cheel, *J. Proc. Roy. Soc. New South Wales* 61: 412 (1928). T: Lindfield, N.S.W., 9 Aug. 1913, E.G. Jacobs *s.n.*; *holo*: NSW.

Illustrations: A.M. Blombery, *Austral. Native Pl.* 178, fig. 102A; 348, fig. 148D (1980); A. Fairley & P. Moore, *Nat. Pl. Sydney* 233, t. 805 (1989); G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 270 (2002).

Erect shrub to 2.5 m tall. Branches stellate-tomentose. Stellate hairs with rays to 0.3 mm long. Leaves 1–11-foliolate, as the plant ages simple leaves only are produced; petiole 2–11 mm long; rachis segments 2–7 mm long; pinnate leaves 3–50 mm long, 5–45 mm wide; leaflets and simple leaves elliptic to narrowly elliptic, 3–43 mm long, 1–7 mm wide, attenuate, revolute to flat, acute to obtuse, with sparse stellate indumentum on adaxial surface. Inflorescence 1–5-flowered; peduncle 1–10 mm long; pedicels (4–) 6–11 mm long. Sepals ovate-deltate to elliptic, 2–3.5 (–4.5) mm long, 1.25–2.5 (–3) mm wide, acute; abaxial surface stellate-tomentose. Petals (5–) 8.5–12 mm long, pink, rarely white; abaxial surface

with moderate to dense stellate indumentum. Stamens: filaments pilose; anther apiculum absent or minute. Style glabrous. Cocci glabrous or hirsute. *n* = 16, S.Smith-White, *Austral. J. Bot.* 2: 291 (1954); F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). *Sydney Boronia*, *Showy Boronia*, *Ledum Boronia*.

Occurs in N.S.W. from Torrington to Eden, especially in the near-coastal areas S from Sydney, and disjunctly in Vic. N of Orbost. Found in heath and dry sclerophyll forest on sandstone and granite. Flowers June–Dec.; fruits Oct.–Jan.

N.S.W.: 21 km E of Wollombi on the Mt Yengo Rd, *R.Coveny 5588* (NSW); 3 miles [5 km] S of Torrington towards Tent Hill, 19 Sept. 1966, *M.E.Phillips* (CANB, MEL); Budawang Natl Park, 22 km ESE of Braidwood, 4 km SE of Mt Budawang, *I.R.Telford 8823* (CANB, NSW); Prominence 1.9 km N of Coondella Trig Point, c. 16 km WSW from Moruya, *N.G.Walsh 1869* (MEL, NSW). Vic.: 'The Playground' near junction of Tambo and Tinbarra Rivers, c. 12 miles [c. 19 km] W of Buchan, Nov. 1963, *J.Galbraith* (MEL).



Boronia ledifolia displays a wide range of leaf forms. Seedling leaves are simple, with later leaves becoming pinnate, often trifoliolate. As plants age further they produce simple leaves again; this is the typical form. The species may intergrade with *B. angustisepala* N of Sandy Hollow (W of Muswellbrook), N.S.W. Common in N.S.W. but considered restricted and vulnerable in Vic.

127. *Boronia chartacea* P.H.Weston, *Telopea* 4: 123 (1990)

T: Newry State Forest, 1.9 km S of Urunga, N.S.W., 13 Sept. 1972, *R.G.Coveny 4603*; holo: NSW; iso: AD, BRI, CANB, K *n.v.*, MEL, NSW (2 specimens), PERTH *n.v.*

B. sp. C (aff. *rosmarinifolia*), S.W.L.Jacobs & J.Pickard, *Pl. New South Wales* 191 (1981).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 271 (2002).

Erect shrub to 2.8 m tall. Branches with sparse to dense stellate indumentum. Stellate hairs with rays to 0.25 mm long. Leaves simple; petiole 0.5–2 mm long; lamina elliptic to narrowly elliptic, 8–45 mm long, 1.5–5 mm wide, attenuate at base, obtuse, chartaceous (on drying); margins finely glandular-warty, flat to revolute (on drying); adaxial surface glabrous or nearly so, glandular-warty. Flowers solitary; peduncle c. 1 mm long; pedicel 4–6 mm long. Sepals ovate-deltate, 2–2.5 mm long, 1–1.5 mm wide, acute; abaxial surface stellate-tomentose. Petals 6–9 mm long, pink; abaxial surface with a moderate to dense stellate indumentum. Stamens: filaments pilose; anther apiculum absent or minute. Style glabrous. Cocci with a few scattered hairs. *n* = 16, F.Shan *et al.*, *Bot. J. Linn. Soc.* 142: 311 (2003). Fig. 42J–M.

Occurs in the Copmanhurst–Grafton and Wauchope areas, N.S.W. Found along creeks in wet and dry sclerophyll woodland and riparian vine thicket over sandstone and granite. Flowers and fruits Aug.–Jan.

N.S.W.: Cabbage Tree Ck, Wimperorree near Casino, *S.Benson 124* (NSW); Pie Mountain Ck, Kippara State Forest, 23 Dec. 1986, *D.Binns* (NSW); Whiteman Ck and Coaldale Rd, c. 20 miles [32 km] NNW of Grafton, 11 Aug. 1969, *K.Grieves* (NSW); Wilson R. above Wild Bull Picnic area, *T. & J.Whaite 3680* (NSW); On Bril Bril Ck at North Snowy Rd, Bellangry State Forest 3117, *T. & J.Whaite 4468* (CANB, NSW).



Can be distinguished from other species of the subsection by the thin, papery (on drying), petiolate, simple leaves with glandular margins.

128. *Boronia hapalophylla* Durretto, F.J.Edwards & P.G.Edwards, *Telopea* 10: 705 (2004)

T: Near Grafton, N.S.W., 16 Sept. 2003, *F.J.Edwards A*; holo: HO; iso: BRI, NSW.

Illustration: M.F.Durretto *et al.*, *Telopea* 10: 707, fig. 1 (2004).

Erect shrub to 3 m tall. Branches with moderately dense stellate indumentum. Stellate hairs with rays to 0.5 mm long. Leaves simple, sessile or petiolate; petiole to 1.5 mm long; lamina narrowly elliptic to elliptic to lanceolate, (13–) 18–50 (–70) mm long, (1–) 3.5–12 mm wide,

strongly attenuate, slightly recurved to revolute; adaxial surface with sparse to moderately dense stellate indumentum. Inflorescence 1–5-flowered; peduncle to 5 mm long; pedicels 2–6.5 mm long. Sepals broadly ovate-deltate, (4–) 5–10 mm long, 3–4.5 mm wide (–7 mm with fruit), acuminate; abaxial surface stellate-tomentose. Petals 6–15 mm long, pink; abaxial surface with dense stellate indumentum. Stamens: filaments pilose; anther apiculum large. Style glabrous or with few hairs. Cocci glabrous or hirsute.

Restricted to the Grafton–Glenreagh area, N.S.W. Found in dry sclerophyll woodland on sandstone. Flowers and fruits mainly Aug.–Sept.

N.S.W.: Near Grafton, *P.G. & F.J. Edwards* 2–3 (HO, NSW); N of Glenreagh, *I.R. Telford* 12767 & *J.J. Bruhl* (HO, NE).

A rare species of uncertain affinities in the series that can be distinguished from other species in the Grafton–Glenreagh area by the simple leaves with a stellate indumentum on the adaxial surface, and by the large flowers.



Subsect. 5. Grandisepalae

Boronia subsect. *Grandisepalae* Durretto, *Muelleria* 12: 88 (1999)

Type: *B. grandisepala* F. Muell.

Stellate hairs with unfused and usually non-appressed rays. Leaves simple or pinnate; midrib usually raised abaxially. Inflorescence 1 (–3)-flowered. Perianth white to pink to burgundy, rarely green or green-yellow. Sepals ranging from nearly as large as to much larger than petals. Petals with firm, shiny stellate hairs, persistent; midrib not prominently raised abaxially. Stamens: filaments clavate, narrowing suddenly to anther connective; antipetalous anthers much larger than antisepalous anthers. Seed sclerotesta (except *B. viridiflora*) black, shiny, elliptic in outline; adaxial side flattened and with prominent ridge; tubercles smooth.

A subsection of 20 species occurring in the Kimberley region, W.A., the ‘Top End’ of the N.T., and NW Qld. All species of *Boronia* from the Kimberley Region, W.A. (except *B. anomala*), the N.T. and NW Qld (except *B. hoipolloi*, *B. lanceolata* and *B. rupicola*) are placed in this subsection, which is divided into 3 series.

Ser. 1. Quadrilatae

Boronia ser. *Quadrilatae* Durretto, *Muelleria* 12: 90 (1999)

Type: *B. quadrilata* Durretto

Shrubs, glabrous except for stellate indumentum on perianth. Stellate hairs with minute rays. Branches distinctly quadrangular, at least when young, purple; leaf bases decurrent. Leaves simple, flat, grey-blue, glaucous with a waxy bloom. Stamens: antipetalous filaments glandular or not. Seed sclerotesta dull, grey, reticulate-foveate (seen for *B. viridiflora* only).

A series of 2 species found on the NW Arnhem Land Plateau, N.T.

129. *Boronia quadrilata* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 297 (1997)

T: Upper Magela Ck, 6 km N of Magela Falls, N.T., 10 Oct. 1991, *K. Brennan* 1567; holo: DNA; iso: CANB, MEL, PERTH.

B. D60356 Magela, *G.J. Leach et al.*, *N. Terr. Pl. Sp. Conservation Significance*, *N. Terr. Bot. Bull.* 13: 35 (1992); *C.R. Dunlop et al.*, *Checklist Vasc. Pl. N. Terr., Australia* 100 (1995).

B. sp. 7 (Magela Creek; *K. Brennan* 1567), *J.D. Briggs & J.H. Leigh*, *Rare Threatened Austral. Pl.* 167 (1996).

Illustrations: M.F.Durretto & P.Y.Ladiges, *op. cit.* 298, fig. 26; M.F.Durretto, *Austral. Pl.* 23 (183): 87 (2005).

Erect shrub to 3 m tall, glabrous apart from perianth. Leaves sessile, elliptic, 23–55 mm long, 12–20 mm wide, cuneate to slightly cordate at base, acute. Peduncle 2–4 mm long; pedicel 0.5–3 mm long. Sepals deltate, 5.5–6 mm long, c. 3 mm wide (to 9–13 mm long and 4.5–6 mm wide when in fruit), green. Petals 4–5 mm long, pale yellow; abaxial surface with minute, moderately dense stellate indumentum. Stamens: antipetalous filaments \pm glandular. Cocci c. 6 mm long; seed not seen.

Known only from a small area in the upper reaches of the Magela Creek Gorge, Arnhem Land Plateau, N.T. Found on sandstone ridges, slopes and sheltered gullies in open shrubland and *Corymbia* woodland. Flowers collected in May, Aug. & Oct.; fruits collected in Aug. & Oct.

N.T.: Western Arnhem Land, E end of Magela Creek Gorge, *I.D.Cowie* 10285 & *D.J.Liddle* (BRI, CANB, DNA, MEL, MO); Arnhem Land, 28 km SE of Jabiru, Upper Magela Ck area, *R.A.Kerrigan* 641 (DNA).

A vulnerable species known from c. 800 mature individuals in an area of c. 4 ha. Distinguishable from other species of *Boronia* by the following combination of characters: erect habit, bluish, glaucous, simple, large leaves, and purple quadrangular stems. The plant apparently vigorously resprouts after fire (Collector's notes).



130. *Boronia viridiflora* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 295 (1997)

T: c. 2 km S of Myra Falls, Arnhem Land, N.T., 14 June 1993, *M.F.Durretto* 421, *J.Chappill*, *G.Howell* & *K.Brennan*; holotype: DNA.

Illustration: M.F.Durretto & P.Y.Ladiges, *op. cit.* 296, fig. 25.

Shrub growing horizontally from near vertical rock faces, to 2 m long, glabrous apart from perianth. Leaves: petiole 0.5–3.5 mm long; lamina elliptic to oblanceolate, 8–40 mm long, 7–16 mm wide, attenuate at base, acute to obtuse. Inflorescence 1–3-flowered; peduncle to 3 mm long; pedicels 1.5–2 mm long. Sepals \pm equal to or a little longer than petals, ovate-deltate, 2.5–4 mm long, 1.5–2.5 mm wide, acute, green, sometimes top half burgundy. Petals 2.5–3 mm long, green, sometimes tips red or burgundy; abaxial surface with minute, sparse stellate indumentum. Stamens: antipetalous filaments smooth. Cocci 4.5–5 mm long; seeds 4–4.5 mm long, grey, dull, not ridged, minutely reticulate or foveolate. Fig. 45A–G.

Occurs in a remote area c. 40 km ESE of Oenpelli, Arnhem Land, N.T. Found only growing almost horizontally from vertical sandstone surfaces of cliffs or boulders: a habit unique in the genus. Flowers and fruits collected in Apr. and June.

N.T.: Tin Camp Ck, c. 2 km S of Myra Falls, *K.Brennan* 2248 (CANB, MEL); c. 4.5 km S and 1.3 km W of Myra Falls, Arnhem Land, *M.F.Durretto* 432 (CANB, DNA, MEL, NSW, PERTH).

A vulnerable species that was first collected in 1993 and is known from an area only about 4 km wide.



Ser. 2. *Grandisepalae*

Boronia ser. *Grandisepalae*

Shrubs with a sparse to dense stellate indumentum on vegetative parts and abaxial surface of perianth. Rays of stellate hairs 0.1–1 mm long. Branches terete to slightly quadrangular, brown; leaf bases not decurrent. Leaves simple, flat or slightly recurved, not glaucous. Stamens: antipetalous filaments glandular distally. Seed sclerotesta shiny, black, verrucose.

A series of 8 species of the 'Top End', N.T., divided into 2 subseries.

Subser. 1. Verecundae

Boronia subser. *Verecundae* Durretto, *Muelleria* 12: 93 (1999)

Type: *B. verecunda* Durretto

Stellate hairs usually stalked, even on perianth, with stalks 0.5–1 mm long and rays 0.5–1 mm long. Adaxial surface of sepals glabrous or with sparse stellate indumentum. Style glabrous. Cocci glabrous. Seed sclerotesta with unfused tubercles.

A subseries of 2 species found in Kakadu Natl Park and the Arnhem Land Plateau, N.T.

131. *Boronia verecunda* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 291 (1997)

T: Kakadu Natl Park, N.T., 22 Apr. 1990, *C.R.Dunlop 8611* & *P.F.Munns*; holo: DNA; iso: AD, BRI, CANB, MEL, NSW, PERTH *n.v.*

B. D6347 Kakadu, G.J.Leach *et al.*, *N. Terr. Pl. Sp. Conservation Significance*, *N. Terr. Bot. Bull.* 13: 35 (1992); *C.R.Dunlop et al.*, *Checklist Vasc. Pl. N. Terr., Australia* 100 (1995).

B. sp. 9 (Kakadu; *Martensz & Schodde 575*), J.D.Briggs & J.H.Leigh, *Rare Threatened Austral. Pl.* 167 (1996).

Illustration: M.F.Durretto & P.Y.Ladiges, *op. cit.* 280, fig. 20e–f.

Subshrub to 40 cm tall. Young branches with moderately dense stellate indumentum. Stellate hairs with 9–15 rays; rays weak, flexuous, dull, light pink to white. Leaves sessile or petiolate; petiole to 1 mm long; lamina narrowly elliptic to narrowly lanceolate, 13–27 (–50) mm long, 2–4 (–8) mm wide, attenuate to cuneate at base, acute, with sparse to moderately dense stellate indumentum. Peduncle 0.5–1 mm long; pedicel 1–1.5 mm long. Perianth white or pink, becoming green when in fruit. Sepals ovate-deltate, 6–7 mm long, 1.5–3 mm wide, acute to acuminate; abaxial surface glabrous or with sparse stellate indumentum. Petals 3.5–4.5 mm long, 1.5–2.5 mm wide; adaxial surface glabrous or hairy.

Restricted to the sandstone escarpment country of the South Alligator R. catchment area, Kakadu Natl Park, N.T. Flowers Jan.–Apr.; fruits Apr.

N.T.: UDP Mine area, *C.Dunlop & N.Byrnes 2121* (CANB, DNA, PERTH); 2–3 miles [c. 3.2–4.8 km] N of El Sharana, *P.N.Martensz & R.Schodde AE575* (CANB, DNA); Kakadu Natl Park, 18.5 km S of Gimbat HS, below E edge of Marawal Plateau, *A.V.Slee & L.A.Craven 2717* (AD, CANB, MEL); UDP Falls, *A.V.Slee & L.A.Craven 3053* (AD, BRI, CANB, MEL).

A rare and poorly collected species that can be distinguished from *B. xanthastrum* by the weak, light pink to white hairs, narrow leaves, large flowers and the glabrous adaxial surface of the petals. Some collectors have commented on the slight lemon scent of the leaves when crushed.



132. *Boronia xanthastrum* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 292 (1997)

T: 25 km WNW of Twin Falls, N.T., 1 June 1980, *L.A.Craven 6226*; holo: CANB.

B. sp. 4 (Craven 6226), M.Lazarides *et al.*, *Checklist Fl. Kakadu Natl Park & Environs*, *N. Terr., Australia. ANPWS (Canberra) Occas. Pap.* 15: 23 (1988).

Illustrations: M.F.Durretto & P.Y.Ladiges, *op. cit.* 280, fig. 20 g–h; M.F.Durretto, *Austral. Pl.* 23 (183): 92 (2005).

Subshrub to 50 cm tall. Young branches with a dense, yellow, stellate indumentum. Stellate hairs with 5–10 (–14) rays; rays firm, glossy, smooth, yellow, becoming white with age. Leaves: petiole 0.5–1.5 mm long; lamina narrowly elliptic to elliptic to lanceolate, 10–36 mm long, 2.5–6.5 mm wide, attenuate to cuneate at base, acute, with sparse to moderately dense stellate indumentum. Peduncle 0.5–1 mm long; pedicel 0.5–1.5 mm long. Perianth yellow-green. Sepals ovate-deltate, 3.5–7 mm long, 1–2.5 mm wide, acuminate; adaxial surface glabrous. Petals 2.5–4 mm long, 1–1.5 mm wide; adaxial surface with sparse to moderately dense indumentum.

Largely confined to Kakadu Natl Park, mainly in the vicinity of the Mt Basedow Ra., Barramundi Gorge and Graveside Gorge, and disjunctly in NE Arnhem Land, N.T. Found growing on schists (Mt Basedow Ra.) and sandstones (escarpment country) in both heath and woodland communities. Flowers and fruits Feb.–June.

N.T.: Kakadu Natl Park, fire plot 140, *K.G.Brennan 3854* (DNA, MEL); Western Arnhem Land, c. 66 km SSW of Maningrida, *I.D.Cowie 8608* (CANB, DNA, MEL); saddle/ridge above side creek, just downstream & W of plunge pool, Barramundi Gorge, Kakadu Natl Park, *M.F.Duretto 464* (DNA, MEL); near summit of Mt Basedow, Kakadu Natl Park, *M.F.Duretto 544* (DNA, MEL); Graveside Gorge, Kakadu, *J.Russell-Smith 2274* (DNA).



A rare, though locally common, and poorly collected species. Distinguished from *B. verecunda* by the stiff, yellow-white hairs, wider leaves, smaller flowers and the petals having hairs on the adaxial surface.

Subser. 2. *Grandisepalae*

Boronia subser. *Grandisepalae*

Stellate hairs sessile or rarely minutely stalked; rays to 0.5 mm long. Sepals with sparse to dense indumentum of minute simple and stellate hairs near margins of adaxial surface. Style glabrous or hairy. Cocci hairy. Seed sclerotesta striate (ridges constructed of single rows of fused tubercles).

A subseries of 6 species found in the N.T. The subseries (except *B. suberosa*) was the subject of a phenetic analysis of morphological characters (M.F.Duretto & P.Y.Ladiges, *op. cit.*). Four of the species, *B. amplexans*, *B. laxa*, *B. prolixa* and *B. zeteticorum*, form a natural group characterised by their sprawling habit.

133. *Boronia suberosa* Duretto in M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 288 (1997)

T: 11.5 km NE of Jabiru East, N.T., 26 May 1980, *L.A.Craven 5947*; holo: CANB; iso: A, CANB, DNA, L, MEL.

B. sp. 1 (Lazarides 9004), M.Lazarides *et al.*, *Checklist Fl. Kakadu Natl Park & Environs, N. Terr., Australia ANPWS (Canberra) Occas. Pap.* 15: 23 (1988)

B. D6852 Jabiru, G.J.Leach *et al.*, *N. Terr. Pl. Sp. Conservation Significance, N. Terr. Bot. Bull.* 13: 35 (1992); C.R.Dunlop *et al.*, *Checklist Vasc. Pl. N. Terr., Australia* 100 (1995).

B. sp. 8 (Jabiru; *C.R.Dunlop 3305*), J.D.Briggs & J.H.Leigh, *Rare Threatened Austral. Pl.* 167 (1996).

Illustration: M.F.Duretto & P.Y.Ladiges, *op. cit.* 289, fig. 22.

Pendulous to semi-pendulous shrub to 50 cm long. Branches stellate-tomentose when young, with massive cork development on older branches. Stellate hairs with (2–) 7–14 rays. Leaves sessile or petiolate; petiole to 3 mm long; lamina elliptic to lanceolate, 7–20 mm long, 3–11 mm wide, attenuate at base, acute. Peduncle to 1 mm long; pedicel 0.5–1 mm long. Sepals ovate-deltate, 3–5 mm long (–7.5 mm when in fruit), 2–3 mm wide, green; abaxial surface stellate-tomentose. Petals 2.5–3 mm long (–4.5 mm when in fruit), white. Fig. 45H–M.

Restricted to the Ja Ja Massif, NE of Jabiru, N.T. Found on sandstone pavements and cliff faces. Flowers Feb.–May; fruits Mar.–May.

N.T.: ESE of Mudginberry, *C.Dunlop 3305* (BRI, CANB, DNA, MEL, NSW, PERTH); NE of Jabiru, Hollow Rock area, *R.A.Kerrigan 631* (DNA).

Known from only a few collections in an area less than 5 km across. Distinguished from other tropical species of *Boronia* by the pronounced cork development on the older stems. *Neobyrnesia suberosa* (Rutaceae) is found in the same general area as *B. suberosa* and is also a specialised cliff-dweller with massive cork development and simple leaves, but can be distinguished from *B. suberosa* by having 4 stamens.



134. *Boronia grandisepala* F.Muell., *Fragm.* 1: 66 (1859)

T: MacAdam Ranges near Fitzmaurice R. [Macadam Ra., N.T.], Oct. 1855, *F.Mueller s.n.*; lecto: K *n.v.* (photo seen), *vide* M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 272 (1997); isolecto: MEL.

Erect or rarely spreading or sprawling shrub to 1.5 m high, with moderately dense to dense stellate indumentum on branches and leaves. Stellate hairs with 10–20⁺ rays; rays 0.1–0.3 (–0.5) mm long. Leaves: petiole 0.5–5 mm long; lamina narrowly elliptic to elliptic, sometimes sublanceolate, 7–62 mm long, 1.5–14.5 mm wide, attenuate to cuneate at base, acute, ±mucronate; indumentum similar on both surfaces. Peduncle to 2.5 (–7) mm long; pedicel 0.5–5 mm long. Perianth white, pink or burgundy. Sepals (4–) 7–10 mm long (–12 mm when in fruit), 2–5.5 mm wide (–7.5 mm when in fruit). Petals 3–7.5 mm long.

Occurs in the ‘Top End’, N.T. There are 2 subspecies.

Leaves of mature plants grey, with indumentum dense, epidermis not visible; >18 rays per hair on average

134a. subsp. *grandisepala*

Leaves of mature plants not grey, with indumentum moderately dense, epidermis visible at magnification; <17 rays per hair on average

134b. subsp. *acanthophida*

134a. *Boronia grandisepala* F.Muell. subsp. *grandisepala*

Illustrations: J.Brock, *Top End Nat. Pl.* 99 (1988), as *B. grandisepala*; J.Brock, *Nat. Pl. N. Australia* 99 (1993), as *B. grandisepala*; M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 273, fig. 17 (1997).

Mature leaves 7–45 mm long, 1.5–10 mm wide, grey with dense stellate indumentum (epidermis not visible), 25–40⁺ hairs per mm², 18–20⁺ rays per hair on average; juvenile leaves to 62 mm long, with a sparse to moderately dense stellate indumentum.

Occurs on the Arnhem Land Plateau, N.T., with collections made in the NE and in the SW c. S of Jim Jim Falls to Katherine and disjunctly in the Macadam and Yambarran Ranges areas to the W. Grows in heath and open woodland on sandstone. Flowers and fruits Dec.–June.

N.T.: Katherine Gorge Natl Park, 20 miles [c. 32 km] NE of Katherine, *L.G.Adams 895* (BRI, CANB, DNA, MEL, PERTH, NSW); headwaters of Lalngang Ck, *I.Cowie 5052* (CANB, DNA, MEL); Western Arnhem Land, c. 62 km SSW of Maningrida, *I.D.Cowie 8621* (DNA, MEL); Birdie Ck, Kakadu Natl Park, *G.J.Leach 2728* (BRI, DNA, MEL, PERTH); 31 km WSW of Twin Falls, *M.Lazarides 9199* (BRI, CANB, DNA, MEL, NSW).

Collections from the Arnhem Land Plateau have slightly smaller inflorescence and floral parts than the collections from the Macadam Ra./Lalngang Ck area. In addition, some specimens from near Katherine have narrower leaves and sometimes much smaller flowers than other specimens.

**134b. *Boronia grandisepala* subsp. *acanthophida* Duretto in M.F.Duretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 278 (1997)**

T: 11 miles SW of Mt Gilruth, N.T., 4 Mar. 1973, *M.Lazarides 8007*; holo: CANB; iso: BRI, DNA, NSW.

Mature leaves 8–55 mm long, 1.5–14.5 mm wide, green-grey, with moderately dense stellate indumentum (epidermis visible), 7–18 hairs per mm², (4–) 8–17 rays per hair on average. Fig. 45N–R.

Occurs between Deaf Adder Gorge and Jim Jim Falls, Arnhem Land Plateau, N.T. Found in sandstone heath and open woodland on the plateau surface. Flowers Jan.–June.; fruits Feb.–June.

N.T.: 10 km N of Jim Jim Falls, *L.A.Craven 6076* (DNA, MEL, CANB); Deaf Adder Gorge, *C.R.Dunlop 5473* (CANB, DNA); Top of Jim Jim Falls, Kakadu Natl Park, *C.R.Dunlop 5667* (CANB, DNA); c. 17 miles [c. 27 km] N of Mt Evelyn, *M.Lazarides 7993* (CANB, DNA, MEL, NSW, PERTH); top of sandstone above creek flowing N at Deaf Adder Gorge, c. 10 km from mouth, *D.J.McGillivray 3935* (DNA, MEL, NSW).



A rare taxon that may intergrade with subsp. *grandisepala*.

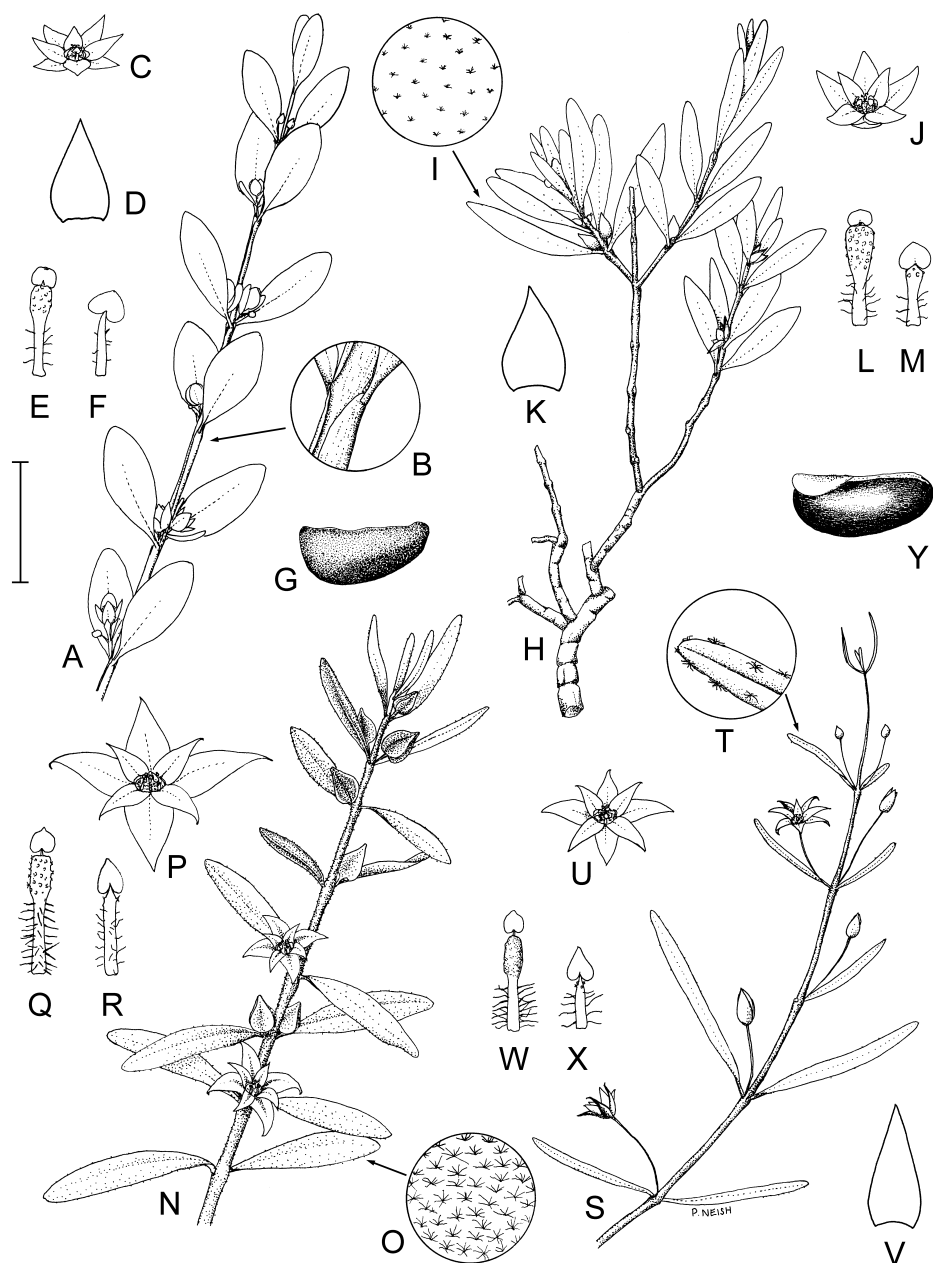


Figure 45. *Boronia*. **A–G**, *B. viridiflora*. **A**, habit; **B**, branchlet detail; **C**, flower; **D**, sepal; **E**, antisepalous stamen, abaxial view; **F**, antipetalous stamen, abaxial view; **G**, seed (**A–G**, M.Duretto 421, DNA). **H–M**, *B. suberosa*. **H**, habit; **I**, leaf surface detail; **J**, flower; **K**, sepal; **L**, antisepalous stamen, abaxial view; **M**, antipetalous stamen, abaxial view (**H–M**, L.Craven 5947, CANB). **N–R**, *B. grandisepala* subsp. *acanthophida*. **N**, habit; **O**, leaf surface detail; **P**, flower; **Q**, antisepalous stamen, abaxial view; **R**, antipetalous stamen, abaxial view (**N–R**, M.Lazerides 8007, CANB). **S–Y**, *B. amplexans*. **S**, habit; **T**, leaf apex; **U**, flower; **V**, sepal; **W**, antisepalous stamen, abaxial view; **X**, antipetalous stamen, abaxial view; **Y**, seed (**S–Y**, L.Craven & G.Wightman 8336, CANB). Scale bar: **A**, **H**, **N**, **S** = 16 mm; **C**, **J**, **P**, **U** = 8 mm; **D**, **G**, **K**, **V**, **Y** = 4 mm; **E**, **F**, **L**, **M**, **Q**, **R**, **W**, **X** = 2 mm. Drawn by P.Neish.

135. *Boronia laxa* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 279 (1997)

T: Site FF, c. 30 km SE of Jabiru, N.T., 30 Mar. 1981, *L.A.Craven* 6600; holotype: CANB; isotypes: AD, DNA, MEL, P, US.

B. sp. 3 (Craven 5715), M.Lazarides *et al.*, *Checklist Fl. Kakadu Natl Park & Environs, N. Terr., Australia ANPWS (Canberra) Occas. Pap.* 15: 23 (1988).

B. aff. laxa 1 (Northern Plateau, Arnhem Land), M.F.Durretto & P.Y.Ladiges, *op. cit.* 282.

B. aff. proluxa 1 (Red Lily Lagoon, Arnhem Land), M.F.Durretto & P.Y.Ladiges, *op. cit.* 285.

Illustration: M.F.Durretto & P.Y.Ladiges, *op. cit.* 280, fig. 20 a–b.

Semi-prostrate shrub to 1.5 m long, with sparse to moderately dense stellate indumentum on branches and leaves. Stellate hairs with 3–15 rays; rays 0.1–0.5 mm long. Leaves: petiole 0.5–5 mm long; lamina elliptic to sub lanceolate, 10–45 (–58) mm long, 2.5–13 mm wide, attenuate to cuneate at base, acute; indumentum similar on both surfaces. Peduncle 0.5–2.5 (–6) mm long; pedicel 0.5–3 mm long. Perianth white to creamy yellow to faintly green. Sepals lanceolate-ovate, 4–6 mm long (–11 mm when in fruit), 1.75–3 mm wide (–6 mm when in fruit); abaxial surface with moderately dense stellate indumentum. Petals 2.5–5 mm long.

Occurs on the Mt Brockman outlier, Kakadu Natl Park, and the adjacent Arnhem Land Plateau, N.T. Found in heath and eucalyptus woodland communities on sandstone, often trailing over and among other species. Flowers and fruits Feb.–Aug.

N.T.: Western Arnhem Land, E end of Magela Creek Gorge, *I.D.Cowie* 10287 & *D.J.Liddle* (DNA, MEL); sandstone plateau, Kakadu, *L.A.Craven* 2423 (CANB, DNA); Lightning Dreaming, Arnhem Land, *C.Dunlop* 6585 (CANB, DNA, NSW); Upper East Alligator R., Arnhem Land, *J.Russell-Smith* 5365 (DNA); 2.5 km NW of Koongarra Saddle, Kakadu Natl Park, *I.R.Telford* 8112 (CANB, DNA, NSW).



Rare and vulnerable, but possibly more common on the plateau than present collections suggest. A more robust form is found on the Arnhem Land Plateau in the N of its range. Closely related to *B. proluxa* from which it can be distinguished by the shorter peduncle.

136. *Boronia proluxa* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 283 (1997)

T: 15 km NNE of Jabiru East, N.T., 7 June 1980, *L.A.Craven* 6486; holotype: CANB; isotypes: A, AD, CANB, DNA, MEL.

B. sp. 2 (Craven 5957), M.Lazarides *et al.*, *Checklist Fl. Kakadu Natl Park & Environs, N. Terr., Australia ANPWS (Canberra) Occas. Pap.* 15: 23 (1988).

Illustration: M.F.Durretto & P.Y.Ladiges, *op. cit.* 280, fig. 20 c–d.

Semi-prostrate subshrub to 50 cm long, with moderately dense stellate indumentum on branches, leaves and abaxial surface of perianth. Stellate hairs with 5–10 (–17) rays; rays 0.1–0.5 mm long. Leaves sessile or petiolate; petiole to 2 (–4.5) mm long; lamina lanceolate to ovate, 4.5–32 (–45) mm long, 2.5–16 mm wide, cuneate to truncate at base, acute; indumentum similar on both surfaces. Peduncle 6–21 mm long; pedicel 1–5 mm long. Perianth white to pinkish mauve. Sepals 4–6 mm long (–7 mm when in fruit), 1.5–3 mm wide. Petals 3–3.5 mm long (–5 mm when in fruit).

Occurs from Jabiru to Nabarlek, on the NW portion and outliers of the Arnhem Land Plateau, N.T. Found in heavily dissected sandstone escarpment country in woodland and heath. Flowers and fruits Jan.–June.

N.T.: 14.5 km NE of Jabiru East, *L.A.Craven* 5957 (CANB, DNA, MEL); East Alligator R., Arnhem Land, *C.Dunlop* 3234 (DNA, NSW); Nabarlek, escarpment country, *M.Lazarides* 9235 (A, CANB, DNA, L, MEL); near Three Pools, Kakadu Natl Park, *J.Russell-Smith* 976 (DNA); 5 km E of Winwuyerr Ck Crossing, Kakadu Natl Park, *J.Russell-Smith* 1098 (DNA).



A rare and poorly collected species, that appears to be closely related to *B. laxa*; distinguishable from other species in the series by the long peduncles and pedicels (together > 10 mm long).

137. *Boronia zeteticorum* Durretto, *Beagle* 24: 10 (2008)

T: Nabarlek, Arnhem Land, N.T., 23 Mar. 1989, *R.Hinz* 467; holo: DNA; iso: CANB.

B. aff. laxa 2 (Nabarlek, Arnhem Land), M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 282 (1997).

Illustration: M.F.Durretto, *Beagle* 24: 11, fig. 1 (2008).

Semi-prostrate shrub. Branches with moderately dense stellate indumentum. Stellate hairs with 6–25 rays; rays 0.1–0.2 mm long. Leaves: petiole 0.5–1.5 mm long; lamina narrowly elliptic, 10–35 mm long, 1.5–3.5 mm wide, attenuate at base, acute; adaxial surface with moderately dense indumentum with epidermis visible; abaxial surface stellate-tomentose with epidermis not visible. Peduncle 0.5 mm long; pedicel 1.5 mm long. Perianth white. Sepals 3.5–4 mm long (–6 mm when in fruit), 2 mm wide (–3.5 mm when in fruit); abaxial surface with moderately dense stellate indumentum. Petals 3–3.5 mm long (–5 mm in fruit).

Known from the type only. Flowers and fruit collected Mar.

Probably most closely related to *B. amplexans* (both have extremely narrow leaves), from which it can be distinguished (as all other species in the subsection) in having vastly different indumentum densities between the adaxial and abaxial leaf surfaces. Differs from *B. laxa* and *B. prolixa* by the smaller and narrower leaves, and the smaller peduncles, pedicels and perianth.



138. *Boronia amplexans* Durretto in M.F.Durretto & P.Y.Ladiges, *Austral. Syst. Bot.* 10: 287 (1997)

T: Headwaters of the East Alligator R., N.T., 31 Mar. 1984, *L.A.Craven* & *G.M.Wightman* 8336; holo: CANB; iso: AD, MEL.

Sprawling shrub to 1 m wide. Branches with sparse to moderately dense stellate indumentum. Stellate hairs with 6–15 rays; rays 0.1–0.5 mm long, appressed. Leaves: petiole 0.5–2.5 mm long; lamina narrowly elliptic, 10–52 mm long, 1–3 mm wide, attenuate to cuneate at base, acute; stellate indumentum sparse, often on midrib and margins only, similar on both surfaces. Peduncle 7–21 mm long; pedicel 2–3 mm long. Perianth white to pink to reddish. Sepals 3–5 mm long, 1.5–2 mm wide, abaxial surface with sparse to moderately dense stellate indumentum. Petals 3–4 mm long. Fig. 45S–Y.

Known from few collections in the central areas of the Arnhem Land Plateau, N.T. Found on sandstone. Flowers and fruits Mar. & Aug.

N.T.: S of Magela Falls, *K.Brennan* 2818 (DNA, MEL); Western Arnhem Land, c. 2 km S of Magella Falls, *I.D.Cowie* 10305 & *C.Brooks* (CANB, DNA).

Distinguishable from the other species in the subseries by having the following combination of characters: sparsely hairy, narrowly elliptic leaves, stellate hairs with appressed rays, and long peduncles. Probably most closely related to *B. zeteticorum*.



Ser. 3. *Lanuginosae*

Boronia ser. *Lanuginosae* Durretto, *Muelleria* 12: 102 (1999)

Type: *B. lanuginosa* Endl.

Shrubs with sparse to dense stellate indumentum or almost glabrous. Rays of stellate hairs to 1 mm long. Branches terete to slightly quadrangular; leaf bases not decurrent. Leaves usually pinnate (sometimes simple in *B. barrettiorum* and usually simple in *B. pauciflora*), not

glaucous; margins flat to revolute. Stamens: antipetalous filaments smooth. Seed sclerotesta black, sometimes mottled, shiny, minutely verrucose-colliculate.

A series of 10 species found in the Kimberley region, W.A., the 'Top End', N.T., and NW Qld. The series contains 3 subseries.

Subser. 1. Lanuginosae

Boronia subser. *Lanuginosae*

Mature plants with dense indumentum of stellate and simple hairs on branches, leaves and abaxial surface of perianth; juvenile plants with sparse to moderately dense stellate and simple indumentum on these parts. Leaves petiolate or rarely sessile, 11–27 (–35)-foliolate; leaflets narrowly elliptic to linear, usually strongly recurved to revolute; midrib raised abaxially. Sepals larger than petals. Seeds black.

Two species, widespread in the Kimberley Region, W.A., the 'Top End', N.T., and NW Qld. The subseries was the subject of a phenetic analysis of morphological characters (M.F.Duretto, *Nuytsia* 11: 301–346 (1997)).

139. *Boronia lanuginosa* Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837)

T: King George's Sound [probably Gulf of Carpentaria, N.T.], *F.Bauer s.n.*; lecto: W *n.v.* (photo PERTH), *fide* M.F.Duretto, *Nuytsia* 11: 317 (1997).

B. artemisiifolia F.Muell., *Fragm.* 1: 66 (1859), as *B. artemisiifolia*. T: In montibus rapid fluvibus flum Fitzmarie River [N.T.], Oct. 1855, *F.Mueller s.n.*; syn: K *n.v.* (photos AD, MEL); Sea Range [Yambaran Range, N.T.], Dec. 1855, *F.Mueller s.n.*; syn: K *n.v.* (photos AD, MEL), MEL.

B. affinis R.Br. ex Benth., *Fl. Austral.* 1: 311 (1863). T: Islands g, h [North Island - and Vanderlin Island, Sir Edward Pellew Group] of the Gulf of Carpentaria and mainland opposite Groote Eylandt [Eylandt] [N.T.], Dec. 1802–Jan. 1803, *R.Brown No.* 5293; syn: BM *n.v.* (photos DNA, MEL), CANB, K *n.v.* (photos AD, MEL), MEL, NSW.

Illustrations: P.Wilson, *Austral. Pl.* 8: 200 (1975); K.Brennan, *Wildfl. Kakadu* 14, fig. 9 (1986); J.Brock, *Nat. Pl. N Australia* 99 (1993).

Erect shrubs to 1.5 m tall; juvenile plants glabrous or with sparse to moderately dense stellate/simple indumentum on branches, leaves and abaxial surface of perianth; mature plants densely stellate-tomentose on branches, leaves and abaxial surface of perianth. Leaves petiolate or rarely sessile, 11–27 (–35)-foliolate, 6–80 mm long, 5–50 mm wide; petiole 0.5–3 mm long; rachis segments 0.5–10 mm long; leaflets linear to narrowly elliptic, 4–26 mm long, 0.5–3 mm wide. Pedicel 4–10 mm long. Perianth white to pink to deep purple. Sepals ovate-deltate, (4–) 7–15 mm long, 2–4 mm wide, acute to acuminate. Petals 3–10 mm long. *Star Boronia*, *Engbajenbaja* (Warnindilyakwa people, Groote Eylandt, *fide* D.Levitt, *Plants and People. Aboriginal uses of Plants on Groote Eylandt* (1981)).

Common and widespread from Westmoreland, NW Qld, through the N.T. from Wollogorang to the Macadam Ra. and Victoria R. areas, and near the Weaber Ra., NE W.A. Growing on sandstone and sands (rarely limestone) in open woodland and forest. Flowers Jan.–Sept.; fruits Jan.–Nov.

W.A.: Limestone hills W of Weaber Ra., c. 50 km N of Kununurra & c. 13 km NW of Point Springs, *M.Lazarides 8426* (CANB, DNA, PERTH). N.T.: Gorge at 1st rapids, Katherine Gorge, *P.A.Fryxell & L.A.Craven 4222* (AD, BRI, CANB, DNA); 40 km W of 'Wollogorang', 'Calvert Hills' road, *S.Jacobs 1587* (CANB, NSW); Wessell Is., *P.K.Latz 3462* (CANB, DNA, PERTH). Qld: Westmoreland, off road past Hells Gate, *P.I.Forster 21066* (BRI, MEL, NSW).



This species shows great variation in indumentum density and the size and colour of the perianth. Juvenile plants can be glabrous or sparsely hairy with large simple hairs and/or stellate hairs. Larger plants usually, but not always, have a denser indumentum. There is a

full grade of hair densities between these extremes. The bulk of collections have a dense indumentum. This variation is also seen on the abaxial surfaces of the perianth. Some populations, e.g. around Mt Cahill and on the sandplains N of the Arnhem Land Plateau, appear never to contain plants with a dense indumentum. In other areas, such as Borroloola, the Sir Edward Pellew Group and Nitmiluk Natl Park, sparsely hairy plants flower alongside densely hairy plants of the same height. Plants S of South Alligator R. usually have larger flowers than northern and eastern plants, but the variation appears to be continuous.

Putative hybrids between *B. lanuginosa* and *B. tolerans* have been collected from Nitmiluk Natl Park and are discussed in detail by Duretto *op. cit.*

The Warnindilyakwa people of Groote Eylandt use a preparation made from *B. lanuginosa* leaves to treat headaches, body aches and pains, and chest colds (Levitt, *op. cit.*).

140. *Boronia wilsonii* (F.Muell. ex Benth.) Duretto, *Nuytsia* 11: 320 (1997)

B. artemisiifolia var. *wilsonii* F.Muell. ex Benth., *Fl. Austral.* 1: 311 (1863), as *artemisiaefolia* var. *Wilsoni*. T: Vansittart's Bay [W.A.], 1819, *A.Cunningham* 432; lecto: PERTH, *vide* M.F.Duretto, *loc. cit.*; isolecto: BM *n.v.* (photo MEL), PERTH, K *n.v.* (2 specimens, photos MEL).

[*B. lanuginosa* auct. non Endl.: J.R.Wheeler in J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 668 (1992), *p.p.*]

Illustrations: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 669, fig. 206 B1–2 (1992), as *B. lanuginosa*; M.F.Duretto, *Austral. Pl.* 23 (183): 93 (2005).

Erect shrub to 1 m tall; juvenile plants with sparse to moderately dense stellate-tomentose indumentum on branches and leaves; mature plants densely stellate-tomentose on branches, leaves and abaxial surface of perianth. Leaves 13–23 (–31)-foliolate, 17–34 (–61) mm long, 6–21 mm wide; petiole 0.5–7 mm long; rachis segments 2–6 mm long; leaflets narrowly elliptic to elliptic or lanceolate, 1.5–23 mm long, 1–6 mm wide. Pedicel 2.5–7 mm long. Perianth white to pink to burgundy. Sepals ovate-deltate, 5–10 mm long, 2–4.5 mm wide, acuminate; abaxial surface with dense stellate indumentum. Petals 4–6 mm long.

Widespread in the Kimberley region and off-shore islands, W.A., and rarely collected in the lower Victoria R. area, N.T. Found in heath and open woodland on sand, sandstone, quartzite or rarely limestone. Flowers Jan.–Sept.; fruits Mar.–Sept.

W.A.: c. 50 km NE of Mitchell River HS, King Edward R., *A.C.Beauglehole* & *E.G.Errey* B58912 E2612 (CANB, PERTH); Middle Springs, 18 km NW of Kununurra, *P.A.Fryxell* & *L.A.Craven* 4002 (AD, BRI, CANB, DNA, MEL, PERTH); Boiga Falls, Drysdale River Natl Park, *K.F.Kenneally* 3025 (CANB, PERTH); Lachlan Is., Buccaneer Archipelago, *K.F.Kenneally* 8319 (CANB, PERTH). N.T.: Victoria R. area, *G.J.Leach* 2399 (BRI, DNA).



Distinguished from *B. lanuginosa* by the wider and usually shorter leaflets and longer pedicels.

Subser. 2. Jucundae

Boronia subser. *Jucundae* Duretto, *Muelleria* 12: 107 (1999)

Type: *B. jucunda* Duretto

Shrubs with sparse to moderately dense simple/stellate indumentum throughout, sometimes with only a few stellate hairs. Leaves sessile, (1–) 3–9-foliolate; leaflets linear to narrowly elliptic, flat or slightly recurved; midrib not or slightly raised abaxially. Sepals larger than petals. Seeds black, usually uniform in colour.

A subseries of 3 species from the eastern Kimberley Region, W.A., and the N.T.

141. *Boronia decumbens* Durretto, *Nuytsia* 11: 323 (1997)

T: c. 70 km NE of Pine Creek, El Sharana Rd, N.T., 5 Mar. 1985, *C.Dunlop 6752 & G.Wightman*; holo: CANB; iso: DNA, MEL, NSW.

Illustration: M.F.Durretto, *op. cit.* 325, fig. 10 A–E.

Multistemmed, decumbent subshrub to 40 cm wide, not obviously glandular, with sparse indumentum of simple hairs on branches, leaves and abaxial surface of perianth; stellate hairs rare. Leaves (3–) 5–7-foliolate, 8–20 mm long, 8–25 mm wide; rachis segments 2–8 mm long; leaflets 4–12 mm long, 0.5–1 mm wide. Pedicels 1–4 mm long. Perianth white to pink. Sepals deltate, 4–6 mm long (–8 mm when in fruit), 1.5–4 mm wide, acute. Petals 3–5.5 mm long. Style glabrous. Fig. 46A–G.

Occurs between Mary R. and Waterfall Ck, Kakadu Natl Park, N.T. Grows on deep sand and sandstone in eucalypt open woodland. Flowers Nov.–Aug.; fruits Mar.–Aug.

N.T.: Moline Rockhole area, Kakadu Hwy, *M.J.Clark 835* (DNA); N of Waterfall Ck turn-off on Pine Creek–Oenpelli road, Kakadu Natl Park, *M.F.Durretto 474* (CANB, DNA, MEL); Mary River Ranger Stn, *M.F.Durretto 549* (CANB, DNA, MEL); c. 35 miles [c. 56 km] NNE of Pine Creek township, *M.Lazarides & L.G.Adams 211* (CANB, DNA, MELU, NSW).

This species tolerates annual fires and many plants consist of a large number of small stems growing from a robust rootstock. Distinguishable from *B. lanuginosa* by the sessile leaves, few (if any) stellate hairs and decumbent habit. A rare species that is often locally common.

**142. *Boronia tolerans* Durretto, *Nuytsia* 11: 326 (1997)**

T: On track to and near Biddlecombe Cascades, Nitmiluk Natl Park, N.T., 28 June 1993, *M.F.Durretto 516, J.Chappill & G.Howell*; holo: MEL; iso: DNA, MEL.

Illustration: M.F.Durretto, *op. cit.* 325, fig. 10 F–J.

Erect shrub to 50 cm high. Branches not obviously glandular, with sparse to moderately dense simple/stellate indumentum. Leaves (1–) 5–7 (–9)-foliolate, 7–50 mm long, 8–17 mm wide, slightly glandular-verrucose, glabrous or nearly so; rachis segments 2–10 mm long; terminal leaflets 8–30 mm long, 1–4 mm wide; lateral leaflets 5–16 mm long. Pedicel 1–2 mm long. Perianth white; abaxial surface glabrous or with sparse indumentum. Sepals ovate-deltate, 4–5 mm long (–6 mm when in fruit), 1.5 mm wide, acute. Petals 3.5–5 mm long. Style glabrous. Fig. 46F–J.

Known from around Biddlecombe Cascades, Nitmiluk Natl Park, N.T. Found growing on deep sand in eucalypt open woodland on the sandstone plateau top. Flowers and fruits Apr.–June.

N.T.: Biddlecombe cascades, Katherine Gorge Natl Park, 16 June 1981, *S.King* (DNA); 3 km E of Biddlecombe cascades, Katherine Gorge Natl Park, 20 June 1981, *S.King* (DNA); Nitmiluk Natl Park, *C.R.Mitchell & B.Deichmann 3145* (DNA, MEL).

A rare and possibly endangered species that is closely related to *B. jucunda* from which it can be distinguished by having up to 7 (rarely 9) leaflets, and by the non-glandular stems. Putative hybrids between *B. lanuginosa* and *B. tolerans* have been collected from Nitmiluk Natl Park and are discussed in detail by Durretto *op. cit.*

**143. *Boronia jucunda* Durretto, *Nuytsia* 11: 328 (1997)**

T: Mabel Downs, Winnama Gorge, Kimberley Region, W.A., 14 May 1984, *E.A.Chesterfield 214*; holo: MEL; iso: CANB, DNA, NSW, PERTH.

B. ? pauciflora, K.Menkhurst & I.Cowie in J.C.Z.Woironarski (ed.), *A Survey of the Wildlife and Vegetation of Purnululu (Bungle Bungle) Natl Park and Adjacent Area. Research Bulletin* 6: 44 (1992).

B. sp. A, J.R.Wheeler in J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 670 (1992).

Illustrations: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 669, fig. 206 D1–3 (1992), as *B. sp. A*; M.F.Duretto, *op. cit.* 325, fig. 10 K–O.

Erect shrub to 50 cm high. Branches glandular-verrucose, with sparse to moderately dense simple/stellate indumentum. Leaves trifoliolate, slightly glandular, glabrous or nearly so; terminal leaflets 8–42 mm long, 1–3 mm wide; lateral leaflets 6–23 mm long. Pedicel 0.5–3 mm long. Perianth white; abaxial surface glabrous or with sparse indumentum. Sepals ovate-deltate, 3–5 mm long (–6 mm when in fruit), 1.5–2.5 mm wide, acute. Petals 2.5–4 mm long. Style hairy. Fig. 46K–O.

Found near Winnama Gorge and on the Gibb River Rd, Kimberley, W.A., and in Gregory Natl Park, N.T. Found amongst quartzite or sandstone rocks, in open eucalypt woodland. Flowering and fruiting material collected May–Aug., Oct.

W.A.: Gibb River Rd, 6.8 km E of Kalumburu road turnoff, *I.D.Cowie 11183* & *R.A.Kerrigan* (AD, BRI, CANB, DNA, HO, NSW, PERTH); Escarpment edge, S side of Winnama Gorge, *M.F.Duretto 509* (CANB, DNA, MEL, NSW, PERTH); SE Kimberley, Winnama Spring c. 17.5 km S of Turkey Ck, 15 May 1984, *J.H.Willis s.n.* (CANB, MEL, PERTH). N.T.: Gregory Natl Park, sandstone escarpment SW of Jasper Gorge, *C.P.Brock 142* (DNA); Gregory Natl Park, *D.L.Napier 7* (DNA).



Closely related to *B. tolerans* from which it can be distinguished by its trifoliolate leaves and the obviously glandular stems.

Subser. 3. Filicifoliae

Boronia subser. *Filicifoliae* Duretto, *Muelleria* 12: 110 (1999)

Type: *B. filicifolia* A.Cunn. ex Benth.

Shrubs glabrous or with sparse to moderately dense stellate indumentum on branches, leaves and abaxial surface of perianth. Leaves ±sessile or rarely petiolate, simple or trifoliolate (*B. barrettiorum*, *B. pauciflora*) or (5–) 15–55-foliolate; leaflets rhombic to elliptic, flat or recurved; midrib raised abaxially. Sepals smaller than, similar in size to or larger than petals. Seeds mottled, black and grey/white.

A subseries of 5 species, found in the Kimberley region, W.A., and the Victoria R. area, N.T.

144. *Boronia pauciflora* W.Fitzg., *J. Proc. Roy. Soc. W. Australia* 3: 158 (1918)

T: Mt Broome, W.A., 1000 feet above the base, May 1905, *W.V.Fitzgerald 825*; lecto: PERTH, *vide* M.F.Duretto, *Nuytsia* 11: 330 (1997); isolecto: K n.v. (photos AD, MEL, PERTH), NSW.

Illustration: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 669, fig. 206 C (1992).

Erect shrub to 60 cm high. Branches nearly glabrous or with sparse to dense stellate indumentum between decurrent leaf bases. Leaves usually petiolate; petiole to 7 mm long; lamina usually simple (juvenile leaves trifoliolate and sessile), elliptic to lanceolate, glabrous or nearly so, attenuate at base, acute; terminal leaflets and simple leaves 12–80 mm long, 2–12 mm wide; lateral leaflets 7–13 mm long. Pedicels 4–23 mm long. Perianth white. Sepals ovate-deltate to narrowly deltate, 2.5–6 mm long, 1–2.5 mm wide, acute to acuminate; abaxial surface with a few scattered hairs. Petals 2–4.5 mm long. Stamens: filaments pilose; anther apiculum absent. Cocci glabrous.

Occurs in the Prince Regent R., Edkins Ra. and King Leopold Ra. areas, W Kimberley region, W.A. Found in rocky sandstone and quartzite areas with *Triodia*. Flowers and fruits Jan.–July.

W.A.: Bold Bluff, King Leopold Ra., *N.Byrnes 2260* (CANB, DNA, PERTH); c. 10 km NE of Prince Regent R. mouth, *L.A.Craven 9212* (CANB, DNA, E, L, MEL, PERTH); c. 4 km E of Mt Broome, 19 Apr. 1992, *D.Dureau* (HO, PERTH); Camp Ck, Prince Regent R., *K.F.Kenneally 11654* (PERTH); Edkins Ra., c. 132 km from Mount Elizabeth HS along the Walcott Inlet track, *I.R.Telford 11627* (PERTH).

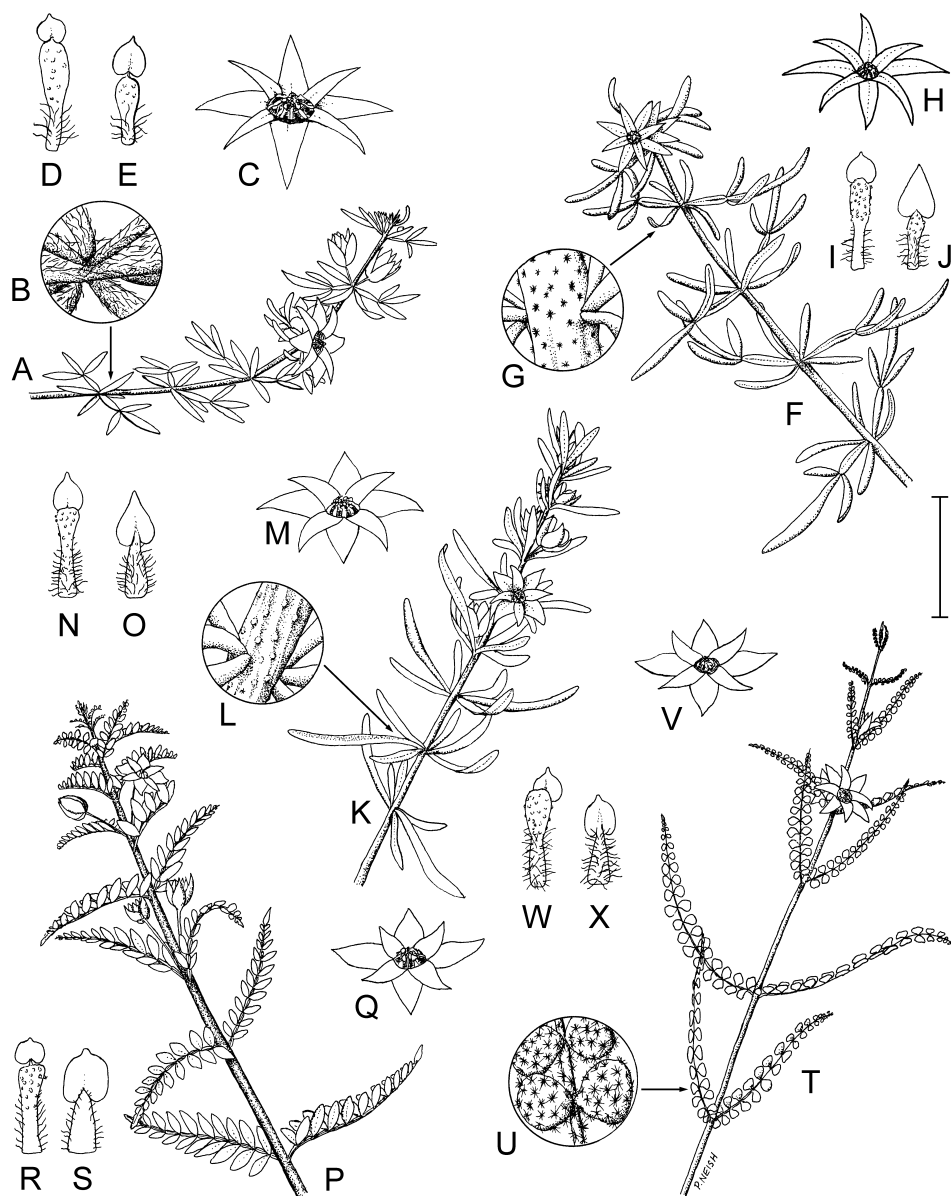


Figure 46. *Boronia*. **A–E**, *B. decumbens*. **A**, habit; **B**, branchlet detail; **C**, flower; **D**, antisepalous stamen, abaxial view; **E**, antipetalous stamen, abaxial view (**A–E**, C.Dunlop 6752, CANB; **C–E**, M.Duretto 474, MEL). **F–J**, *B. tolerans*. **F**, habit; **G**, branchlet detail; **H**, flower; **I**, antisepalous stamen, abaxial view; **J**, antipetalous stamen, abaxial view (**F–J**, M.Duretto 516, MEL). **K–O**, *B. jucunda*. **K**, habit; **L**, branchlet detail; **M**, flower; **N**, antisepalous stamen, abaxial view; **O**, antipetalous stamen, abaxial view (**K–L**, Chesterfield 214, MEL; **M–O**, M.Duretto 509, MEL). **P–S**, *B. kalumburuensis*. **P**, habit; **Q**, flower; **R**, antisepalous stamen, abaxial view; **S**, antipetalous stamen, abaxial view (**P–S**, E.Edwards LAC9247, CANB). **T–X**, *B. minutipinna*. **T**, habit; **U**, leaf detail, adaxial surface; **V**, flower; **W**, antisepalous stamen, abaxial view; **X**, antipetalous stamen, abaxial view (**T–X**, I.Cowie 1911, MEL). Scale bar: **A**, **F**, **K**, **P**, **T** = 16 mm; **C**, **H**, **M**, **Q**, **V** = 8 mm; **D**, **E**, **I**, **J**, **N**, **O**, **R**, **S**, **W**, **X** = 2 mm. Drawn by P.Neish.

A rare and poorly collected species known from 3 widely separated areas. Collections from the Edkins Ra. area are notable in that they have branches with just a few hairs, whereas plants from elsewhere have a sparse to dense indumentum on the branches. Plants from S of the Prince Regent R. have small hairs (with rays to 0.1 mm long) while the collections from N of the river have large hairs (with rays to 1.5 mm long). Only the Prince Regent R. collection (*Craven 9212*) has trifoliolate leaves, and then only on the lower nodes. Plants from the N end of the distributional range tend to have larger leaves. Sepal size is variable and the collection from near Mt Broome is notable for its large sepals (c. 6 mm long).



145. *Boronia barrettiorum* Durretto, *Nuytsia* 16: 16 (2006)

T: 15 km N of junction of Youwanjela Ck and Prince Regent R., W.A., 28 Jan. 1999, *M.D.Barrett 600*; holo: PERTH; iso: HO.

Illustrations: M.F.Durretto, *Austral. Pl.* 23 (183): 93 (2005); M.F.Durretto, *Nuytsia* 16: 17, fig. 1 (2006).

Erect shrub to 1.5 m high; with moderately dense stellate indumentum on branches and leaves. Leaves simple and petiolate with petiole to 3 mm long, or trifoliolate and sessile; simple leaves and terminal leaflets ovate to lanceolate to elliptic, 10–33 mm long, 4–11.5 mm wide, attenuate at base, acute; lateral leaflets 5–19 mm long, 3–7 mm wide. Pedicels 5–25 mm long. Perianth white, becoming green when in fruit. Sepals narrowly ovate-deltate, 2.5–3.75 mm long, 1–1.5 mm wide, acute to acuminate; abaxial surface with sparse to dense stellate indumentum. Petals 2.5–3.5 mm long. Stamens: filaments pilose; anther apiculum absent. Cocci glabrous.

Found near the Prince Regent R., W Kimberley region, W.A. in rocky sandstone areas with *Triodia*. Flowers and fruits Jan.

W.A.: 15 km N of King Cascade on Prince Regent R., *M.D.Barrett 1017* (HO, PERTH).

A rare and poorly collected species. Closely related to *B. pauciflora*, from which it can be distinguished by having a sparse to dense stellate indumentum on the leaves. Like *B. pauciflora* the species has both simple and trifoliolate leaves, but in *B. barrettiorum* specimens have both leaves though in varying proportions. Plants from the E part of the range (e.g. *Barrett 600*, *925*) have stellate hairs which are longer (to 0.5 (–1.5) mm long) than plants from the W (*Barrett 1017*; rays to 0.1 mm long).



146. *Boronia kalumburuensis* Durretto, *Nuytsia* 11: 334 (1997)

T: Outcropping sandstone immediately N of Kalumburu airstrip, W.A., 22 May 1993, *E.D.Edwards LAC9247*; holo: CANB; iso: DNA, MEL, PERTH.

Illustrations: M.F.Durretto, *Nuytsia* 11: 325, fig. 10 P–S (1997); M.F.Durretto, *Austral. Pl.* 23 (183): 93 (2005).

Erect shrub to 50 cm tall, with sparse to moderately dense stellate indumentum on branches and leaves. Leaves 15–27 (–33)-foliolate, 8–40 (–65) mm long, 4–14 mm wide; petiole 1–2 (–7) mm long; rachis segments triangular, 1.5–3.5 (–6) mm long; leaflets 1–11 mm long, 0.5–3 mm wide; terminal leaflets lanceolate, longer than laterals; lateral leaflets elliptic. Pedicels 7–24 mm long. Perianth creamy-white or white. Sepals ovate-deltate, 3.5–6 mm long, 1.5–2.5 mm wide, acute to acuminate; abaxial surface with sparse stellate indumentum. Petals 2.5–4 mm long; abaxial surface glabrous or with sparse stellate indumentum. Stamens: filaments with stellate, bifid and simple hairs; anther apiculum absent, or present and glabrous or with a few hairs. Cocci with a sparse stellate indumentum. Plate 34; Fig. 46P–S.

Occurs in the Kalumburu area, Kimberley region, W.A. Grows mainly on sandstones and quartzites. Flowers and fruits May–July.



W.A.: 3.6 km N of Kalumburu on road to Pago Mission, *T.E.H.Aplin* 867 (PERTH); Theda Stn near HS on banks of Morgan R., *P.A.Fryxell* 4858 (CANB, MEL, PERTH); c. 10 km N of Kalumburu Mission, *P.A.Fryxell* & *L.A.Craven* 4131 (CANB, DNA, MEL, PERTH); 4 km N Kalumburu, *A.S.George* 15199 (CANB, MEL, NSW); quartzite outcrop between Kalumburu Mission & Longini Landing, *D.E.Symon* 10184 (CANB, PERTH).

Can be distinguished from *B. filicifolia* and *B. minutipinna* by having fewer, larger leaflets; and from *B. wilsonii* by the sparse to moderately dense indumentum, much longer pedicels and smaller and less hairy flowers.

147. *Boronia filicifolia* A.Cunn. ex Benth., *Fl. Austral.* 1: 311 (1863)

T: Montague and York Sounds, N.W. Australia [W.A.], 1820, *A.Cunningham* 220; lecto: K *n.v.* (photos AD, MEL), *fide* M.F.Duretto, *Nuytsia* 11: 332 (1997); isolecto: BM *n.v.* (photos MEL, PERTH).

B. gravicocca Duretto, *Muelleria* 17: 123 (2003). T: Bradshaw Stn, Fire Plot 3, N.T., 18 Feb. 1999, *C.R.Mitchell* & *J.Russell-Smith* 2182; holo: DNA; iso: MEL, NSW, PERTH *n.v.*

Illustrations: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 669, fig. 206 A1, 2 (1992); M.F.Duretto, *Muelleria* 17: 102, fig. 12 K–M (2003), as *B. gravicocca*; M.F.Duretto, *Austral. Pl.* 23 (183): 90 (2005).

Erect shrub to 50 cm tall, with sparse to moderately dense stellate, and sometimes also simple, indumentum on branches and leaves. Leaves sessile or rarely with petiole to 2 mm long, (5–) 11–55-foliolate, (7–) 30–75 mm long, (3–) 6–12 mm wide; rachis segments oval, 0.5–7 mm long; terminal leaflets lanceolate, rarely oblanceolate (NT), 1–8 mm long, 0.5–5 mm wide, acute; lateral leaflets rhombic or circular or rarely oblanceolate to elliptic, 0.5–7 mm long, 0.5–3 mm wide, obtuse to acute. Pedicels (2–) 6–22 mm long. Perianth cream to yellow-white. Sepals ovate-deltate, 2–3.5 mm long, 1.5–2 mm wide, acute, slightly shorter than petals (Port Warrender & N.T.) to slightly longer (other areas); abaxial surface glabrous or with sparse stellate indumentum. Petals 2.5–5 mm long; abaxial surface glabrous or with sparse stellate indumentum. Stamens: filaments with bifid and simple hairs; anther apiculum absent, or present and glabrous or hirsute. Cocci glabrous or with a few hairs.

Occurs in the Mitchell R. and Port Warrender areas, NW Kimberley Region, W.A., and disjunctly at Bradshaw Stn, Victoria R. area, NT. Found in heath and open woodland on sandstones and quartzites. Flowers Dec.–June.; fruits (Dec., Feb.) June–July.

W.A.: 6 km W of Mitchell River Falls, *I.Cowie* 4346 (CANB, DNA); along Mitchell R., S of Mitchell Plateau, *P.A.Fryxell* 4735 (CANB, DNA, MEL, PERTH); E side of Mindjau Ck, Port Warrender, Admiralty Gulf, *K.F.Kenneally* 7763 (CANB, PERTH). N.T.: Bradshaw Stn, Fire Plot 3, *C.P.Brock* & *J.Russell-Smith* 319 (DNA); c. 88 km NW of Timber Ck, *P.S.Short* 5487 & *J.O.Westoway* (AD, CANB, DNA, MEL, MO).



A rare and poorly collected species that can be distinguished from *B. kalumburuensis* by the larger number of leaflets; and from *B. minutipinna* by the larger and more numerous leaflets, the longer pedicels and by having fewer hairs on the abaxial leaf surface. Plants from Port Warrender and Bradshaw Stn (previously recognised as *B. gravicocca*) have narrower leaflets and smaller sepals (that are shorter than the petals) than plants from other populations.

148. *Boronia minutipinna* Duretto, *Nuytsia* 11: 335 (1997)

T: Osmond Plateau, W.A., 19 July 1991, *I.Cowie* 1991; holo: CANB; iso: DNA, MEL, PERTH.

Illustrations: M.F.Duretto, *Nuytsia* 11: 325, fig. 10 T–X (1997); M.F.Duretto, *Austral. Pl.* 23 (183): 93 (2005).

Erect shrub to 50 cm tall, with moderately dense stellate indumentum on branches and leaves. Leaves sessile, 17–35-foliolate, 5–34 mm long, 2–4 mm wide; rachis segments oval, 0.5–12 mm long; terminal leaflets elliptic, 1–3 mm long, longer than laterals; lateral leaflets rhombic to ±circular, 0.5–2 mm long, 0.5–1.5 mm wide, obtuse to acute. Pedicels 1–6 mm long. Perianth pink or white. Sepals deltate, 3–5 mm long, 1.5–2 mm wide, acute; abaxial surface with sparse stellate indumentum. Petals 2.5–4.5 mm long; abaxial surface with sparse to moderately dense stellate indumentum. Stamens: filaments with bifid and stellate hairs; anther apiculum glabrous. Cocci hirsute. Fig. 46T–X.

Known from the type only; Osmond Plateau, SE Kimberley region, W.A. Found growing in sand amongst boulders. Flowers and fruits collected in July.

Can be distinguished from *B. filicifolia* by having smaller and fewer leaflets, smaller pedicels, and sparsely hairy perianth parts.



Doubtful names

Boronia caerulata Boitard, *J. Jardins* 154 (1828)

We have not seen this publication. According to a note by Mabberley (*Telopea* 8: 379 (1999)), the name is validly published in this obscure and short-lived journal, however he gave no details which might allow us to identify it.

Boronia cuneata A.Cunn. in R.Heward, *J. Bot. (Hooker)* 4: 272 (1841), *nom. nud.*

Description insufficient for identification.

Boronia ledifolia var. *denticulata* F.Muell. ex C.Moore & Betche, *Handb. Fl. New South Wales* 41 (1893)

T: Culgoa, N.S.W., Hickey; syn: MEL, not located.

No material from Culgoa has been located at MEL, and the description does not match any species of *Boronia* known from the area. It seems best to treat this as a *nomen dubium*, *fide* M.F.Duretto, *Muelleria* 12: 114 (1999).

Boronia rinzii Huegel ex Heynh., *Nom. Bot. Hort.* 2: 73 (1846), *nom. nud.*

Listed in A.Chapman, *Austral. Pl. Name Index* 1: 438 (1991), but publication not seen for this treatment. The name cannot be placed.

Boronia salicifolia A.Cunn. ex Heynh., *Nom. Bot. Hort.* 2: 73 (1846), *nom. nud.*

Listed in A.Chapman, *Austral. Pl. Name Index* 1: 439 (1991), but publication not seen for this treatment. The name cannot be placed.

ZIERIA

A.S.George, M.F.Duretto & P.I.Forster

Zieria Sm., *Trans. Linn. Soc. London* 4: 216 (1798); after Johannis Zier (17??–1796), Fellow of the Linnean Society, Polish botanist.

Type: *Z. smithii* Jacks.

Boronia sect. *Zieria* F.Muell., *Trans. Philosoph. Inst. Victoria* 2: 65 (1857). T: *B. granulata* F.Muell.

Shrubs to small trees, mostly highly aromatic. Leaves opposite (rarely slightly alternate), petiolate, palmately trifoliolate (rarely unifoliolate). Inflorescence a dischysial cyme, 1–many-flowered, axillary. Flowers 4-merous. Sepals united basally. Petals free, valvate or imbricate. Disc hypogynous, with 4 prominent lobes opposite sepals. Stamens 4, antisepalous; anthers usually apiculate. Gynoecium 4-carpellate; carpels slightly united at base, unilocular; placentation mid-axile; style solitary; stigma 4-lobed. Fruit of 1–4 cocci; undeveloped

carpels, if any, persistent; placental endocarp membranous to subfleshy, forming an ant-attracting elaiosome. Seeds 1 (rarely 2) per coccus; testa thin, brittle, irregularly sculptured; endosperm copious, fleshy; embryo straight; hypocotyl terminal.

A genus of 60 species, 59 endemic in Australia and one (*Z. chevalieri* Viot) in New Caledonia. Characterised by the 4-merous flowers, free petals, a disc with 4 prominent lobes opposite the sepals and a dry, dehiscent fruit. In Australia the genus extends from NE Qld to Tas. and W to Kangaroo Is., S.A., occurring commonly in open forest and heathland. Usually pollinated by flies and beetles, occasionally bees and possibly nymphalid butterflies. In this account the central leaflet is described; the lateral ones are similar but usually slightly smaller. Much of the account is based on Armstrong's revision of 2002.

J.M.Powell & J.A.Armstrong, Seed surface structure in the genus *Zieria* Sm. (Rutaceae), *Telopea* 2: 85–112 (1980); I.A.Southwell & J.A.Armstrong, Chemical variation within the genus *Zieria*, *Phytochemistry* 26: 1687–1692 (1987); J.A.Armstrong, *Zieria* (Rutaceae): a systematic and evolutionary study, *Austral. Syst. Bot.* 15: 277–463 (2002); M.F.Duretto & P.I.Forster, A taxonomic revision of the genus *Zieria* Sm. (Rutaceae) in Queensland, *Austrobaileya* 7: 473–544 (2007).

- 1 Leaves prominently glandular-verrucose on both or one surface or on margins
- 2 Margins of leaflets flat to slightly recurved
- 3 All leaflets not more than 15 mm long
- 4 Procumbent shrubs; leaflets ovate to broadly elliptic; branchlets velvety with stellate hairs **54. *Z. littoralis***
- 4: Erect shrubs; leaflets cuneate to obovate; branchlets pubescent with simple hairs
- 5 Inflorescence 5–9⁺-flowered; petals imbricate **38. *Z. robusta***
- 5: Inflorescence 1–3-flowered; petals valvate
- 6 Branchlets not or slightly glandular-verrucose; leaflet margins not glandular-verrucose **36. *Z. obcordata***
- 6: Branchlets densely glandular-verrucose; leaflet margins glandular-verrucose **37. *Z. adenophora***
- 3: All or most leaflets more than 15 mm long
- 7 Leaflets glabrous or hirsute abaxially with scattered stellate hairs
- 8 Leaf bases prominently decurrent **8. *Z. boolbunda***
- 8: Leaf bases not decurrent
- 9 Leaflets not glandular-verrucose adaxially; petiole 8–26 mm long; sepals 0.8–1.5 mm long **6. *Z. smithii***
- 9: Leaflets sparingly glandular-verrucose adaxially; petiole 4–6 mm long; sepals 0.8–1 mm long **29. *Z. floydii***
- 7: Leaflets velvety abaxially
- 10 Sepals 1.3–1.8 mm long **30. *Z. parrisiae***
- 10: Sepals 0.5–1 mm long
- 11 Adaxial surface of leaflets velvety or densely hairy
- 12 Petiole 2–5 mm long **26. *Z. buxijugum***
- 12: Petiole 8–25 mm long **27. *Z. furfuracea***
- 11: Adaxial surface of leaflets sparsely hairy or with few hairs
- 13 Adaxial surface of leaflets with an indumentum of minute simple and stellate hairs; inflorescence usually longer than leaves; petiole 1–8 mm long **24. *Z. collina***

- 13:** Adaxial surface of leaflets with a sparse indumentum of mainly large simple and bifid hairs or glabrous or with few hairs; inflorescence shorter than leaves; petiole 5–25 mm long
- 14** Petals 2.3–3.5 mm long; inflorescence 20–125-flowered **27. *Z. furfuracea***
- 14:** Petals c. 2 mm long; inflorescence 3–15-flowered **34. *Z. vagans***
- 2:** Margins of leaflets recurved to revolute
- 15** All or most leaflets less than 20 mm long
- 16** Leaflets cuneate-obovate, obcordate to rounded **36. *Z. obcordata***
- 16:** Leaflets linear, lanceolate, oblanceolate, elliptic, obovate or ovate
- 17** Leaflets ovate to broadly elliptic; sepals 2.5–2.8 mm long; cocci velvety **54. *Z. littoralis***
- 17:** Leaflets lanceolate, oblanceolate, narrowly elliptic, elliptic or obovate to narrowly oblanceolate; sepals 0.4–2 mm long; cocci hirsute or glabrous or almost so
- 18** Sepals 0.4–0.8 mm long; petiole 3–7 mm long **39. *Z. adenodonta***
- 18:** Sepals 1–2 mm long; petiole 0.5–3 mm long
- 19** Leaflets 2.5–10 mm long **45. *Z. odorifera***
- 19:** Leaflets mostly more than 10 mm long
- 20** Branchlets sparsely hairy, with stellate caducous hairs; leaflets narrowly elliptic to narrowly obovate, tomentose abaxially (near Nebo, Qld) **22. *Z. cephalophila***
- 20:** Branchlets densely hairy with mainly simple and bifid (also trifid and stellate) hairs between faint decurrent leaf bases, otherwise glabrous, rarely pilose; leaflets sparsely pilose or with few hairs abaxially (Stanthorpe, Qld) **48. *Z. graniticola***
- 15:** At least some leaflets more than 20 mm long
- 21** Leaflets narrowly linear, prominently glandular-verrucose both sides
- 22** Warts on younger branchlets glabrous **32. *Z. granulata***
- 22:** Warts on younger branchlets tomentose
- 23** Adaxial leaflet surface stellate-pubescent **31. *Z. tuberculata***
- 23:** Adaxial leaflet surface with scattered stellate and simple hairs **33. *Z. verrucosa***
- 21:** Leaflets broadly linear or wider, prominently glandular-verrucose on both sides, or only on one side
- 24** Leaflet margins glandular-verrucose
- 25** Adaxial surface of leaflets densely pubescent (W of Pambula, N.S.W.) **30. *Z. parrisiae***
- 25:** Adaxial surface of leaflets glabrous or with few hairs
- 26** Warts on adaxial leaflet surface and branchlets hairy (central Qld) **33. *Z. verrucosa***
- 26:** Warts on adaxial leaflet surface and branchlets glabrous (Mt Warning, N.S.W.; Lamington Natl Park, Qld) **39. *Z. adenodonta***
- 24:** Leaflet margins not glandular-verrucose
- 27** Adaxial leaflet surface not glandular-verrucose **34. *Z. vagans***
- 27:** Adaxial leaflet surface glandular-verrucose
- 28** Inflorescence usually 10–20-flowered **26. *Z. buxijugum***
- 28:** Inflorescence typically more than 20-flowered
- 29** Leaflets tomentose adaxially, epidermis not visible **25. *Z. formosa***

- 29:** Leaflets pubescent or velvety or with few hairs adaxially, epidermis visible
- 30** Adaxial leaflet surface with an indumentum of mainly simple and bifid hairs **27. *Z. furfuracea***
- 30:** Adaxial leaflet surface with an indumentum of mainly or only stellate hairs
- 31** Leaflets with scattered hairs abaxially (Guy Fawkes Natl Park, N.S.W.) **29. *Z. floydii***
- 31:** Leaflets velvety below (Central Tilba & Nowra areas, N.S.W.; SE Qld)
- 32** Adaxial leaflet surface pubescent; inflorescence 60–200-flowered (N.S.W.) **31. *Z. tuberculata***
- 32:** Adaxial leaflet surface with scattered stellate and simple hairs; inflorescence 17–60-flowered (Qld) **33. *Z. verrucosa***
- 1:** Leaves not prominently glandular-verrucose (abaxial midrib may be so)
- 33** Leaves unifoliolate, or mixed unifoliolate and trifoliolate
- 34** Leaves 5–16 mm long, all unifoliolate (S.A.; Vic.; Tas.) **59. *Z. veronicea***
- 34:** Leaves commonly (20–) 30–50 mm long, often both unifoliolate and trifoliolate (N.S.W.)
- 35** Inflorescence bracts small, caducous, 3.5–6.1 mm long, 0.7–1 mm wide **56. *Z. murphyi***
- 35:** Inflorescence subtended by prominent, persistent bracts (5.2–) 7.1–14 mm long, 2–7.4 mm wide **58. *Z. involucrata***
- 33:** Leaves all trifoliolate
- 36** Central leaflet commonly 50–90 mm long
- 37:** Abaxial leaf surface hirsute to tomentose
- 38** Inflorescence bracts usually scale-like, 1–3 mm long **6. *Z. smithii***
- 38:** Inflorescence bracts large, 8–20 mm long
- 39** Inflorescence bracts 12–20 mm long; sepals 1.3–2 mm long **1. *Z. arborescens***
- 39:** Inflorescence bracts 8–12 mm long; sepals 2–2.5 mm long **57. *Z. caducibracteata***
- 37:** Abaxial leaf surface glabrous
- 40** Branchlets not or scarcely ridged
- 41** Peduncles glabrous; sepals 1.3–2 mm long **1. *Z. arborescens***
- 41:** Peduncles hirsute; sepals 0.6–1 mm long (Dorrigo Natl Park, N.S.W., to far SE Qld) **2. *Z. southwellii***
- 40:** Branchlets ridged
- 42** Branchlets pubescent (Mt Boss State Forest, N.S.W.) **3. *Z. lasiocaulis***
- 42:** Branchlets, except when very young, glabrous (Grampians, Vic.) **4. *Z. oreocena***
- 36:** Central leaflet commonly less than 45 mm long
- 43** Adaxial surface of leaves with a dense stellate-tomentose indumentum (epidermis not visible)
- 44** Leaflets obcordate; petiole 1.4–3 mm long **53. *Z. baeuerlenii***
- 44:** Leaflets oblong, ovate or narrowly to broadly elliptic; petiole 4–18 mm long
- 45** Sepals 1–2.5 mm long; petals 2–2.5 mm long; leaves with secondary venation not prominent on abaxial surface **23. *Z. tenuis***

- 45: Sepals 2.5–3 mm long; petals 3.6–6 mm long; leaves with secondary venation prominent on abaxial surface **52. *Z. cytisoides***
- 43: Adaxial surface of leaves glabrous, or with a sparse to moderately dense indumentum of simple and/or stellate hairs though never so dense that epidermis is completely obscured
- 46 Inflorescence bracts c. as long as or longer than inflorescence, (5.2–) 7–14 mm long, persistent **58. *Z. involucrata***
- 46: Inflorescence bracts much shorter than inflorescence, 0.5–8.5 mm long, persistent or caducous (if > 3.5 mm long then caducous)
- 47 Abaxial surface of leaves with a dense indumentum of stellate hairs (epidermis not visible)
- 48 Branchlets glabrous, with prominent decurrent leaf bases
- 49 Sepals 2–2.6 mm long; staminal filaments hirsute **20. *Z. laevigata***
- 49: Sepals 1.2–1.7 mm long; staminal filaments usually glabrous, rarely with few hairs **21. *Z. laxiflora***
- 48: Branchlets glabrous or variously hairy, without prominent decurrent leaf bases
- 50 Sepals 4–4.5 mm long **55. *Z. covenyi***
- 50: Sepals 0.5–2.5 mm long
- 51 Adaxial surface of leaflets glabrous (sometimes with few hairs on midrib)
- 52 Branchlets glandular-verrucose
- 53 Branchlets glabrous or nearly so, though with a sparse stellate indumentum when young; inflorescence usually 7–13-flowered; sepals 0.5–1 mm long (N.S.W.) **28. *Z. hindii***
- 53: Branchlets with a sparse to dense indumentum, densely stellate-tomentose when young; inflorescence 12–21+-flowered; sepals 1–1.2 mm long (Qld) **35. *Z. distans***
- 52: Branchlets not glandular-verrucose
- 54 Leaflets elliptic to obovate, minutely mucronate; margins flat to recurved (sometimes revolute on drying); midrib of abaxial surface with a stellate indumentum as or nearly as dense as that of lamina; pedicels with moderately dense indumentum; sepals acute, inflexed (can be difficult to see); cocci stellate-hairy, if only on upper margin **17. *Z. compacta***
- 54: Leaflets narrowly elliptic to narrowly obovate; margins recurved to revolute; midrib of abaxial surface glabrous or with indumentum markedly less dense than lamina; pedicels glabrous or with sparse indumentum; sepals slightly acuminate, not inflexed; cocci glabrous **19. *Z. fraseri***
- 51: Adaxial surface of leaflets with a sparse to dense indumentum
- 55 Adaxial surface of leaves with stellate hairs, minute and sometimes scattered amongst minute simple hairs
- 56 Petals 2–2.5 mm long; sepals narrowly triangular, 1–2.5 mm long **23. *Z. tenuis***
- 56: Petals 1.2–2 mm long; sepals broadly ovate, 0.7–1 mm long **24. *Z. collina***
- 55: Adaxial surface of leaves with obvious simple hairs only
- 57 Petals 3.5–5.5 mm long
- 58 Inflorescence bracts c. 0.9 mm long, persistent **17. *Z. compacta***

- 58: Inflorescence bracts 3.5–6.1 mm long, caducous 56. *Z. murphyi*
- 57: Petals 1.5–2.5 mm long
- 59 Inflorescence longer than subtending leaves; bracts 2–2.5 mm long; sepals 1–1.2 mm long 18. *Z. exsul*
- 59: Inflorescence shorter than subtending leaves; bracts c. 0.7 mm long; sepals 0.5–0.7 mm long 42. *Z. minutiflora*
- 47: Abaxial surface of leaves glabrous or with a sparse to moderately dense indumentum of simple and/or stellate hairs though never so dense that epidermis is completely obscured
- 60 Branchlets prominently ridged or angular, at least with decurrent leaf bases; leaflets glabrous adaxially except sometimes a few hairs along midrib
- 61 Petiole commonly less than 10 mm long
- 62 Young branchlets glabrous
- 63 Plant prostrate 13. *Z. prostrata*
- 63: Plant erect 14. *Z. scopulus*
- 62: Young branchlets with a sparse to dense indumentum, sometimes only between decurrent leaf bases
- 64 Leaflet margins revolute; abaxial surface glabrous to simple-hirsute
- 65 Abaxial surface of sepals variously hairy, not glaucous 47. *Z. aspalathoides*
- 65: Abaxial surface of sepals glabrous and slightly glaucous 50. *Z. ingramii*
- 64: Leaflet margins flat to recurved; abaxial surface glabrous or with few hairs except sometimes midrib sparsely to moderately densely stellate-hairy
- 66 Branchlets glandular-verrucose
- 67 Leaflets elliptic to slightly obovate, entire, 11–25 mm long (Boolbunda Rock area, Qld) 8. *Z. boolbunda*
- 67: Leaflets obovate, crenate-dentate, 2.5–12 mm long (central-eastern N.S.W.; Moroka R., Vic.) 38. *Z. robusta*
- 66: Branchlets not or faintly glandular-verrucose
- 68 Branchlets pubescent with simple hairs; inflorescences to 50-flowered; peduncle 12–22 mm long 51. *Z. rimulosa*
- 68: Branchlets glabrous, with few hairs or with moderately dense stellate hairs mixed with a few simple and bifid ones; inflorescences 1–10-flowered; peduncle less than 8 mm long
- 69 Sepals glabrous or sparsely hairy with mainly simple hairs (Clarke Ra., Qld) 10. *Z. eungellensis*
- 69: Sepals pubescent at least at base with mainly stellate hairs (Mt Finnegan to Hinchinbrook Is., Qld) 12. *Z. robertsiorum*
- 61: Petiole more than 10 mm long or commonly so
- 70 Abaxial leaf surface hirsute to tomentose 1. *Z. arborescens*
- 70: Abaxial leaf surface glabrous or with few hairs
- 71 Branchlets tomentose or pubescent, sometimes becoming glabrous when old, if glabrous then not prominently ridged
- 72 Sepals densely pubescent (epidermis not visible) on abaxial surface (Dorrigo Natl Park, N.S.W., to far SE Qld) 2. *Z. southwellii*

- 72: Sepals glabrous or sparsely hirsute on abaxial surface (epidermis visible) (Mt Boss State Forest, N.S.W.) **3. *Z. lasiocaulis***
- 71: Branchlets glabrous or with few hairs, prominently ridged
- 73 Inflorescence 10–30-flowered
- 74 Stems not glandular-verrucose; leaflets lanceolate; sepals 1.2–1.9 mm long (Grampians, Vic.) **4. *Z. oreocena***
- 74: Stems slightly glandular-verrucose; leaflets elliptic to obovate; sepals 0.7–1 mm long (SE Qld) **9. *Z. montana***
- 73: Inflorescence 1–12-flowered
- 75 Leaflets obtuse or scarcely acute; decurrent leaf bases not or slightly glandular-verrucose; peduncle not glandular-verrucose **7. *Z. madida***
- 75: Leaflets acute; decurrent leaf bases markedly glandular-verrucose; peduncle glandular-verrucose **11. *Z. alata***
- 60: Branchlets not ridged or angular; leaf bases not or weakly decurrent; leaflets glabrous or variously hirsute adaxially
- 76 Most leaflets more than 20 mm long
- 77 Leaflets glabrous adaxially except sometimes a few hairs along midrib
- 78 Branchlets tomentose or velvety (sometimes with few hairs with age), or rarely glabrous; petiole 8–26 mm long (most > 10 mm long); sepals hirsute to glabrous (Qld; N.S.W.; Vic.) **6. *Z. smithii***
- 78: Branchlets glabrous except when very young; petiole 2–10 mm long; sepals glabrous (Mt Larcom, Qld) **16. *Z. actites***
- 77: Leaflets hairy adaxially (sometimes hairs minute)
- 79 Leaflets with mainly stellate hairs on adaxial surface **6. *Z. smithii***
- 79: Leaflets with simple and bifid hairs on adaxial surface **15. *Z. hydroscopica***
- 76: All or most central leaflets less than 20 mm long
- 80 Sepals 0.5–0.7 mm long; leaflets obovate, adaxial surface pubescent with mainly long simple hairs, rarely with few hairs **42. *Z. minutiflora***
- 80: Sepals more than 0.9 mm long, if 0.7–0.9 mm long then leaflets lanceolate to elliptic or obovate or ±ovate; leaflets glabrous adaxially or with few hairs or with an indumentum of simple and/or minute stellate hairs
- 81 Petiole to 1 mm long
- 82 Sepals 1–1.2 mm long; central leaflets obovate, rounded and slightly acute, flat or slightly recurved, 2–7 mm wide **40. *Z. obovata***
- 82: Sepals 1.3–2 mm long; central leaflets narrowly lanceolate to narrowly elliptic to narrowly oblanceolate, acute, revolute, 0.9–4.2 mm wide
- 83 Abaxial surface of leaflets glabrous or with an indumentum of simple and bifid hairs **47. *Z. aspalathoides***
- 83: Abaxial surface of leaflets with a stellate indumentum
- 84 Leaflets with revolute margins and virtually no abaxial surface visible; abaxial surface of sepals with a sparse indumentum (Moura, Qld) **47. *Z. aspalathoides***

- 84:** Leaflets with recurved to revolute margins, many with clearly visible abaxial surface; abaxial surface of sepals with few hairs or with a moderately dense to dense indumentum (N Qld) **49. *Z. whitei***
- 81:** Petiole 1–18 mm long, rarely some leaves with petioles 0.5–1 mm long also present
- 85** Leaflets stellate-tomentose abaxially
- 86** Adaxial surface of petals hairy; leaflets glabrous, adaxially with few hairs or pilose, rarely stellate-hairy **12. *Z. robertsiorum***
- 86:** Adaxial surface of petals glabrous, with few hairs or with hairs along margins; leaflets stellate-tomentose adaxially **23. *Z. tenuis***
- 85:** Leaflets pilose or with few hairs or glabrous abaxially; hairs mainly simple or bifid but a few stellate ones may be present
- 87** Leaflets commonly 4–6.5 mm long
- 88** Petals glabrous or with a few hairs near margins **45. *Z. odorifera***
- 88:** Petals with a sparse to dense indumentum on adaxial or both surfaces
- 89** Abaxial surface of sepals with scattered stellate hairs, mainly near base **46. *Z. inexpectata***
- 89:** Abaxial surface of sepals with simple hairs, rarely glabrous or also with stellate hairs
- 90:** Procumbent shrub to 0.15 m high, proliferating from rhizomes; central leaflets 4–5 (–10) mm long, 1.5–1.9 mm wide **44. *Z. citriodora***
- 90:** Erect shrub to 1 m high; central leaflets 3.5–10 mm long, 2–5 mm wide **45. *Z. odorifera***
- 87:** Leaflets commonly 7–25 mm long
- 91** Leaflet margins clearly recurved to revolute
- 92** Petals glabrous or with few hairs near margins **45. *Z. odorifera***
- 92:** Petals moderately to densely stellate-hairy on abaxial surface
- 93** Leaflets weakly glandular-verrucose including midrib
- 94** Leaflets pilose **45. *Z. odorifera***
- 94:** Leaflets glabrous apart from few hairs along midrib and where joined to petiole, rarely sparsely pilose **48. *Z. graniticola***
- 93:** Leaflets not glandular-verrucose
- 95** Petals c. 2.8 mm long; sepals glabrous **50. *Z. ingramii***
- 95:** Petals 3–5.8 mm long; sepals hirsute or with few hairs
- 96** Inflorescences shorter than leaves; petals 3–4.5 mm long **43. *Z. pilosa***
- 96:** Inflorescences longer than leaves; petals 4.4–5.8 mm long **47. *Z. aspalathoides***
- 91:** Leaflet margins flat to slightly recurved
- 97** Branchlets glabrous; sepals 0.7–1 mm long; petals 2–2.5 mm long **14. *Z. scopulus***

- 97: Branchlets pilose (rarely glabrous and then sepals at least 1.5 mm long), sometimes also with bifid and stellate hairs; sepals 1–3.5 mm long; petals 1.8–4.5 mm long
- 98 Petals 1.8–2 mm long; cocci 2–3 mm long (SE Qld) **41. *Z. bifida***
- 98: Petals c. 3–4.5 mm long; cocci 3–4 mm long
- 99 Sepals very broadly ovate-deltate, 1–1.1 mm long and wide; leaflet margins slightly crenulate (NE Qld) **5. *Z. insularis***
- 99: Sepals linear-subulate or narrowly lanceolate, 1.5–3.5 mm long, 0.6–1.5 mm wide; leaflet margins entire (N.S.W.) **43. *Z. pilosa***

1. *Zieria arborescens* Sims, *Bot. Mag.* 34: t. 1395 (1811)

Boronia arborescens (Sims) F.Muell., *Fragm.* 1: 100 (1859). T: Port Dalrymple, Tas., Jan. 1804, *R. Brown Iter Austral.* 5279; lecto: BM, *fide* J.A. Armstrong, *Austral. Syst. Bot.* 15: 306 (2002); isolecto: BM, K, MEL.

Shrub or tree to 10 m high. Branchlets slightly to distinctly ridged with decurrent leaf bases, not glandular-verrucose, stellate-pubescent, rarely with few hairs. Leaves trifoliolate; petiole 8–40 mm long; central leaflet variable, narrowly elliptic, oblong, or lanceolate, (24–) 50–90 (–126) mm long, 4–22 mm wide, entire, shortly recurved at margins, acute; both surfaces not glandular-verrucose; adaxial surface with few hairs; abaxial surface tomentose to hirsute, or glabrous, with midrib not glandular-verrucose, secondary venation prominent. Inflorescences shorter than or rarely equal to leaves, usually 120–500-flowered; bracts 12–20 mm long, caducous. Sepals 1.3–2 mm long, rarely slightly glandular-verrucose, pubescent. Petals imbricate, 3–6.5 mm long, creamy white, gland-dotted abaxially, pubescent or hirsute adaxially. Filaments glandular-verrucose apically, dilated basally. Cocci apiculate, glabrous.

Widespread in wet forests of eastern Australia from SE Qld to Tas. There are 3 subspecies. Flowers June–Dec.; fruits Nov.–Dec.

- 1 Shrub to 3 m high; branchlets distinctly ridged **1b. subsp. *decurrens***
- 1: Shrub or small tree to 10 m high; branchlets slightly ridged
- 2 Central leaflet hirsute to densely tomentose on abaxial surface **1a. subsp. *arborescens***
- 2: Central leaflet glabrous or with scattered minute stellate hairs on abaxial surface **1c. subsp. *glabrifolia***

1a. *Zieria arborescens* Sims subsp. *arborescens*

Z. macrophylla Bonpl., *Descr. Pl. Malmaison* 64 (1815); *Z. smithii* var. *macrophylla* (Bonpl.) Benth., *Fl. Austral.* 1: 307 (1863). T: eastern Australia, *coll. unknown*; neo: G-DC, *fide* J.A. Armstrong, *Austral. Syst. Bot.* 15: 307 (2002).

Z. smithii var. *tomentosa* Maiden & Betche, *Proc. Linn. Soc. New South Wales* ser. 2, 28: 904 (1904). T: Mt Useful and Baw Baw, Vic., Jan. 1886, *A.H.S. Lucas*; syn: NSW 2752; Mt Tomah, N.S.W., Dec. 1897, *J. Gregson*; syn: NSW 2774.

Z. arborescens subsp. A, J.A. Armstrong in G.J. Harden (ed.), *Fl. New South Wales* 2: 240 (1991).

Illustrations: N.G. Walsh & T.J. Entwisle (eds), *Fl. Victoria* 4: 167 fig. 30a (1999), as *Z. arborescens*; G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 281 (2002); J.A. Armstrong, *op. cit.* 308, fig. 9 (2002).

Robust shrub or small tree to 10 m high. Branchlets slightly ridged, scurfy-pubescent with short stellate hairs, rarely with few hairs; older branches rarely faintly glandular-verrucose, with few hairs or glabrous, lenticellate. Petiole tomentose all over (densely so on adaxial surface). Central leaflet hirsute to densely tomentose on abaxial surface. Peduncle pubescent. *Stinkwood*. Plate 36.

Widespread in eastern Australia from Springbrook and Lamington Plateau, SE Qld (with an outlier on Mt Norman), along the coast and adjacent ranges of N.S.W. and eastern Vic., on islands of Bass Strait and throughout Tas. Common in moist, tall open forest and the margins of rain forest.

Qld: Springbrook, *A.R.Bean* 7175 (AD, BRI, CANB, NSW). N.S.W.: Mt Tomah, *J.A.Armstrong* 1269 (HO, NSW). Vic.: 10 km SE of Forrest, Benwerrin–Mt Sabine road, eastern Otways, *S.G.Harris* 70 (AD, CANB, HO, MEL). Tas.: 18.1 km from Breona, Lake Hwy, Great Western Tiers, *F.E.Davies* 1006 & *P.Ollerenshaw* (AD, HO, MEL); Mt Strzelecki, Flinders Is., *M.Visoiu* 263 *et al.* (BRI, HO, K).

Varies in the shape, size and indumentum of leaflets. Plants with a glabrous abaxial surface to the leaflets occur in Tas. (including King Is.), Vic. and SE N.S.W.

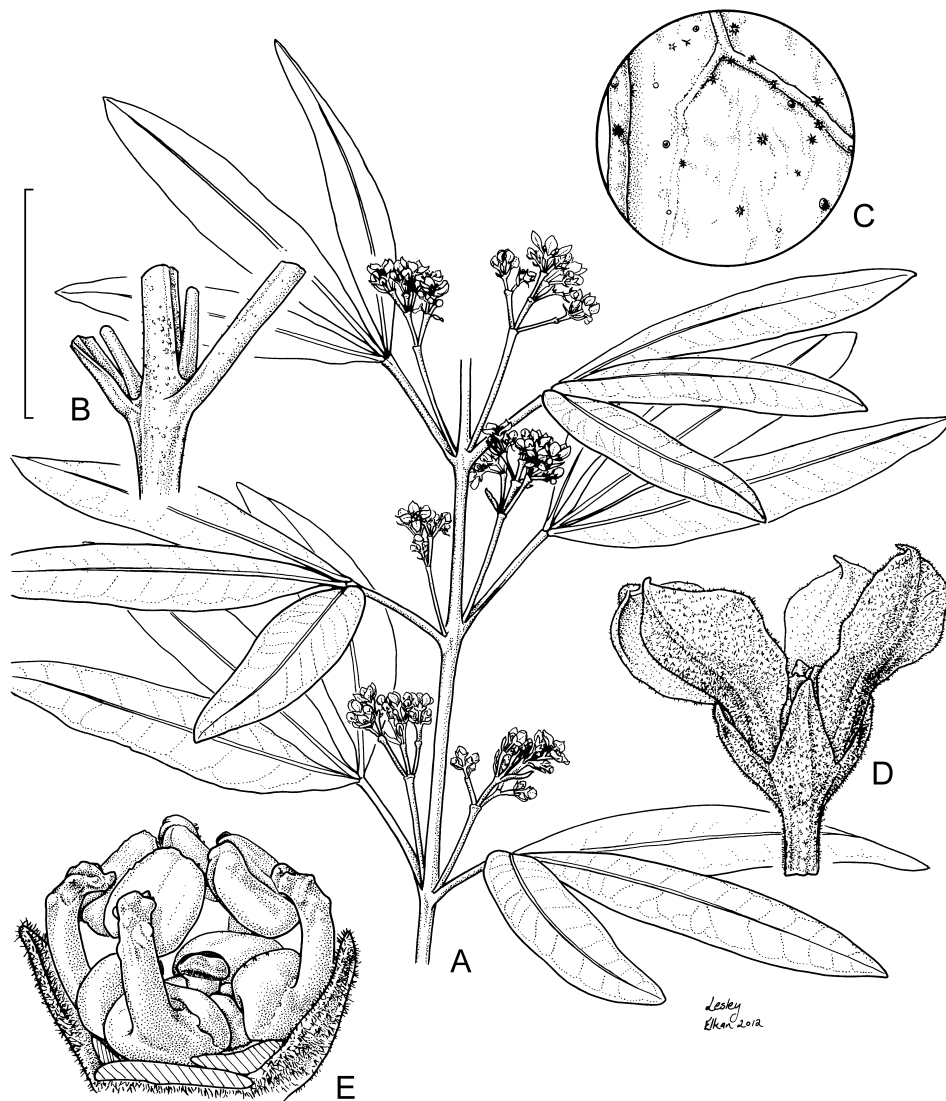


Figure 47. *Zieria arborescens* subsp. *glabrifolia*. **A**, habit; **B**, stem detail; **C**, leaf, abaxial surface detail; **D**, flower; **E**, flower showing stamens & carpels (petals & 1 sepal removed) (**A–E**, *J.Armstrong* 1153, NSW). Scale bar: **A** = 45 mm; **B** = 15 mm; **C** = 2.5 mm; **D** = 5 mm; **E** = 2 mm. Drawn by L.Elkan.

1b. *Zieria arborescens* subsp. *decurrens* J.A.Armstr., *Austral. Syst. Bot.* 15: 312 (2002)

T: 1.5 miles [c. 2.4 km] along Caves Beach Rd near Jervis Bay, N.S.W. [A.C.T.], 18 Oct. 1974, *J.A.Armstrong 749* & *R.Coveny*; holo: NSW; iso: BRI, CANB, MEL.

Z. arborescens subsp. B, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 240 (1991).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 281 (2002).

Robust shrub to 3 m high. Branches distinctly ridged (particularly when older), stellate-hirsute when very young (more densely so between ridges), becoming glabrous (rarely faintly hirsute between ridges) when older. Petiole pubescent or with few hairs adaxially, glabrous or with few hairs abaxially. Central leaflet hirsute on abaxial surface. Peduncle with few hairs (more densely so between ridges).

Restricted to Jervis Bay, A.C.T./N.S.W. Grows in sand in open forest and woodland.

A.C.T.: c. 3 miles [4.8 km] SW of Jervis Bay on Caves Beach Rd, *R.G.Coveny 11034* (NSW).

**1c. *Zieria arborescens* subsp. *glabrifolia*** J.A.Armstr., *Austral. Syst. Bot.* 15: 312 (2002)

T: Baboon Gully, Girraween Natl Park, c. 2 km N of ranger station, Qld, 28 Sept. 1977, *J.A.Armstrong 1153*; holo: NSW; iso: BRI, CANB, MEL.

Robust shrub or small tree to 10 m high. Branchlets slightly ridged, scurfy-pubescent with short stellate hairs, rarely with few hairs; older branches rarely faintly glandular-verrucose, glabrescent or glabrous, lenticellate. Petiole hirsute or with few hairs adaxially, glabrous abaxially. Central leaflet glabrous or with scattered minute stellate hairs on abaxial surface. Peduncle glabrous or with few hairs. Fig. 47.

Occurs in the Stanthorpe–Wallangarra area, SE Qld, and in NE N.S.W. Grows in rocky, granitic soil in eucalypt open forest and at edge of rain forest.

Qld: Bald Rock Ck, N of Wallangarra, *E.J.Carroll 729* (CANB); Donnelly's Castle, c. 6.5 km W of Thulimbah off Donnelly's Castle Rd, *M.T.Mathieson 213* (BRI, MEL); Gully between Wallangarra Ridge and Shark Fin Ridge, Girraween Natl Park, *M.T.Mathieson 459* (BRI, MEL). N.S.W.: WSW of Torrington, *J.B.Williams* & *G.J.White NRAC4* (BRI, NE).

Plants at Baboon Gully and Bald Rock Ck have larger leaves and inflorescences than those elsewhere; those at Jollys Falls (e.g. *J.B.Williams s.n.*, BRI, CANB) have narrower, shorter leaves and smaller inflorescences and flowers.

**2. *Zieria southwellii*** J.A.Armstr., *Austral. Syst. Bot.* 15: 443 (2002)

T: Mt Moombil, 6 km SE of Megan, Dorriggo Plateau, N.S.W., 10 Sept. 1988, *I.R.Telford 10705*; holo: CANB; iso: BRI, NSW.

Z. sp. K, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 246 (1991).

Z. sp. (Lamington G.Leiper AQ502702), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 288 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 444, fig. 128 (2002).

Shrub or small tree to 5 m high. Branchlets terete or slightly ridged, with decurrent leaf bases absent or faint, not glandular-verrucose, hirsute with stellate hairs, sometimes with few hairs. Leaves trifoliate; petiole 12–50 mm long; central leaflet narrowly elliptic, commonly 45–90 mm long, 8–33 mm wide, entire, flat, obtuse, concolorous; adaxial surface not glandular-verrucose, glabrous or with few hairs; abaxial surface not glandular-verrucose, with few hairs to glabrous, the midrib not glandular-verrucose, with few hairs, secondary

venation prominent. Inflorescences shorter than leaves, many-flowered; peduncle hirsute. Sepals 0.6–1 mm long, densely pubescent. Petals imbricate, 4–5.5 mm long, creamy white, pubescent adaxially. Filaments glandular-verrucose apically, prominently dilated basally. Cocci apiculate, glabrous. *n* = 18, J.A.Armstrong, *op. cit.* 15: 286 (2002).

Confined to the Whian Whian State Forest, Dorrigo Plateau and Mt Warning, NE N.S.W., and SE Qld at Springbrook Plateau and Lamington Plateau. Grows near rain forest margins and adjacent wet sclerophyll forest in skeletal soil. Flowers late winter to spring.

Qld: Boy-ull Ck, Springbrook, *P.I. Forster PIF13881* & *G. Leiper* (BRI, CANB); Coomera Falls Track, 5.7 km from Binna Burra, Lamington Natl Park, *I. Southwell 80-12* (BRI, NSW). N.S.W.: Whian Whian State Forest, 15 Jan. 1953, *E.F. Constable* (NSW); Mt Warning 14.5 km SW of Murwillumbah, *R. Coveny 4330* & *J.A. Armstrong 49* (BRI, CANB, K, NSW); near Bobs Ridge Rd, c. 2 km SSW of Tinebank Mtn, NW of Wauchope, *P. Gilmour 7889* (BRI, CFSHB, NSW).



3. *Zieria lasiocaulis* J.A.Armstr., *Austral. Syst. Bot.* 15: 382 (2002)

T: Mt Banda Banda, c. 44 km NW of Wauchope, in Mt Boss State Forest, N.S.W., 17 Sept. 1978, *J.A. Armstrong 1238* & *P. Hind*; holo: NSW; iso: AD, BRI, CANB, K, MEL, NSW.

Z. sp. N, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 246 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 288 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 383, fig. 72 (2002).

Shrub or tree to 6 m high. Branchlets terete, with decurrent leaf bases faint to prominent, not to slightly glandular-verrucose, pubescent with stellate and simple hairs. Leaves trifoliolate; petiole 14–28 mm long; central leaflet elliptic to oblanceolate, (24–) 40–60 (–82) mm long, 8–25 mm wide, entire, almost flat, acute, concolorous; both surfaces glabrous, not glandular-verrucose; midrib with few hairs; secondary venation prominent on abaxial surface. Inflorescences shorter than leaves, c. 20–many-flowered. Sepals 1–1.2 mm long, sparsely hirsute or glabrous. Petals imbricate, 3.5–4 mm long, creamy white, gland-dotted abaxially, pubescent adaxially. Filaments slightly glandular-verrucose apically. Cocci not apiculate.

Restricted to headwaters of Wilson R. in Mt Boss State Forest, N.S.W. Grows on rocky (volcanic) escarpments, in clearings and along margins of *Nothofagus* rain forest. Flowers late autumn to spring.

N.S.W.: Mt Boss, 6 June 1980, *A. Floyd* (NSW); 2.5 km SE of Mt Banda Banda, *P. Hind 2373* (NSW); North Wilson, NW of Wauchope, *H. Streimann 8204* (CANB, NSW).

Plants at Mt Banda Banda show variation in leaf size but otherwise this is a uniform species.

Listed as Endangered under the EPBC Act, 1999.



4. *Zieria oreocena* J.A.Armstr., *Austral. Syst. Bot.* 15: 414 (2002)

T: Mt Zero, The Grampians, Vic., 27 July 1950, *J.H. Willis s.n.*; holo: MEL.

Z. sp. 1, M.F.Duretto in N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 165 (1999).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 167, fig. 30b (1999), as Z. sp. 1; J.A.Armstrong, *op. cit.* 415, fig. 101.

Shrub to 3.5 m high. Branchlets ridged, with decurrent leaf bases, not glandular-verrucose, glabrous except when very young. Leaves trifoliolate; petiole 11–36 mm long; central leaflet lanceolate, commonly 37–55 mm long, 4–15 mm wide, entire, flat or margins slightly recurved, acute, both surfaces glabrous, not glandular-verrucose; midrib with few hairs or very rarely glabrous; secondary venation obscure on abaxial surface. Inflorescences shorter than leaves, to 30-flowered. Sepals 1.2–1.9 mm long, pubescent. Petals imbricate, 3.5–5.2 mm

long, creamy white, \pm gland-dotted abaxially, pubescent adaxially. Filaments glandular-verrucose apically. Cocci minutely apiculate, glabrous.

Restricted to The Grampians, western Vic. Grows along creek banks, usually in sandy or loamy soil in eucalypt woodland. Flowers winter to spring.

Vic.: Flat Rock Ck, Difficult Ra., SE of Mt Zero, *R.Anderson* 4522 (NSW); Deep Ck, Victoria Ra., *A.C.Beaglehole* 4813 (MEL); c. 6 km N of Victoria Point, *A.C.Beaglehole* 7075 (MEL).

Plants at Brown Ck in the Victoria Ra. have the central leaflet shorter than in plants elsewhere.



5. *Zieria insularis* Durretto & P.I.Forster, *Austrobaileya* 7: 516 (2007)

T: State Forest 144, Mt Windsor Tableland, Qld, 11 July 1995, *P.I.Forster PIF17246* & *S.J.Figg*; holo: BRI; iso: AD, CANB, CNS, DNA, K, MEL, NSW.

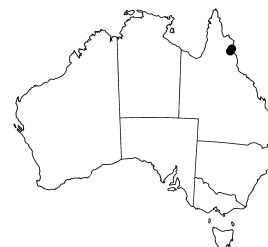
Z. smithii subsp. (SF144 B.Gray 428), *P.I.Forster* in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002), p.p.

Illustration: M.F.Durretto & P.I.Forster, *op. cit.* 517.

Shrub to 2 m tall. Branchlets \pm terete, with faint decurrent leaf bases, not glandular-verrucose, pilose with mainly simple and bifid hairs. Leaves trifoliolate; petiole 2–4 mm long; central leaflet narrowly elliptic, elliptic or obovate, 8–21 mm long, 2–6 mm wide, slightly crenulate, \pm flat, acute to obtuse, not glandular-verrucose; secondary veins obscure; adaxial surface with few simple hairs along midrib or with a sparse indumentum of simple and bifid hairs; abaxial surface with a sparse indumentum of simple and bifid hairs though a few stellate hairs sometimes also present. Inflorescences usually longer than subtending leaves but sometimes shorter, 1–several-flowered. Sepals very broadly ovate-deltate, 1–1.1 mm long, sparsely pilose adaxially, with sparse stellate hairs abaxially. Petals valvate, c. 3 mm long, white, not obviously glandular, stellate-tomentose both sides. Filaments glabrous or sparsely hairy near tip. Cocci 3–4 mm long, not or slightly glandular-verrucose, glabrous.

Endemic in NE Qld on the Mt Windsor Tableland and near Black Mtn in Daintree Natl Park. Grows in vegetation mats (mainly monocots) on exposed rocky ridges and watercourses surrounded by rain forest, or in open forest of *Syncarpia*, *Callitris*, *Lophostemon* etc. Flowers and fruits Jan.–July.

Qld: Daintree Natl Park, Little Daintree R., *P.I.Forster* 22796 *et al.* (AD, BRI, CNS, MEL); Daintree Natl Park, NW of Black Mtn, *P.I.Forster* 22873 *et al.* (AD, BRI, K, MEL, NSW); State Forest Res. 144, *B.Gray* 428 (BRI, CANB); Mt Windsor, Granite Dome, *P.Hind* 3168 (NSW); Mt Windsor forestry camp, on Spencer Ck, *P.Hind* 5684 & *G.D'Aubert* (HO, NSW).



Related to *Z. smithii* but has a weaker habit, smaller leaves and an indumentum of mainly simple and bifid (not stellate) hairs on the abaxial surface of the leaflets.

6. *Zieria smithii* Jacks. in H.C.Andrews, *Bot. Repos.* 9: t. 606 (1810)

T: communicated by *A.B.Lambert* from New Holland [Sydney district], N.S.W., Apr. 1810; holo: illustration in H.C.Andrews, *Bot. Rep.* 9: t. 606 (1810).

Z. smithii Bonpl., *Descr. Pl. Malmaison* 62, t. 24 (1815), *nom. illeg., non* Jacks. (1810). T: Habitat in Nova Hollandia; *n.v.*

Z. lanceolata Sm. in A.Rees, *Cycl.* 39, no. 1 (1818), *nom. illeg. non* R.Br. ex Sims (1811). T: Port Jackson, N.S.W., 179-, *J.White*; *n.v.*

Z. smithii var. *parvifolia* Benth., *Fl. Austral.* 1: 307 (1863), p.p. T: Sandy Bay and Cape Hervey [Qld], 31 July 1802, *R.Brown Iter Austral.* 5280; syn: BM, MEL. [The other syntype 'New England, [C.]Stuart' is *Z. compacta*]

Z. smithii subsp. *tomentosa* J.A.Armstr., *Austral. Syst. Bot.* 15: 440 (2002). T: above Walsh Falls on Wallum Trig Road, c. 6.5 km N of Atherton, Qld, 9 Sept. 1977, J.A.Armstrong 1027 & J.M.Powell; holo: BRI; iso: MEL, NSW.

Z. multiflora Sm. in A.Rees, *Cycl.*, 39, no. 1 (1818), *nom. inval.* (not accepted by Smith)

[*Boronia arborescens* auct. non (Sims) F.Muell.: F.J.H.von. Mueller, *Fragm.* 1: 100 (1859), p.p.]

Z. smithii subsp. A, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 244 (1991).

Z. smithii subsp. B, J.A.Armstrong, *loc. cit.*

Z. sp. (Mt Ballow, G.Leiper AQ473220), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 167, fig. 30g (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 286 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 438, fig. 122 (as *Z. smithii* subsp. *smithii*), 441, fig. 125 (as *Z. smithii* subsp. *tomentosa*) (2002).

Shrub to 2 m high, with lignotuber. Branchlets terete, smooth or rarely very slightly ridged, with leaf bases not decurrent, sometimes glandular-verrucose, pubescent or with few hairs, with stellate hairs or glabrous. Leaves trifoliolate; petiole 8–26 mm long; central leaflet narrowly elliptic, oblong or lanceolate, 22–70 mm long, 3–15 mm wide, entire, flat to recurved at margins, acute; both surfaces \pm glandular-verrucose; adaxial surface glabrous or with a sparse indumentum of stellate and/or simple hairs; abaxial surface glabrous or pubescent to hirsute with scattered stellate hairs, with midrib glandular-verrucose, glabrous or with few hairs to pubescent; secondary venation prominent on abaxial surface. Inflorescences shorter than leaves, to 60-flowered; inflorescence bracts usually scale-like, 1–3 mm long. Sepals 0.8–1.5 mm long, glandular-verrucose, hirsute to glabrous. Petals imbricate, 2–4 mm long, creamy white, very rarely pale pink, glandular-verrucose and tomentose abaxially, sparsely hairy adaxially. Filaments glandular-verrucose apically. Cocci apiculate, glandular-verrucose, glabrous.

Occurs from near Atherton, N Qld, S through eastern N.S.W. to eastern Vic. Widespread on the margins of closed forest or as an undershrub in eucalypt tall open forest. Flowers and fruits all months but mainly Jan.–Sept.



Qld: near 'Get Down', Robinson Gorge, Expedition Natl Park, P.I.Forster 17729 & S.J.Figg (AD, BRI, MEL, NSW); Davies Ck, B.Wannan 1393 & K.Wilson (BRI, CANB, NSW). N.S.W.: Moogem State Forest, c. 60 km E of Glen Innes, L.M.Copeland 2947 (CANB, NE, NSW). Vic.: NE of Stockdale, A.C.Beauglehole 77401 (MEL, NSW); Croajingalong Natl Park, Allen Head, Bottom L., Mallacoota, J.Ross 3458 & C.Coles (BRI, CANB, HO, MEL).

The two subspecies recognised by Armstrong (2002) are no longer accepted (Durretto & Forster, 2007). *Z. smithii* shows considerable variation in the density of the indumentum and tubercles, size of leaflets, size and shape of sepals etc. Some plants from NE Qld and Eungella Natl Park (Qld) are quite slender with relatively small leaves. Plants from central Qld (e.g. Blackdown Tableland & Kroombit Tops) have stems that are slightly to strongly glandular-verrucose. In near-coastal sandy areas of SE Qld (including the sand islands), on the 'Scenic Rim' (SE Qld) and Gibraltar Ra., plants have large leaves and are more robust than those elsewhere. On the Lamington Plateau and the 'Scenic Rim' are plants with slightly glandular-verrucose leaves and sepals. A variant from the N coast of N.S.W. resembling *Z. prostrata* was studied by P.M.Hogbin & M.D.Crisp (*Austral. Syst. Bot.* 16: 515–525 (2003)). Detailed field and laboratory research is required to resolve the taxonomy of this variation.

7. *Zieria madida* Durretto & P.I.Forst., *Austrobaileya* 7: 519 (2007)

T: Hilda Ck, Thornton Peak, Qld, 25 Sept. 1984, J.R.Clarkson 5587; holo: BRI; iso: CANB, CNS, HO, K, L, NSW.

Z. sp. (Thornton Peak J.R.Clarkson 5556), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Z. sp. (Pieter Botte M.Godwin C2471), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Illustration: M.F.Durretto & P.I.Forster, *op. cit.* 521.

Shrub to 2 m tall. Branchlets ridged with prominent, raised decurrent leaf bases, not or slightly glandular-verrucose, glabrous or with simple and/or stellate hairs; older branches with conspicuous leaf scars. Leaves trifoliolate; petiole 8–23 mm long; central leaflet elliptic to obovate, 15–29 mm long, 5–14 mm wide, entire, flat, obtuse or scarcely acute, not glandular-verrucose, glabrous both sides. Inflorescences shorter than leaves, 3–10-flowered (1–3 open at one time); peduncle not glandular-verrucose. Sepals c. 0.7 mm long, glabrous adaxially, sparsely stellate-pubescent at base abaxially. Petals valvate, 3.5–3.7 mm long, white to pale pink, with glands abaxially, stellate-pubescent both sides. Filaments sparsely to densely stellate-pubescent, particularly towards apex, not or slightly glandular towards tip. Cocci smooth, glabrous.

Endemic in NE Qld on and around Thornton Peak and Mt Pieter Botte in clefts and crevices in *Borya* patches and in low closed forest and heath, all usually in exposed, windswept situations on granite above 900 m. *Webb & Tracey 12158* was collected at around 200 m at the edge of a rock outcrop in complex mesophyll vineforest on riverine levee. Flowers June, Sept., Nov.; fruits Sept.

Qld: Thornton Peak, *L.J.Brass 207* (BRI); Thornton Peak (Daintree Natl Park), between campsite on Hilda Ck and summit, *J.R.Clarkson 5556* (BRI, CANB, HO, K); Mt Pieter Botte, *M.Godwin C2471* (BRI); Timbercamp Ck on road between Daintree and Bloomfield Rivers, *L.G.Webb & J.G.Tracey 12158* (BRI).

Close to *Z. montana* which has 10–20 or more flowers per inflorescence that usually open all at the same time, and *Z. alata* which may be distinguished by the acute leaflets. Some noteworthy variation requires field research: *Webb & Tracey 12158* is more glandular-verrucose than other specimens and apparently from a fairly low altitude; and the leaflets of *Godwin 2471* are more acute than those of other collections.



8. *Zieria boolbunda* Duretto & P.I.Forster, *Austrobaileya* 7: 491 (2007)

T: 1.5 km SSW of Boolbunda Rock, Qld, 15 May 1986, *P.I.Forster PIF2441*; holo: BRI; iso: CANB, K, MEL.

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 492.

Shrub to 1 m tall. Branchlets ridged or angular with prominent decurrent leaf bases, glandular-verrucose, with sparse, mainly stellate hairs between decurrent leaf bases, otherwise glabrous. Leaves trifoliolate; petiole 6–10 mm long; central leaflet elliptic to slightly obovate, 11–25 mm long, 3.5–8 mm wide, entire, flat or margins slightly recurved, acute, shortly mucronate, slightly glandular-verrucose; adaxial surface with few simple hairs along midrib; abaxial surface glabrous or with few hairs, with midrib raised, slightly glandular-verrucose, secondary veins usually obscure. Inflorescences shorter than or nearly equal to subtending leaves, usually 7-flowered. Sepals c. 1.5 mm long, not glandular-verrucose; adaxial surface with scattered appressed simple hairs; abaxial surface glabrous or few hairs at base. Petals imbricate, c. 2.5 mm long, pink-cream, sparsely to densely stellate adaxially, sparsely stellate-pubescent abaxially, denser along margins. Filaments glabrous, slightly glandular or not at tip. Cocci smooth or slightly glandular-verrucose, glabrous.

Endemic in Qld, known only from and near Boolbunda Rock, NE of Mt Perry township. Grows at altitudes of 600–680 m in clefts and crevices of granite outcrops, under tall, open woodland of *Eucalyptus montivaga* with a shrubby understorey, and in montane heath with *Leptospermum*, *Alyxia* and *Lomandra*. Flowers and fruits May.

Qld: summit of Boolbunda Rock, near Mt Perry, *A.R.Bean 477* (BRI); Boolbunda Rock, c. 9 km NE of Mount Perry township, *K.M.Sparshott KMS616 & P.Sparshott* (BRI).

May be distinguished from *Z. montana* by its glandular-verrucose branchlets, sparse indumentum, and up to 7 flowers per inflorescence, and from *Z. smithii* by its prominently raised decurrent leaf bases.



9. *Zieria montana* J.A.Armstr., *Austral. Syst. Bot.* 15: 398 (2002)

T: in saddle between east and west peaks, Mt Barney, Qld, 26 Sept. 1977, *J.A.Armstrong 1142 & J.Powell*; holotype: NSW; isotypes: AD, BRI, CANB.

Z. sp. 5, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Illustration: J.A.Armstrong, *op. cit.* 399, fig. 86.

Shrub to 4 m high. Branchlets ridged with prominent decurrent leaf bases, slightly glandular-verrucose, glabrous or with few hairs, later with conspicuous leaf scars. Leaves trifoliolate; petiole 10–20 mm long; central leaflet elliptic to obovate, 20–45 mm long, 10–17 mm wide, slightly crenulate, flat to recurved at margins, obtuse to rounded; adaxial surface not glandular-verrucose, glabrous except hairs on midrib; abaxial surface not glandular-verrucose, glabrous or with few hairs; secondary venation obscure. Inflorescences shorter than leaves, 10–20+ flowered (all or most opening at once). Sepals 0.7–1 mm long, slightly glandular-verrucose, with few hairs adaxially, pubescent or with few hairs at base abaxially. Petals imbricate, 4–4.5 mm long, creamy white, edged with pink, stellate-pubescent both sides. Filaments slightly glandular-verrucose apically. Cocci minutely apiculate, slightly glandular-verrucose, glabrous.

Endemic on Mt Barney, SE Qld. Grows in skeletal loamy soil on granophyre in mountain-top shrub communities. Flowers Sept.–Dec.; fruiting time unknown.

Qld: S slopes, Mt Barney [Natl Park], *P.I.Forster PIF11879 et al.* (BRI, HO, MEL); Mt Barney, Rum Jungle, *P.I.Forster PIF15724* (BRI, MEL); Mt Barney, *W.J.McDonald 759* (BRI).

Specimens from localities other than Mt Barney, included under this species by Armstrong (2002), have been described by Duretto & Forster (2007) as *Z. alata*, *Z. boolbunda*, *Z. eungellaensis*, *Z. madida* and *Z. scopulus*.

**10. *Zieria eungellaensis* Duretto & P.I.Forst., *Austrobaileya* 7: 500 (2007)**

T: Mt William, Eungella Ra. [Eungella Natl Park], Qld, 8 Aug. 1978, *P.Hind 2263*; holotype: BRI; isotype: MEL, NSW.

Z. sp. nov. (Mt William), S.Pearson & A.Pearson, *Rainforest Pl. E Australia* 214 (1992).

Illustrations: S.Pearson & A.Pearson, *loc. cit.*, as *Z. sp. nov.* (Mt William); J.A.Armstrong, *Austral. Syst. Bot.* 15: 399, fig. 86c (2002), as *Z. montana*; M.F.Duretto & P.I.Forster, *op. cit.* 501.

Shrub to 2 m tall. Branchlets ridged with prominent decurrent leaf bases, not glandular-verrucose, glabrous or with few hairs or with moderately dense stellate hairs mixed with a few simple and bifid ones. Leaves trifoliolate; petiole 2–8 mm long; central leaflet elliptic to obovate, 5–14 mm long, 3–8 mm wide, crenulate, flat, obtuse or acute, not glandular-verrucose, glabrous or with few hairs along midvein or adaxial surface with scattered appressed hairs and abaxial surface with a sparse indumentum of simple and bifid hairs concentrated near base; midrib raised abaxially; secondary veins obscure. Inflorescences shorter than leaves, 1–3 flowered; peduncle less than 8 cm long. Sepals 0.7–0.8 mm long, glabrous or with scattered appressed hairs adaxially and with sparse simple and bifid hairs mainly near base abaxially, slightly glandular-verrucose. Petals valvate, 2.5–3.5 mm long, white to pink, densely stellate-hairy adaxially, sparsely stellate-hairy abaxially and pubescent along margins. Filaments glabrous or with scattered simple hairs, not or slightly glandular distally. Cocci glabrous, smooth.

Endemic in Qld, confined to the Clarke Ra., on Mt William (c. 1250 m), Mt Dalrymple (c. 1300 m), and Mt David (c. 1250 m), in Eungella Natl Park. Grows in windswept heath on decomposed granitic soil, in clefts and crevices and small patches of dense vegetation. Flowers May–Aug.; fruits Apr., Aug.

Qld: WSW of Mt David, Eungella Natl Park, *A.R.Bean 4435* (BRI, HO, MEL); Mt Dalrymple, Clarke Ra., Eungella Natl Park, *I.R.Telford 11165 & R.J.Rudd* (CANB).



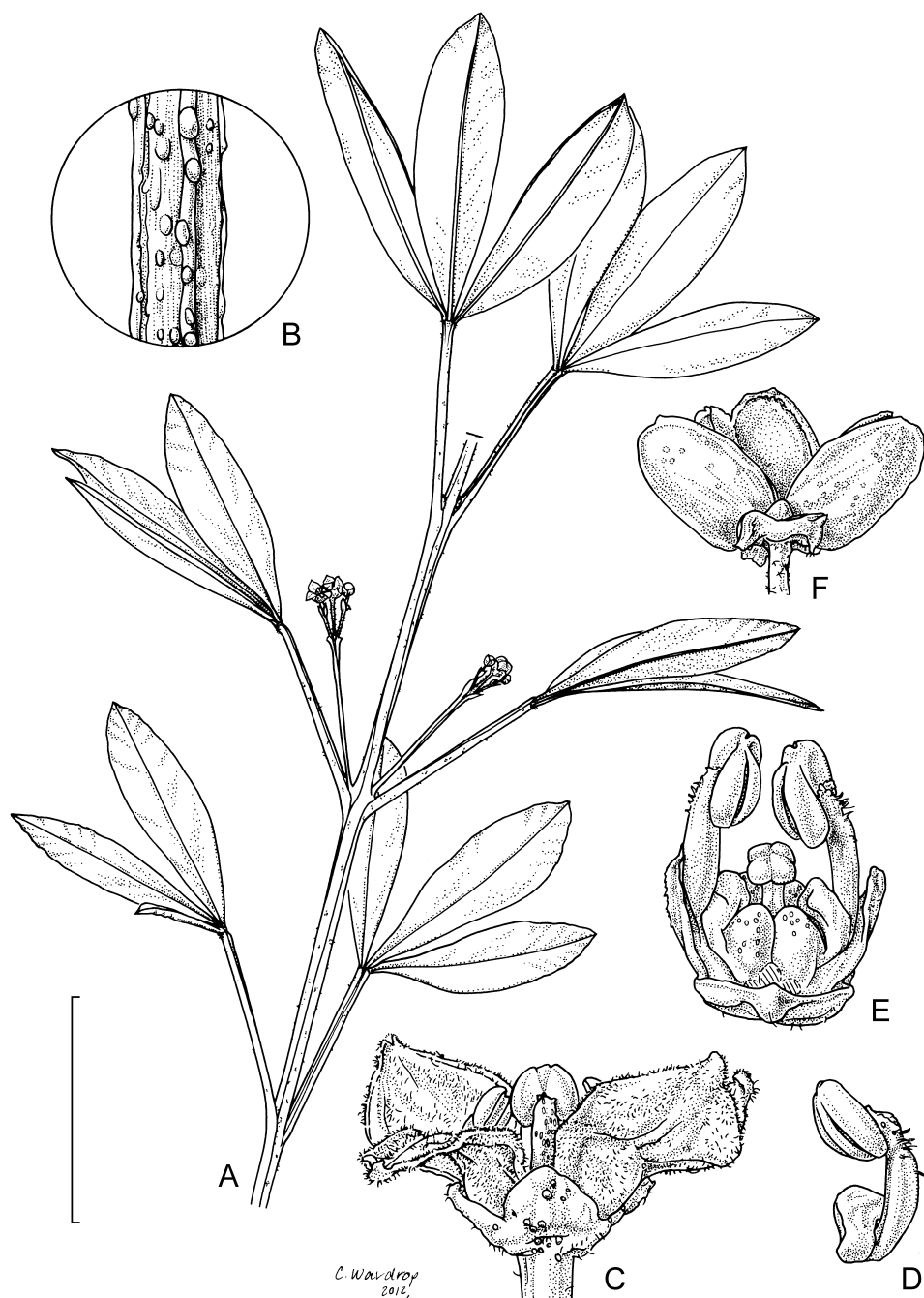


Figure 48. *Zieria alata*. A, habit; B, stem detail; C, flower; D, antisepalous stamen; E, carpel & 2 stamens (petals & 2 stamens removed); F, fruit (A, P.H.Weston 1218, NSW; B, F, I.R.Telford 12215, NSW; C–E, P.I.Forster 15630 et al., NSW). Scale bar: A = 22 mm; B = 4 mm; C = 3 mm; D, E = 2 mm; F = 5 mm. Drawn by C.Wardrop.

Formerly included in *Z. montana*, which is disjunct geographically and has leaflets 20–45 mm long and more than 10 flowers per inflorescence (see discussion in Duretto & Forster, *loc. cit.*). There are two forms: a glabrous or very sparsely hairy one with obtuse leaflets from Mt William and Mt Dalrymple and a hirsute one with acute leaflets from nearby Mt David. The hirsute form is superficially similar to *Z. robertsiorum* from the ‘Wet Tropics’, but differs in having an indumentum of mainly simple (not stellate) hairs on the leaves and acute (not obtuse) leaflets.

11. *Zieria alata* Duretto & P.I.Forster, *Austrobaileya* 7: 482 (2007)

T: North Mary Logging Area, State Forest 143, Qld, 17 July 1994, *P.I.Forster PIF15630*, *G.Sankowsky & M.C.Tucker*; holotype: BRI; isotype: MEL, NSW.

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 484.

Shrub to 3 m high. Branchlets glandular-verrucose, especially along prominent ridged decurrent leaf bases, glabrous or with few hairs. Leaves trifoliate; petiole (8–) 12–18 mm long; central leaflet elliptic to obovate, 22–41 mm long, 7–13 mm wide, entire or crenulate towards tip, flat, acute, not glandular-verrucose, glabrous; midrib raised abaxially; secondary veins obscure. Inflorescences shorter than leaves, 3–7 (–12)-flowered; peduncle glandular-verrucose. Sepals c. 0.7 mm long, not or slightly glandular-verrucose, glabrous adaxially, sparsely stellate-pubescent abaxially at base. Petals valvate, 3.5–4 mm long, white to cream or pale pink, stellate-pubescent on both surfaces. Filaments glabrous or with few small hairs, particularly towards apex, slightly glandular distally. Cocci smooth, glabrous. Fig. 48.

Endemic in Qld, confined to areas over 1000 m in the Main Coast Ra. W of the Daintree R. and Mossman. Occurs in windswept heath and stunted closed forest, in clefts and crevices, among granite boulders and on pavements. Flowers Mar., July–Sept.; fruits Mar., July, Sept.

Qld: Mt Lewis, 27 km from Rex Hwy on main forestry road, *J.R.Clarkson* 6565 (BRI, MEL); S.F. 143, North Mary L.A., 27 km along Mt Lewis road, *P.I.Forster PIF26979 et al.* (BRI, HO, MEL); S.F.R. 143, North Mary Logging Area, *B.Gray* 614 (BRI, NSW); Devil’s Thumb [Daintree Natl Park], *R.L.Jago* 4501 (BRI); Mt Lewis, *I.R.Telford* 12215 & *S.Donaldson* (BRI, CANB, NE, NSW).



Differs from *Z. montana* in having fewer flowers per inflorescence (10–20+ in *Z. montana*), prominently glandular-verrucose decurrent leaf bases and acute leaflets; and from *Z. madida* in its acute leaflets.

12. *Zieria robertsiorum* J.A.Armstr., *Austral. Syst. Bot.* 15: 429 (2002)

T: Mt Finnigan, Qld, 7 Sept. 1948, *L.J.Brass* 20113; holotype: BRI; isotype: CANB.

Illustration: J.A.Armstrong, *op. cit.* 431, fig. 116.

Shrub to 2 m high. Branchlets with slight to prominently decurrent leaf bases, not glandular-verrucose, pubescent with stellate hairs. Leaves trifoliate; petiole 2.5–10 mm long; central leaflet elliptic to obovate, 6–28 mm long, 2.5–11 mm wide, entire, flat to recurved at margins, obtuse, rounded or emarginate; both surfaces not glandular-verrucose; adaxial surface glabrous or sparsely to moderately densely stellate-hairy; abaxial surface sparsely to moderately densely stellate-hairy sometimes only on midribs, secondary venation obscure. Inflorescences shorter than leaves, 1–10-flowered; peduncle less than 8 mm long. Sepals 0.7–1 mm long, very slightly glandular-verrucose, pubescent (sometimes only at base). Petals imbricate, 1.5–3.5 mm long, creamy white, pubescent both sides. Filaments slightly dilated basally, glandular-verrucose apically. Cocci apiculate, smooth, glabrous.

Restricted to NE Qld from Mt Finnigan to Hinchinbrook Is. Grows on mountain tops in low, windswept shrubland in skeletal soil among granitic boulders. Flowers May–Dec.; fruits July–Dec.



Qld: Mt Finnigan, *J.A. Armstrong 1032* (CANB, NSW); North Bell Peak, Malbon Thompson Ra., *P.I. Forster 18047* (BRI, MEL); Kahlpahlm Rock, Lamb Ra., *P.I. Forster 25766* (A, AD, BRI, HO, MEL, NSW); c. 2 km NW of Mt Diamantina [Hinchinbrook Channel Natl Park], *J. Le Cussan 81* (CNS).

Plants on Hinchinbrook Is. have a denser indumentum on the adaxial leaf surface than those on the mainland, and the ovary is also stellate-hairy (glabrous elsewhere).

13. *Zieria prostrata* J.A. Armstr., *Austral. Syst. Bot.* 15: 425 (2002)

T: Emerald Beach, c. 15 km N of Coffs Harbour, N.S.W., 7 Sept 1981, *J.W. Wrigley (Nursery 1215)*; holo: CANB.

Z. sp. Q, J.A. Armstrong in G.J. Harden (ed.), *Fl. New South Wales* 2: 239 (1991).

Illustrations: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 281 (2002); J.A. Armstrong, *op. cit.* 425, fig. 110 (2002).

Prostrate shrub, forming mats to 0.5 m wide. Branchlets terete to quadrangular, with decurrent leaf bases faint to slightly ridged, not glandular-verrucose, glabrous. Leaves trifoliolate; petiole 3–4 mm long; central leaflet obovate, 10–16 mm long, 4–6 mm wide, entire, flat to recurved at margins, obtuse; both surfaces glabrous, not glandular-verrucose; abaxial surface with midrib not glandular-verrucose, glabrous, and prominent secondary venation. Inflorescences shorter than leaves, 3–7⁺-flowered. Sepals 0.5–1 mm long, glabrous, not glandular-verrucose. Petals imbricate, 2.1–2.5 mm long, creamy white or pink, pubescent adaxially. Filaments glabrous, not glandular-verrucose. Cocci minutely apiculate, not glandular-verrucose, glabrous.

A rare species from near Coffs Harbour, N.S.W.; in shallow soil in low, dense, coastal heath. Flowers Sept.–Oct.; fruits Oct.–Nov.

N.S.W.: Diggers Head, Emerald Beach, 25 Aug. 1997, *S.C. Clemesha* (NSW); Dammerels Head, Emerald Beach, *P.M. Hogbin 30* (NSW).

Stems layer when in contact with soil. Sometimes the flowers remain pink when open.

Listed as Endangered under the EPBC Act, 1999.



14. *Zieria scopulus* Durretto & P.I. Forst., *Austrobaileya* 7: 526 (2007)

T: Mt Elliot, 30 km S of Ipswich, Qld, 31 May 1990, *L.H. Bird s.n.*; holo: BRI; iso: CANB.

Z. sp. (Flinders Peak S.L. Everist 1169), P.I. Forster in P.D. Bostock & A.E. Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F. Durretto & P.I. Forster, *op. cit.* 528.

Shrub to at least 1 m high. Branchlets ridged or angular with decurrent leaf bases, sometimes faint, weakly glandular-verrucose with occasional prominent glands, glabrous. Leaves trifoliolate; petiole 5–11 mm long, slightly glandular-verrucose, glabrous or with few hairs; central leaflet elliptic to obovate, 11–23 mm long, 3–9 mm wide, crenulate, especially in distal half, flat to slightly recurved at margins (sometimes revolute on drying), acute, not glandular-verrucose; adaxial surface glabrous apart from few simple hairs on proximal portion of midrib; abaxial surface glabrous, with raised midrib. Inflorescences shorter to slightly longer than leaves, 1–20-flowered. Sepals 0.7–1 mm long, not glandular-verrucose, glabrous. Petals valvate, 2–2.5 mm long, white, both sides densely stellate-pubescent along margins, pilose towards centre. Filaments glabrous, slightly glandular towards apex. Cocci sometimes minutely apiculate, smooth, glabrous.

Confined to Flinders Peak and Mt Elliot, near Ipswich, Qld. On Flinders Peak grows among trachytic rocks. Flowers and fruits May–June.

Qld: Flinders Peak, *S.L. Everist 1155* (BRI).

This species was included by Armstrong (2002) in his concept of *Z. montana*: it differs from the latter species in having smaller leaves, less pronounced decurrent leaf bases and flowers that mature successively (not simultaneously) in the inflorescence.



Zieria scopulus appears to be related to *Z. actites* but differs from that species in having weakly glandular-verrucose stems.

15. *Zieria hydroscopica* Duretto & P.I.Forst., *Austrobaileya* 7: 512 (2007)

T: Coomingleh State Forest, W of Monto, Qld, 16 Sept. 1995, *A.R.Bean 8959* & *P.Robbins*; holo: BRI; iso: MEL.

Z. sp. (Coomingleh, *A.R.Bean 8959*), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 513.

Shrub to 50 cm tall. Branchlets \pm terete, without or with slightly decurrent leaf bases, slightly glandular-verrucose, sparsely stellate-hairy. Leaves trifoliolate; petiole 8–11 mm long; central leaflet narrowly elliptic to narrowly lanceolate, 20–33 mm long, 4–6 mm wide, obtuse to acute, flat to recurved or slightly revolute at margins; adaxial surface sparsely pilose with mainly simple and bifid hairs; abaxial surface with sparse simple, bifid and stellate hairs, with midrib strongly raised, very slightly glandular-verrucose. Inflorescences shorter than leaves, 8–25+-flowered. Sepals c. 1 mm long, slightly glandular-verrucose, with scattered appressed simple hairs adaxially and moderately dense stellate hairs abaxially. Petals imbricate, 2.1–2.5 mm long, white, densely stellate-tomentose both sides. Filaments with minute, simple hairs, weakly glandular-verrucose near tip. Cocci (only seen very immature) with scattered stellate hairs.

Known only from Coomingleh State Forest near Monto, Qld. Grows in rocky creekbeds with *Corymbia trachyphloia* and *Lophostemon suaveolens*, or in open forest of *Eucalyptus acmenoides*, *Angophora leiocarpa*, *Allocasuarina littoralis* and *Dodonaea triangularis*. Flowers Aug.–Sept.

Qld: Coomingleh State Forest, *I.R.Telford 11900* (BRI, CANB, NSW); Coomingleh State Forest (S.F. 28), Rocky Gorge Waterhole, *P.I.Forster 38247* (BRI, MEL, NSW).

Similar to *Z. smithii* but differs in having leaflets that are pilose on the adaxial surface and the stellate hairs on the branchlets having longer rays. Differs from *Z. boolbunda* in having leaf bases that are not or only slightly decurrent.



16. *Zieria actites* Duretto & P.I.Forst., *Austrobaileya* 7: 480 (2007)

T: Mt Larcom, 5 km NW of Yarwun, Qld, 25 Jan. 1994, *P.I.Forster PIF14654*; holo: BRI; iso: MEL.

Z. sp. (Mt Larcom N.Gibson TO18), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 481.

Wiry shrub to 1 m tall. Branchlets \pm terete with slightly decurrent leaf bases, weakly glandular-verrucose, glabrous or with few hairs. Leaves trifoliolate; petiole 2–10 mm long; central leaflet lanceolate to elliptic, (13–) 20–28 mm long, 6.5–11 mm wide, crenulate, slightly recurved at margins, acute, not glandular-verrucose, glabrous or with few hairs; midrib weakly glandular-verrucose abaxially; secondary veins obscure. Inflorescences shorter than leaves, 9–20-flowered. Sepals 1–1.5 mm long, not obviously glandular, glabrous. Petals imbricate, 1.8–2 mm long, cream to pale pink, not obviously glandular, with sparse stellate and simple hairs on margins. Filaments glabrous, not glandular. Cocci smooth, glabrous.

Endemic in Qld, known only from Mt Larcom, an isolated peak WNW of Gladstone. Grows in open woodland and shrubland in crevices and clefts on exposed quartz alunite outcrops and cliffines at c. 630 m alt. Flowers and fruits Sept.–May.

Qld: Mt Larcom, *S.T.Blake 22446* (BRI, CANB); Mt Larcom S peak, 17.5 km WNW of Gladstone, *J.Brushe JB260 et al.* (BRI); Mt Larcom Peak, 7 km NW of Yarwun, *J.Brushe 1358* & *J.Williams* (BRI); 6 km NW of Yarwun, Mt Larcom, Mt Larcom Ra., *N.Gibson TO18* (BRI).



Leaves with an aniseed scent. Affinity to *Z. compacta* but differs in its leaflets being glabrous below, the midrib not impressed above and the petals smaller. Also related to *Z. montana*, from which it may be distinguished by its slightly decurrent leaf bases on younger branchlets only and crenulate leaf margins.

17. *Zieria compacta* C.T.White, *Proc. Roy. Soc. Queensland* 53: 209 (1942)

Z. fraseri subsp. *compacta* (C.T.White) J.A.Armstr., *Austral. Syst. Bot.* 15: 355 (2002). T: Messines, near Stanthorpe, Darling Downs, Qld, 13 Sept. 1930, *C.E.Hubbard* 3965 (ex Brisbane Wild Flower Show); holo: BRI; iso: K.

Z. smithii var. *parvifolia* Benth., *Fl. Austral.* 1: 307 (1863), *p.p.* T: New England, N.S.W., *C.Stuart*; probable syn: MEL. [The other syntype 'Sandy Bay and Cape Hervey, *R.Brown*' is *Z. smithii*]

Z. smithii var. *fraseri* F.Muell. ex Maiden & Betche, *Proc. Linn. Soc. New South Wales* ser. 2, 26: 79 (1901). T: Wallangarra, N.S.W., Dec. 1891, *E.Betche*; syn: NSW; Mograni Mtn, near Gloucester, N.S.W., Sept. 1897, *J.H.Maiden*; syn: NSW.

Z. fraseri subsp. B, S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Z. fraseri subsp. B, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 244 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 286 (2002), as *Z. fraseri* subsp. *compacta*; J.A.Armstrong, *Austral. Syst. Bot.* 15: 356 (2002), as *Z. fraseri* subsp. *compacta*; Logan River Branch SGAP (QLD Region) Inc., *Mangroves to Mountains* 2: 174 (2005), as *Z. fraseri*.

Shrub to 2 m high. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, densely hairy with stellate, simple and bifid hairs. Leaves trifoliate; petiole 3–8 mm long, stellate-tomentose; central leaflet elliptic to obovate, 11–32 mm long, 3.5–10 mm wide, flat to recurved at margins, obtuse to acute, minutely mucronate; both surfaces not glandular-verrucose; adaxial surface glabrous or rarely sparsely pilose (Bull Ck Gorge); abaxial surface densely stellate-tomentose, often with scattered long simple hairs. Inflorescences usually shorter than leaves, 3–20⁺-flowered; bracts c. 0.9 mm long, persistent; pedicels with moderately dense indumentum. Sepals 1–2 mm long, acute, inflexed, glabrous or with scattered simple, bifid and stellate hairs towards tip adaxially, with sparse to moderately dense stellate and sometimes simple hairs abaxially, sometimes only at base. Petals imbricate, 3.5–5 mm long, white or white-pink, not obviously glandular, sparsely hairy adaxially, stellate-tomentose abaxially. Filaments glabrous or with few hairs, weakly warted at tip. Cocci not glandular-verrucose, sparsely stellate-hairy on inner edge or all over. *n* = 18, J.A.Armstrong, *op. cit.* 15: 352 (2002).

Widespread in the Central Highland area of Qld, with records also near Crows Nest and Helidon, and along the Great Dividing Ra. to southern N.S.W. Occurs in open eucalypt forest, woodland and shrubland in sand over sandstone or granite, commonly in sheltered situations such as the base of cliffs and in gullies. Flowers Aug.–Oct.; fruits June, Sept.–Dec.

Qld: Bull Creek Gorge, S of Springsure–Tambo road, *A.R.Bean* 15383 (BRI, MEL, NSW); Expedition Natl Park, NW of Taroom, Spring Ck, *P.I.Forster* PIF26127 *et al.* (AD, BRI, HO, MEL, NSW); ridge of Bald Mtn, W section of Girraween Natl Park, *P.Grimshaw* PG973 & *G.Turpin* (BRI, NSW). N.S.W.: Sailor Jack Mtn, c. 20 km WSW of Wallangarra, *L.M.Copeland* 3456 *et al.* (BRI, CANB, K, MEL, NSW); Holbrook Castle [c. 30 km SSW of Sandy Hollow], *T.Whaite* 3355 & *J.Whaite* (CANB, NSW).



Closely related to *Z. fraseri*, which has narrowly elliptic to narrowly obovate, subulate to acute leaflets with recurved to revolute margins, the midrib of the abaxial surface glabrous or with an indumentum markedly less dense than that of the lamina, glabrous or sparsely hairy pedicels, slightly acuminate, not inflexed sepals, and glabrous cocci. Specimens from Bull Creek Gorge are unusual in being sparsely pilose on the adaxial surface of the leaflets.

18. *Zieria exsul* Duretto & P.I.Forst., *Austrobaileya* 7: 502 (2007)

T: Sugarbag road, Caloundra, Qld, 16 Mar. 1997, *A.R.Bean* 11773; holo: BRI; iso: MEL, NSW.

Z. sp. (Mooloolaba G.Leiper AQ636552), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustrations: Logan River Branch SGAP (QLD Region) Inc., *Mangroves to Mountains* 2: 176 (2005), as *Z. sp.* Mooloolaba; M.F.Duretto & P.I.Forster, *op. cit.* 504.

Shrub to 60 cm high. Branchlets terete, with leaf bases not decurrent, not obviously glandular, with sparse to moderately dense simple, bifid and stellate hairs. Leaves trifoliate, not glandular-verrucose; petiole 2–3 mm long, sparsely pilose; central leaflet obovate, 10–16 mm long, 2.5–5 mm wide, recurved to revolute at margins, acute to apiculate, sparsely pilose adaxially, densely stellate-tomentose abaxially; midrib and some secondary veins raised abaxially. Inflorescences longer than leaves, 1–12-flowered; bracts 2–2.5 mm long. Sepals 1–1.2 mm long, minutely pilose adaxially becoming glabrous towards centre, glabrous and slightly glaucous abaxially. Petals valvate, 2–2.5 mm long, white though drying pink, minutely pilose adaxially, densely stellate-tomentose abaxially. Filaments glabrous, eglandular. Cocci minutely apiculate, slightly glandular-verrucose, glabrous.

Endemic in Qld, near Buderim and Caloundra. Grows in wallum as well as woodland of *Corymbia trachyphloia*, *Eucalyptus siderophloia*, *E. racemosa* and *Allocasuarina littoralis*. The Buderim population has been largely destroyed by recent freeway extensions and the Caloundra population is now extinct. Considered critically endangered. Flowers Mar., Sept., Oct.; fruits Mar.

Qld: Buderim, next to Sunshine Motorway and corner of Mooloolaba Rd, *P.I.Forster* 28967 (BRI, HO); along old Mooloolaba Bypass road, c. 300 m S of Buderim road intersection, Jan. 1993, *G.Leiper s.n.* (BRI); Buderim, near Sunshine Motorway, Aug. 1996, *T.Patterson s.n.* (BRI).



Appears closely allied to *Z. compacta*, which has antrorse hairs, the adaxial surface of the leaves usually glabrous (rarely sparsely pilose), the inflorescence sparsely to densely hairy, longer petals and sparsely hairy cocci. *Zieria exsul* is always a weak, spindly subshrub with inflorescences markedly exceeding the leaves, whereas *Z. compacta* is almost always a stout, erect bush with inflorescences either shorter than or as long as the leaves.

19. *Zieria fraseri* Hook. in T.L.Mitchell, *J. Exped. Trop. Australia* 339 (1848), as *Z. frazeri*

Z. laevigata var. *fraseri* (Hook.) Domin, *Feddes Repert. Spec. Nov. Regni Veg.* 12: 133 (1913). T: Mt Lindesay [Mt Barney, Qld], c. 1829, *C.Fraser*; holo: K.

Shrub to 2 m high, with lignotuber. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, glabrous to velvety with stellate and bifid hairs. Leaves trifoliate; petiole 2–10 mm long; central leaflet narrowly elliptic, occasionally narrowly obovate, 8–50 mm long, 1–8 mm wide, entire, recurved to revolute at margins, acute to obtuse; both surfaces not glandular-verrucose; adaxial surface glabrous; abaxial surface velvety, but midrib with few hairs or sparsely to moderately hairy, the secondary venation obscure. Inflorescences shorter or longer than leaves, to 35-flowered; pedicels glabrous or with a sparse indumentum. Sepals 1.4–2.1 mm long, slightly acuminate, with scattered simple and stellate hairs adaxially (mainly towards apex), glabrous or with a few stellate hairs abaxially at base, sometimes glaucous. Petals imbricate, 2.5–6 mm long, white to pink, hairy with simple and stellate hairs adaxially, stellate-tomentose and glandular-verrucose towards apex abaxially. Filaments glandular-verrucose apically. Cocci apiculate, glabrous.

Occurs from east-central and southern Qld S to eastern N.S.W. Two subspecies are recognised. Flowers Aug.–Sept.; fruits Oct., rarely Jan.

Inflorescences shorter than subtending leaves (rarely longer and then pedicels densely hairy); pedicels very sparsely to densely hairy; branchlets hirsute

19a. subsp. *fraseri*

Inflorescences longer than subtending leaves (rarely shorter and then pedicels and/or branchlets glabrous); pedicels glabrous or sparsely hairy; branchlets glabrous or hirsute

19b. subsp. *robusta*

19a. *Zieria fraseri* Hook. subsp. *fraseri*

Z. fraseri Hook. subsp. A (type subsp.), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Z. fraseri subsp. A, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 244 (1991).

[*Z. laevigata* auct. non Sm.: F.M.Bailey, *Queensland Fl.* 1: 183 (1899)]

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 286 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 353, fig. 47 (2002).

Shrub to 1 m tall. Branchlets hirsute. Central leaflet 8–38 mm long, 1–6 mm wide. Inflorescences shorter than leaves (rarely slightly longer and then pedicels densely hairy), 3–12-flowered, moderately hairy with simple, bifid and stellate hairs; peduncle 4–15 mm long, rarely (Mt Ernest) 25 mm long. Pedicels with very few hairs or sparsely to densely hairy. Petals 2.5–4.5 mm long.

Occurs on the ‘Scenic Rim’, SE Qld, and on North Obelisk Mtn, NE N.S.W. Grows in open-forest and woodland, on rocky hillsides in skeletal sandy soil.

Qld: northern slopes of Mt Maroon, Mt Barney Natl Park, *P.I.Forster 6834 et al.* (BRI, MEL); Mt Ernest, Mt Barney Natl Park, *P.I.Forster 7389 et al.* (BRI, CANB); Mt May, Moogerah Peaks Natl Park, *P.I.Forster 11767 et al.* (BRI); Mt Gillies, 20 km SW of Rathdowney, *P.R.Sharpe 1080* (BRI). N.S.W.: North Obelisk Mtn, 1.4 km SW of Urbenville, *R.G.Coveny 5179* (NSW).

**19b. *Zieria fraseri* subsp. *robusta* (C.T.White) Duretto & P.I.Forst., *Austrobaileya* 7: 506 (2007)**

Z. compacta var. *robusta* C.T.White, *Proc. Roy. Soc. Queensland* 53: 210 (1942). T: Blackdown Tableland, Leichhardt District, Qld, Sept. 1937, *H.G.Simmons 73*; holo: BRI.

Z. compacta var. *glabrata* C.T.White, *Proc. Roy. Soc. Queensland* 53: 209 (1942). T: Blackdown Tableland, Leichhardt District, Qld, Sept. 1937, *H.G.Simmons 57*; holo: BRI; iso: K.

Illustrations: K.A.W.Williams, *Native Pls Queensland* 2: 297 (1984); S.Pearson & A.Pearson, *Pls Central Queensland* 404 (1989); both as *Z. compacta* var. *glabrata*.

Shrub to 2 m tall. Branchlets glabrous or hirsute. Central leaflet 15–51 mm long, 1.5–8 mm wide. Inflorescences longer than subtending leaves (rarely shorter and then pedicels and/or branchlets glabrous), 3–20⁺-flowered, glabrous or with sparse to moderately dense simple, bifid and stellate hairs; peduncle 25–37 mm long (as short as 4 mm at Yandaburra Stn). Pedicels glabrous or sparsely hairy. Petals 4–6 mm long.

Endemic in Qld, on the Blackdown Tableland and Salvator Rosa, with isolated collections from Carnarvon Gorge and near Theodore. At Blackdown Tableland and Salvator Rosa occurs in open eucalypt-sheoak forest and shrubland, in sand or sandstone; at Carnarvon Gorge (Wards Canyon) at the foot of vertical cliffs, among boulders in a woodland of *Eucalyptus propinqua* and *Livistona fulva*; near Theodore occurs on the edge of a sandstone escarpment in a low eucalypt woodland.

Qld: near Burnley road, S.F. 44, WSW of Theodore, *A.R.Bean 19861* (BRI); Yandaburra Stn, *B.O'Keefe 674* (BRI); Salvator Rosa [Carnarvon] Natl Park, *B.O'Keefe 1075* (BRI); Ka Ka Mundi [Carnarvon] Natl Park, Bunbuncundoo Spring area, *R.Purdie 4336* (CANB); Blackdown Tableland, *I.R.Telford 5727* & *R.K.Ellyard* (BRI, CANB).



This subspecies has longer leaflets and much larger flowers (especially on the Blackdown Tableland) than *Z. fraseri* subsp. *fraseri*. Plants with glabrous and pubescent stems can occur in the same population on the Blackdown Tableland, and the filaments are slightly hairy (elsewhere they are glabrous). Specimens from Yandaburra Station (*O'Keefe 674*) and from near Theodore (*Bean 19861*) and Carnarvon Gorge (*Parris 9110*) have inflorescences that are shorter than the subtending leaves, and glabrous, glaucous sepals and pedicels. All the specimens listed in the ‘Selected specimens examined’ under *Z. fraseri* subsp. *fraseri* by Armstrong (2002) are referable to *Z. fraseri* subsp. *robusta*.

20. Zieria laevigata Bonpl., *Descr. Pl. Malmaison* 64 (1815)

T: Prince Regents Glen, Blue Mtns, N.S.W., 4 Oct. 1822, *A.Cunningham* 27; neo: K, *fide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 378 (2002); isoneo: BM, BRI.

Z. laevigata Sm. in A.Rees, *Cycl.* 39: no. 2 (1818), *nom. illeg.* non Bonpl.; *Boronia laevigata* F.Muell., *Fragm.* 1: 101 (1859). T: near Port Jackson, N.S.W., 179-, *J.White*; holo: LINN n.v. (photo NSW).

Z. revoluta A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 330 (1825); *Z. laevigata* var. *revoluta* (A.Cunn.) Domin, *Biblioth. Bot.* 89: 836 (1926). T: Prince Regents Glen, Blue Mtns, N.S.W., 4 Oct. 1822, *A.Cunningham* 27; holo: K (photo BRI, HO); iso: BM, BRI.

Z. laevigata subsp. A (type subsp.), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Z. laevigata subsp. (Wyberba T.L.Ryan 37), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 280 (2002); J.A.Armstrong, *op. cit.* 380, fig. 69.

Shrub to 1.5 m high, with lignotuber. Branchlets prominently ridged, with decurrent leaf bases, not glandular-verrucose, glabrous. Leaves trifoliolate; petiole 1.4–7.4 mm long, angular, glabrous; central leaflet linear to very narrowly elliptic, 10–43 mm long, 1–3.2 mm wide, crenate, revolute at margins, acute to acuminate; both surfaces not glandular-verrucose; adaxial surface glabrous; abaxial surface stellate-velvety, with midrib not glandular-verrucose, glabrous, secondary venation obscure. Inflorescences as long as or shorter than leaves, usually 3 (–21)-flowered. Sepals 2–2.6 mm long, glabrous. Petals imbricate, usually 3.4–4.8 mm long, creamy white or pale pink, pubescent adaxially. Filaments hirsute, slightly glandular-verrucose apically. Cocci not apiculate, slightly glandular-verrucose, glabrous. *n* = 36, J.A.Armstrong, *op. cit.* 286.

Occurs in SE Qld (Darling Downs district) and S along the tablelands and coast of N.S.W. Widespread, in shrubland and eucalypt open-forest in sandy skeletal soils on sandstone or granite. Flowers late winter to spring.

Qld: Bald Rock Ck, Girraween Natl Park, *A.R.Bean* 6370 & *P.I.Forster* (BRI, NSW); Portion 90, Wyberba, *P.I.Forster* 17596 & *S.J.Figg* (BRI, MEL). N.S.W.: c. 2 km N of Caves Beach turnoff, Jervis Bay Rd, *J.A.Armstrong* 1359 (NSW); Gibraltar Ra., near Glen Innes, Aug. 1963, *L.Wescombe* (CANB); c. 10 km E of Olinda on road to Mt Coricudgy, *T. & J.Whaite* 3308 (NSW).



In some populations near Wallangarra and Wyberba, Qld, and Backwater, N.S.W., plants have pubescent stems, short inflorescences, glabrous peduncles, scale-like bracts, deep pink petals and glabrous fruit. This variant is similar to *Z. graniticola* and may be distinguished from the latter by its densely tomentose abaxial leaf surface. It may represent a stabilised hybrid between *Z. laevigata* and *Z. aspalathoides*.

21. Zieria laxiflora (Benth.) Domin, *Feddes Repert. Spec. Nov. Regni Veg.* 12: 132 (1913)

Z. laevigata var. *laxiflora* Benth., *Fl. Austral.* 1: 304 (1863). T: Moreton Is. [Qld], Aug. 1855, *F.J.H.Mueller*; lecto: K (photos BRI, HO), *fide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 388 (2002).

Z. laevigata subsp. B, S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 281 (2002); J.A.Armstrong, *op. cit.* 386, fig. 75.

Shrub to 1.2 m high, with lignotuber. Branchlets ridged with prominent decurrent leaf bases, not glandular-verrucose, glabrous. Leaves trifoliolate; petiole 4–11 mm long, angular; central leaflet linear, 10–36 mm long, 0.8–5 mm wide, entire, revolute at margins, acute to acuminate; both surfaces not glandular-verrucose; adaxial surface glabrous; abaxial surface stellate-velvety, glabrous, secondary venation obscure. Inflorescences as long as or exceeding leaves, 9 (–50)-flowered. Sepals 1.2–1.7 mm long, glabrous. Petals imbricate, 3–4.5 mm long, creamy white or pale pink, pubescent adaxially. Filaments glabrous, rarely with few hairs, prominently dilated basally. Cocci not apiculate, slightly glandular-verrucose, glabrous. *n* = 18, J.A.Armstrong, *op. cit.* 286.

Occurs in coastal areas S from Shoalwater Bay, Qld, to Newcastle, N.S.W. Grows on sand dunes in heath and low woodland, and in sandy swampy areas further inland. Flowers late winter–spring.

Qld: Caloundra, *S.L.Everist 447* (BRI); Mt Bilewilm, *P.I.Forster 15682* (BRI, K, MEL, NSW); near Brown L., Stradbroke Is., *D.A.Goy 49* (BRI, K); Port Clinton, 60 km N of Yeppoon, *P.R.Sharpe 5420* & *G.Thomas* (BRI). N.S.W.: Crowdy Bay Natl Park, c. 28 km N of Coopernook, *J.A.Armstrong 1160* (NSW).



Similar to *Z. laevigata* but has smaller sepals and petals.

22. *Zieria cephalophila* Durretto & P.I.Forst., *Austrobaileya* 7: 492 (2007)

T: Sydney Heads, 32 km NNW of Nebo, Qld, 11 Nov. 1990, *A.R.Bean 2562*; holo: BRI.

Z. sp. (Sydney Heads, *A.R.Bean 2562*), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F.Durretto & P.I.Forster, *op. cit.* 493.

Shrub to 50 cm tall. Branchlets with or without slightly decurrent leaf bases, prominently glandular-verrucose, sparsely stellate-hairy between glands, with hairs caducous. Leaves trifoliate; petiole 2–3 mm long; central leaflet narrowly elliptic to narrowly obovate, 11–18 mm long, 1.5–3.5 mm wide, revolute at margins, acute; midrib strongly raised abaxially, glandular-verrucose; adaxial surface slightly glandular-verrucose, sparsely stellate-hairy sometimes with few hairs; abaxial surface glandular-verrucose, densely stellate-tomentose except midrib. Inflorescences shorter than leaves, 1–3-flowered. Sepals 1–1.5 mm long, slightly glandular-verrucose, with scattered appressed simple hairs adaxially, stellate-hairy abaxially. Petals imbricate, c. 3.5 mm long, white, both surfaces densely stellate-tomentose. Filaments glabrous or with few hairs near tip, very weakly glandular-verrucose near tip. Cocci smooth, glabrous.

Occurs at Sydney Heads, near Nebo, Qld. Grows on a rocky mountain top (tertiary acid volcanic plateau) in shrubland dominated by *Lophostemon confertus*. Flowers and fruit both recorded in May and Nov.

Qld: SE edge of Sydney Heads, Britton Ra., 6.3 km NE/ENE of Homevale HS [Homevale Natl Park], *J.E.Kemp TH7339* (BRI).

Related to *Z. compacta* and *Z. fraseri* but differs in its glandular-verrucose, sparsely tomentose branchlets, small glandular-verrucose leaves, leaflets that have a sparse or very sparse stellate indumentum on the adaxial surface, and secondary veins that are not noticeably raised on the abaxial surface.



23. *Zieria tenuis* Durretto & P.I.Forst., *Austrobaileya* 7: 531 (2007)

T: Agate Ck, Robinhood Stn, SW of Forsyth, Qld, 20 Apr. 1996, *P.I.Forster PIF19086*, *R.L.Jago*, *R.Jensen* & *T.Ryan*; holo: BRI; iso: MEL.

Z. sp. (White Mt D.G.Fell+ DGF1257), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F.Durretto & P.I.Forster, *op. cit.* 532.

Shrub to 1.5 m tall. Branchlets terete, without obvious decurrent leaf bases, weakly glandular-verrucose, stellate-tomentose. Leaves trifoliate; petiole 5–18 mm long; central leaflet oblong to narrowly elliptic, 9–32 mm long, 2.5–7 mm wide, entire, flat, obtuse, slightly mucronate, not glandular-verrucose; midrib raised abaxially; secondary veins slightly raised; adaxial surface with sparse to dense indumentum of minute stellate hairs; abaxial surface stellate-tomentose. Inflorescences shorter than leaves, 9–12-flowered. Sepals 1–2.5 mm long, not glandular-verrucose, stellate-tomentose both sides. Petals valvate, 2–2.5 mm long, white or pink-white, not glandular-verrucose; adaxial surface glabrous or with few hairs or hairy on margins, stellate-tomentose abaxially. Filaments glabrous. Cocci apiculate, gland-dotted, glabrous.

Endemic in northern Qld, known from two widely disjunct areas: Agate Ck near Forsayth and the White Mtns, N of Torrens Creek. Grows in sandstone in gorges or on alluvium in eucalypt woodland. Flowers and fruits Apr.–July.

Qld: Bertya Ck, W of 'Warang', White Mountains Natl Park, *A.R.Bean* 4609 (AD, BRI, K, MEL, NSW, PERTH); gorge off Agate Ck, *R.L.Jago* 3968 & *P.I.Forster* (BRI); 41 km NW of Torrens Creek, *J.Thompson HUG416* *et al.* (BRI, NSW); White Mountains Natl Park, NW of Warang, *B.Wannan* 1702 & *C.Martindell* (BRI, CANB, NSW).

Similar to *Z. collina* which has smaller, ovate petals 1.2–2 mm long, broadly ovate sepals, and smaller cocci with no appendage. Also resembles *Z. cytisoides* which has elliptic to oblong leaflets, prominent secondary venation on the abaxial surface of the leaflets, a shaggy indumentum, and larger petals. Some collections of *Z. tenuis* from the White Mountains area have a less dense indumentum on the adaxial surface of the leaflets and one collection from Bertya Ck (*Bean* 4609) has smaller floral and vegetative parts than other specimens.



24. *Zieria collina* C.T.White, *Proc. Roy. Soc. Queensland* 43: 46–47 (1932)

T: Tamborine Mtn, Qld, 11 Aug. 1929, *C.T.White* 6155; holo: BRI.

Illustration: J.A.Armstrong, *Austral. Syst. Bot.* 15: 336, fig. 32 (2002).

Shrub to 3 m high. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, velvety with stellate hairs. Leaves trifoliolate; petiole 1–8 mm long, pubescent; central leaflet lanceolate to elliptic, 7.5–29 mm long, 1.5–6.5 mm wide, entire to crenate, slightly recurved at margins, acute to obtuse; adaxial surface slightly glandular-verrucose, hirsute with minute simple and stellate hairs; abaxial surface not glandular-verrucose, velvety, the midrib not glandular-verrucose, pubescent, secondary venation obscure. Inflorescences longer than leaves, rarely shorter, usually 15–30-flowered. Sepals 0.7–1 mm long, slightly glandular-verrucose, glabrous. Petals imbricate, 1.2–2 mm long, creamy white, pubescent adaxially. Filaments slightly dilated basally, not glandular-verrucose. Immature cocci not apiculate, with few hairs.

Known only from Tamborine Mtn and Canungra Military training area, SE Qld, at an altitude of c. 550 m. Grows on steep hillsides in shallow gravel, clay or clay-loam, in open forest. Flowers spring.

Qld: Palm Grove Natl Park, Tamborine Mtn, *G.P.Guymer* 1866 & *W.McDonald* (BRI, CANB, MEL, NSW); Wongawallan Rd, near Panorama Point Lookout, *D.A.Halford* Q7041 *et al.* (BRI, MEL, NSW); Mt Tamborine golf course, Mt Tamborine, *D.A.Halford* Q7043 (AD, BRI); Maybury Gully area, Canungra Land Warfare Centre, May 1997, *J.Hauser* (BRI).



A fairly uniform species morphologically.

Listed as Vulnerable under the EPBC Act, 1999.

25. *Zieria formosa* J.D.Briggs & J.A.Armstr. in J.A.Armstrong, *Austral. Syst. Bot.* 15: 347 (2002)

T: Pambula–Wyndam [Wyndham] road, near junction with Back Creek Rd at Lochiel, N.S.W., 21 Sept. 1987, *M.Parris* 9206 & *J.D.Briggs*; holo: CANB; iso: MEL, NSW.

Z. sp. 7, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. H, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 242 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 284 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 350, fig. 44 (2002).

Shrub to 1.5 m high. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, pubescent with stellate hairs. Leaves trifoliolate; petiole c. 2.4 mm long; central leaflet lanceolate to narrowly elliptic, 10–37 mm long, 2–6 mm wide, slightly undulate, revolute at margins, obtuse, occasionally acute; adaxial surface glandular-verrucose, closely tomentose; abaxial surface sparsely glandular-verrucose, velvety, with midrib glandular-verrucose,

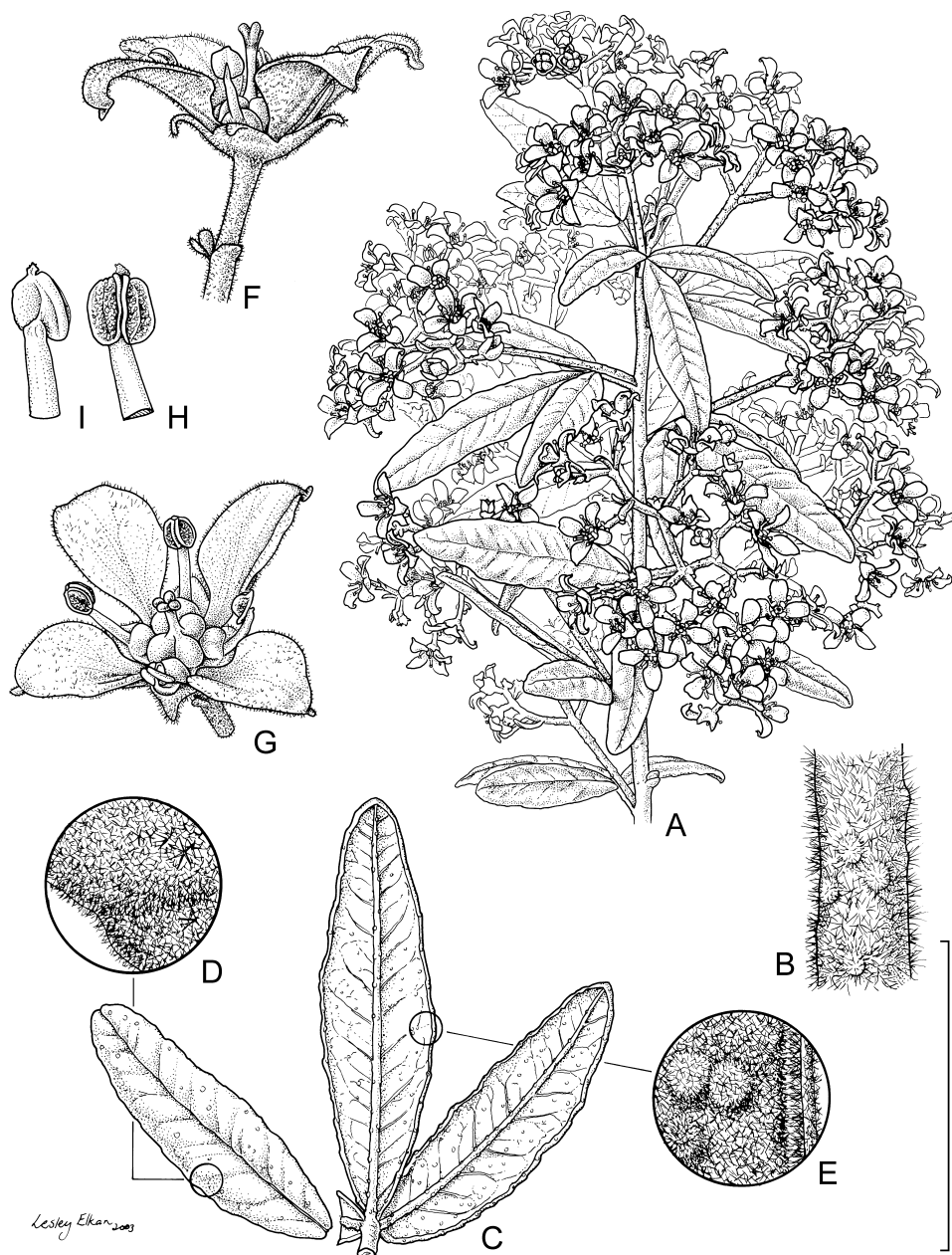


Figure 49. *Zieria formosa*. **A**, habit; **B**, stem detail; **C**, leaf, showing adaxial & abaxial surfaces; **D**, leaflet, adaxial surface; **E**, leaflet, abaxial surface; **F**, flower, lateral view; **G**, flower from above; **H**, stamen, adaxial view; **I**, stamen, abaxial view (**A–I**, L.Elkan & C.Wardrop, Sept. 2002, NSW). Scale bar: **A** = 33 mm; **B** = 3 mm; **C** = 20 mm; **D**, **E**, **H**, **I** = 2.5 mm; **F**, **G** = 15 mm. Drawn by L.Elkan. ©Royal Botanic Gardens & Domain Trust. Reproduced with permission.

pubescent, secondary venation prominent. Inflorescences slightly longer than leaves, usually 25–45-flowered. Sepals 1.5–2 mm long, glandular-verrucose, pubescent. Petals valvate, 3.5–4 mm long, pale pink to creamy white, glandular-verrucose abaxially, with few hairs or glabrous adaxially. Filaments glandular-verrucose apically. Cocci not apiculate, glabrous or with few hairs. Fig. 49.

Known only from one population at Lochiel, SW of Pambula, N.S.W. Grows in heath on a rocky (ignimbrite) outcrop. Flowers spring; fruits Nov.–Dec.

N.S.W.: SW of Pambula, E of Back Creek Rd turn-off on Wyndam–Pambula road, *D.E. Albrecht 2958* (CANB, MEL, NSW).

Listed as Endangered under the EPBC Act, 1999.



26. *Zieria buxijugum* J.D.Briggs & J.A.Armstr. in J.A.Armstrong, *Austral. Syst. Bot.* 15: 320 (2002)

T: W of Pambula, N.S.W., 20 Sept. 1986, *M.Parris 9079* & *N.Fisher*; holo: CANB; iso: BRI, CANB, MEL, NSW.

Z. sp. 14 (sp. 'P'; Box Range North), J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. G, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 243 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 285 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 322, fig. 20 (2002).

Shrub to 2 m high. Branchlets terete, with leaf bases not decurrent, velvety with stellate hairs all over. Leaves trifoliolate; petiole 2–5 mm long; central leaflet broadly linear to narrowly oblanceolate, commonly 15–30 mm long, 1.5–4 mm wide, entire, revolute (recurved) at margins, obtuse; both surfaces glandular-verrucose and velvety; abaxial surface with midrib glandular-verrucose, pubescent, and secondary venation obscure. Inflorescences as long as or exceeding leaves, usually 10–20-flowered. Sepals 0.8–1 mm long, glandular-verrucose, pubescent. Petals imbricate, 3.5–4 mm long, creamy white, glandular-verrucose abaxially, pubescent to hirsute adaxially. Filaments not glandular-verrucose. Cocci not apiculate, sometimes sparsely hirsute when young only. Fig. 50.

Known only from the type locality, W of Pambula, N.S.W. Grows in heath in dry sclerophyll scrub surrounded by forest on a rocky (ignimbrite) outcrop. Flowers spring; fruits early summer.

N.S.W.: W of Pambula, *J.A.Armstrong 5092 et al.* (AD, BRI, MEL, NSW).

Listed as Endangered under the EPBC Act, 1999.



27. *Zieria furfuracea* R.Br. ex Benth., *Fl. Austral.* 1: 306 (1863)

Z. smithii var. *furfuracea* (R.Br. ex Benth.) Moore & Betche, *Handb. Fl. New South Wales* 41 (1893). T: Hastings R., N.S.W., late 1850s, *H.Beckler s.n.*; lecto: K, *vide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 358 (2002); isolecoto: K, MEL (3 sheets).

Shrub to 2 m tall. Branchlets terete, slightly ridged, with decurrent leaf bases faint or absent, glandular-verrucose, stellate-pubescent. Leaves trifoliolate; petiole 8–25 mm long; central leaflet lanceolate, 22–72 mm long, 1.5–11.5 mm wide, entire or crenulate, flat to recurved at margins, rounded; adaxial surface ±glandular-verrucose, velvety or with few hairs to glabrous, indumentum of mainly simple and bifid hairs; abaxial surface densely glandular-verrucose, velvety, with midrib glandular-verrucose, pubescent, secondary venation generally obscure. Inflorescences shorter than leaves, 20–125-flowered. Sepals 0.5–1 mm long, ±glandular-verrucose, pubescent or glabrous. Petals valvate or imbricate, 2.3–3.5 mm long, creamy white, pubescent adaxially. Filaments slightly dilated basally, not glandular-verrucose. Cocci not apiculate, ±glandular-verrucose, pubescent to hirsute or glabrous. *n* = 18, J.A.Armstrong, *op. cit.* 286.

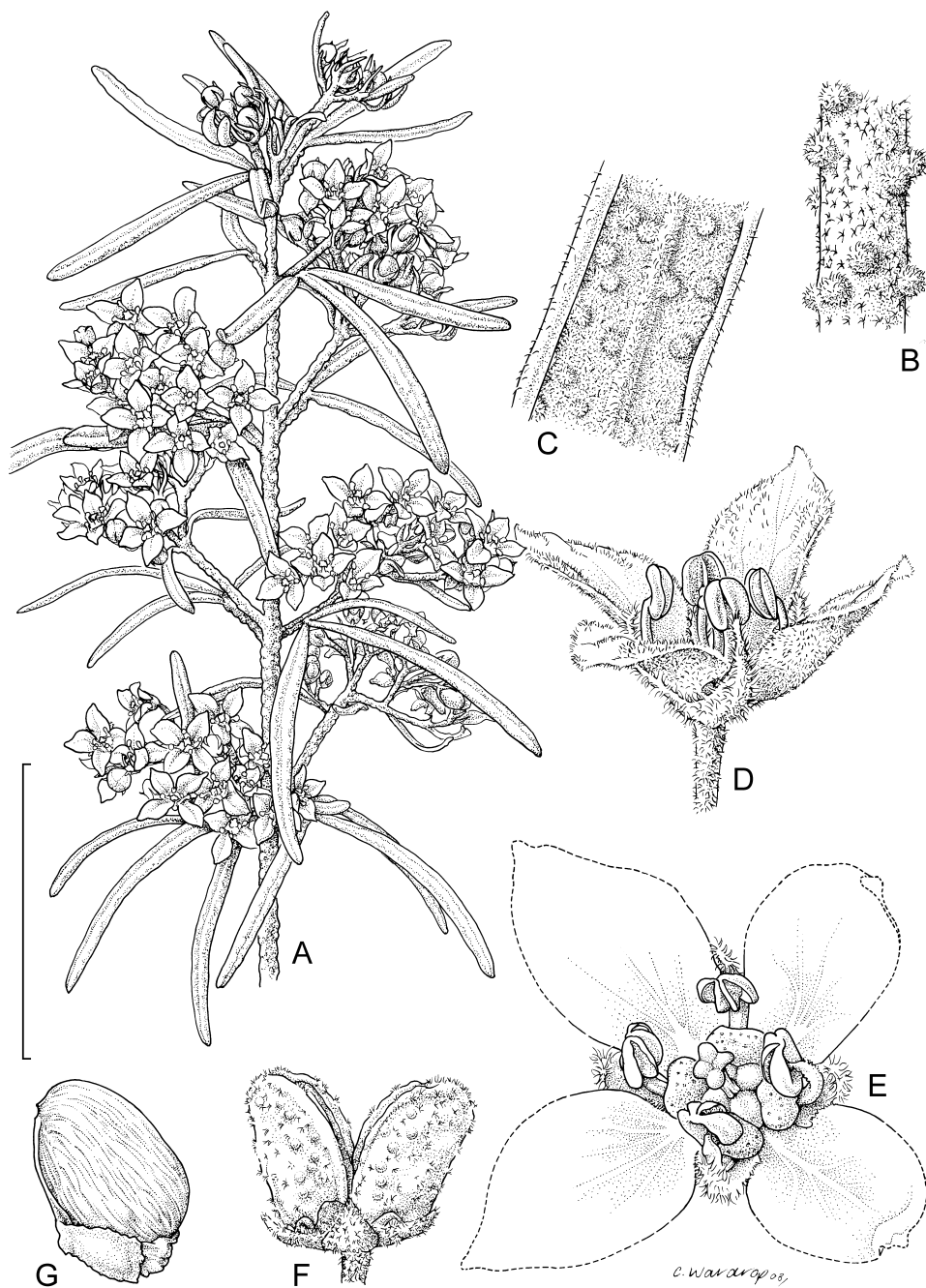


Figure 50. *Zieria buxijugum*. A, habit; B, stem detail; C, leaf abaxial surface; D, flower, lateral view; E, flower from above; F, fruit; G, seed (A, from fresh material; B–E, NSW499255; F, G, J.A.Armstrong 5092 et al., NSW). Scale bar: A, 33 mm; B, C, E = 4 mm; D, F = 5 mm; G = 3.3 mm. Drawn by C.Wardrop. ©Royal Botanic Gardens & Domain Trust. Reproduced with permission.

Extends from SE Qld through eastern N.S.W. S to Wyong. Flowers spring to summer. Three subspecies are recognised.

- | | | |
|----|--|--------------------------------------|
| 1 | Leaflets velvety and not glandular-verrucose on adaxial surface | 27a. subsp. <i>furfuracea</i> |
| 1: | Leaflets glabrous or with few hairs and glandular-verrucose on adaxial surface | |
| 2 | Leaflets entire or sinuate with poorly developed glands; petals valvate | 27b. subsp. <i>euthadenia</i> |
| 2: | Leaflets crenate with well developed marginal glands; petals imbricate | 27c. subsp. <i>gymnocarpa</i> |

27a. *Zieria furfuracea* R.Br. ex Benth. subsp. *furfuracea*

Boronia granulata F.Muell., *Trans. Vict. Inst.* 2: 65 (1857). T: interior, N.S.W., *T.Mitchell*; n.v.

Z. furfuracea subsp. A (type subsp.), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

[*Boronia arborescens* auct. non (Sims) F.Muell.: F.J.H.von Mueller, *Pl. Victoria*. 1: 112 (1862), p.p.]

[*Z. granulata* auct. non C.Moore ex Benth.: F.M.Bailey, *Queensland Fl.* 1: 184 (1899)]

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 284 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 359, fig. 52 (2002).

Central leaflet entire; adaxial surface velvety, glandular-verrucose. Inflorescence bracts not glandular-verrucose, pubescent on both surfaces. Sepals not glandular-verrucose, pubescent. Petals valvate. Cocci pubescent to hirsute. Fig. 51D, E.

Occurs from NE N.S.W. south to Wyong. Grows in open to closed forest and on steep, exposed, rocky sites.

N.S.W.: Wollomombi Falls, *R.Coveny 5664* & *N.Lander* (AD, CANB, HO, MEL, NSW); Mitchell Trig., Cangi State Forest, *A.G.Floyd 1545* (NSW); 57 km W of Wauchope, 29 June 1986, *G.J.White* (NE, NSW).

Shows little variation except plants from exposed sites at Wollomombi Falls which have short, narrower leaflets and branchlets with few hairs.



27b. *Zieria furfuracea* subsp. *euthadenia* J.A.Armstr., *Austral. Syst. Bot.* 15: 362 (2002)

T: Kin Kin, Qld, Jan. 1917, *C.T.White s.n.*; holo: BRI; iso: K.

Z. furfuracea subsp. (Kin Kin V.K.Moriarty 134), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Central leaflet entire; adaxial surface glabrous or with few hairs, glandular-verrucose. Peduncle pubescent all over. Inflorescence bracts glandular-verrucose, glabrous or with few hairs on adaxial surface; abaxial surface pubescent. Sepals glandular-verrucose, pubescent. Petals valvate. Cocci hirsute with long simple hairs. Fig. 51F, G.

Restricted to the Kin Kin area and Mt Woocoo, SE Qld. Grows on sandstone in eucalypt-dominated shrubland and woodland.

Qld: Parsons Rd, W of Mt Coondoo, via Kin Kin, *A.R.Bean 6488* (BRI, MEL); Mt Woocoo State Forest 57, St Mary, *P.I.Forster PIF19503* & *G.Leiper* (AD, BRI, CANB, MEL, NSW); Como State Forest, NE of Kin Kin, *V.K.Moriarty 134* (BRI).



27c. *Zieria furfuracea* subsp. *gymnocarpa* J.A.Armstr., *Austral. Syst. Bot.* 15: 363 (2002)

T: Belmont, [Brisbane], Qld, 10 Sept. 1987, *J.H.Simmons s.n.*; holo: BRI.

Z. furfuracea subsp. (Belmont Scrub Anon. AQ152898), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Central leaflet crenulate with marginal glands; adaxial surface glandular-verrucose, glabrous or with few hairs. Peduncle with scattered stellate, bifid and simple hairs. Inflorescence

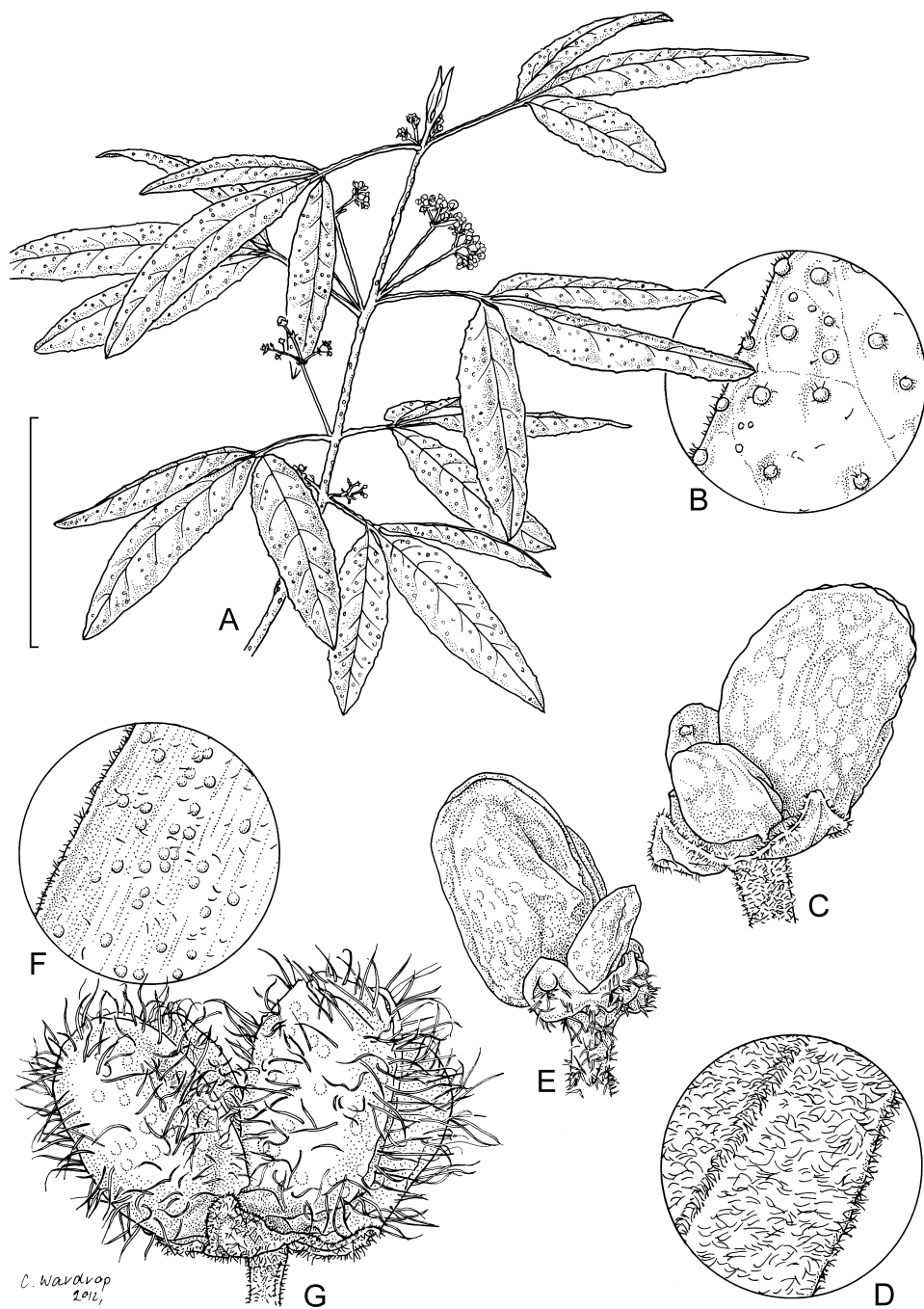


Figure 51. *Zieria*. **A–C**, *Z. furfuracea* subsp. *gymnocarpa*. **A**, habit; **B**, leaf, adaxial surface; **C**, fruit (**A–C**, A.McKerrow, 18 Apr 2008, NSW). **D, E**, *Z. furfuracea* subsp. *furfuracea*. **D**, leaf, adaxial surface; **E**, fruit (**D, E**, A.Benwell 55, NSW). **F–G**, *Z. furfuracea* subsp. *euthadenia*. **F**, leaf, adaxial surface; **G**, fruit (**F, G**, P.I.Forster 19503 & G.Leiper, NSW). Scale bar: **A** = 36 mm; **B, D, F** = 4 mm; **C, E, G** = 2.5 mm. Drawn by C.Wardrop.

bracts glandular-verrucose, glabrous or with few hairs on adaxial surface; abaxial surface with few hairs. Sepals glandular-verrucose, glabrous except stellate and bifid hairs at apex and on margins. Petals imbricate. Cocci glabrous. Fig. 51A–C.

Known only from the suburb of Belmont in Brisbane, Qld. Grows in eucalypt open forest. Flowers spring.

Qld: Belmont, Oct. 2002, *G.Leiper* (BRI, MEL, NSW).



28. *Zieria hindii* J.A.Armstr., *Austral. Syst. Bot.* 15: 369 (2002)

T: North Rocks Rd, Nightcap Ra., Whian Whian State Forest, c. 15 km W of Mullumbimby, N.S.W., 1 Dec. 1977, *R.G.Coveny 9906* & *L.Haegi*; holo: NSW; iso: BRI, CANB.

Z. sp. 10 (sp. 'J'; Nightcap Range), J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. J, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 242 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 284 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 370, fig. 60 (2002).

Shrub to 1 m high. Branchlets terete, with faint decurrent leaf bases, glandular-verrucose, glabrous though sparsely stellate-hirsute when young. Leaves trifoliolate; petiole 4.8–9.6 mm long, glabrous abaxially; central leaflet narrowly lanceolate, 17–32 mm long, 2.9–4.6 mm wide, entire, recurved at margins, acute; both surfaces not glandular-verrucose; adaxial surface glabrous; abaxial surface stellate-velvety, with midrib glandular-verrucose, with few hairs, secondary venation obscure. Inflorescences shorter than leaves, usually 7–13-flowered. Sepals 0.5–1 mm long, glandular-verrucose, pubescent. Petals imbricate, 2.2–2.6 mm long, creamy white, glandular-verrucose abaxially, pubescent adaxially. Filaments slightly glandular-verrucose apically. Cocci apiculate, glandular-verrucose, glabrous.

Restricted to dry, rocky (granite) hillsides in the Nightcap Ra. and the Koonyum Ra., far NE N.S.W. Flowers late spring–summer.

N.S.W.: Nandaly Rd, Koonyum Ra., *D.F.Blaxell 1384* (NSW); Nightcap Ra., Whian Whian SF, *R.G.Coveny 4467* & *A.N.Rodd* (BRI, CANB, NSW, PERTH).

A very localised species that shows little variation.



29. *Zieria floydii* J.A.Armstr., *Austral. Syst. Bot.* 15: 345 (2002)

T: Big Scrub Ck, Guy Fawkes Natl Park, N.S.W., 10 Nov. 1978, *A.G.Floyd 1141*; holo: NSW; iso: CFSHB.

Z. sp. L, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 243 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 285 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 346, fig. 41 (2002).

Shrub to 2 m high. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, stellate-pubescent. Leaves trifoliolate; petiole 4–6 mm long; central leaflet narrowly lanceolate to narrowly elliptic, 17–25 mm long, 2.5–3.5 mm wide, crenulate, recurved at margins, acute; adaxial surface with scattered stellate hairs, sparingly glandular-verrucose; abaxial surface densely glandular-verrucose, with scattered stellate hairs, with midrib glandular-verrucose, with few hairs, secondary venation prominent. Inflorescences shorter than leaves, 20–80-flowered. Sepals 0.8–1 mm long, slightly glandular-verrucose, with few hairs. Petals imbricate, c. 2.4 mm long, creamy white, glandular-verrucose abaxially, pubescent adaxially. Filaments slightly dilated basally, not glandular-verrucose. Mature cocci not seen.

Known only from the type collection. Grows on the fringe of rain forest in hilly country. Flowers late spring.

Listed as Endangered under the EPBC Act, 1999.



30. *Zieria parrisiae* J.D.Briggs & J.A.Armstr. in J.A.Armstrong, *Austral. Syst. Bot.* 15: 417 (2002)

T: 9 km W of Pambula on Box Range Farm, N.S.W., 16 Dec. 1987, *J.A.Armstrong 5091, J.D.Briggs, M.Parris & N.Fisher*; holo: CANB; iso: AD, CANB, MEL, NSW.

Z. sp. 15, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. 1, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 243 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 285 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 418, fig. 104 (2002).

Shrub to 3 m high. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, stellate-pubescent. Leaves trifoliolate; petiole 1.5–5 mm long; central leaflet lanceolate to narrowly oblanceolate, 18–44 mm long, 1.5–5.5 mm wide, glandular-verrucose and shortly recurved at margins, obtuse to acute; both surfaces glandular-verrucose; adaxial surface pubescent; abaxial surface velvety, with midrib glandular-verrucose, pubescent, secondary venation obscure. Inflorescences almost equal to leaves, 9–24-flowered. Sepals 1.3–1.8 mm long, glandular-verrucose, pubescent. Petals imbricate, c. 4 mm long, creamy white, glandular-verrucose abaxially, pubescent adaxially. Filaments not dilated or glandular-verrucose. Cocci not apiculate, glandular-verrucose, glabrous.

Known only from the type population near Pambula, N.S.W. Grows in heath on margins of sclerophyll forest on exposed rocky (ignimbrite) outcrop. Flowers late winter to spring.

N.S.W.: W of Pambula, *J.D.Briggs 2270* (CANB).

Listed as Endangered under the EPBC Act, 1999.



31. *Zieria tuberculata* J.A.Armstr., *Austral. Syst. Bot.* 15: 449 (2002)

T: Little Dromedary Mtn, near Central Tilba, N.S.W., 18 Oct. 1974, *J.A.Armstrong 743 & R.G.Coveny*; holo: NSW; iso: AD, BRI, CANB, HO, K, NBG.

Z. sp. C (aff. *granulata*), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Z. sp. C, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 243 (1991).

Z. sp. 6, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 285 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 447, fig. 131 (2002).

Shrub to 3.5 m high. Branchlets terete, with decurrent leaf bases faint or absent, glandular-verrucose, stellate-pubescent. Leaves trifoliolate; petiole 2–12 mm long; central leaflet linear to broadly linear, 16–49 mm long, 1.4–5 mm wide, slightly undulate, recurved at margins, rounded; both surfaces glandular-verrucose; adaxial surface stellate-pubescent; abaxial surface velvety, with midrib glandular-verrucose, pubescent, secondary venation obscure. Inflorescences shorter than leaves, 60–200-flowered. Sepals 0.7–1 mm long, glandular-verrucose, pubescent. Petals imbricate, 2.6–3.6 mm long, creamy white, glandular-verrucose abaxially, pubescent adaxially. Filaments dilated basally. Cocci glandular-verrucose, glabrous, not apiculate. *n* = 18, J.A.Armstrong, *op. cit.* 15: 286 (2002).

Known from the Central Tilba area and from Good Dog Mtn, Cambewarra Ra., N of Nowra, N.S.W. Grows in heath on margins of sclerophyll forest on exposed rocky (granitic) outcrops. Flowers late winter to spring.

N.S.W.: NE boundary of Dromedary Flora Res., *J.D.Briggs 2344* (BRI, CANB, MEL, NSW); Good Dog Mtn, Cambewarra Ra., *F.A.Rodway 993* (NSW); Mt Dromedary, *I.R.H.Telford 4380* (CANB, NSW).

Listed as Vulnerable under the EPBC Act, 1999.



32. *Zieria granulata* C.Moore ex Benth., *Fl. Austral.* 1: 307 (1863)

T: Kiama, N.S.W., Jan. 1856, *W.H. Harvey*; syn: K; near Goulburn, N.S.W., c. 1859, *C. Moore s.n.*; syn: MEL; woods of Paris Exhibition no. 204, *W. Macarthur*; syn: K.

Boronia granulata F.Muell., *Fragm.* 1: 101 (1859), *nom. illeg. non* F.Muell. (1857). T: near Goulburn, N.S.W., c. 1859, *C. Moore s.n.*; holo: MEL.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 284 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 366, fig. 57 (2002).

Shrub to 3 m high. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, stellate-pubescent except on warts. Leaves trifoliate; petiole 3–10.5 mm long; central leaflet

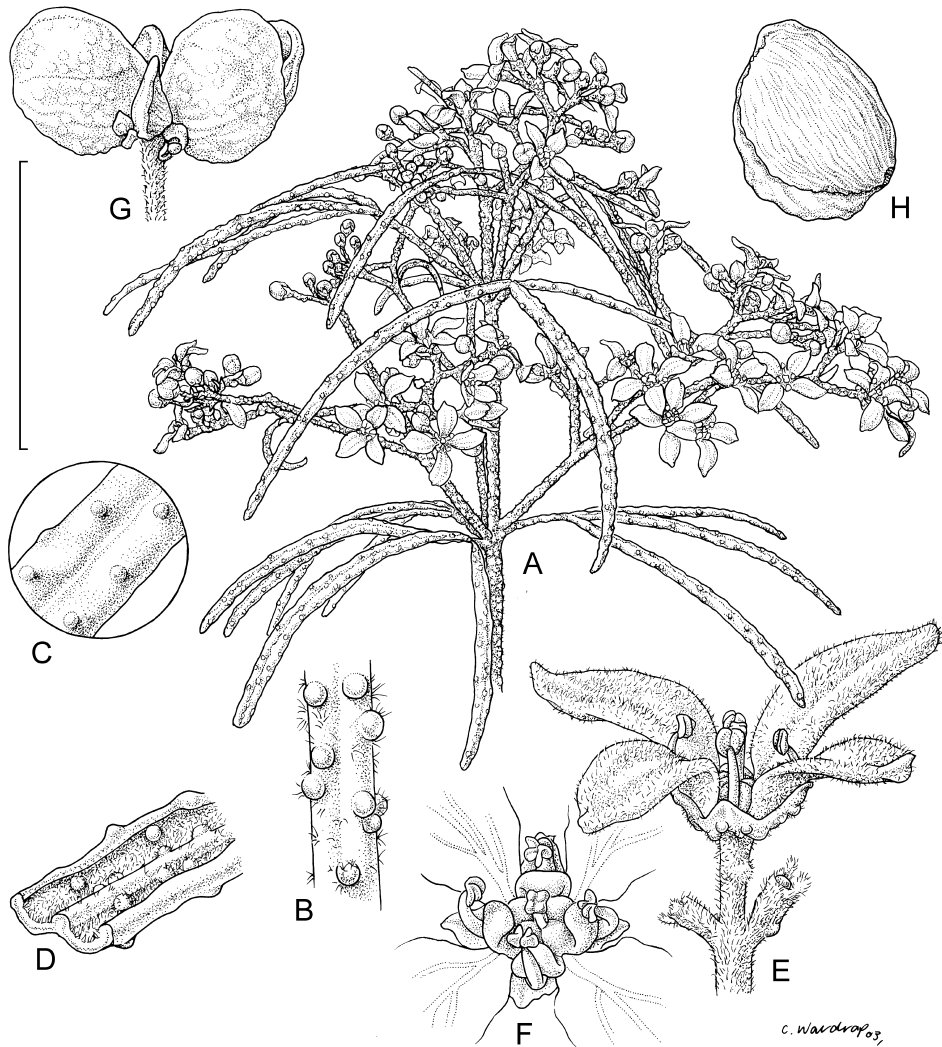


Figure 52. *Zieria granulata*. A, habit; B, stem detail; C, leaf adaxial surface; D, leaf T.S.; E, flower; F, flower, detail; G, fruit; H, coccus (A–F, L.F.Elkan & C.Wardrop, 12 Sept. 2002, NSW; G, H, J.L.Boorman, Apr. 1909, NSW). Scale bar: A = 30 mm; B, H = 3.3 mm; C = 6 mm; D, E, G = 5 mm; F = 4 mm. Drawn by C.Wardrop. ©Royal Botanic Gardens & Domain Trust. Reproduced with permission.

narrowly linear, 15–50 mm long, 0.5–2.5 mm wide, dentate, recurved to revolute at margins, obtuse; both surfaces glandular-verrucose; adaxial surface with few hairs; abaxial surface velvety, with midrib glandular-verrucose, pubescent, secondary venation obscure. Inflorescences shorter than leaves, 50–180-flowered. Sepals 0.5–0.8 mm long, glandular-verrucose, hirsute or with few hairs. Petals valvate, 1.7–2.5 mm long, creamy white, pubescent adaxially. Filaments slightly dilated basally, not glandular-verrucose. Cocci not apiculate, glandular-verrucose, glabrous. *Hill Zieria*, *Illawarra Zieria*. Fig. 52.

Occurs in the Kiama–Jamberoo area, N.S.W. Grows on dry rocky (volcanic) ridges in sclerophyll forest and rain forest margins. Flowers late spring to summer.

N.S.W.: John Cleary Lookout, W of Kiama, *J.A.Armstrong* 757 (CANB, K); Albatross Drive, Shellharbour, *R.Johnstone* 1450 *et al.* (K, MEL, NSW).

Listed as Endangered under the EPBC Act, 1999.



33. *Zieria verrucosa* J.A.Armstr., *Austral. Syst. Bot.* 15: 456 (2002)

T: W of Proston, Qld, July 1949, *L.J.Webb* 5068; holo: BRI; iso: BRI.

Z. sp. 1, E.M.Ross in T.D.Stanley & E.M.Ross (eds), *Fl. South-eastern Queensland* 1: 442 (1983).

Z. sp. 13, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. (Monogorilby P.I.Forster PIF1004), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Illustration: J.A.Armstrong, *op. cit.* 454, fig. 137.

Shrub to 1.5 m high. Branchlets terete, with leaf bases not decurrent, prominently glandular-verrucose, stellate-pubescent all over. Leaves trifoliolate; petiole 2–15 mm long; central leaflet oblong-linear, 8–50 mm long, 1–5 mm wide, entire to obscurely undulate-glandular-verrucose, revolute at margins, obtuse; both surfaces glandular-verrucose, adaxial surface with scattered stellate and simple hairs; abaxial surface velvety, with midrib glandular-verrucose, pubescent, secondary venation obscure. Inflorescences shorter than leaves, 17–60-flowered. Sepals 0.7–1.5 mm long, glandular-verrucose, pubescent. Petals imbricate, c. 2.6 mm long, creamy white to pale pink, pubescent adaxially. Filaments slightly dilated basally, glandular-verrucose apically. Cocci apiculate, glabrous.

Restricted to SE Qld, mainly near Monogorilby and Proston. Grows in red krasnozom soil and black earth as well as shallow soils overlying sandstone, in brigalow scrub and eucalypt/acacia open forest. Flowers spring.

Qld: Speedwell, N of Proston, *A.R.Bean* 11807 (BRI, MEL); 3 km N of Monogorilby, *P.I.Forster* 5646 (BRI, CANB, DNA, MEL, PERTH); 2 km S of Abbeywood, on Proston road, *P.I.Forster* 5655 (BRI, CANB, MEL); Reinke Scrub, 1.5 km SW of Proston, *P.I.Forster* 9096 (BRI, L, MEL, NSW); Narayen Research Stn, Mundubbera, 17 Oct. 1977, *J.Hargraves* (CANB, NSW).

Listed as Vulnerable under the EPBC Act, 1999.



34. *Zieria vagans* Durretto & P.I.Forst., *Austrobaileya* 7: 533 (2007)

T: Fontainea Scrub, Gurgeena Plateau, State Forest 172, Qld, 9 Feb. 1994, *P.I.Forster* PIF14801; holo: BRI; iso: A, MEL, MO, NSW.

Z. sp. (Binjour P.I.Forster PIF14134), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F.Durretto & P.I.Forster, *op. cit.* 534.

Open shrub to 2 m tall. Branchlets terete, with leaf bases not decurrent, markedly glandular-verrucose, stellate-tomentose. Leaves trifoliolate; petiole 5–13 mm long; central leaflet narrowly elliptic, 32–45 mm long, 3.5–5.5 mm wide, entire to glandular-dentate, almost flat, obtuse; midrib and some secondary veins raised abaxially; adaxial surface not glandular-

verrucose, glabrous or with sparse simple and/or stellate hairs; abaxial surface glandular-verrucose, stellate-tomentose. Inflorescences shorter than leaves, 3–15-flowered. Sepals 0.8–1 mm long, not obviously glandular, glabrous adaxially except puberulous margins, with sparse to dense stellate and simple hairs abaxially, denser along margins. Petals valvate, c. 2 mm long, creamy white, not obviously glandular, minutely pilose adaxially, with moderately dense simple and stellate hairs abaxially. Filaments glabrous or with few simple or stellate hairs, weakly glandular-verrucose distally. Cocci smooth, glabrous.

Endemic in Qld, confined to the Gurgeena Plateau near Binjour, a relictual plateau with a lateritised duricrust. Occurs in understorey of semi-evergreen vine thicket dominated by *Backhousia kingii* on red soils and in the ecotone between this community and adjacent eucalypt woodland. Flowers Oct.–Mar.; fruits Dec.–Mar.

Qld: Binjour Plateau, State Forest 172, near Merediths Rd, *P.I.Forster 14134* (A, AD, BRI, DNA, L, MEL, MO, NSW, NY); Fontainea Scrub, State Forest 172, Gurgeena Plateau, *P.I.Forster 15065* (A, BRI, L, MEL, NE); Orchid Scrub, Gurgeena Plateau, State Forest 172, *P.I.Forster 20122* (BRI, MEL).



Closely related to *Z. distans* and *Z. verrucosa*. It differs from *Z. distans* in being woolly stellate-tomentose all over the stems and on the midrib of the abaxial surface of the leaflets, in having narrower leaflets, narrowly oblong inflorescence bracts, and in having only a few hairs between the glands on the abaxial surface of the sepals. Differs from *Z. verrucosa* in its spreading to erect leaves, narrowly elliptic leaflets that are not obviously glandular above, and the obscurely glandular sepals.

35. *Zieria distans* Duretto & P.I.Forst., *Austrobaileya* 7: 497 (2007)

T: Mt Walla, Walla Ra., 5 km SW of Coalstoun Lakes, Qld, 12 Sept. 2002, *P.I.Forster PIF28835*; holotype: BRI; isotype: A, AD, HO, L, MEL, NSW, NY, Z.

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 499.

Shrub to 1.5 m tall. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, densely stellate-tomentose when young, becoming glabrous with age. Leaves trifoliate; petiole 5–12 mm long; central leaflet narrowly elliptic, (8–) 11–30 (–37) mm long, 1–4.5 mm wide, slightly recurved or sometimes revolute at margins, obtuse to acute, weakly glandular-verrucose on adaxial surface, margin and abaxial midrib; adaxial surface glabrous except a few simple or stellate hairs along midrib and near base, abaxial surface densely stellate-tomentose except raised midrib, with secondary veins obscure. Inflorescences shorter than leaves, 12–21+ flowered. Sepals 1–1.2 mm long, glandular-verrucose, with few hairs adaxially, stellate-tomentose at base abaxially, with few hairs between glands. Petals imbricate, 1.8–3 mm long, white, stellate-tomentose both sides. Filaments glabrous or with few scattered minute hairs, eglandular. Cocci not or slightly glandular-verrucose, glabrous.

Endemic in SE Qld, from Walla Ra. near Coalstoun Lakes, Coongara Rock, Kroombit Tops, Westwood Ra. and Mt Roberts. Grows in rocky clefts (e.g. rhyolitic ignimbrite) on pavements, in tall open shrubland, in an ecotone between woodland and fragmented semi-evergreen vine thicket, and in woodland on rock faces or rubble at cliff bases. Flowers May–Sept.; fruits Dec.

Qld: S base of Coongara Rock, 11 km ESE of Coalstoun Lakes, *P.I.Forster 28843* (A, AD, BRI, HO, L, MEL, MO, NSW, NY); c. 9 km E of Miriam Vale, Westwood Ra., *E.J.Thompson MIR173* & *R.Price* (BRI); Kroombit Tops Natl Park, W section, *E.J.Thompson BIL132* & *G.Turpin* (BRI, MEL); Timber Reserve 353, Mt Roberts, *E.J.Thompson MON1* & *G.Turpin* (BRI, HO).



Closely related to *Z. vagans* and *Z. verrucosa*, but a much smaller plant than those two species and with much smaller leaves. *Zieria verrucosa* has drooping leaves, linear leaflets and sepals with scattered glands. *Zieria vagans* has woolly stellate-tomentose branchlets, relatively broader leaflets (length/width ratio of 7.5–10.8), a woolly stellate-tomentose midrib on the abaxial surface of the leaf and sepals that have only a few hairs between the glands.

36. *Zieria obcordata* A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 330 (1825)

T: hills on the Macquarie R., N.S.W., Oct. 1822, *A.Cunningham* 92; holo: K; iso: BM, BRI, K, MEL.

Z. obcordata subsp. A (type subsp.), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 283 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 405, fig. 92 (2002).

Shrub to 0.5 m high. Branchlets terete, with leaf bases not decurrent, not to slightly glandular-verrucose, pubescent with simple hairs. Leaves trifoliolate; petiole 1.5–3 mm long, hairy; central leaflet cuneate-obovate, 3–8.5 mm long, 1.3–3.7 mm wide, slightly undulate, flat to marginally recurved especially towards apex, obcordate to rounded; adaxial surface glandular-verrucose, hirsute; abaxial surface not glandular-verrucose, hirsute, with midrib glandular-verrucose, hirsute, secondary venation obscure. Inflorescences shorter than leaves, 1–3-flowered. Sepals 1–1.4 mm long, glandular-verrucose, hirsute. Petals valvate, 1.8–2.6 mm long, creamy white, with few hairs to glabrous adaxially. Filaments glandular-verrucose apically. Cocci not apiculate, glandular-verrucose, pubescent.

A rare species known only from near Bathurst and near Wellington, N.S.W. Grows in eucalypt woodland and shrubland on rocky (granite) hillsides. Flowers spring; fruits summer.

N.S.W.: Bulbudgerie Stn, c. 16 km ENE of Wellington, *J.D.Briggs* 2376 (CANB, MEL, NSW); NNE of Crackerjack Rock, W of Bathurst, *J.D.Briggs* 2433 (CANB, NSW).

Close to *Z. minutiflora* but distinguished by its smaller, obovate-cuneate, obtuse leaves and smaller cocci.

Listed as Endangered under the EPBC Act, 1999.

**37. *Zieria adenophora* Blakely, *Contr. New South Wales Natl Herb.* 1: 123 (1941)**

T: Bells Creek Falls, Araluen, N.S.W., Sept. 1890, *W.Baeuerlen*; holo: NSW.

Z. obcordata subsp. B, S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981), p.p.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 283 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 304, fig. 6 (2002).

Shrub to 1 m high. Branchlets terete, with leaf bases not decurrent, densely glandular-verrucose, pubescent with simple hairs. Leaves trifoliolate; petiole 1.5–2 mm long, pubescent; central leaflet cuneate-obovate, 2.5–8 mm long, 2–4 mm wide, prominently glandular-dentate, slightly recurved at margins, rounded to emarginate; adaxial surface glandular-verrucose, glabrous or almost so; abaxial surface not glandular-verrucose, with midrib glandular-verrucose, sparsely hirsute, secondary venation obscure. Inflorescences shorter than leaves, 1–3-flowered. Sepals c. 1 mm long, glandular-verrucose, glabrous. Petals valvate, 2–3 mm long, creamy white to pale pink, glandular-verrucose towards apex abaxially, glabrous or with few hairs adaxially. Filaments not glandular-verrucose or dilated. Cocci not apiculate, glandular-verrucose, glabrous. *Araluen Zieria*.

Known from a single, small population in the Bells Creek valley N of Araluen, N.S.W. Grows in shrubland on hillside among granite boulders. Flowers spring.

N.S.W.: Bells Creek Falls, *J.A.Armstrong* 5097A (BRI, CANB, MEL, NSW, PERTH).

The small leaflets with prominent, gland-tipped teeth are distinctive.

Listed as Endangered under the EPBC Act, 1999.



38. *Zieria robusta* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 35: 788 (1911)

T: E of Mt Werong, on edge of 'The Big Plain' overlooking Kowmung R., N.S.W., 4 Oct. 1909, *R.H.Cambage* 2261; holotype: NSW; isotype: MEL.

Illustrations: N.G. Walsh & T.J. Entwistle (eds), *Fl. Victoria* 4: 167, fig. 30c (1999); G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 282 (2002); J.A. Armstrong, *Austral. Syst. Bot.* 15: 434, fig. 119 (2002).

Shrub to 2.5 m high. Branchlets ridged with decurrent leaf bases, glandular-verrucose, pubescent in bands between ridges with simple hairs. Leaves trifoliate; petiole 1.5–5.6 mm long; central leaflet obovate, 2.5–12 mm long, 2–6.5 mm wide, crenate-dentate, flat to recurved at margins, rounded or emarginate; both surfaces glabrous, not glandular-verrucose; abaxial surface with midrib glandular-verrucose, glabrous, secondary venation obscure. Inflorescences usually longer than leaves, 5–9+-flowered. Sepals 1–1.5 mm long, glandular-verrucose, glabrous. Petals imbricate, 2.5–3.5 mm long, creamy white to pale pink, pubescent adaxially. Filaments slightly glandular-verrucose apically, dilated basally. Cocci not apiculate, not to slightly glandular-verrucose. *n* = 18, J.A. Armstrong, *op. cit.* 286.

Occurs in N.S.W. in the Rylstone–Mudgee area and Wee Jasper and disjunctly in Vic. on the Moroka R. NE of Mt Wellington. Grows in heath on rocky outcrops on exposed ranges. Flowers spring to mid-summer.

N.S.W.: Eskdale Gulf, Winburndale Nat. Res., J.A. Armstrong 1268 & R. Coveny (NSW); Kanangra Walls, 0.8 km E of Kittani Top, M.D. Crisp 4009 (CANB, NSW); above Mountain Ck, c. 11 km E of Wee Jasper, A. Lyne 2538 *et al.* (CANB, NSW). Vic.: Moroka R., Dec. 1976, W. Cane (MEL, NSW).



A fairly consistent species, but plants near Wee Jasper and in Vic. have more deeply crenate leaflets. Plants from the Warrumbungle Ra. have a longer central leaflet than those elsewhere.

39. *Zieria adenodonta* (F. Muell.) J.A. Armstr., *Austral. Syst. Bot.* 15: 299 (2002)

Z. granulata var. *adenodonta* F. Muell., *Fragm.* 9: 116 (1875). T: highest mountains on the Tweed R., N.S.W., [c. 1865], W. Carron s.n.; lectotype: MEL, *fide* J.A. Armstrong, *loc. cit.*; isotype: MEL, NSW.

Z. granulata var. *adenodonta* F. Muell. ex Maiden & Betche, *Proc. Linn. Soc. New South Wales* 26: 80 (1901), *nom. illeg.*

Z. sp. B, S.W.L. Jacobs & J. Pickard, *Pls New South Wales* 195 (1981).

Z. sp. B, J.A. Armstrong in G.J. Harden (ed.), *Fl. New South Wales* 2: 242 (1991).

Z. sp. 8, J.D. Briggs & J.H. Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Illustrations: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 284 (2002); J.A. Armstrong, *op. cit.* 300, fig. 3 (2002).

Shrub to 4 m high. Branchlets terete, with leaf bases not decurrent, glandular-verrucose, velvety with stellate hairs except on warts. Leaves trifoliate; petiole 3–7 mm long, hairy abaxially; central leaflet lanceolate, 7–23 mm long, 1–3.5 mm wide, glandular-verrucose and recurved at margins, acute to obtuse; adaxial surface glandular-verrucose, with few hairs; abaxial surface not glandular-verrucose, velvety, with midrib pubescent, secondary venation obscure. Inflorescences shorter than leaves, 5–8-flowered, rarely 20 or more. Sepals 0.4–0.8 mm long, glabrous. Petals imbricate, 2.5–3 mm long, creamy white, pubescent adaxially. Filaments not glandular-verrucose, slightly dilated basally. Cocci not apiculate, glabrous. *n* = 18, J.A. Armstrong, *op. cit.* 286 (2002).

Restricted to eastern parts of Lamington Natl Park, SE Qld, and Mt Warning, NE N.S.W. Confined to exposed rocky outcrops and dry eucalypt forest. Flowers May–Sept.; fruits Nov.–Jan.

Qld: near Binna Burra, Lamington Natl Park, S.T. Blake 14628 (BRI); E side of Mt Roberts, S.T. Blake 15844 (BRI, NSW); lower Ballanjui Track, near Yangahla Lookout, Lamington Natl Park, W.J. McDonald 2438 (BRI, CANB). N.S.W.: Mt Warning, J.A. Armstrong 51 & R.G. Coveny (NSW).



Plants on Mt Warning have shorter, broader leaflets than those on the McPherson Ra.

40. *Zieria obovata* (C.T.White) J.A.Armstr., *Austral. Syst. Bot.* 15: 408 (2002)

Z. aspalathoides var. *obovata* C.T.White, *Proc. Roy. Soc. Queensland* 53: 208 (1942). T: Herberton, Qld, Jan. 1912, *F.H.Kenny*; holotype: BRI.

Z. sp. 4, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. (Herberton J.A.Armstrong 1025), P.I.Forster in R.J.F.Henderson (ed.), *Queensland Pls: Names Distrib.*, 188 (1997).

Illustration: J.A.Armstrong, *op. cit.* 409, fig. 95.

Shrub to 1 m high. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, hirsute with mainly simple hairs, stellate and bifid hairs also present. Leaves trifoliolate, subsessile or with petiole 0.5–1 mm long; central leaflet obovate, 6–13 mm long, 2–7 mm wide, entire, recurved to revolute at margins, rounded and shortly acute; both surfaces not glandular-verrucose; adaxial surface sparsely pilose or with few hairs; abaxial surface hirsute, with midrib not glandular-verrucose, hirsute, secondary venation obscure. Inflorescences longer than leaves, 1–3-flowered. Sepals 1–1.2 mm long, slightly glandular-verrucose, hirsute. Petals imbricate, 2–3.2 mm long, creamy white to pale pink, glandular-verrucose abaxially, pubescent adaxially. Filaments prominently dilated basally. Cocci apiculate, usually glabrous.

Known only from Wild River Gorge near Herberton, in the Stannary Hills, N Qld. Grows on granite rockfaces and in eucalypt open forest. Flowers spring.

Qld: Wild River Gorge, NNE of Herberton, *J.A.Armstrong 1025* (BRI, CANB, NSW); Stannary Hills, *T.L.Bancroft 287* (BRI); Herberton Weir, Wild R., *P.I.Forster PIF6251* (BRI); 2 km W of Herberton, *A.Freeman Rush Track 13* (BRI).

Specimens from Trinity Bay cited by Armstrong (2002) are *Z. minutiflora* subsp. *trichocarpa*.

Listed as Vulnerable under the EPBC Act, 1999.



41. *Zieria bifida* Durretto & P.I.Forster., *Austrobaileya* 7: 488 (2007)

T: Triunia Natl Park, W of Woombye, Qld, 30 Jan. 2000, *A.R.Bean 16002*; holotype: BRI; iso: AD, HO, MEL, NSW, NY.

Z. sp. (Brolga Park; A.R.Bean 1002), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustrations: Logan River Branch SGAP (QLD Region) Inc., *Mangroves to Mountains* 2: 175 (2005), as *Z. sp.* Brolga Park; M.F.Durretto & P.I.Forster, *op. cit.* 490.

Shrub to 2 m high. Branchlets terete, with leaf bases not decurrent, weakly glandular-verrucose, pilose with mainly bifid hairs. Leaves trifoliolate; petiole 3–7 mm long, pilose; central leaflet elliptic, narrowly elliptic or obovate, 7–20 mm long, 3.5–8 mm wide, slightly crenulate and thickened at margins, ±flat, acute to obtuse, not glandular-verrucose; adaxial surface with few simple hairs along margin; abaxial surface with simple or bifid hairs on margin and midrib; secondary veins visible but not raised. Inflorescences shorter than or as long as leaves, 1–several-flowered. Sepals 1–2 mm long, sparsely pilose adaxially, glabrous abaxially except minutely pilose margins. Petals valvate, 1.8–2 mm long, white, glabrous adaxially except scattered stellate and bifid hairs near margin, with scattered to sparse bifid and stellate hairs abaxially along margins and near apex. Filaments with occasional bifid hairs, not glandular. Cocci 2–3 mm long, minutely apiculate, not glandular-verrucose, glabrous.

Endemic in Qld, known from the type locality in Triunia Natl Park (formerly Brolga Park) and on Town Mount Rd, both near Nambour. Occurs on margins of rain forest (complex notophyll vine forest) and open forest of *Eucalyptus propinqua*, *Corymbia intermedia* and *Lophostemon confertus* in rich loam. Flowers and fruits Dec.–Apr.

Qld: Brolga Park, W of Woombye, *A.R.Bean 1465* (BRI, MEL); Blackall Ra., Brolga Environmental Park, c. 6 km WNW of Nambour, *F.E.Davies 1540 & M.M.Richardson* (BRI, MEL); Towen Mount Rd, Nambour, July 2003, *A.Moran s.n.* (BRI).

Zieria bifida differs from *Z. obovata* in its pilose stems with bifid trichomes (versus dense-shaggy, stellate-tomentose), longer petioles, flat leaflet margins, lanceolate sepals and glabrous cocci.

Listed as Endangered under the EPBC Act, 1999.



42. *Zieria minutiflora* Domin, *Biblioth. Bot.* 89: 283 (1926)

Based on *Boronia minutiflora* F.Muell., *Fragm.* 1: 100 (1859), *nom. illeg.* (*Z. obcordata* in syn.). T: Glass House Mtns, Moreton Bay [Qld], 1857, *F.Mueller*; lecto: MEL, *fide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 393 (2002); isolecto: K.

Procumbent shrub to 1 m high. Branchlets terete, with leaf bases not decurrent, not or slightly glandular-verrucose, hirsute with simple, bifid and stellate hairs. Leaves trifoliate; petiole 1.1–3.6 mm long; central leaflet obovate, 5–16 mm long, 1.7–11 mm wide, entire, slightly recurved at margins, retuse to emarginate; both surfaces not glandular-verrucose; adaxial surface pubescent with simple hairs or rarely with few hairs; abaxial surface velvety to hirsute, with midrib not glandular-verrucose, pubescent, secondary venation obscure. Inflorescences shorter than leaves, 1–7-flowered; bracts c. 0.7 mm long. Sepals 0.5–0.7 mm long, hirsute to glabrous. Petals imbricate, 1.5–2.1 mm long, creamy white or pale pink, hirsute adaxially. Filaments slightly glandular-verrucose towards apex. Cocci apiculate, glandular-verrucose, hirsute or glabrous.

Occurs in coastal districts from NE Qld S to Coffs Harbour in NE N.S.W. Flowers throughout the year, but mainly summer and autumn. Two subspecies are recognised.

Ovary and cocci glabrous

42a. subsp. *minutiflora*

Ovary and cocci hirsute

42b. subsp. *trichocarpa*

42a. *Zieria minutiflora* Domin subsp. *minutiflora*

Z. minutiflora subsp. A (type subsp.), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 287 (2002), as *Z. minutiflora*; J.A.Armstrong, *Austral. Syst. Bot.* 15: 394, fig. 81a–f, i (2002).

Peduncle and pedicels glabrous except a few stellate hairs on some specimens. Ovary and cocci glabrous. Fig. 53H.

Occurs from Wide Bay, SE Qld, S to Coffs Harbour, N.S.W. Grows in sandy or rocky soil near the coast, typically in open forest or woodland, sometimes on cliffs and on creek margins.

Qld: 5 km SE of Pomona, SE of Gympie, *B.G.Briggs 4252 & L.A.S.Johnson* (NSW); Buderim, *P.I.Forster 28821* (A, BRI, CANB, L, MEL, MO, NSW, NY); Mt Ngungun, *J.M.Powell 4611* (BRI, NSW, PERTH). N.S.W.: 10 km SE of Woodburn on Gap Road, *R.G.Coveny 5103* (NSW); near Parberry's Spur Rd, Conglomerate State Forest, *P.Richards 759* (NSW).



42b. *Zieria minutiflora* subsp. *trichocarpa* J.A.Armstr., *Austral. Syst. Bot.* 15: 396 (2002)

T: 3.8 km S of Ravenshoe P.O., on Tully Falls Rd, Qld, 7 Sept. 1977, *J.A.Armstrong 1022 & D.F.Blaxell*; holo: NSW; iso: CANB, K.

Z. sp. 12 (sp. 'L'; Russell River, S.Johnson s.n., 189 [1892]), J.D.Briggs & J.Leigh, *Rare or Threatened Austral. Pls* 170, 290 (1996).

Z. sp. (Russell River S.Johnson in 1892), P.I.Forster in R.J.F.Henderson (ed.), *Queensland Pls: Names Distrib.* 188 (1997).

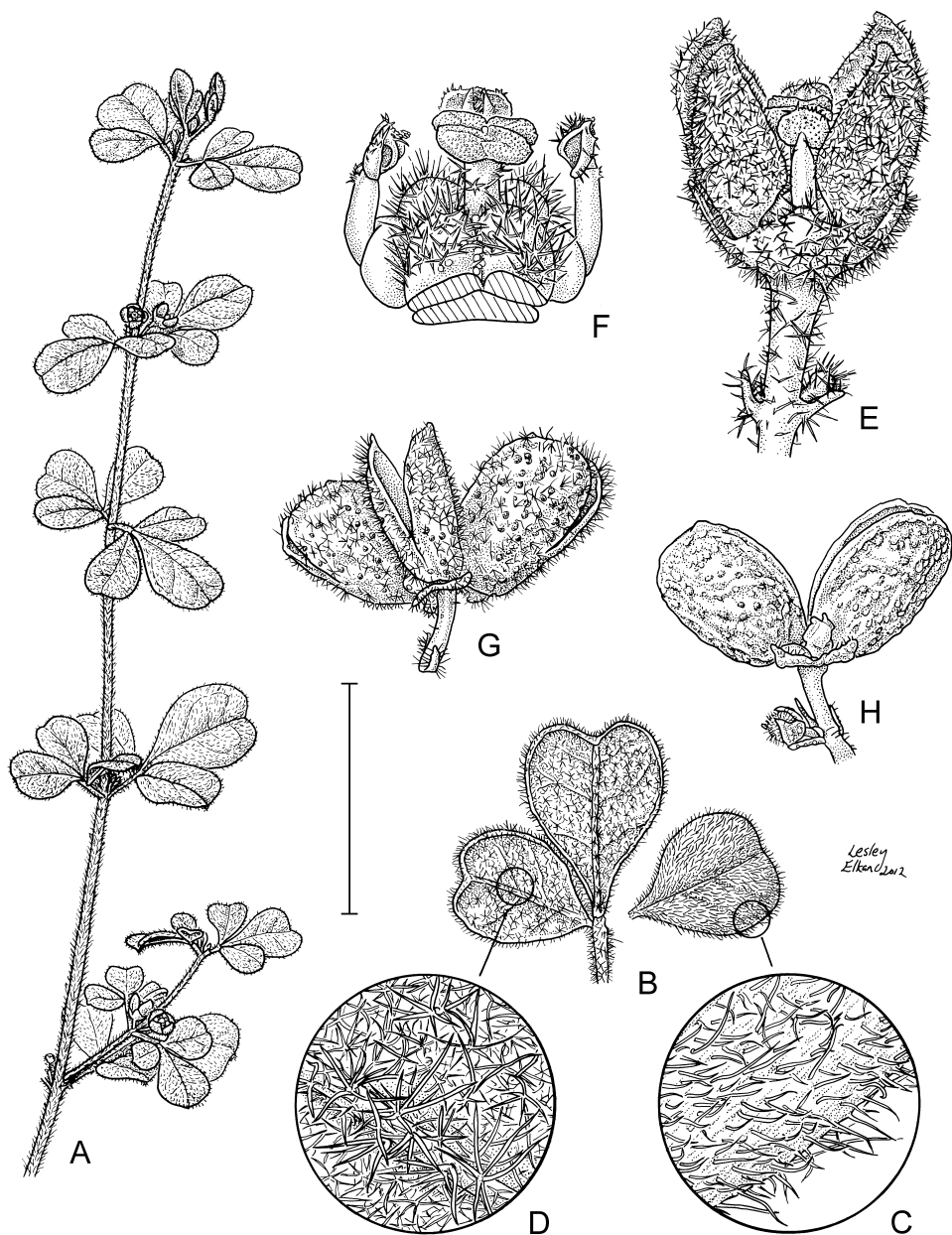


Figure 53. *Zieria*. A–G, *Z. minutiflora* subsp. *trichocarpa*. A, habit; B, leaf, showing adaxial & abaxial surfaces; C, leaflet, adaxial surface detail; D, leaflet, abaxial surface detail; E, flower; F, stamens & carpels (1 stamen & part of disc removed); G, fruit (A–F, B.S.Wannan 535 & R.Jago, NSW; G, M.Lockyer 20 July 1978, NSW). H, *Z. minutiflora* subsp. *minutiflora*, fruit (R.Johnstone 477, NSW). Scale bar: A = 20 mm; B = 10 mm; C, D, F = 1.5 mm; E = 2 mm; G, H = 4 mm. Drawn by L.Elkan.

Z. minutiflora subsp. (Danbulla L.J.Webb 5732), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Illustration: J.A.Armstrong, *op. cit.* 394, fig. 81g, h.

Peduncle and pedicels hirsute, rarely with few hairs. Ovary densely hirsute with mainly simple and bifid hairs. Cocci hirsute all over with mainly stellate and bifid hairs. Fig. 53A–G.

Occurs in NE Qld between the Atherton Tableland and Townsville, with disjunct populations S to the Blackdown Tableland and at Shoalwater Bay. Grows in clay over sedimentary rocks in open forest and in sand over granite rocks in tall woodland.

Qld: road to Wild River Gorge, c. 8 km NNE of Herberton, *J.A.Armstrong 1026* (NSW); just above Walsh Falls, *J.A.Armstrong 1028* (BRI, CANB, NSW); W of Mt Spec, Paluma Ra., *D.F.Blaxell 1619* (NSW); Shoalwater Bay Army Res., 2.5 km N of Mt Parnassus, *J.R.Clarkson 665* & *T.D.Stanley* (BRI, NSW); c. 35 km SE of Blackwater, Blackdown Tableland, *R.J.Henderson H1164 et al.* (BRI).



43. *Zieria pilosa* Rudge, *Trans. Linn. Soc. London* 10: 293, t. 17 fig. 2 (1811)

T: N.S.W., 179-, *J.White*; holo: BM.

Z. microphylla Bonpl., *Descr. Pl. Malmaison* 64 (1815). T: originally from Australia; *n.v.*

Z. pauciflora Sm. in A.Rees, *Cycl.* 39: no. 3 (1818); *Z. pilosa* var. *pauciflora* (Sm.) Domin, *Biblioth. Bot.* 95: 837 (1926). T: Port Jackson, N.S.W., 179-, *J.White*; holo: LINN *n.v.* (photo NSW).

Z. hirsuta DC., *Prodr.* 1: 723 (1824); *Boronia hirsuta* (DC.) F.Muell., *Fragm.* 1: 101 (1859). T: Blue Mtns, N.S.W., *coll. unknown*; holo: G *n.v.* (photo NSW).

Z. commutata Schult. & Schult.f., *Mant.* 3: 324 (1827). T: “*Zieria microphylla*” *F.Sieber Herb. Nov. Holl.* No. 283; holo: M; iso: P.

Z. pilosa var. *parviflora* Benth., *Fl. Austral.* 1: 305 (1863). T: ‘Both in Banks’ and in R.Brown’s collections; near Sydney, N.S.W., Aug. 1803, *R.Brown Iter Austral.* 5284; lecto: BM, *fide* A.S.George, *Fl. Australia* 26: 583 (2013).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 283 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 422, fig. 107 (2002).

Shrub to 1 m high, without lignotuber. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, pubescent with mainly simple hairs, rarely glabrous. Leaves trifoliate, not glandular-verrucose; petiole 1.5–4 mm long, hairy, rarely glabrous; central leaflet linear to oblong or lanceolate, commonly 5–25 mm long, 1.5–8.5 mm wide, entire, almost flat to recurved or revolute at margins, obtuse; both surfaces not glandular-verrucose; adaxial surface glabrous or sparsely hairy; abaxial surface pubescent or hirsute, with midrib not glandular-verrucose, hirsute, secondary venation obscure. Inflorescences shorter than leaves, 1–7-flowered. Sepals linear-subulate or narrowly lanceolate, 1.5–3.5 mm long, 0.6–1.5 mm wide, hirsute to with few hairs. Petals imbricate, 3–4.5 mm long, creamy white to pale pink, pubescent on both surfaces. Filaments slightly glandular-verrucose apically. Cocci 3–4 mm long, not apiculate, not glandular-verrucose, glabrous to hirsute. *n* = 18, J.A.Armstrong, *op. cit.* 286. *Hairy Zieria*.

Grows in coastal districts and adjacent ranges of central N.S.W. with outliers near Wombeyan Caves and Shoalhaven. Understorey plant in tall open forest, woodland or heathland in sandy soil, commonly over sandstone. Flowers throughout the year but mainly spring to early summer.

N.S.W.: Ku-ring-gai Chase Natl Park, *J.A.Armstrong 762* (NSW); Christmas Bush Trail, Toorooroo Plateau, SW of Nowra, *B.G.Briggs 3960* (NSW); Hornsby, 18 Aug. 1953, *G.Chippendale* (NSW); Bullio Tunnel, Mittagong–Wombeyan Caves Rd, *M.J.Taylor 373 et al.* (CANB).

Varies considerably in leaflet size and indumentum; occasionally plants are glabrous, e.g. ‘Lugarna Ferry’ via Peakhurst, *A.Forster* (NSW 2776).



44. Zieria citriodora J.A.Armstr., *Austral. Syst. Bot.* 15: 330 (2002)

T: 5.5 km by road E of Umaralla on Countegany Rd, N.S.W., 3 Aug. 1975, R.G.Coveny 6590, P.Hind & M.Parris; holo: NSW; iso: CANB, MEL.

Z. sp. D (aff. *aspalathoides*), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Z. sp. D, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 241 (1991).

Z. sp. 2 (sp. 'B'; Numeralla–Kybean Trig), J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. 2, M.F.Dureto in N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 166 (1999).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 167, fig. 30f (1999), as Z. sp. 2; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 283 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 332, fig. 29 (2002).

Procumbent shrub to 0.15 m high, proliferating from rhizomes. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, pubescent to hirsute with simple hairs. Leaves trifoliolate; petiole 2–4 mm long; central leaflet lanceolate or linear, 4–5 (–10) mm long, 1.5–1.9 mm wide, entire, recurved at margins (more prominently when dried), rounded to acute, not glandular-verrucose, hirsute; midrib not glandular-verrucose, hirsute; secondary venation obscure. Inflorescences longer than leaves, 1–3-flowered. Sepals 1.4–1.8 mm long, hirsute or glabrous. Petals imbricate, 4–6 mm long, creamy white to pale pink, pubescent adaxially. Filaments glandular-verrucose apically, dilated basally. Cocci commonly apiculate, hirsute. *n* = 18, J.A.Armstrong, *op. cit.* 286 (2002).

Occurs in the Countegany district, southern N.S.W., and near Benambra, eastern Vic. Grows in low eucalypt woodland or open forest in shallow sandy or gravelly soil among granitic or volcanic rocks. Flowers late winter to summer.

N.S.W.: 1.7 km NNW of Kybean Trig, near Kybean East Fire Trail, J.D.Briggs 2089 & M.Parris (CANB, MEL, NSW); 2 km NNW of Umaralla Mtn, 23 km ENE of Cooma, I.R.Telford 7346 & S.Corbett (CANB, NSW). Vic.: Limestone Ck, 6.2 km WNW of Mt Cobberas, N.Walsh 2038 (CANB, MEL, NSW).



Plants are strongly lemon-scented. Varies in leaflet size and flower width, even in one plant. Petals may fade from pink to white.

Listed as Vulnerable under the EPBC Act, 1999.

45. Zieria odorifera J.A.Armstr., *Austral. Syst. Bot.* 15: 412 (2002)

T: Burrumbuckle Rock, Warrumbungle Ra., N.S.W., 8 Nov. 1977, M.D.Crisp 3609; holo: CANB; iso: NSW.

Z. *aspalathoides* subsp. B, S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 194 (1981).

Shrub to 1 m high. Branchlets not or weakly ridged with decurrent leaf bases, not or weakly to strongly glandular-verrucose and pubescent with simple or stellate hairs. Leaves trifoliolate; petiole 0.5–2.1 mm long; central leaflet narrowly elliptic to elliptic or oblanceolate, 2.5–10 mm long, 0.75–5 mm wide, entire to prominently glandular-dentate, recurved to revolute at margins, obtuse to rounded; both surfaces pilose or with few hairs; adaxial surface not or slightly glandular-verrucose; abaxial surface not glandular-verrucose, with midrib slightly glandular-verrucose hirsute and secondary venation obscure. Inflorescences shorter or longer than leaves, usually 1–3 (–12)-flowered. Sepals 1–2 mm long, hirsute or glabrous. Petals imbricate, 2–4.5 mm long, white to deep pink, densely stellate-hairy to glabrous abaxially, pubescent to glabrous adaxially. Filaments slightly glandular-verrucose apically, dilated basally. Cocci commonly apiculate, hirsute or glabrous. *n* = 18, J.A.Armstrong, *op. cit.* 286.

Occurs in N.S.W. from the Mount Kaputar Natl Park and Inverell E to Cathedral Range Natl Park and S to the Warrumbungle and Nandewar Ranges. There are 4 subspecies.

- | | | |
|----|---|----------------------------------|
| 1 | Petals glabrous or with a few hairs near margins on abaxial surface | 45b. subsp. copelandii |
| 1: | Petals densely stellate-hairy on abaxial surface | |
| 2 | Branchlets with an indumentum of mainly stellate hairs; sepals c. 1 mm long, glabrous or sparsely stellate-hairy on abaxial surface | 45c. subsp. warrabahensis |

- 2: Branchlets pilose, with no or few stellate hairs; sepals 1–2 mm long, variously pilose on abaxial surface though a few stellate hairs may also be present
- 3: Petals (3.5–) 4–4.5 mm long; leaflets narrowly elliptic to narrowly oblanceolate to oblanceolate with smooth or slightly glandular-dentate margins
- 3: Petals 2–2.5 (–3.5) mm long; leaflets narrowly elliptic or narrowly oblanceolate with margins slightly to prominently glandular-dentate

45a. subsp. *odorifera*45d. subsp. *williamsii***45a. *Zieria odorifera* J.A.Armstr. subsp. *odorifera***

Z. sp. P, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 241 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 282 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 412, fig. 98 (2002); both as *Z. odorifera*.

Branchlets pilose, with mainly simple and bifid hairs. Leaves pilose; central leaflet narrowly elliptic to narrowly oblanceolate to oblanceolate, 3.5–10 mm long, 2–5 mm wide; margins smooth to slightly glandular-dentate; adaxial surface not or slightly glandular-verrucose. Pedicels with moderately dense indumentum of mainly stellate and bifid hairs. Sepals 1.5–2 mm long, minutely hirsute, sometimes with some bifid and stellate hairs. Petals (3.5–) 4–4.5 mm long; adaxial surface glabrous or sparsely pilose; abaxial surface with dense indumentum of mainly minute stellate hairs. Cocci smooth, with sparse to dense indumentum or rarely glabrous.

Widespread in Warrumbungle Natl Park, but also at Mt Bulga and near Mendooran and Molong, N.S.W. Occurs in heath, shrubland and low eucalypt woodland on sandstone and trachyte, often in rocky situations. Flowers Sept.–Dec.; fruits Oct.–Dec.

N.S.W.: walking track to Beloungery Split Rock, Warrumbungle Natl Park, *R.Johnstone 414* & *G.Burrell* (MEL); summit of Mt Bulga, May 2003, *S.Lewer* & *D.Chaffey s.n.* (NSW); c. 9 km (direct) SW of Molong, Bocoble Gap, *R.O.Makinson 1196* (BRI, CANB, MEL, NE, NSW); Split Rock, 24 km NW of Coonabarabran, *H.Streimann 678* (A, CANB, K, L, NSW).



The material from Mt Bulga differs from the remaining material of this subspecies in having glabrous fruit and leaves that are slightly more glandular-verrucose.

45b. *Zieria odorifera* subsp. *copelandii* Durretto & P.I.Forst., *Austrobaileya* 7: 684 (2008)

T: Mount Kaputar Natl Park, N.S.W., 5 Oct. 2002, *L.M.Copeland 3432*; holo: NE; iso: BRI, CANB, NSW.

Illustration: M.F.Durretto & P.I.Forster, *op. cit.* 685, fig. 1.

Branchlets with sparse, simple, bifid and stellate hairs. Leaves with a few simple hairs on midvein and/or margin; central leaflet narrowly elliptic to narrowly oblanceolate to oblanceolate, 5–8.5 mm long, 1.5–3.5 mm wide; margins entire to slightly glandular-dentate; adaxial surface not glandular-verrucose. Pedicels sparsely to densely stellate-hairy. Sepals 1–1.5 mm long; abaxial surface glabrous or with few stellate hairs towards base. Petals c. 3.5 mm long; adaxial surface glabrous or with few hairs, abaxial surface glabrous or with a few hairs near margins. Cocci smooth, glabrous.

Restricted to Mount Kaputar Natl Park, N.S.W.; growing on rocky outcrops in heath. Flowers and fruits have been collected in October.

N.S.W.: Mount Kaputar Natl Park, c. 1.5 km from park entrance on road to Mt Kaputar, *D.L.Jones 5182A* (CANB); 33 km from Narrabri to Mt Kaputar, *B.Muffet M3/95* (CANB).



45c. *Zieria odorifera* subsp. *warrabahensis* Durretto & P.I.Forst., *Austrobaileya* 7: 684 (2008)

T: Warrabah Natl Park, N.S.W., 22 Oct. 2006, *L.M.Copeland 4113* & *D.M.Raets*; holo: NE; iso: BRI, CANB, HO, NSW.

Illustrations: M.F.Durretto & P.I.Forster, *op. cit.* 687, fig. 2.

Branchlets with a moderately dense indumentum of mainly stellate hairs. Leaves sparsely pilose, sometimes with hairs concentrated on midribs; central leaflet narrowly elliptic to oblanceolate, 2.5–5 mm long, 1–3 mm wide; margins slightly to obviously glandular-dentate; adaxial surface not glandular-verrucose. Pedicels sparsely stellate-hairy. Sepals c. 1 mm long; abaxial surface glabrous or with sparse indumentum of minute stellate hairs. Petals c. 2.5 mm long; adaxial surface glabrous or with few hairs; abaxial surface densely stellate-hairy. Cocci not seen.

Restricted to Warrabah Natl Park, N.S.W.; growing in skeletal sandy soils over granite in herbland, heath and woodland. Flowers Sept., Oct.

N.S.W.: Warrabah, W of Kingstown, *J.T.Hunter 3590* (CANB, NE, NSW).



45d. *Zieria odorifera* subsp. *williamsii* Durretto & P.I.Forst., *Austrobaileya* 7: 686 (2008)

T: Oxley Wild Rivers Natl Park, N.S.W., 12 Oct. 2002, *L.M.Copeland 3437* & *D.A.Carter*; holo: NE; iso: BRI, CANB, K n.v., MEL, NSW.

Z. sp. 'Cathedral Rock' (J.B.Williams 95303), J.A.Armstrong & G.J.Harden in G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 282 (2002).

Z. sp. 'Oxley Wild Rivers N.P.' (Copeland 2174), J.A.Armstrong & G.J.Harden in G.J.Harden (ed.), *op. cit.* 283.

Illustrations: G.J.Harden (ed.), *op. cit.* 282, as *Zieria* sp. 'Cathedral Rock' (J.B.Williams 95303); G.J.Harden (ed.), *op. cit.* 283, as *Zieria* sp. 'Oxley Wild Rivers N.P.' (Copeland 2174); M.F.Durretto & P.I.Forster, *op. cit.* 688, fig. 3, 689, fig. 4.

Branchlets pilose. Leaves variously pilose, sometimes hairy only on midrib; central leaflet narrowly elliptic to narrowly oblanceolate, (3–) 5–10 mm long, 0.75–2 mm wide; margins slightly to prominently glandular-dentate; adaxial surface slightly to strongly glandular-verrucose. Pedicels with moderately dense indumentum of simple, bifid or stellate hairs. Sepals 1–1.5 mm long; abaxial surface with moderately dense simple and bifid indumentum, sometimes with few stellate hairs. Petals 2–2.5 (–3.5) mm long; adaxial surface glabrous; abaxial surface with moderately dense to dense mainly stellate hairs. Cocci slightly glandular-verrucose, glabrous to densely pilose.

Occurs in widely scattered populations between Inverell, Cathedral Rock Natl Park and Oxley Wild Rivers Natl Park, N.S.W., on various rock types including granite, porphyry and other volcanics in heath, shrubland and woodland. Flowers Aug.–Nov.; fruits Aug.–Dec. (Mar., June).

N.S.W.: Oxley Wild Rivers Natl Park, *L.M.Copeland 2174 et al.* (CANB, NE, NSW); Murchison S.F., W side of Copeton Dam, *L.M.Copeland 2836* & *J.O.Westaway* (CANB, NE, NSW); The Basin Nat. Res., c. 20 km E of Bundarra, 2.8 km S of 'Lutana', *L.M.Copeland 3260* & *P.Croft* (CANB, NE); 3 km E of Howell, 6 Sept. 1966, *J.B.Williams* (NE, NSW); Biffen's property, Maiden Ck, just W of Cathedral Rock Natl Park, c. 15 km E of Wollomombi, *J.B.Williams 95303* & *P.Metcalf* (NSW).



Specimens from the Copeton Dam and Inverell areas are almost intermediate between subsp. *odorifera* and the more 'typical' forms of subsp. *williamsii* in that they have longer peduncles, inflorescences that are much longer than the leaves, larger petals (to 3.5 mm long) and leaves that are not always glandular-dentate.

A putative hybrid between *Zieria odorifera* subsp. *williamsii* and *Z. cytisoides* (Copeland 3439 & Carter) has been collected in the Oxley Wild Rivers Natl Park from a solitary plant; both parent species were present nearby (collector's notes).

46. *Zieria inexpectata* Duretto & P.I.Forst., *Austrobaileya* 7: 514 (2007)

T: 'Bronte', 9 km SW of Gayndah, Qld, 14 Sept. 1999, *P.I.Forster PIF24851, M.F.Duretto & P.Grimshaw*; holo: BRI; iso: AD, K, MEL, NSW.

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 515.

Rounded, dense shrub to 50 cm tall. Branchlets terete, with leaf bases not decurrent, weakly glandular-verrucose, pilose with simple, bifid and few trifid hairs. Leaves trifoliolate, weakly glandular-verrucose; petiole 1–1.5 mm long; central leaflet narrowly elliptic to narrowly oblanceolate, 4–6.5 (–9) mm long, 0.7–2.5 mm wide, obscurely glandular-verrucose and recurved to revolute at margins, obtuse; adaxial surface with few hairs to sparsely pilose; abaxial surface with few simple hairs, especially along raised midrib, as well as tufts of simple hairs at join of leaflets and petiole. Inflorescences longer than leaves, 1–12-flowered. Sepals 1–2 mm long, puberulous adaxially, with scattered stellate hairs mainly near base abaxially. Petals valvate, 2–3 mm long, white, not obviously glandular, sparsely hairy adaxially, densely hairy abaxially. Filaments with scattered stellate and simple hairs, slightly glandular-verrucose at apex. Cocci slightly glandular-verrucose, glabrous.

Endemic in SE Qld, in mixed woodland on a duricrust jumpup, and in open eucalypt forest, in sandy soil. Flowers Mar.–Nov.; fruits June–Nov.

Qld: Compartment 21, State Forest 12, near Wondai, *A.R.Bean 10822* (BRI, MEL, NSW); State Forest 146, SE of Proston, *A.R.Bean 11818* (BRI, MEL, NSW); Aranbanga Ck catchment area, Bronte, *M.F.Duretto 1318 et al.* (BRI, MEL); Bronte, 9 km WSW of Gayndah, *P.I.Forster 25857* (BRI, MEL).



Superficially similar to the widespread *Z. aspalathoides*, which has stems and leaves without obvious warts, sepals pilose abaxially and the petiole subsessile to 1 mm long. Specimens from southern parts of the species' range, e.g. near Wondai (*Bean 10822*) and from near Proston (*Bean 11818*), have smaller floral parts, but there are too few collections to determine if this variation warrants taxonomic recognition.

47. *Zieria aspalathoides* A.Cunn. ex Benth., *Fl. Austral.* 1: 305 (1863)

Z. laevigata var. *aspalathoides* (A.Cunn. ex Benth.) C.Moore & Betche, *Handb. Fl. New South Wales* 40 (1893). T: 'Grampians', N.S.W., June 1827, *A.Cunningham 39*; lecto: K, *fide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 313 (2002); isolecto: BM, BRI.

Shrub to 1 m high, with lignotuber. Branchlets terete or ridged with faint decurrent leaf bases, not glandular-verrucose, hirsute with simple (rarely stellate) hairs. Leaves trifoliolate; petiole 0.1–1.3 mm long, hairy or glabrous; central leaflet narrowly lanceolate to linear, 2.5–8 (–12.5) mm long, 0.9–4.2 mm wide, dentate, revolute at margins, acute; both surfaces not or rarely slightly glandular-verrucose, glabrous to slightly hirsute usually with simple and few bifid hairs, very rarely with stellate hairs (Moura, Qld); midrib slightly glandular-verrucose, hirsute or glabrous; secondary venation obscure on abaxial surface. Inflorescences longer than leaves (shorter in specimens from Amiens), 1–13-flowered. Sepals 1.3–1.7 mm long, not or slightly glandular-verrucose, hirsute or occasionally glabrous. Petals imbricate, 4.4–5.8 mm long, pale to deep pink, pubescent on both surfaces. Filaments glandular-verrucose apically, dilated basally. Cocci commonly apiculate, glandular-verrucose, glabrous or occasionally hirsute. *n* = 36, J.A.Armstrong, *op. cit.* 286. *Whorled Zieria*.

Widespread in eastern Qld, N.S.W. and central Vic. Flowers and fruits spring to mid-summer. Two subspecies are recognised.

At least some leaflets more than 4 mm long

47a. subsp. *aspalathoides*

Leaflets not more than 3 mm long

47b. subsp. *brachyphylla*

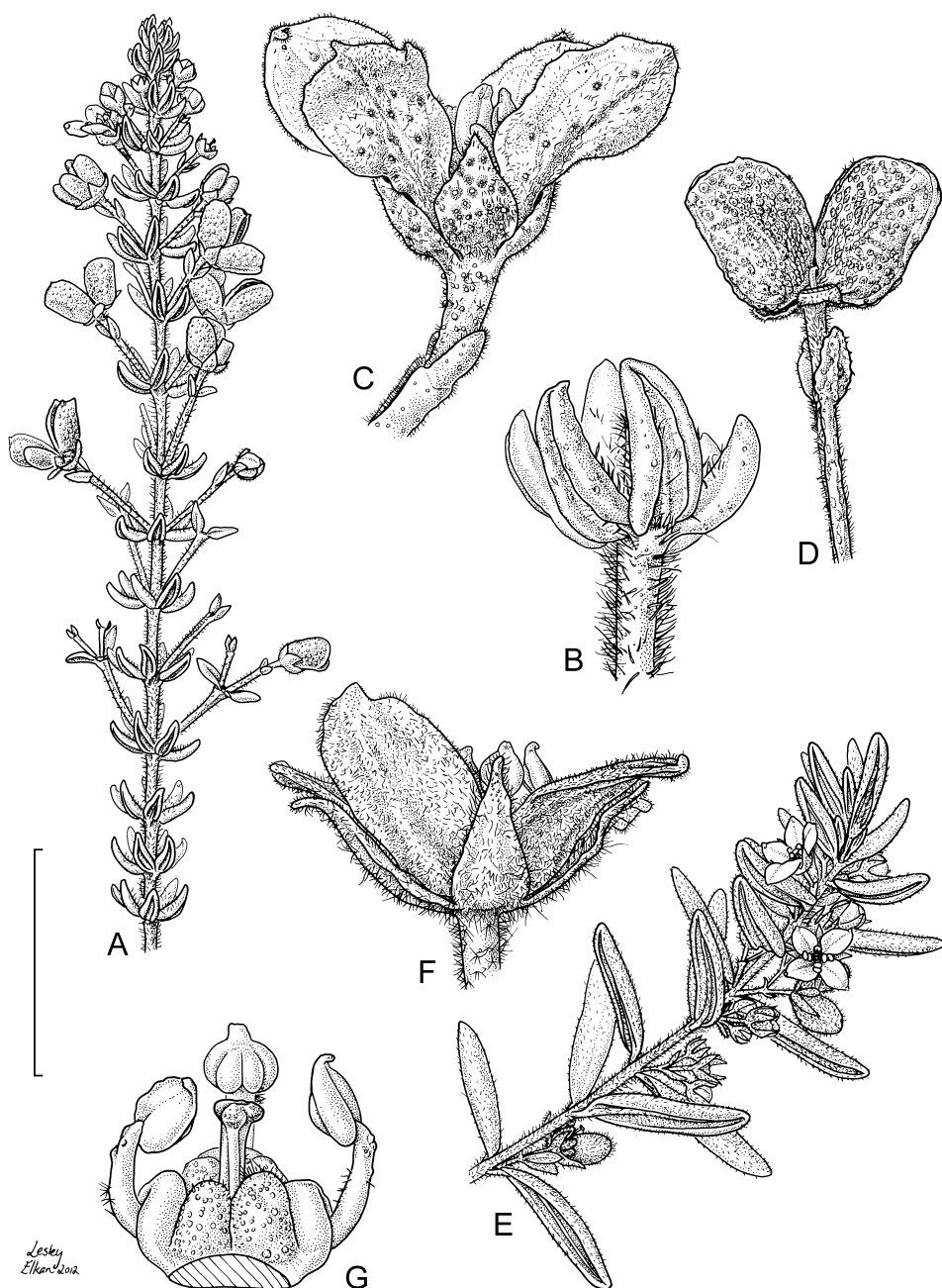


Figure 54. *Zieria*. A–D, *Z. aspalathoides* subsp. *brachyphylla*. A, habit; B, stem & leaf detail; C, flower; D, fruit (A–D, G.H.Gittens 919, NSW). E–G, *Z. veronicea* subsp. *insularis*. E, habit; F, flower; G, stamens & carpels (1 stamen & part of disc removed) (E–G, D.M.Crayn 1027 & H.McPherson, NSW). Scale bar: A, E = 15 mm; B, C, F = 3 mm; D = 5 mm; G = 2 mm. Drawn by L.Elkan.

47a. *Zieria aspalathoides* A.Cunn. ex Benth. subsp. *aspalathoides*

[*Boronia laevigata* auct. non F.Muell.: F.J.H.von Mueller, *Pl. Victoria* 1: 111 (1862)]

Z. aspalathoides var. (Springsure L.Cockburn AQ195493), P.I.Forster in R.J.F.Henderson (ed.), *Names Distrib. Queensland Pls, Algae Lichens* 181 (2002).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 167, fig. 30e (1999), as *Z. aspalathoides*; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 282 (2002), as *Z. aspalathoides*; J.A.Armstrong, *Austral. Syst. Bot.* 15: 315, fig. 14 (2002).

Central leaflet 3–12.5 mm long.

Widespread from NE Qld to west-central Vic. (where rare), especially along and W of the Great Dividing Ra. Occurs in dry sclerophyll forest and heath in sandy soil, commonly among rocks (granite, sandstone, rhyolite).

Qld: NW of Taroom, Palmgrove Natl Park, *P.I.Forster* 23644 & *R.Booth* (AD, BRI, MEL). N.S.W.: Green Gully, Glen Davis, *E.F.Constable* 7209 (K, NSW). Vic.: near Melville Caves, 2 Oct. 1986, *F.Watts s.n.* (CANB, MEL).

Some plants from SE Qld and NE N.S.W. have attenuate sepals and short, compact inflorescences. Those from around Coonabarabran, N.S.W., have large leaves and fruit. The leaves and anther appendage vary greatly in size. Plants near Moura, Qld, sometimes have an indumentum of stellate hairs.

**47b. *Zieria aspalathoides* subsp. *brachyphylla* J.A.Armstr., *Austral. Syst. Bot.* 15: 317 (2002)**

T: Blackdown Tableland, c. 35 km SE of Blackwater, Qld, 9 Sept. 1971, *R.J.Henderson* 1098, *L.Durrington* & *P.Sharpe*; holo: BRI; iso: CANB, K, MEL, NSW.

Z. aspalathoides subsp. c, J.M.Powell & J.A.Armstrong, *Telopea* 2: 86 (1980).

Central leaflet 2–3 mm long. Fig. 54A–D.

Restricted to the Blackdown Tableland, SE Qld. Grows in crevices in sandstone outcrops, in shallow white-grey sandy soil.

Qld: plateau above Rockland Spring, W side of Blackdown Tableland, *C.H.Gittins* 919 (BRI, NSW).

The typical subspecies also occurs on the Blackdown Tableland and field research is required to determine if the subspecies are taxonomically distinct.

**48. *Zieria graniticola* J.A.Armstr. ex Duretto & P.I.Forst., *Austrobaileya* 7: 509 (2007)**

T: Mt Janet Road, Passchendale State Forest, NW of Stanthorpe, Qld, 4 Oct. 1997, *A.R.Bean* 12477; holo: BRI; iso: MEL.

Z. sp. (Amiens L.Pedley 1518), P.I.Forster in P.D.Bostock & A.E.Holland (eds), *Census Queensland Fl.* 183 (2007).

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 511.

Shrub to 1 m tall. Branchlets \pm terete, weakly glandular-verrucose, densely hairy with mainly simple and bifid (also trifid and stellate) hairs between faint decurrent leaf bases, otherwise glabrous, rarely pilose. Leaves trifoliate; petiole 1–3 mm long, weakly glandular-verrucose; central leaflet narrowly elliptic to narrowly oblanceolate, 6–18 mm long, 1.5–4 mm wide, slightly glandular-dentate, recurved to revolute at margins, acute; midrib raised abaxially and weakly to strongly glandular-verrucose; both surfaces with few hairs on midvein and at tip or sparsely pilose, with tufts of simple hairs at join of leaflets and petiole. Inflorescences shorter to longer than leaves, 1–3 (–9)-flowered. Sepals 1–1.5 mm long, sparsely to moderately densely stellate-hairy both sides. Petals valvate or slightly imbricate, 3.5–4.5 mm long, pale pink, moderately to densely stellate-hairy on both surfaces. Filaments slightly glandular-verrucose at apex. Immature cocci slightly glandular-verrucose, glabrous or sparsely pilose dorsally.

Endemic in Qld, confined to two disjunct areas N and S of Stanthorpe. Grows in sandy soil over granite, in open forest of *Eucalyptus andrewsii* and *E. banksii* with a shrubby understorey; also on rocky outcrops. Flowers Aug.–Nov.; fruits Oct.–Nov.

Qld: Messines via Cottonvale, Sept. 1930, *M.Greener s.n.* (BRI); 15.7 km SW of Stanthorpe, portion 87, Stalling Lane, *D.Halford Q2330* (BRI, MEL); 'Mountain View', Amiens, Oct. 1983, *J.Harslett s.n.* (BRI, CANB); Bapaume via Cottonvale, *O.Horn 15* (BRI); c. 1 mile [1.6 km] W of Jollys Falls, 5 miles [8 km] N of Stanthorpe, *L.Pedley 1534* (BRI, HO).



The southern population (*Halford Q2330*, *Q2346*) differs from the northern (typical) one as follows: sparsely pilose all over the stems and leaves, smaller leaves and petals (2.5–3.2 mm long) and sparsely pilose cocci.

49. *Zieria whitei* J.A.Armstr. ex Duretto & P.I.Forst., *Austrobaileya* 7: 536 (2007)

Z. aspalathoides var. *intermedia* C.T.White, *Proc. Roy. Soc. Queensland* 43: 209 (1942). T: Ravenshoe, Qld, June 1913, *E.W.Bick 116*; holo: BRI.

Z. sp. (Ravenshoe E.W.Bick 116), P.I.Forster in R.J.F.Henderson (ed.), *Queensland Pls: Names Distrib.* 188 (1997).

Illustration: M.F.Duretto & P.I.Forster, *op. cit.* 537.

Rounded, dense shrub to 50 cm tall. Branchlets ±terete, sometimes with slight decurrent leaf bases, not glandular-verrucose, pubescent with stellate hairs and a few simple, bifid and trifid hairs. Leaves trifoliolate, not glandular-verrucose; petiole 0.5–1 mm long; central leaflet narrowly elliptic to narrowly oblanceolate, 5–10 mm long, 1–2.5 (3) mm wide, commonly recurved to revolute at margins, sometimes flat, acute; adaxial surface sparsely pilose to pilose with simple and bifid hairs, sometimes only on midrib; abaxial surface moderately hairy with stellate and a few simple hairs, with midrib raised and secondary veins obscure. Inflorescences longer than leaves, usually 3-flowered. Sepals 1.5–2 mm long, slightly glandular-verrucose, with scattered simple and bifid appressed hairs adaxially, with few hairs or with dense stellate hairs abaxially. Petals valvate, 2.5–3 mm long, white to pale pink, with few hairs adaxially, stellate-tomentose abaxially. Filaments with few hairs, slightly glandular-verrucose at apex. Cocci smooth to slightly glandular-verrucose, glabrous or with scattered stellate hairs.

Endemic in NE Qld, near Atherton and Ravenshoe. Grow in rocky (rhyolite) soil in tall heathy shrubland or eucalypt woodland. Flowers May–July; fruits June.

Qld: near Mt Emerald, SW of Walkamin, *A.R.Bean 13750* (BRI); State Forest Reserve 488, 2.5 km S of Ravenshoe, off Wooroora road, *A.J.Ford AF2808 et al.* (BRI, MEL); State Forest 511, Bald Rock, near Ravenshoe, *P.I.Forster 30695* & *K.R.McDonald* (BRI, HO); headwaters of Archer Ck, c. 5 km WNW of Ravenshoe, *M.Lockyer 3* (NSW).



Clearly allied to *Z. aspalathoides* but differs from that species in having a stellate indumentum on the stems, abaxial surface of the leaves and the abaxial surface of the sepals.

50. *Zieria ingramii* J.A.Armstr., *Austral. Syst. Bot.* 15: 370 (2002)

T: Goonoo State Forest, N of Garlings Rd, on Dubbo–Mendooran road, N.S.W., 19 Sept. 1988, *J.D.Briggs 2388*; holo: CANB; iso: CANB, NSW.

Z. sp. 3 (sp. 'D'; Goonoo Goonoo S.F.), J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. E, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 240 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 281 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 373, fig. 63 (2002).

Shrub to 0.6 m high. Branchlets ridged, with decurrent leaf bases faint or absent, not glandular-verrucose, hirsute or pubescent with simple hairs. Leaves trifoliolate; petiole 1.4–2 mm

long; central leaflet linear to narrowly elliptic, 9–19 mm long, 1–3 mm wide, entire, revolute at margins, acute; both surfaces not glandular-verrucose; adaxial surface glabrous or with appressed indumentum; abaxial surface hirsute, the midrib pubescent, secondary venation obscure. Inflorescences from twice as long as to shorter than leaves, 3–13-flowered. Sepals 1.4–1.8 mm long, glabrous. Petals imbricate, c. 2.8 mm long, creamy white to pale pink, gland-dotted and pubescent abaxially, glabrous adaxially. Filaments glandular-verrucose apically, dilated basally. Cocci often apiculate, glabrous.

Known from the Goonoo State Forest and Kings Plain Natl Park, near Dubbo, N.S.W. Grows in dry, open eucalypt forest, in rocky-loamy soil. Flowers spring; fruits summer.

N.S.W.: Goonoo State Forest, *G.Althofer* (MEL, NSW); WNW of Glen Innes, Kings Plain Natl Park, *R.G.Coveny 16603* & *A.J.Whelan* (NSW, BRI, PERTH).



Listed as Endangered under the EPBC Act, 1999.

51. *Zieria rimulosa* C.T.White, *Proc. Roy. Soc. Queensland* 53: 210 (1942)

T: Mt Mulligan, Qld, 21 Apr. 1931, *N.McDonald 450*; holo: BRI.

Illustration: J.A.Armstrong, *Austral. Syst. Bot.* 15: 428, fig. 113 (2002).

Shrub to 1.5 m high. Branchlets ridged, with decurrent leaf bases present, not glandular-verrucose, pubescent with simple hairs. Leaves trifoliolate; petiole 3–5 mm long; central leaflet lanceolate, 5–20 mm long, 3–5 mm wide, crenulate, almost flat, acute to obtuse; both surfaces not glandular-verrucose; adaxial surface glabrous; abaxial surface with few hairs, with midrib pubescent, secondary venation obscure. Inflorescences longer than leaves, to 50-flowered; peduncle 12–22 mm long. Sepals 0.8–1.2 mm long, glabrous. Petals imbricate, 2.5–5 mm long, creamy white to pale pink, pubescent adaxially. Filaments slightly glandular-verrucose apically. Cocci not apiculate, glabrous.

Known from Reedy Ck and Mt Mulligan, N Qld. Grows on sandstone pavements and cliffs. Flowers and fruits Apr.

Qld: Reedy Ck, Carbine Tableland, *S.Burnett KRM1919* (BRI); Mt Mulligan, *J.R.Clarkson 5802* (BRI, MEL).



Has been reported to spread by suckering.

Listed as Vulnerable under the EPBC Act, 1999.

52. *Zieria cytisoides* Sm. in A.Rees, *Cycl.* 39: no. 4 (1818)

T: N.S.W., 1805, per *Earl of St. Vincent* (J.E.Smith Herb. 214.4); holo: LINN.

Z. cytisoides subsp. A (type subsp.), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

[*Z. smithii* var. *fraseri* auct. non F.Muell. ex Maiden & Betche: J.H.Maiden & E.Betche, *Proc. Linn. Soc. New South Wales* ser. 2, 28: 904 (1904)]

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 167, fig. 30i (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 287 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 343, fig. 38 (2002).

Shrub to 3 m high. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, velvety with stellate hairs. Leaves trifoliolate; petiole 4–10 mm long; central leaflet ovate to broadly elliptic, 6–30 mm long, 2.5–17 mm wide, entire, gently to strongly recurved at margins, acute to rounded (rarely emarginate); both surfaces velvety, not glandular-verrucose; midrib not glandular-verrucose, hirsute; secondary venation prominent on abaxial surface. Inflorescences usually not exceeding leaves, 3–30-flowered. Sepals 2.5–3 mm long, stellate-tomentose both sides. Petals valvate, 3.6–6 mm long, pale to deep pink, occasionally creamy white, stellate-pubescent on both surfaces. Filaments dilated basally, glandular-verrucose apically. Cocci not apiculate, velvety. *n* = 36, J.A.Armstrong, *op. cit.* 286. *Downy Zieria*. Plate 35.

Extends from Mt Emerald near Atherton, N Qld, through eastern N.S.W. to E Gippsland, Vic. Grows in dry sclerophyll forest, woodland and heath, commonly on rocky hillsides in sandy soil. Flowers Aug.–Sept.; fruits Oct.–Dec.

Qld: Mt Jukes Natl Park, c. 30 km W of Mackay, *A.R.Bean* 3182 (BRI, CANB, NSW). N.S.W.: Norton Basin, 13 km SW of Penrith, *R.G.Coveny* 5493 (NSW); Waa Gorge, *K.Hill* 2215 (BRI, CANB, HO, NSW); Mt Bunganbil, NE of Griffith, *I.Thomas & E.Norris* 857 (NSW). Vic.: Ballantyne Hills, c. 2.5 km SW of Suggan Buggan R. crossing on Snowy River Rd, *A.C.Beauglehole* 33391 *et al.* (MEL, NSW).



Varies greatly in leaflet size and shape. Specimens from Mt Bunganbil, N.S.W., have cocci with scattered stellate hairs.

53. *Zieria baeuerlenii* J.A.Armstr., *Austral. Syst. Bot.* 15: 318 (2002)

T: Bomaderry Ck, N.S.W., 11 Dec. 1987, *J.A.Armstrong* 5087 & *J.D.Briggs*; holo: CANB; iso: AD, BRI, DNA, MEL, NSW.

Z. sp. 1 (sp. 'M'; Bomaderry), *J.D.Briggs & J.H.Leigh*, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Z. sp. M, *J.A.Armstrong* in *G.J.Harden* (ed.), *Fl. New South Wales* 2: 245 (1991).

Illustrations: *G.J.Harden* (ed.), *Fl. New South Wales* 2nd edn, 2: 287 (2002); *J.A.Armstrong*, *Austral. Syst. Bot.* 15: 319, fig. 17 (2002).

Procumbent shrub to 0.8 m high, proliferating by suckers. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, velvety with stellate and simple hairs. Leaves trifoliate; petiole 1.4–3 mm long; central leaflet obcordate, 6–12 mm long, 4.5–8.8 mm wide, entire, recurved to revolute at margins, emarginate to retuse; both surfaces velvety, not glandular-verrucose; midrib not glandular-verrucose, pubescent; secondary venation prominent on abaxial surface. Inflorescences longer than leaves, usually 7-flowered. Sepals 2.2–2.4 mm long, velvety. Petals imbricate, c. 3.2 mm long, creamy white to pale pink, pubescent abaxially, glabrous adaxially. Filaments not glandular-verrucose or dilated. Mature cocci not seen.

Restricted to the plateau above Bomaderry Ck, near Nowra, N.S.W. Grows in dry sclerophyll forest and woodland, in skeletal soil among sandstone boulders. Flowers late autumn to spring.

N.S.W.: Bomaderry Ck, *J.D.Briggs* 2296 (CANB, NSW).

Apparently a stabilised, vegetative apomict, producing only sterile pollen and spreading by suckers.

Listed as Endangered under the EPBC Act, 1999.



54. *Zieria littoralis* J.A.Armstr., *Austral. Syst. Bot.* 15: 389 (2002)

T: Green Cape Lighthouse, Disaster Bay, c. 2.6 km SE of Eden, N.S.W., 15 Oct. 1974, *J.A.Armstrong* 723 & *R.G.Coveny*; holo: NSW; iso: CANB, K.

Z. cytisoides subsp. B, *S.W.L.Jacobs & J.Pickard*, *Pls New South Wales* 195 (1981).

Z. sp. O, *J.A.Armstrong* in *G.J.Harden* (ed.), *Fl. New South Wales* 2: 244 (1991).

Z. sp. 3, *M.F.Duretto* in *N.G.Walsh & T.J.Entwisle* (eds), *Fl. Victoria* 4: 168 (1999).

Illustrations: *N.G.Walsh & T.J.Entwisle* (eds), *op. cit.* 167, fig. 30h, as *Zieria sp.* 3; *G.J.Harden* (ed.), *Fl. New South Wales* 2nd edn, 2: 286 (2002); *J.A.Armstrong*, *Austral. Syst. Bot.* 15: 390, fig. 78 (2002).

Procumbent shrub to 1 m high, with lignotuber. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, velvety with stellate hairs. Leaves trifoliate; petiole 0.5–5.4 mm long; central leaflet ovate to broadly elliptic, 7–13 mm long, 1.3–8.7 mm wide, entire, shortly revolute or recurved at margins, rounded apically; both surfaces glandular-verrucose, velvety; midrib glandular-verrucose, pubescent; secondary venation prominent on abaxial surface.

Inflorescences generally not exceeding leaves, 3–30-flowered. Sepals 2.5–2.8 mm long, pubescent. Petals imbricate, 2–4.5 mm long, creamy white, pubescent abaxially, glabrous adaxially. Filaments glandular-verrucose apically. Cocci not apiculate, not glandular-verrucose, velvety.

Confined to coastal and near-coastal areas from Tathra on the S coast of N.S.W. to far eastern Vic. and in NE Tas. Grows on exposed, rocky (e.g. granite, rhyolite) headlands in low dense shrubland; inland on rocky ridges in shrubland. Flowers winter to early summer.

N.S.W.: Chamberlin Lookout, Tathra, *E.M.Canning* 2847 (CANB, NSW); S end, Tura Beach, 11 Oct. 1998, *K.Mills* (NSW). Vic.: Gabo Is., *A.C.Beaglehole* 31558 & *J.H.Willis* (NSW). Tas.: near Long Ck, Freycinet Natl Park, *A.M.Buchanan* 1182 (AD, CHR, HO).



Plants on exposed headlands are very compact in habit.

55. *Zieria covenyi* J.A.Armstr., *Austral. Syst. Bot.* 15: 337 (2002)

T: Narrow Neck Penin., c. 4 miles (c. 6.4 km) SW of Katoomba, N.S.W., 5 Dec. 1972, *R.G.Coveny* 4768 & *J.A.Armstrong*; holo: NSW; iso: AD, BRI, DNA, MEL.

Z. sp. F (aff. *involutrata*), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Z. sp. F, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 246 (1991).

Z. sp. 9, J.D.Briggs & J.H.Leigh, *Rare or Threatened Pls Rev. Edn, ANPWS Special Publ.* 14: 99 (1988 [1989]).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 288 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 339, fig. 35 (2002).

Shrub to 2 m high, proliferating by suckers. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, velvety with stellate hairs. Leaves trifoliate; petiole 4.7–11 mm long; central leaflet oblong to elliptic or ovate, 23–40 mm long, 5–11 mm wide, entire, recurved at margins, rounded to obtuse; both surfaces not glandular-verrucose; adaxial surface with few hairs or with a sparse indumentum of simple, bifid and stellate hairs; abaxial surface not glandular-verrucose, stellate-velvety, with midrib not glandular-verrucose, pubescent, secondary venation obscure. Inflorescences as long as or exceeding leaves, 3–21-flowered. Sepals 4–4.5 mm long, pubescent. Petals valvate, c. 6 mm long, creamy white to pale pink, glandular-verrucose abaxially, with few hairs or glabrous adaxially. Filaments glandular-verrucose apically, dilated basally. Mature cocci not seen. $2n = 54$, J.A.Armstrong, *op. cit.* 286 (2002). *Coveny's Zieria*.

Known from a single population on Narrow Neck Penin. in the Blue Mtns, N.S.W. Grows in eucalypt woodland on sandy soil. Flowers summer.

N.S.W.: Narrow Neck Plateau, *R.Coveny* 5298 (BRI, CANB, K, L, MEL, MO, NBG, NSW, P).

Varies slightly in flower size and petal colour. Possibly a sterile hybrid, spreading by suckers.

Listed as Endangered under the EPBC Act, 1999.



56. *Zieria murphyi* Blakely, *Austral. Naturalist* 10: 246 (1940)

T: Gold Gully, Penrose, N.S.W., 2 Oct. 1938, *E.Murphy*; holo: MEL. [Collections by *E.Murphy* & *W.F.Blakely*, dated 15 Oct. 1938, cited by J.A.Armstrong, *Austral. Syst. Bot.* 15: 401 (2002), as isotypes, have no type status.]

Z. pilosa var. (?) *canescens* Benth., *Fl. Austral.* 1: 305 (1863). T: Fern Tree Hill, N.S.W., 1804, *G.Caley*; holo: BM.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 287 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 402, fig. 89 (2002).

Shrub to 1–2 m high. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, velvety with stellate and simple hairs. Leaves unifoliate and trifoliate; petiole 3–9 mm long; central leaflet linear to oblong-lanceolate, 30–50 mm long, 3.4–10 mm wide, entire, recurved at margins, obtuse to acute; both surfaces not glandular-verrucose; adaxial surface pubescent, with obvious simple hairs only; abaxial surface stellate-velvety, with midrib pubescent, not glandular-verrucose, secondary venation obscure. Inflorescences shorter than leaves, 3–9-flowered; inflorescence bracts caducous, 3.5–6.1 mm long, 0.7–1 mm wide. Sepals 1.8–2.5 mm long, pubescent on abaxial surface. Petals imbricate, 4–5.5 mm long, creamy white to pale pink, with few hairs to glabrous adaxially. Filaments glandular-verrucose towards apex. Cocci not apiculate, not glandular-verrucose, pubescent.

Occurs on the Great Dividing Ra. from Mt Tomah to Penrose, N.S.W. Grows in eucalypt open-forest in sandy soil and in sand over sandstone. Flowers mainly spring; fruits summer.

N.S.W.: Mt Tomah, *J.A.Armstrong 1356* (BRI, NSW); near Gaping Hill, Blue Mtns Natl Park, *A.Curry 89/41* (NSW); between Echo Point & Bonnie View Lookout, S of Bundanoon, *I.R.Telford 6943* (CANB, NSW).

The population at Mt Tomah is consistently trifoliate. Elsewhere plants are usually unifoliate, but trifoliate leaves occur in some plants at Penrose and at Morton Natl Park.

Listed as Vulnerable under the EPBC Act, 1999.



57. *Zieria caducibracteata* J.A.Armstr., *Austral. Syst. Bot.* 15: 324 (2002)

T: 2.5 km S of Myrtle Ck on Princess Hwy between Milton and Conjola, N.S.W., 18 Oct. 1974, *J.A.Armstrong 744* & *R.G.Coveny*; holotype: NSW; isotype: CANB, K, MEL.

Z. sp. A (aff. *arborescens*), S.W.L.Jacobs & J.Pickard, *Pls New South Wales* 195 (1981).

Zieria sp. A, J.A.Armstrong in G.J.Harden (ed.), *Fl. New South Wales* 2: 246 (1991).

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 288 (2002); J.A.Armstrong, *Austral. Syst. Bot.* 15: 326, fig. 23 (2002).

Shrub or tree to 6 m high. Branchlets terete or slightly ridged, with leaf bases not decurrent, not glandular-verrucose, pubescent with stellate and simple hairs. Leaves trifoliate; petiole 5–21 mm long, terete or with lateral ribs; central leaflet narrowly elliptic, oblong or lanceolate, (32–) 60–75 (–120) mm long, 3–19 mm wide, entire, recurved at margins, acute (rounded in Colo R. Gorge population); both surfaces not glandular-verrucose; adaxial surface pubescent to with only a few hairs; abaxial surface velvety to hirsute, with midrib pubescent to hirsute, secondary venation sometimes prominent. Inflorescences shorter than leaves, 180–420-flowered; inflorescence bracts 8–12 mm long. Sepals 2–2.5 mm long, hirsute to almost glabrous abaxially. Petals imbricate, c. 4.5 mm long, creamy white, pubescent on both surfaces. Filaments slightly glandular-verrucose apically. Cocci not apiculate, glabrous.

Occurs in N.S.W. from the Colo R. to Bateman Bay. Grows chiefly on escarpment ranges, near rain forest margins and adjacent wet sclerophyll forest in skeletal soils on sandstone and mudstone. Flowers Aug.–Oct.; fruits Nov.–Dec.

N.S.W.: Mt Owen, *B.G.Briggs 3536* (NSW); junction of Woolshed Gully & Colo R., below Boorai Ridge, *R.G.Coveny 9140* & *P.Hind* (NSW); c. 2 km E of Corang Peak, Morton Natl Park, *A.M.Lyne 772* & *J.Lyne* (CANB, NSW, PERTH).

The bracts are prominent but caducous. Leaf indumentum varies throughout the range of the species. Plants from the Colo R. gorge have shorter leaflets with a more rounded apex than those elsewhere.



58. *Zieria involucrata* R.Br. ex Benth., *Fl. Austral.* 1: 306 (1863)

Z. cytisoides var. *involucrata* (R.Br. ex Benth.) C.Moore & Betche, *Handb. Fl. New South Wales* 41 (1893). T: valleys of the Blue Mtns, N.S.W., 183-, *J.Backhouse*; neo: BM, *fide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 373 (2002); possible isoneo: K.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 287 (2002); J.A.Armstrong, *op. cit.* 376, fig. 66.

Shrub to 1.5 m high, with lignotuber. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, velvety, with stellate and simple hairs. Leaves heterophyllous, trifoliolate and unifoliolate, rarely all unifoliolate; petiole 2–12 mm long, velvety; central (or only) leaflet variable, oblong to elliptic or ovate, (21–) 30–52 (–65) mm long, 5.2–15 mm wide, entire, flat, obtuse; both surfaces not glandular-verrucose; adaxial surface pubescent; abaxial surface velvety, with midrib not glandular-verrucose, pubescent, secondary venation obscure. Inflorescences usually not exceeding leaves, occasionally much longer, 3–21-flowered; inflorescence bracts persistent, (5.2–) 7–14 mm long. Sepals 3–4.5 mm long, pubescent. Petals imbricate, 3.6–5.2 mm long, creamy white, pubescent both sides. Filaments slightly glandular-verrucose towards apex. Cocci not apiculate, not glandular-verrucose, pubescent. *n* = 18, J.A.Armstrong, *op. cit.* 286.

Occurs in the Blue Mtns, N.S.W. Grows on creek margins in moist sclerophyll forest. Flowers in spring.

N.S.W.: tributary of Marra Marra Ck (off Duck Ponds Ridge), S of Canoelands, *J.A.Armstrong 1256* (BRI, K, NSW); 4 km NW of Colo Heights, *R.O.Makinson 374* & *A.N.Rodd* (NSW, PERTH).

Listed as Vulnerable under the EPBC Act, 1999.

**59. *Zieria veronicea* (F.Muell.) Benth., *Fl. Austral.* 1: 305 (1863)**

Boronia veronicea F.Muell., *Trans. Philos. Soc. Victoria* 1: 11 (1855). T: Encounter Bay, S.A., Nov. & Dec. 1847, *C.Stuart*; lecto: MEL, *fide* J.A.Armstrong, *Austral. Syst. Bot.* 15: 450, 453 (2002).

Lemon-scented shrub to 60 cm high, without lignotuber. Branchlets terete, with leaf bases not decurrent, not glandular-verrucose, stellate-pubescent. Leaves unifoliolate, subsessile or petiole to 0.7 mm long; lamina oblong to ovate, 5–16 mm long, 1–5.5 mm wide, entire, recurved to revolute at margins, obtuse; both surfaces not glandular-verrucose; adaxial surface velvety; abaxial surface pubescent, with midrib not glandular-verrucose, pubescent, with secondary venation obscure. Inflorescences usually not exceeding leaves, 1–3-flowered. Sepals 1.6–2 or 2.5–5.5 mm long, pubescent. Petals imbricate, 2–2.2 or 4–7 mm long, pale pink or very occasionally creamy white, pubescent both sides. Filaments not dilated or glandular-verrucose, hirsute to glabrous. Cocci apiculate, not glandular-verrucose, pubescent.

Occurs from SE S.A. (including Kangaroo Is.) to E Vic. and in NE Tas. Flowers spring; fruits late spring to early summer. There are 2 subspecies.

Sepals 2.5–5.5 mm long; petals 4–7 mm long; ovary and style pubescent; filaments hirsute

59a. subsp. *veronicea*

Sepals 1.6–2 mm long; petals 2–2.2 mm long; ovary and style with scattered hairs or glabrous; filaments glabrous to sparsely hairy

59b. subsp. *insularis*

59a. *Zieria veronicea* (F.Muell.) Benth. subsp. *veronicea*

Illustrations: N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 167, fig. 30d (1999), as *Z. veronicea*; J.A.Armstrong, *Austral. Syst. Bot.* 15: 451, fig. 134 (2002).

Sepals 2.5–5.5 mm long. Petals usually 4–7 mm long. Filaments stellate-hirsute. Ovary densely pubescent; style pubescent.

Occurs from near Adelaide, S.A. (excluding Kangaroo Is.), to western and south-eastern Vic. and from Mount William Natl Park to Coles Bay, north-eastern Tas. Grows in deep sand in low heathland and low open-woodland.

S.A.: c. 4 km NE of McLaren Flat, S Mt Lofty Ra., *A.Bell* 277 (CANB). Vic.: 14 km S of Sale, S Gippsland Hwy, *J.A.Armstrong* 5086A (CANB, NSW); Providence Ponds Flora & Flora Res., *A.C.Beauglehole* 78737 (CANB, MEL, NSW); Lowan Mallee, c. 1 km E of Broughtons Waterhole, Little Desert Natl Park, *I.C.Clarke* 2375 (CANB, MEL, NSW). Tas.: Mount William Natl Park, *M.Visoiu* 236 *et al.* (HO, K, MEL).



59b. *Zieria veronicea* subsp. *insularis* J.A.Armstr., *Austral. Syst. Bot.* 15: 454 (2002)

T: W of Kelly Hill, S of South Coast Rd, Kangaroo Is., S.A., 4 Nov. 1958, *Hj.Eichler* 15176; holotype: AD; isotype: NSW.

Sepals 1.6–2 mm long. Petals 2–2.2 mm long. Filaments glabrous to sparsely hairy. Ovary and style with scattered hairs, occasionally glabrous. Fig. 54E–G.

Restricted to Kangaroo Is., S.A. Grows in grey sand with heath.

S.A.: 6 Mile Lagoon, 16 km W of Vivonne Bay turnoff along South Coast Rd, Kangaroo Is., *R.C.Weston* 38 (CANB); Mt Taylor Conservation Park, *R.C.Weston* 71 (CANB).



Unplaced names

Zieria octandra Sweet ex G.Don, *Gen. Hist.* 1: 794 (1831)

T: from Australia; *n.v.*

Since the type has not been located, this name cannot be assigned with certainty to any known taxon.

Zieria trifoliata Lois., *Herb. Gén. Amat.* 3: t. 190 (1819)

T: cultivated in England and at the Jardin de la Malmaison, France; *n.v.*

A sheet at P has a specimen grown in Paris, 'ex herb A.Jamain', undated but probably early 19th century, labelled with this name. It is *Z. smithii*.

NEOBYRNESIA

J.A.Armstrong & Paul G.Wilson

Neobyrnesia J.A.Armstr. in J.A.Armstrong & J.M.Powell, *Telopea* 1: 399 (1980); named in honour of the botanist Norman B. Byrnes (1922–1998).

Type: *N. suberosa* J.A.Armstr.

Shrub; indumentum velutinous, of simple hairs. Leaves opposite, petiolate, simple, flat, entire, glandular-punctate. Inflorescences axillary, cymose. Flowers bisexual, 4-merous. Sepals shortly connate at base. Petals free, valvate, inflexed at tip, persistent. Stamens 4, antisepalous; anthers versatile, not apiculate, gland-dotted on abaxial surface. Disc entire, narrow. Ovary pyramidal; carpels 4, free; style inserted centrally; stigma shortly 4-lobed. Fruit of 1–4 basally connate cocci dehiscing along adaxial margin with dry epicarp and cartilaginous elastic endocarp. Seed ovoid; outer testa wrinkled; sclerotesta smooth; hilum linear; elaiosome persistent. *n* = 12, H.M.Stace & G.J.Leach, *Telopea* 6: 167 (1993).

A monotypic genus endemic to the far N of the N.T.

J.A.Armstrong & J.M.Powell, *Neobyrsnesia* (Rutaceae): a new genus endemic to Northern Australia, *Telopea* 1(6): 399–408 (1980).

Neobyrsnesia suberosa J.A.Armstr. in J.A.Armstrong & J.M.Powell, *Telopea* 1: 401 (1980)

T: 4 miles [6 km] NNE of Mudginberry HS, 4 July 1972, *M.Lazarides* 7525; holo: CANB.

Illustration: J.A.Armstrong & J.M.Powell, *op. cit.* 400, pl. 15; 402, fig. 1.

Weak shrub to 50 cm high. Branchlets closely velutinous. Branches corky with age. Leaves: petiole 2–6 mm long, velutinous; lamina oblong-elliptic to ovate, 1.5–4 cm long, glabrous and dark green adaxially, velutinous abaxially. Inflorescences 3–7-flowered, much shorter than leaves, velutinous; peduncle c. 1 mm long; pedicels c. 1 mm long, to 3 mm in fruit. Sepals triangular, 1 mm long, velutinous. Petals thick, ovate, c. 3 mm long, glabrous adaxially, somewhat woolly abaxially. Stamens glabrous; filaments compressed-terete, attenuate, c. 1.2 mm long; anthers orbicular, 0.7 mm long. Ovary sparsely puberulous; style minute, glabrous; stigma very shortly 4-lobed. Cocci obtuse, c. 3.5 mm long. Seed c. 3 mm long, black. Plate 38.

Known only from the Alligator R. area, N.T., where growing in fissures in sandstone cliff-face. Specimens have been collected in February, May, June, and July and all bore both flowers and fruit.

N.T.: 20 km NE of Jabiru, *L.A.Craven* 6625 (CANB); near Cahill's crossing, East Alligator R., 2 Dec. 1982, *R.Muller* (CBG); ESE of Mudginberry, *C.Dunlop* 3292 (CANB).



25. CORREA

Paul G.Wilson

Correa Andrews, *Bot. Repos.* 1: t. 18 (1798), *nom. cons.*; named after the Portuguese botanist José Francisco Corrêa da Serra (1751–1823).

Type: *C. alba* Andrews

Mazeutoxeron Labill., *Voy. Rech. Pérouse* 2: 11, t. 17 (1800). T: *M. rufum* Labill.

Antommarchia Colla, *Hortus Ripul.* App. 2: 345 (1826). T: *A. rubra* Colla ex C.Presl

Didimeria Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 197 (1838). T: *D. aemula* Lindl.

Shrubs or small trees, stellate-pubescent. Leaves opposite, subsessile to petiolate, simple, ±flat, entire or irregularly undulate-dentate. Flowers 1–5 (–7) and terminal to short branchlets or solitary and axillary, bisexual, 4-merous. Pedicels bibracteolate. Calyx cup-shaped, entire or 4 (or 4 + 4)-lobed. Corolla mostly sympetalous, mostly tubular, stellate-hairy; tips of lobes slightly inflexed. Stamens 4 + 4, inserted at base of disc; filaments linear, variably broadened at base, glabrous, antipetalous ones shorter; anthers included or exserted, versatile, oblong to lanceolate, introrse, not apiculate, abaxially with reddish brown connective. Disc 8-lobed, glabrous. Carpels 4, united at base, variably tomentose; style filiform, attached subapically to adaxial margin of ovaries; stigma minutely 4-lobed. Fruit of 4 cocci. *n* = 16, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954).

A genus of 11 species, all endemic to Australia, in all States and Territories except N.T.

The species fall into 2 groups, the first containing *C. lawrenceana* and *C. baeuerlenii*, and the second all the other species. The species in the second group are able to hybridise with each other, and frequently do so. This ability, along with the movement of species distributions due to changes in climate and sea levels, has resulted in the production of numerous introgressive populations and local variants whose parentage is often difficult to

interpret. It is impractical and unproductive to distinguish each variant by name and some of the taxa here recognised encompass a number of different forms. However, further studies are likely to indicate that some of the variants that here have been glossed over are deserving of formal recognition.

Extensively cultivated and hybridised.

P.G.Wilson, A taxonomic revision of the genus *Correa* (Rutaceae), *Trans. Roy. Soc. S. Australia* 85: 21–53 (1961); P.G.Wilson, Notes on the genus *Correa* (Rutaceae), *Nuytsia* 12: 89–105 (1998); M.Hitchcock, Descriptions of the species, varieties and cultivars [of *Correa*], *Austral. Pl.* 174: 15–38 (2003).

- 1 Calyx with a saucer-shaped outgrowth at base **11. *C. baeuerlenii***
- 1: Calyx without an outgrowth at base
 - 2 Leaves glabrous beneath or almost so
 - 3 Calyx and pedicel glabrous; corolla entirely pink to red or orange **6. *C. pulchella***
 - 3: Calyx and pedicel variably stellate-pubescent; corolla yellow-green or red with green lobes
 - 4 Staminal filaments broadened towards base; anthers not reflexed at anthesis **3. *C. glabra***
 - 4: Staminal filaments linear throughout; anthers strongly reflexed on margins at anthesis **10. *C. lawrenceana***
- 2: Leaves variably stellate-pubescent beneath
 - 5 Corolla divided into separate petals after anthesis
 - 6 Flowers subsessile or with pedicels to 5 mm long; corolla white (rarely pink) **1. *C. alba***
 - 6: Flowers with slender pedicels 10–30 mm long; corolla pale green or cream, becoming mauve with age **7. *C. aemula***
 - 5: Corolla not divided into separate petals after anthesis
 - 7 Calyx deeply divided into 4 triangular or lanceolate lobes
 - 8 Leaves narrowly oblong-elliptic, mostly 2–3 cm long; calyx sparsely stellate-hairy adaxially **4. *C. calycina***
 - 8: Leaves ovate to broadly ovate, 2–6 cm long; calyx glabrous adaxially
 - 9 Leaves 2–4.5 cm long, sparsely stellate-scabridulous adaxially; anthers not reflexed on margins at anthesis **9. *C. reflexa***
 - 9: Leaves 3–6 cm long, glabrescent adaxially; anthers reflexed on margins at anthesis **10. *C. lawrenceana***
- 7: Calyx truncate, undulate or shortly 4- or 8-lobed
 - 10 Calyx ±8-lobed; leaves narrowly oblong or narrowly elliptic
 - 11 Calyx with 4 linear and 4 linear to triangular lobes (S.A.) **8. *C. decumbens***
 - 11: Calyx with 4 linear and 4 triangular lobes (Grampians, Vic.) **9. *C. reflexa***
 - 10: Calyx truncate, undulate, or 4-dentate; leaves mostly ovate
 - 12 Staminal filaments linear throughout; anthers strongly reflexed on margins at anthesis; leaves tomentose beneath with minute stellate hairs **10. *C. lawrenceana***
 - 12: Antipetalous staminal filaments broadened towards base; anthers not or scarcely reflexed on margins; leaf tomentum various
 - 13 Flower or flower cluster subtended by a pair of leaf-like bracts, usually reflexed

- 14 Corolla cream or green; calyx cream-tomentose, prominently undulate-dentate; leaves smooth adaxially, minutely tomentose beneath 5. *C. eburnea*
- 14: Corolla cream to yellow, green or red; calyx rusty-tomentose; leaves scabridulous adaxially, coarsely stellate-hairy beneath 9. *C. reflexa*
- 13: Flowers not subtended by a pair of leaf-like bracts
- 15 Leaves scabridulous adaxially, coarsely stellate-hairy beneath 9. *C. reflexa*
- 15: Leaves smooth and glabrous adaxially
- 16 Leaves densely tomentose with minute hairs beneath 2. *C. backhouseana*
- 16: Leaves glabrous to moderately fawn-tomentose with obvious hairs beneath 3. *C. glabra*

1. *Correa alba* Andrews, *Bot. Repos.* 1: t. 18 (1798)

C. cotinifolia Salisb., *Parad. Lond.* t. 100 (1808), *nom. illeg.*, *C. alba* in synonym. T: raised in 1793 from seeds given by J.Banks to J.Vere; holo: illustration in H.C.Andrews, *Bot. Repos.* 1: t. 18 (1798).

Procumbent to spreading shrub to 3 m high. Branchlets smooth, closely ferruginous-tomentose to -flocculose. Leaves with petiole 0.2–0.8 cm long; lamina elliptic to broadly elliptic, 0.5–4.6 cm long (or suborbicular and 1–1.5 cm long), entire, coriaceous, sparsely tomentose or soon glabrous adaxially, densely tomentose or sometimes floccose abaxially. Flowers 1–5, terminal to short branchlets; peduncle not differentiated; pedicels 0.5–5 mm long, tomentose; bracteoles basal, linear to spatulate, 1–5 mm long, caducous. Calyx hemispherical, 2–4 mm high, truncate to 4-dentate or broadly lobed, fawn-tomentose. Corolla c. 12 mm long, closely stellate-hairy abaxially; petals soon free and spreading, white (rarely pink). Stamens included; antipetalous filaments broadened at base; anthers broadly elliptic or obovate, 1–2 mm long, rounded at apex.

A coastal species in N.S.W. (S of Newcastle), Vic., SE S.A., and Tas. Three varieties are recognised.

B.Choi & M.F.Duretto, *Correa alba* var. *rotundifolia* (Rutaceae): an old name for a newly recognised variety endemic to south-eastern Tasmania, *Muelleria* 26: 45–53 (2008).

- 1 Stellate hairs on abaxial surface of leaves not stalked or stalks to 0.05 mm long 1a. var. *alba*
- 1: Stellate hairs on abaxial surface of leaves stalked; stalks to 2 mm long
- 2 Indumentum of branches and sometimes of abaxial surface of leaves uneven and appearing floccose 1b. var. *pannosa*
- 2: Indumentum of the branches and abaxial surface of leaves smooth and even 1c. var. *rotundifolia*

1a. *Correa alba* Andrews var. *alba*

Erect shrub 1.5–3 m high. Indumentum smooth; stellate hairs mostly sessile or stalks to 0.05 mm long and without rays along length; rays 0.1–0.25 (–0.5) mm long. Leaves with petiole 0.2–0.7 cm long; lamina elliptic and obtuse to broadly elliptic and rounded at apex, 7–46 mm long, 4.5–28 mm wide, smooth and becoming glabrous adaxially, densely pale tomentose abaxially with minute stellate hairs. Peduncle 1–6.5 mm long; pedicels 1.25–6.5 mm long. Calyx 3–7 mm long, with broadly triangular lobes. Petals 8.5–17 mm long, 1.5–4.5 mm wide. Fig. 55C, D.

Found in coastal N.S.W. (S of Newcastle), Vic., and Tas.; growing on coastal dunes and cliffs. Flowers in spring and summer.

N.S.W.: Broulee, *J.Baker* 185 (CANB). Vic.: Cape Nelson, *J.C.Anway* 447 (PERTH). Tas.: Binalong Bay, *J.Armstrong* 887 (NSW).

Hybrids between *C. alba* var. *alba* and other coastal species of *Correa* are common where they co-occur and in places form introgressive populations. The type of *C. rubra* Sm. from Botany



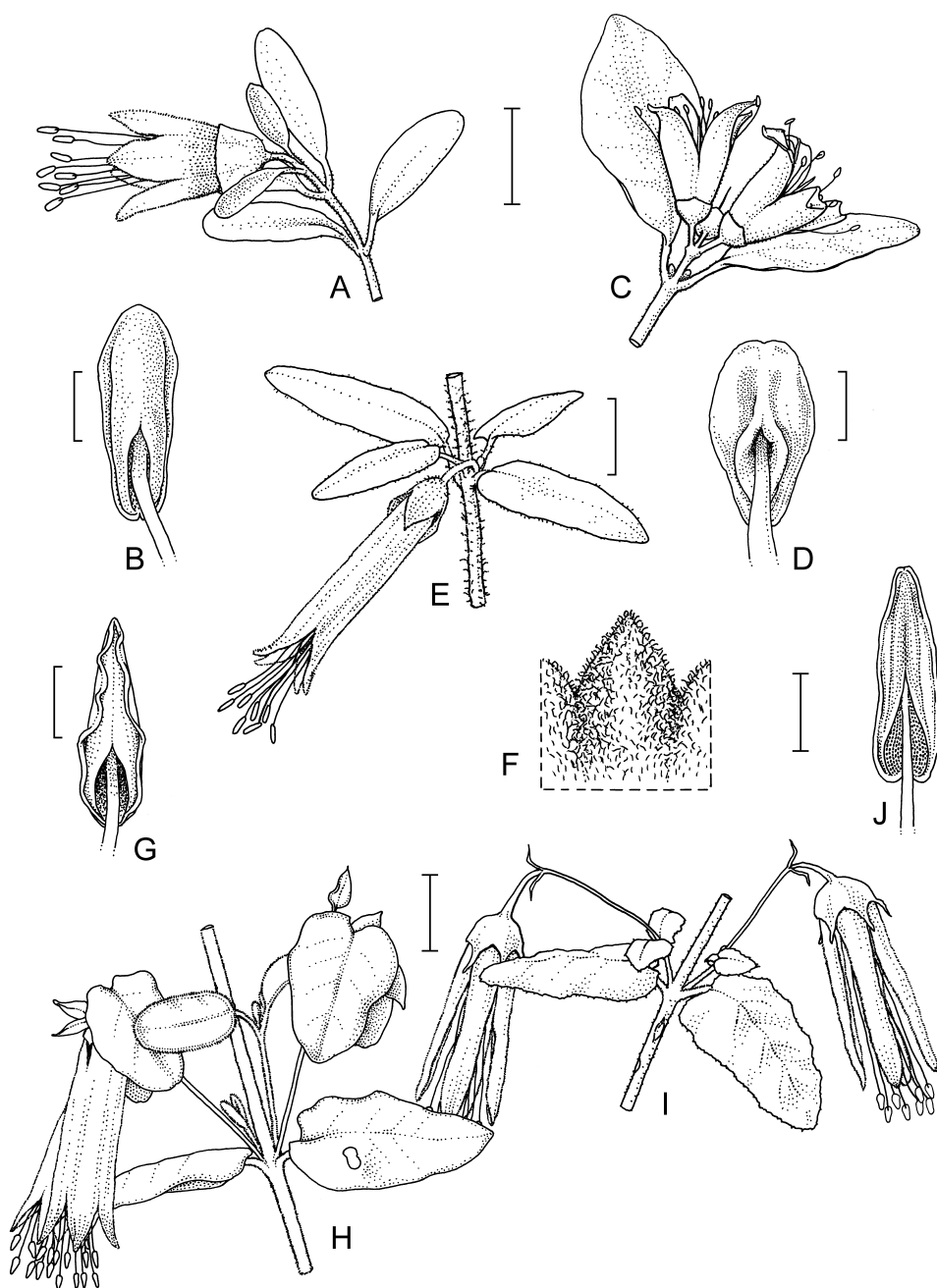


Figure 55. *Correa*. **A, B,** *C. glabra* var. *turnbullii*. **A,** flowering branchlet; **B,** anther, abaxial view (**A, B,** M.C.R.Sharrad 593, AD). **C, D,** *C. alba* var. *alba*. **C,** flowering branchlet; **D,** anther, abaxial view (**C, D,** cult. Kings Park, W.A.). **E–G,** *C. calycina*. **E,** flowering branchlet; **F,** inner surface of calyx; **G,** anther, abaxial view (**E–G,** cult. Kings Park, W.A.). **H,** *C. eburnea*, flowering branchlet (R.J.Bates 25726, AD). **I, J,** *C. aemula*. **I,** flowering branchlet; **J,** anther, abaxial view (**I, J,** Hj.Eichler 15308, AD). Scale bars: **A, C, E, H, I** = 10 mm; **B, D, G, J** = 1 mm; **F** = 4 mm. Drawn by A.Menadue.

Bay appears to be a hybrid of var. *alba* with *C. reflexa* var. *speciosa* while the type of *C. reflexa* var. *nummulariifolia* from Bass Strait is probably a hybrid involving var. *alba*, *C. reflexa* var. *reflexa*, and *C. backhouseana* var. *backhouseana*. A hybrid population of var. *alba* with *C. reflexa* var. *reflexa* is (or was) found near Sandringham, Vic., where it is associated inland with an introgressive population of the two taxa.

1b. *Correa alba* var. *pannosa* Paul G. Wilson, *Trans. Roy. Soc. S. Australia* 85: 40 (1961)

Based on *C. rotundifolia* Lindl. in T.L. Mitchell, *Three Exped. Australia* 2: 217 (1838); *C. alba* var. *rotundifolia* (Lindl.) Benth., *Fl. Austral.* 1: 354 (1863), *nom illeg. non DC.* (1824). T: Near mouth of Glenelg R. [Vic.], 15 Aug. 1836, *T.L. Mitchell* 287; holo: CGE; iso: MEL.

Procumbent to spreading shrubs to 1 m high. Indumentum of branches and abaxial leaf surface densely stellate-tomentose, appearing floccose. Leaves suborbicular to orbicular, mostly 8–14 mm long, moderately tomentose adaxially, thickly tomentose abaxially with usually reddish brown stipitate stellate hairs. Pedicels 0.5–2 mm long. Calyx semiorbicular, c. 3 mm long, with truncate margin. Petals 7–10 mm long.

Found from the Encounter Bay area of S.A. E to Cape Otway region, Vic.; growing in coastal dunes and on cliff tops. Flowers spring and early summer.

S.A.: Newland Head, *N.N. Donner* 11283 (CANB); Kingston to Salt Ck, *Hj. Eichler* 17785 (CANB). Vic.: Portland, 15 Sept. 1961, *M.E. Phillips* (CANB).

Introgressive populations between *C. alba* var. *pannosa* and *C. reflexa* var. *scabridula* occur in coastal or near-coastal situations.



1c. *Correa alba* var. *rotundifolia* DC., *Prodr.* 1: 719 (1824)

Based on: *Mazeutoxeron rufum* Labill., *Voy. Rech. Pérouse* 2: 12 (1800), *Atlas* t. 17 (1800); *C. rufa* (Labill.) Vent., *Jard. Malmaison* 1: sub. t. 13 (1803). T: Near 'cap meridional' [South Cape, Tas.], Feb. 1793, *J.J.H. de Labillardière*; lecto: FI, *fide* B. Choi & M.F. Duretto, *Muelleria* 26: 50 (2008).

Shrub to 3 m high, 4 m wide. Stems and leaves tomentose with reddish brown mostly stipitate stellate hairs. Leaves with petiole 3–8 mm long; lamina 5–28 mm long, 2.5–27 mm wide. Peduncle 1–9 mm long; pedicels 0.75–3 mm long. Calyx 3–6 mm long. Petals 8–14 mm long.

Found in SE Tas. mainly on the Tasman and Forestier Peninsulas, the South Arm area, and Bruny Is. Flowers Mar.–Dec.

Tas.: Cape Frederick Hendrick, Forestier Penin., *P. Collier* 2577 (HO); Droughty Point, *A.M. Buchanan* 3243 (HO); Pirates Bay, Tasman Penin., *B. Choi* 17-19 & *M.F. Duretto* (HO).



2. *Correa backhouseana* Hook., *J. Bot. (Hooker)* 1: 253 (1834), as *Backhousiana*

C. speciosa race *backhouseana* (Hook.) Benth., *Fl. Austral.* 1: 355 (1863); *C. speciosa* var. *backhouseana* (Hook.) Rodway, *Tasman. Fl.* 21 (1903). T: Cape Grim, Tas., 1833, *J. Backhouse*; holo: K.

? *C. backhouseana* var. *uniflora* Regel, *Ind. Sem. Hort. Petrop.* 50 (1859). T: "In hortis sub nomine *C. Grevillei* colitur"; *n.v.*

Rounded shrub to 2 (–4) m high. Branchlets smooth, ferruginous-tomentose when young. Leaves shortly petiolate, elliptic to ovate or suborbicular, mostly 1.5–2.5 cm long, rounded at base, entire, obtuse to rounded at apex, coriaceous, ±glabrous adaxially, densely stellate-tomentose with minute soft hairs abaxially. Flowers 1–3, terminal to short branchlets, usually pendulous, with terminal leaves persistent and unmodified; pedicels 5–10 mm long; bracteoles submedial to basal, linear, caducous. Calyx hemispherical, 2–7 mm high, truncate to undulate, densely tomentose. Corolla cylindrical or funnel-shaped, 1.5–2.5 cm long

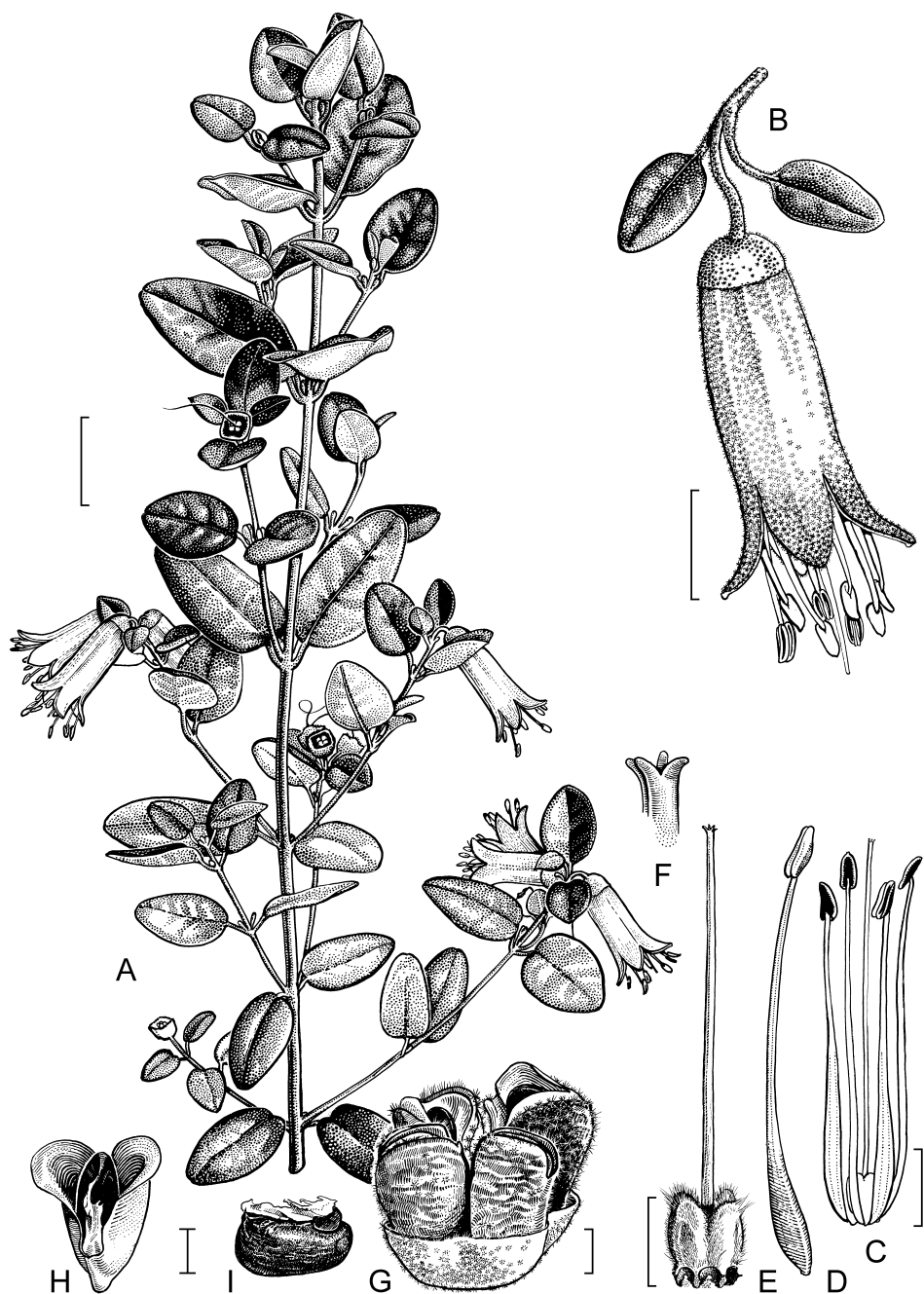


Figure 56. *Correa backhouseana* var. *coriacea*. **A**, habit; **B**, flower; **C**, flower (calyx, corolla and some stamens removed); **D**, stamen; **E**, pistil; **F**, stigma, detail; **G**, fruit; **H**, endocarp with enclosed seed; **I**, seed with placental endocarp & sterile ovule attached (**A**–**I**, drawn from fresh material, voucher not recorded). Scale bars: **A** = 10 mm; **B**, **D** = 4 mm; **C**, **E** = 6 mm; **G**–**I** = 2 mm. Drawn by M. Wilson.

including the prominent erect lobes, cream to pale green or red and yellow. Stamens with antipetalous filaments broadened towards base; anthers included to exserted, not recurved at margins, obtuse to truncate.

Occurs in coastal or near-coastal areas of SE W.A., S.A., Vic. and Tas.; 3 varieties are recognised.

Distinguished principally by the flower shape and by the leaves which are entire, coriaceous, smooth, \pm glabrous adaxially and densely tomentose beneath with very small and weak stellate hairs. In characters of leaf and indumentum it resembles *C. alba* var. *alba*.

- | | | |
|----|---|------------------------------|
| 1 | Corolla cream to pale green | |
| 2 | Leaves ovate to broadly ovate or broadly elliptic, smooth adaxially | 2a. var. backhouseana |
| 2: | Leaves ovate, sometimes slightly scabridulous adaxially | 2b. var. coriacea |
| 1: | Corolla red with yellowish or green tips to lobes | |
| 3 | Leaves ovate | 2b. var. coriacea |
| 3: | Leaves broadly ovate to circular | 2c. var. orbicularis |

2a. *Correa backhouseana* Hook. var. *backhouseana*

Illustration: N.G. Walsh & T.J. Entwistle (eds), *Fl. Victoria* 4: 172, fig. 31c (1999).

Rounded shrub to 2 (–4) m high. Leaves ovate to broadly ovate or broadly elliptic, mostly 1.5–2.5 cm long, obtuse to subcordate at base, obtuse at apex, smooth and glabrous on adaxial surface. Calyx hemispherical, 3–7 mm high, truncate and briefly 4-toothed to gently or deeply undulate and then with recurved margin, closely fawn-tomentose. Corolla broadly cylindrical, c. 2.5 cm long, cream. Anthers included or slightly exserted. Fig. 57G.

Occurs in coastal Tas., the Bass Strait islands, and Cape Otway Vic.; growing in dunes and amongst rocks. Flowers winter to summer.

Vic.: mouth of Parker R., 18 July 1971, *G. Carr s.n.* (MEL). Tas.: Mt Wellington, 23 Sept. 1951, *W.M. Curtis* (HO); Rocky Cape Natl Park, 23 Aug. 1986, *R. Burns* (CANB); Turua Beach, *A.M. Buchanan* 3449 (HO); King Is., Nov. 1884, *W.A. Sayer* (MEL).

Stated to grow on the W coast of Tas. ‘solidly, acres in width, as high as haystacks, right down to the sea shore; travellers have to go over the top’.

The calyces of those plants from the N and NW coasts of Tas. tend to be short, truncate, and briefly 4-toothed, while in those from the S coast they are large and deeply undulate. The type was collected from the NW coast and has a short calyx. In the islands of the Bass Strait this variety has small ovate leaves and it there hybridises with both *C. alba* var. *alba* and *C. reflexa* var. *reflexa*.



2b. *Correa backhouseana* var. *coriacea* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 12: 90 (1998)

C. reflexa var. *coriacea* Paul G. Wilson, *Trans. Roy. Soc. S. Australia* 85: 30 (1961). T: North Pearson Is., S.A., 14 Feb. 1960, *R.L. Specht* 2102; holotype: AD.

Shrub to 1 m high. Leaves narrowly to broadly ovate, 1–2 cm long, obtuse to rounded; adaxial surface smooth or slightly crinkled when dry or minutely scabridulous, sparsely and minutely stellate-hairy when young; abaxial surface softly and densely tomentose with minute fawn or rust-coloured hairs. Calyx shortly hemispherical, 2–3 mm high, \pm truncate, fawn- to grey-tomentose. Corolla broadly cylindrical to somewhat funnel-shaped, 1.5–2 cm long, cream to pale green or red with cream tip. Anthers included, narrowly oblong; apex truncate or rounded. Fig. 56.

Occurs in southern S.A. from the Mt Lofty Ra. westwards, and in SE W.A. along the Great Australian Bight. Growing on dunes and granite outcrops in S.A. while in W.A. it is found on the limestone escarpment that borders the Bight. Flowers winter to summer.

W.A.: Toolinna Cove, *G.J.Keighery* 1938 (PERTH); Wilson Bluff, *P.Hussey* 65 (PERTH). S.A.: 32 km SW of Yardea, *B.A.Clements* 304 (CANB); Greenly Is., 20 Mar. 1974, *E.Jericho* (AD); Sandy Creek Conservation Park, *A.G.Spooner* 6947 (AD).

The variant found in mainland S.A. shows a strong resemblance to *C. reflexa* var. *scabridula*, particularly in often having a reddish corolla and occasionally slightly scabrid adaxial leaf surface; it presumably owes this resemblance to introgression between the two taxa, for in the Mt Lofty Ra. hybridisation has been confirmed. *Correa backhouseana* var. *coriacea* is to be distinguished principally by its smooth leaves which have a dense fine indumentum abaxially.



Near Pt Lincoln and at the southern end of Yorke Penin., plants have been collected that suggest hybridisation with *C. pulchella*.

2c. *Correa backhouseana* var. *orbicularis* Paul G.Wilson, *Nuytsia* 12: 91 (1998)

T: Mt Thisby, Kangaroo Is., S.A., 30 Dec. 1965, *Hj.Eichler* 18565; holo: AD.

C. rubra var. *orbicularis* J.M.Black, *Fl. S. Australia* 2nd edn 496 (1948), *nom. inval.*

Plant similar to var. *coriacea* but differs in the following characters: leaves mostly broadly ovate to almost circular; calyx rusty-tomentose; corolla red with yellowish lobes; anthers well exserted, oblong or narrowing towards apex, somewhat triangular in cross-section on dehiscence.

Endemic to Kangaroo Is., S.A., where growing in coastal heath in sand, often over limestone. Flowers winter to summer.

S.A.: Dudley Penin., *B.Overton* 16030 (AD); Flinders Chase Natl Park, *E.N.S.Jackson* 4395 (AD); Karatta, 24 Jan. 1883, *R.Tate* (AD); Pennington Bay, *D.E.Symon* 8498 (AD).

This variety hybridises with *C. reflexa* var. *insularis* and many collections are somewhat intermediate between the two taxa. The anthers are in some specimens narrowly triangular, which suggests introgression with *C. reflexa*, although in leaf and indumentum this taxon is closer to *C. backhouseana*.



3. *Correa glabra* Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 48 (1838)

C. speciosa race *glabra* (Lindl.) Benth., *Fl. Austral.* 1: 355 (1863); *C. speciosa* var. *glabra* (Lindl.) Maiden & Betche, *Census New South Wales Pl.* 117 (1916); *C. rubra* var. *glabra* (Lindl.) J.M.Black, *Fl. S. Australia* 340 (1924); *C. reflexa* var. *glabra* (Lindl.) Court, *Victorian Naturalist* 73: 175 (1957). T: Near Hillston, N.S.W., 21 Apr. 1836, *T.L.Mitchell* 84; holo: CGE; ?iso: MEL.

Erect shrub to 2 m high. Branchlets weakly tomentose. Leaves: petiole 2–4 mm long; lamina narrowly to broadly elliptic, 1–4 cm long, entire, obtuse, papery to subcoriaceous, smooth and soon glabrous adaxially, glabrous to fawn-tomentose abaxially. Flowers solitary on short branchlets, with terminal leaves not differentiated; pedicel 2–4 mm long; bracteoles basal, linear to oblanceolate, 4–7 mm long, caducous. Calyx semiorbicular and 3 mm long to cup-shaped and 10 mm long, truncate, thin, glabrous or fawn-tomentose. Corolla cylindrical to funnel-shaped, 1.5–3 cm long, with erect or spreading lobes, either pale green to pale yellow all over or red with green lobes. Stamens: filaments broadened towards base; anthers prominently exserted, obtuse, not recurved after anthesis.

Found in SE Qld, N.S.W., and western Vic. W to Fleurieu Penin. in S.A. Three varieties are recognised but these are not always clearly distinguishable since they grade into each other.

1 Flowers red with green lobes

3c. var. **turnbullii**

1: Flowers pale green or pale yellow

2 Leaves glabrous or glabrescent; calyx hemispherical, glabrous or glabrescent to sparsely and minutely grey-pubescent

3a. var. **glabra**

2: Leaves tomentose abaxially; calyx cup-shaped to shortly cylindrical, tomentose

3b. var. **leucoclada**

3a. *Correa glabra* Lindl. var. **glabra**

Illustration: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 172, fig. 31d (1999).

Leaves glabrous or nearly so abaxially. Calyx hemispherical, 3–5 mm long, glabrous to sparsely and minutely grey-pubescent. Corolla pale green to pale yellow.

Found in SE Qld, N.S.W., and central and western Vic.; growing principally in rocky habitats and along water courses. Flowers mainly Apr.–May.

Qld: 3 km SSW of Gladfield, *P.I.Forster* 2468 (MEL). N.S.W.: Mt Waabalong, *P.L.Milthorpe* 1279 (NSW). Vic.: Mitre Rock, 35 km W of Horsham, 29 July 1950, *J.H.Willis* (MEL).

A widespread and polymorphic taxon that in places hybridises with varieties of *C. reflexa*.

The plant found in the Torrens Gorge of the Mt Lofty Ra. in S.A., that is usually referred to this taxon, appears to be a hybrid between the local variants of var. *turnbullii* and var. *leucoclada*, both of which grow in the area.



3b. *Correa glabra* var. **leucoclada** (Lindl.) Paul G.Wilson, *Nuytsia* 12: 95 (1998)

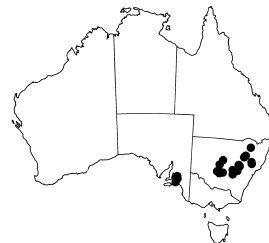
C. leucoclada Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 39 (1838); *C. speciosa* race *leucoclada* (Lindl.) Benth., *Fl. Austral.* 1: 355 (1863); *C. speciosa* var. *leucoclada* (Lindl.) Maiden & Betche, *Census New South Wales Pl.* 117 (1916). T: Summit of Goulburn Ra. [Ural Ra.], N.S.W., 29 Apr. 1836, *T.L.Mitchell* 106; holo: CGE; ?iso: MEL.

C. rubra var. *megacalyx* J.M.Black, *Fl. S. Australia* 2nd edn 496 (1948), *nom. inval.*

Leaves tomentose abaxially. Calyx cup-shaped and c. 7 mm long to shortly cylindrical and c. 10 mm long, fawn-tomentose. Corolla pale green.

Found in S.A. in the southern Mt Lofty Ra. and also in eastern and central N.S.W.; generally growing in hilly situations along banks of streams. Flowers mainly May–Aug.

S.A.: Sturt Gorge, 22 May 1945, *E.Ashby* (AD); Morialta Falls, *H.Salasoo* 1693 (AD). N.S.W.: Mt Arthur Natl Park, 8 Oct. 1969, *J.H.Willis* (MEL); Mt Wheoga, 21 Mar. 1956, *E.F.Constable* (NSW).



3c. *Correa glabra* var. **turnbullii** (Ashby) Paul G.Wilson, *Nuytsia* 12: 95 (1998)

C. turnbullii Ashby, *Proc. Linn. Soc. London*, Sess. 151: 219, 220, t. 4, fig 8 (1939); *C. rubra* var. *turnbullii* (Ashby) J.M.Black, *Fl. S. Australia* 2nd edn 496 (1948). T: Near Monarto South, S.A., *s. dat.*, *E.Ashby*; holo: AD.

C. schlechtendalii Behr, *Linnaea* 20: 630 (1847). T: Stony scrubland, S.A., June–Aug., *H.Behr* 139; holo: HAL.

Leaves glabrous to sparsely pubescent abaxially. Calyx hemispherical, 3–5 mm long, glabrous or nearly so. Corolla red with green lobes. Fig. 55A, B.

Found in S.A. in the rocky hills of the Mt Lofty and Flinders Ranges and on the plains of the Murray Lands. Flowers principally in winter.

S.A.: Between Monarto South and Chaunceys Line, *M.Fagg* 387 (AD); Telowie Gorge, Flinders Ra., *R.Filson* 2113 (MEL); Baker Ck, Mt Lofty Ra., *R.Schodde* 338 (CANB).

The foliage has a fruity fragrance.

This variety hybridises with *C. reflexa* var. *scabridula*.



4. *Correa calycina* J.M.Black, *Trans. & Proc. Roy. Soc. S. Australia* 49: 273 (1925)

T: Upper Waterfall, Hindmarsh Valley, S.A., 29 Jan. 1924, *J.B.Cleland*; holo: AD; iso: K.

Dense erect shrub to 2 m high. Branchlets rusty-flocculose. Leaves: petiole to 8 mm long; lamina narrowly oblong-elliptic, mostly 2–3 cm long, obtuse, papery, sparsely and minutely stellate-hairy or scabridulous adaxially, sparsely to densely stellate-hairy abaxially with large hairs. Flowers solitary, terminal to branches; pedicel 2–4 mm long; bracteoles filiform, caducous. Calyx turbinate, square in cross-section, thin-walled, in all to 15 mm long with the upper $\frac{2}{3}$ divided into 4 lanceolate valvate lobes, green, sparsely stellate-hairy on both surfaces. Corolla narrowly cylindrical, to 3 cm long, green (mauve with age), densely stellate with fawn hairs. Stamens: antipetalous filaments slightly broadened at base; anthers sub lanceolate, 2.2–3.2 mm long, with margins slightly reflexed on drying.

Occurs in a few isolated localities in southern Fleurieu Penin., and on Kangaroo Is., S.A.; growing on or near banks of streams. Two varieties are recognised.

The species is listed as vulnerable under the EPBC Act, 1999.

The morphology of the leaves and flowers suggests that this species originated through the crossing of *C. aemula* with *C. glabra*, however, certain of its characters cannot be attributed to either of these species (see R.J.Anderson in J.P.Jessop & H.R.Toelken, *Fl. S. Australia* 4th edn, 2: 774 (1986)).

Leaves sparsely to moderately stellate-hairy abaxially

4a. var. *calycina*

Leaves moderately to densely stellate-hairy abaxially

4b. var. *halmaturorum*

4a. *Correa calycina* J.M.Black var. *calycina*

Branchlets pale rusty-flocculose. Leaf lamina mostly 2–3 cm long, flat, sparsely and minutely stellate-hairy or scabridulous adaxially, sparsely to moderately stellate-hairy abaxially with large hairs. Pedicel 2–4 mm long. Calyx lobes lanceolate, acute. Fig. 55E–G.

Occurs in a few isolated localities in southern Fleurieu Penin., S.A.; growing on or near stream banks. Flowers Apr.–Sept.

S.A.: Hindmarsh Falls, Mt Lofty Ra., *M.D.Crisp* 2116 (CANB); Boundy Ck, Mt Lofty Ra., *P.J.Lang* 8579 (MEL).



4b. *Correa calycina* var. *halmaturorum* Paul G.Wilson, *Nuytsia* 12: 92 (1998)

T: De Mole R., Kangaroo Is., S.A., 13 Aug. 1985, *G.Jackson* 1760; holo: AD; iso: CANB, MEL.

Branchlets strongly rusty-flocculose. Leaf lamina mostly 2–4 cm long, slightly recurved at margin, obtuse, scabridulous adaxially, moderately to densely fawn to rusty stellate-hairy abaxially. Flowers sessile. Calyx lobes lanceolate, acuminate.

Recorded only from the banks of De Mole R., Kangaroo Is., S.A. Flowers in winter.

S.A.: De Mole R., *K.Clipstone* 852089 (AD); mouth of De Mole R., *B.M.Overton* 390 (AD).



5. *Correa eburnea* Paul G. Wilson, *Nuytsia* 12: 93 (1998)

T: Deep Creek Conservation Park, Fleurieu Penin., S.A., 4 Aug. 1991, *R.J. Bates* 25726; holo: AD.

Illustration: P.G. Wilson, *Nuytsia* 12: 93, fig. 1 (1998).

Shrub 1–4 m high. Branchlets closely rusty-tomentose. Leaves shortly petiolate; lamina ovate to elliptic, mostly 3–5 cm long, rounded to slightly cordate at base, flat, entire, obtuse, papery, smooth, glabrous and glossy adaxially, minutely cream- to fawn-tomentose abaxially. Flowers 1–5, axillary, nodding; peduncle bearing a pair of terminal rounded to cordate bracts 1–2.5 cm long, appressed to flowers in bud; pedicels c. 2 mm long with a pair of small caducous bracteoles. Calyx cup-shaped, 5 mm high, undulate and 4-dentate on margin, sparsely tomentose adaxially, closely cream-tomentose abaxially. Corolla cylindrical, c. 25 mm long, green or cream with close green tomentum; lobes triangular. Stamens: filaments broadened towards base; anthers shortly or prominently exserted, oblong to narrowly triangular, c. 3 mm long, with margins slightly reflexed. Fig. 55H.

Found on or near the S coast of Fleurieu Penin. at Encounter Bay, S.A.; growing on banks of damp creeks and on cliff tops. Flowers in winter.

S.A.: Deep Ck area, *R. Schodde* 1139 (AD); Boat Harbour Ck., *Hj. Eichler* 14426 (AD); c. 3 km from Goolwa, Jan. 1934, *J.B. Cleland* (AD); Callawonga Ck, 25 Nov. 1953, *F.M. Hilton* (AD); E of Tunkalilla Ck, *D.N. Kraehenbuehl* 5249 (AD).

A possible hybrid origin has been postulated for this species (see Wilson *loc. cit.*), and herbarium specimens are somewhat distorted which may be due to disease or to hybridity. However, there appears to be now no indication of intergradation with other *Correa* species found on the Fleurieu Penin.

**6. *Correa pulchella* J. Mackay ex Sweet, *Fl. Australas.* t. 1 (1827)**

C. rubra var. *pulchella* (Sweet) J.M. Black, *Fl. S. Australia* 2nd edn 496 (1948); *C. reflexa* var. *pulchella* (Sweet) Court, *Victorian Naturalist* 73: 175 (1957). T: illustration of plant raised by J. Mackay from seed collected by W. Baxter at Kangaroo Is., S.A., R. Sweet, *Fl. Australas.* t. 1 (1827).

C. pulchella Lindl., *Edwards's Bot. Reg.* 15: t. 1224 (1829), *nom. illeg. non Sweet*. T: illustration of plant raised by the Comte de Vandes, *Edwards's Bot. Reg.* t. 1224 (1829).

C. neglecta Ashby, *Proc. Linn. Soc. London*, Sess. 151: 219 (1939). T: Cape Spencer, Yorke Penin., S.A., *E. Ashby*; holo: AD.

C. neglecta var. *minor* Ashby, *loc. cit.*, *nom. inval.*

C. minor J.M. Black, *Fl. S. Australia* 2nd edn 496 (1948), *nom. inval.*

Procumbent to erect shrub to 1 m high. Branchlets smooth. Leaves \pm glabrous; petiole 3–5 mm long; lamina narrowly oblong to broadly ovate or trullate, 1–2 cm long, coriaceous, smooth, pitted adaxially when dry. Flowers solitary, pendulous, on short axillary branchlets; pedicel slender, 5–10 mm long, glabrous; bracteoles just above terminal leaves, linear-elliptic, 1–2 mm long, caducous. Calyx broadly semiorbicular, 3–6 mm high, entire, truncate, green, \pm glabrous. Corolla cylindrical or funnel-shaped, 1–3 cm long with erect or spreading lobes, pink to red or orange, falling in fruit. Stamens enclosed or just exserted; filaments distinctly broadened at base; anthers c. 2 mm long, not recurved after dehiscence.

Occurs in S.A. in Eyre and Yorke Peninsulas, Encounter Bay, Kangaroo Is., and in the SE of the State; mostly coastal and growing usually in calcareous soils. Flowers Apr.–Sept.

S.A.: Memory Cove, 20 Nov. 1968, *J.W. Wrigley* (CANB); 13 km SW of Victor Harbour, *M.D. Crisp* 4726 (CANB); 1.4 km from Stenhouse Bay, *E.M. Canning* 5510 (CANB); Remarkable Rocks, Kangaroo Is., 29 Sept. 1965, *E.M. Phillips* (CANB); 46 km S of Keith, *P. Gibbons* 444 (AD).

On Kangaroo Is. this species hybridises with *C. decumbens* and with *C. backhouseana* var. *orbicularis*.



Several variants of *C. pulchella* are popular garden plants and have been used in the production of many horticultural hybrids.

7. *Correa aemula* (Lindl.) F.Muell., *Fragm.* 1: 3 (1858)

Didimeria aemula Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 197 (1838). T: Between Douglas and the Glenelg R. [Vic.], 28 July 1836, *T.L.Mitchell* 266; holo: CGE (photo seen), iso: MEL.

C. affinis Ashby, *Proc. Linn. Soc. London*, Sess. 151: 216 (1939). T: Lower Mt Lofty Ra., S.A., s. dat., *E.Ashby*; lecto: AD, *fide* P.G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 42 (1961).

Erect or spreading shrub to 2.5 m high. Branches ferruginous-tomentose. Leaves: petiole to 4 mm long; lamina broadly subcordate, to 3 (–6) cm long, papery, sparsely to moderately stellate-hairy on both surfaces. Flowers solitary (rarely 2), terminal to short or slender branchlets; peduncle terminating in a pair of small or foliaceous bracts; pedicel slender, 1–3 cm long, with medial to subapical linear bracteoles 0.5–2 mm long. Calyx hemispherical to cup-shaped, 2–4 mm long, with 4 very narrowly triangular acuminate lobes 3–8 mm long, glabrous or sparsely stellate-hairy outside. Corolla narrowly cylindrical, 2–3 cm long, splitting into petals which enfold stamens, pale green or cream, or mauve with age. Stamens: antipetalous filaments slightly broadened at base; anthers slightly exserted, oblong, narrowing toward apex, c. 2.5 mm long, usually reflexed on margins at anthesis. Fig. 55I, J.

Occurs in S.A. in the Mt Lofty Ra., the Fleurieu Penin., and Kangaroo Is.; also in western Vic. in The Grampians and the Pyrenees Ra. Found along streams and in shaded woodlands as well as on mountains. Flowers Sept.–Dec.

S.A.: Kaiserstuhl Conservation Park, *D.J.E.Whibley* 7057 (AD); 5 km S of Myponga, *E.N.S.Jackson* 364 (AD); Brooklands Park, Kangaroo Is., *Hj.Eichler* 15308 (AD). Vic.: near Halls Gap, The Grampians, *R.Melville* 1771 (MEL); Mt Langi Ghiran, *M.G.Corrick* 7456 (MEL).

The plants from the Kaiserstuhl area in S.A. are distinctive due to their large entire broadly cordate pale leaves, very short peduncles and pedicels, and very small bracts. The Kangaroo Is. variant is also distinctive: it has crenulate-dentate subglabrous leaves, while its stellate hairs are considerably larger than those found on the mainland plants.



Hybridisation occurs with *C. glabra* on Fleurieu Penin., with both *C. decumbens* and *C. reflexa* var. *insularis* on Kangaroo Is., and with *C. reflexa* var. *angustifolia* in The Grampians.

8. *Correa decumbens* F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 30 (1855)

T: Ad ripas Fl. Onkaparinga, S.A., 21 Dec. 1848, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 34 (1961).

Illustration: M.Stones, *Bot. Mag.* 177: t. 538 (1969).

Procumbent to spreading shrub. Branchlets with brown indumentum. Leaves: petiole to 3.5 mm long; lamina narrowly oblong or narrowly elliptic, mostly 2–5 cm long, recurved, rounded at apex, smooth to scabrous adaxially, fawn-tomentose abaxially. Flowers solitary, erect, terminal to short branchlets, with terminal leaves unmodified; pedicel 5–10 mm long, tomentose; bracteoles near-basal, linear to spatulate, 5–10 mm long, eventually caducous. Calyx hemispherical to cup-shaped, 2–4 mm long, thin, tomentose, 8-lobed; sepaline lobes linear, 3–7 mm long; intersepaline lobes linear to triangular, to 3 mm long. Corolla narrowly cylindrical, 1.8–2.7 cm long including the erect lobes, pink to red with green lobes, falling after anthesis. Stamens: antipetalous filaments slightly broader at base; anthers well exserted, 2–2.3 mm long, narrowly oblong to lanceolate, with margins recurved on drying.

Occurs in S.A. in the Mt Lofty Ra. on moist slopes in dry sclerophyll forest and on Kangaroo Is. in sclerophyll forest or mallee. Flowers Nov.–Feb.

S.A.: Mt Bold Reservoir Reserve, *R.J.Chinnock* 8709 (CANB); Onkaparinga R., *R.Schodde* 766 (CANB); 8 km NNE of Mt Taylor, Kangaroo Is., *P.J.Lang* D 8278 (BRI); 7 km S of Parndana, *B.A.Clements* 336 (CANB).

On Kangaroo Is. the leaves tend to be elliptic and scabridulous while on the mainland they are more often narrowly oblong and smooth.

Hybridisation occurs on Kangaroo Is. with *C. reflexa* var. *insularis* at Cape Borda, with *C. aemula* at Kelly Hill, and with *C. pulchella* at Southwest R. In The Grampians of Vic. are found plants that are intermediate in appearance between *C. reflexa* subsp. *speciosa* and *C. decumbens*; although these plants are here recognised as a distinct taxon, *C. reflexa* subsp. *angustifolia*, the morphology of their leaves and flowers suggests that *C. decumbens* was once found in this area.



The terminal internode of a branchlet is sometimes very short thus producing the appearance of a 4-leaved node.

9. *Correa reflexa* (Labill.) Vent., *Jard. Malmaison*. 1: sub t. 13 (1803)

Mazeutoxeron reflexum Labill., *Voy. Rech. Perouse* 2: 66 (1800); *Correa virens* Sm., *Exot. Bot.* 2: 25, t. 72 (Feb. 1806), *nom. illeg.*, based on preceding; *C. viridiflora* Andrews, *Bot. Repos.* 7: t. 436 (Dec. 1806), *nom. illeg.*, based on *C. virens*; *Antommarchia virens* M.Colla, *Mem. Reale Accad. Sci. Torino* ser. 2, 5: 483 (1843), *nom. illeg.*; *C. speciosa* var. *virens* Hook.f., *Fl. Tasman.* 1: 62 (1855), *nom. illeg.*, includes type of *C. reflexa*. T: "La baie de l'Aventure" [Adventure Bay, Tas.], Feb. 1793, J.J.H. de Labillardière; *n.v.*

?*C. revoluta* Vent., *Jard. Malmaison* sub t. 13 (1803). T: "Specimena Dom. Cavanilles datum"; *n.v.*

Erect or spreading shrub to 2 m high. Branchlets rusty-flocculose. Leaves subsessile to distinctly petiolate; lamina narrowly oblong to cordate, 1–5 cm long, entire to crenulate-dentate, rounded to obtuse, chartaceous to coriaceous, scabridulous adaxially, variously coarsely stellate-hairy abaxially. Flowers 1–3 (–5), terminal to short branchlets or axillary on slender peduncles; terminal leaf-pair sometimes appearing as reflexed foliaceous bracts; pedicels 2–4 mm long; bracteoles basal, linear, 3–11 mm long, usually persistent. Calyx hemispherical to cup-shaped, 3–6 mm long, truncate to dentate or with 4 prominent triangular lobes, or shortly 8-lobed, glabrous adaxially, densely tomentose abaxially. Corolla cylindrical to trumpet-shaped, 1.5–4 cm long, cream or yellow or green or red with green lobes, squamulose, falling after anthesis. Stamens enclosed to well-exserted; antipetalous filaments broadened at base; anthers mostly narrowly oblong, c. 3 mm long, with margins not recurved.

A very variable species. Seven varieties are recognised but these cannot easily be delineated as each grades into one or more of the other varieties and each hybridises with those *Correa* species with which it comes in contact.

- 1 Corolla green to yellow
- 2 Calyx with 4 deep triangular lobes 9b. var. *lobata*
- 2: Calyx truncate, undulate, or dentate
- 3 Flowers drooping, clasped between 2 reflexed foliaceous bracts 9a. var. *reflexa*
- 3: Flowers erect to drooping, not obviously clasped by foliaceous bracts
- 4 Calyx fawn-tomentose; anthers prominently exserted 9f. var. *insularis*
- 4: Calyx rusty-tomentose; anthers not or scarcely exserted 9g. var. *nummulariifolia*
- 1: Corolla red or orange with green or pale lobes
- 5 Leaves narrowly oblong; calyx 8-lobed (4 lobes linear and 4 broadly triangular) 9e. var. *angustifolia*
- 5: Leaves narrowly to broadly ovate or cordate; calyx truncate or 4-dentate
- 6 Flowers drooping, usually clasped between 2 reflexed foliaceous bracts 9a. var. *reflexa*
- 6: Flowers erect to drooping, not clasped between reflexed foliaceous bracts
- 7 Corolla broadly cylindrical or slightly inflated (N.S.W.; SE & central Vic.) 9c. var. *speciosa*
- 7: Corolla trumpet-shaped (S.A.; western Vic.) 9d. var. *scabridula*

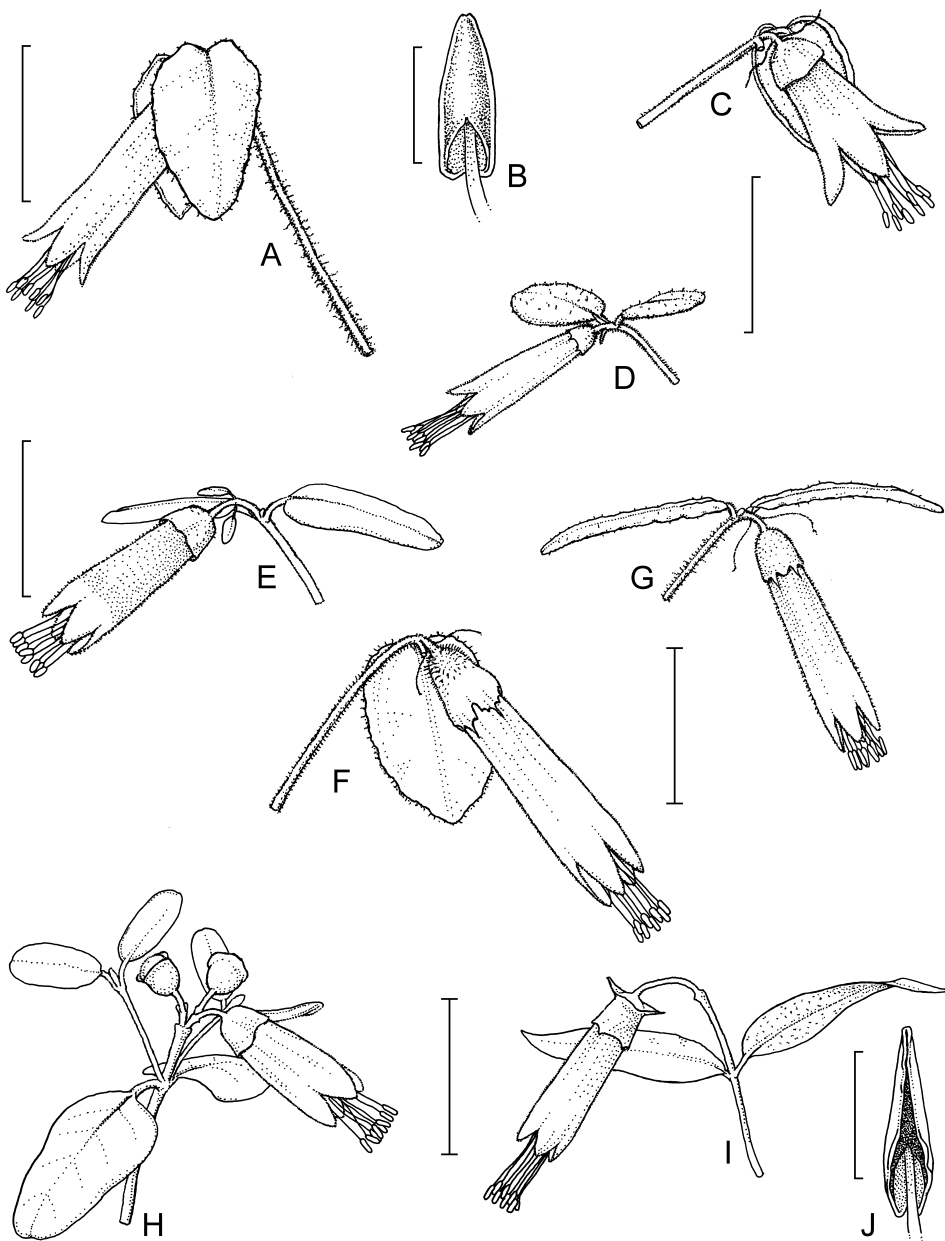


Figure 57. *Correa*. **A, B**, *C. reflexa* var. *reflexa*. **A**, flowering branchlet; **B**, anther, abaxial view (**A, B**, A.Moscal 8149, HO). **C**, *C. reflexa* var. *insularis*, flowering branchlet (M.Hart 1, AD). **D**, *C. reflexa* var. *scabridula*, flowering branchlet (D.J.E.Whibley 9759, AD). **E**, *C. reflexa* var. *speciosa*, flowering branchlet (F.E.Davies 622, PERTH). **F**, *C. reflexa* var. *lobata*, flowering branchlet (voucher not recorded). **G**, *C. reflexa* var. *angustifolia*, flowering branchlet (A.C.Beaglehole 24909, PERTH). **H**, *C. backhouseana* var. *backhouseana*, flowering branchlet (A.Moscal 5610, AD). **I, J**, *C. baeuerlenii*. **I**, flowering branchlet; **J**, anther, abaxial view (I.R.Telford 2876, CANB). Scales bars: **A, C–I** = 20 mm; **B, J** = 2 mm. Drawn by A.Menadue.

9a. *Correa reflexa* (Labill.) Vent. var. *reflexa*

C. virens Hook., *J. Bot. (Hooker)* 1: 253 (1834), *nom. illeg. non* Sm. (1806). T: Tas., *R. Gunn* 152; syn: K; Tas., 1831, *R. Lawrence*; syn: K. [Evidently described in error, see W.J.Hooker, *Companion Bot. Mag.* 1: 276 (1836)]

C. cordifolia Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 231 (1838). T: Near junction of Crawford R. and Glenelg R. [Vic.], 24 Aug. 1836, *T.L.Mitchell* 295; holo: CGE, iso: MEL.

C. rubra var. *virens* A.E.Jarman, *Austral. Pl. Drawings* t. 35 & 36 (1927). T: not cited, if based on *C. virens* Sm. then illegitimate.

Shrub to 2 m high. Branchlets loosely rusty-flocculose. Leaves thin, very shortly petiolate, broadly ovate, 1.5–5 cm long, cordate or rounded at base, obtuse, sparsely stellate-hairy or scabridulous adaxially, fawn-tomentose to sparsely stellate-hairy with moderately large hairs abaxially. Flowers 1–3 (–5), usually nodding; peduncle axillary, often slender, terminating in a pair of foliaceous bracts that are frequently reflexed and clasp the flowers. Calyx hemispherical, truncate to undulate or shortly 4-lobed or 4-dentate, fawn- to rusty-tomentose. Corolla narrowly cylindrical (or narrowly obconical), 2.5–3 cm long, predominantly green or yellow (sometimes dull red with green lobes). Anthers shortly exserted, narrowly oblong and obtuse to narrowly triangular and acuminate. Fig. 57A, B.

Found in the mountains of SE Qld., eastern N.S.W., and eastern Vic., and in the coastal and near-coastal areas of southern N.S.W., Vic., southern S.A., and eastern Tas. Often growing in damp gullies and rainforest. Flowers Apr.–Sept.

S.A.: W bank of Glenelg R., *D.N.Kraehenbuehl* 956 MEL). Qld: Mt Huntley, *P.I.Forster* 15759 (BRI). N.S.W.: Bents Basin, Blue Mtns, *J.Pulley* 917 (CANB). Vic.: Drummer State Forest, *T.J.Christensen* 319 (MEL). Tas.: North Bruny Is., *J.D.Briggs* 1502 (HO).

A variable taxon. On the NE coast of Tas. is found a form with small leaves rounded at base and almost glabrous abaxially which appears to grade to the N and S into typical var. *reflexa*. In East Gippsland, the Snowy Mtns and in the Southern Tablelands of N.S.W. the flowers are sometimes dull red and green and are broader than is usual in var. *reflexa*. On the N coast of Tas. is found a form with red and green flowers that otherwise differs little from the more widespread green-flowered plant.

In far SW Vic. is found a variant with green flowers and with thin, sessile, cordate and dentate leaves that are sparsely pubescent beneath. It was on this variant that the name *C. cordifolia* was based. It intergrades with both var. *speciosa* and *C. alba* var. *pannosa*. The variant found in far SE S.A. is a red-flowered plant that is intermediate in morphology between var. *scabridula* and the SW Vic. variant of var. *reflexa*.

On the E side of Port Phillip Bay and near Port Campbell are found plants that appear to be derived from an introgression between var. *reflexa* and *C. alba* var. *alba*.

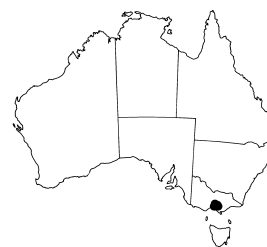
**9b. *Correa reflexa* var. *lobata* Paul G.Wilson, *Nuytsia* 12: 100 (1998)**

T: headwaters of Bunyip R., 10 km NE of Gembrook, Vic., 27 June 1959, *T.B.Muir* 774; holo: MEL.

Shrub to 2 m. Leaves ovate, mostly 2–4.5 cm long, rounded or subcordate at base, crenulate, papery, scabridulous adaxially, moderately fawn stellate-hairy abaxially. Flowers on slender axillary peduncle; terminal leaves clasping a cluster of flower buds. Calyx obconical, to 16 mm long, sparsely stellate-hairy abaxially; upper 1/2 divided into 4 triangular acuminate lobes. Corolla narrowly cylindrical, to 3.5 cm long, entirely yellow green. Fig. 57F.

Found in the Dandenong and Powelltown area of Vic.; growing in eucalypt forest and heathland in hilly terrain. Flowers principally autumn to spring.

Vic.: Gembrook, 16 Aug. 1917, *E.H.Ising* (AD); S of Avonsleigh, Dandenong Ra., *M.G.Corrick* 5040 (MEL); 3 km W of Powelltown, *D.Foreman* 1037 (CANB); Cranbourne, *J.H.Ross* 2594 (MEL).



This variety is similar to var. *reflexa*, into which it grades, but differs in having a deeply lobed calyx.

9c. *Correa reflexa* var. *speciosa* (Andrews) Paul G. Wilson, *Nuytsia* 12: 101 (1998)

C. speciosa Donn ex Andrews, *Bot. Repos.* 10: t. 653 (1812); *Antommarchia rubra* Colla ex C. Presl, *Repert. Bot. Syst.* 1: 185 (1834), *nom. illeg.* based on preceding; *C. speciosa* var. *speciosa*, cf. Hook.f., *Fl. Tasman.* 1: 62 (1855); *Antommarchia speciosa* (Andrews) B.D.Jacks., *Index Kew.* 1: 157 (1895) *pro syn.*, *nom. inval.* T: "native of New Holland"; holo: illustration in H.C.Andrews, *loc. cit.*

C. cardinalis F.Muell. ex Hook., *Bot. Mag.* 82: t. 4912 (1856); *C. speciosa* var. *cardinalis* (F.Muell. ex Hook.) J.Stirling, *Proc. Linn. Soc. New South Wales* 11: 1058 (1887); *C. speciosa* f. *cardinalis* (F.Muell. ex Hook.) Siebert & Voss, *Vilm. Blumengärtn.* ed. 3, 1: 170 (1896); *C. reflexa* var. *cardinalis* (F.Muell. ex Hook.) Court, *Victorian Naturalist* 73: 175 (1957). T: illustration in W.J.Hooker, *loc. cit.*

Spreading shrub to 1 m high. Leaves narrowly ovate to ovate, mostly 1–2 cm long, obtuse, rounded or slightly cordate at base, often recurved, somewhat coriaceous, sparsely stellate-hairy and scabrid adaxially, sparsely to densely fawn-tomentose abaxially. Flowers solitary, terminal to branchlets, erect to drooping; subtending leaves not modified and not addressed. Calyx hemispherical, 3–4 mm high, ±truncate, scarcely dentate, rusty-tomentose with compact stellate hairs. Corolla broadly cylindrical or slightly inflated, 2.5–4 cm long, red with greenish lobes. Anthers slightly exserted, obtuse to rounded. Fig. 57E.

Coastal N.S.W., S of Port Stephen, and SE and central Vic.; growing on coastal dunes, sand, or on sandstone in dry sclerophyll wood-land. Flowers autumn to spring.

N.S.W.: Port Stephens, 1 Sept. 1941, *C.Davies* (NSW); La Perouse, *R.Coveny 11208* (CANB). Vic.: Wilsons Promontory, *E.Chesterfield 2488* (CANB); 7 km E of Marlo, *S.Forbes 2841* (MEL).

Near Ulladulla, N.S.W., is found a variant with a pale yellow corolla which appears to grade into the common red variant and which is possibly the result of an intergradation between var. *speciosa* and the green-flowered var. *reflexa* that is found further inland.

Near Sydney plants that appear to be intermediate between var. *reflexa* and var. *speciosa* have been collected.

Hybrids with *C. alba* var. *alba* are found in coastal areas.

This variety grades westwards into var. *scabridula*.



9d. *Correa reflexa* var. *scabridula* Paul G. Wilson, *Nuytsia* 12: 101 (1998)

T: Coorong Rd near Salt Ck, c. 60 km SSE of Meningie, S.A., 4 May 1958, *D.J.E.Whitley 193*; holo: AD.

Erect or spreading shrub to 0.5 m high. Leaves: petiole 2–3 mm long; lamina ovate, c. 1.5 cm long, rounded to slightly cordate at base, somewhat recurved and irregularly undulate on margin, coriaceous, scabridulous adaxially, moderately rusty stellate-hairy abaxially. Flowers erect to drooping, not clasped between reflexed foliaceous bracts. Calyx hemispherical, truncate or 4-dentate, loosely to densely rusty-stellate-tomentose. Corolla trumpet-shaped, 1.5–2 (–3) cm long, red to orange with paler lobes. Anthers shortly exserted, narrowly oblong, rounded at apex. Fig. 57D.

Found in the Mt Lofty Ra. in S.A. to western Vic.; generally growing as an understorey in mallee heathland. Flowers autumn to spring.

S.A.: 4 km NE of MacLaren Flat, *A.W.Bell 200* (AD); 3 km NW of Coomandook, *M.C.R.Sharrad 958* (AD); Mt Boothby Conservation Park, *E.N.S.Jackson 5699* (AD). Vic.: Little Desert, *M.G.Corrick 6281* (MEL).

In S.A. this variety hybridises with *C. glabra* var. *turnbullii* while in The Grampians it hybridises with *C. reflexa* var. *angustifolia*. In Victoria it grades eastwards into var. *speciosa* and collections from the intermediate zone cannot be precisely determined. In far SW Vic. it forms introgressive populations involving both var. *reflexa* and *C. alba*.



9e. *Correa reflexa* var. *angustifolia* Paul G. Wilson, *Nuytsia* 12: 102 (1998)

T: Victoria Ra., The Grampians, Vic., 23 Feb. 1957, *M.M. & P.E. Finck & A.C. Beauglehole ACB4038*; holo: MEL, iso: MEL.

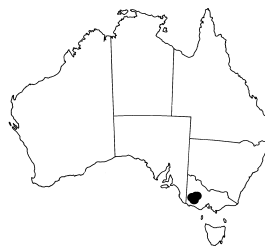
Shrub to 1 m high. Leaves narrowly oblong, 1.5–3 cm long, obtuse, somewhat recurved, scabrid adaxially, densely rusty-flocculose abaxially. Calyx hemispherical or bell-shaped, shortly 8-lobed (sepaline lobes linear to 1.5 mm long, intersepaline lobes triangular to 1 mm long), c. 5 mm high to base of lobes, with dense rusty tomentum, sometimes slightly folded towards margin. Corolla cylindrical, 3–4 cm long, red with pale green lobes. Anthers obtuse. Fig. 57F.

Found principally in the Victoria Ra. and the Mt William Ra. in The Grampians, Vic.; often growing on sandstone slopes in stringy bark (*Eucalyptus viminalis*) woodland. Flowers autumn to spring.

Vic.: Redmans Gap, The Grampians, *D.E. Albrecht 3167* (MEL); Barneys Ck., Mt William Ra., 30 Sept. 1959, *J.H. Willis* (MEL); Silverband Rd, The Grampians, 23 Mar. 1961, *M.E. Phillips* (CANB); Cultivation Ck, Victoria Ra., *H. Streimann 2960* (PERTH).

This variety may be recognised by its narrow leaves which are recurved on their margins and densely flocculose abaxially, its 8-lobed calyces, and its large red corollas. Although treated here as a variety of *C. reflexa* it has the appearance of being a hybrid between *C. decumbens* and a red-flowered variety of *C. reflexa*, however, *C. decumbens* is not known to occur in Vic.

This variety intergrades with *C. reflexa* var. *speciosa*. Hybridisation also occurs wherever *C. reflexa* var. *angustifolia* and *C. aemula* grow next to each other.

**9f. *Correa reflexa* var. *insularis*** Paul G. Wilson, *Nuytsia* 12: 103 (1998)

T: Section 36, Hundred of Haines, Kangaroo Is., S.A., 23 May 1989, *P.J. Lang 8544*; holo: AD.

Erect shrub to 2 m high. Leaves: petiole c. 4 mm long; lamina broadly ovate to circular, mostly 1.5–2 cm long, rounded at base, flat, obtuse, minutely stellate-scabridulous adaxially, tomentose with obvious stellate hairs abaxially. Flowers terminal to branches, not surrounded by obvious leafy bracts, erect to drooping. Calyx thin, cup-shaped, 3–4 mm long, truncate and shortly 4-dentate, fawn-tomentose. Corolla narrowly cylindrical, c. 2 cm long, yellowish green, moderately rusty-stellate-hairy towards apex but sparsely so towards base. Anthers well-exserted, narrowly oblong and narrowed towards obtuse apex. Fig. 57C.

Endemic to Kangaroo Is., S.A., mainly in the eastern half; found on a variety of soils including ironstone and sand. Flowers autumn to spring.

S.A.: Kangaroo Is., 1 km N of Flour Cask Bay, 20 June 1986, *D.N. Kraehenbuehl* (CANB); Dudley Conservation Park, *G. Jackson 2004* (AD); Nepean Esplanade, *M. Hart 1* (CANB).

This variety hybridises with *C. decumbens* and with *C. backhouseana* var. *orbicularis*.

Similar to *C. reflexa* var. *nummulariifolia* from the Bass Strait in which variety the anthers are enclosed or just exserted and the calyx hemispherical and densely rusty-tomentose.

**9g. *Correa reflexa* var. *nummulariifolia*** (Hook.f.) Paul G. Wilson, *Trans. Roy. Soc. S. Australia* 85: 30 (1961)

C. speciosa var. *nummulariifolia* Hook.f., *Fl. Tasman.* 1: 62 (1855), as *nummulariaefolia*. T: Flinders Is., Bass Str., Tas., 26 Mar. 1844, *J. Milligan per C. Gunn 1945b*, lecto: K; isolecto: CANB, MEL, *fide* P.G. Wilson, *Nuytsia* 12: 104 (1998).

Low shrub. Leaves very shortly petiolate, ovate to circular, mostly 1–2 cm long, rounded at base, scabridulous and sparsely stellate-hairy adaxially, tomentose with obvious stellate hairs

abaxially. Flowers 1–3, terminal to branchlets, erect to drooping; terminal pair of leaves not differentiated. Calyx hemispherical, \pm truncate, densely rusty-tomentose. Corolla cylindrical or slightly expanded above, c. 2 cm long, greenish yellow. Anthers enclosed or just exserted, oblong, rounded at apex.

Found in the islands of the Furneaux Group, Bass Strait, Tas.; on mountains and coasts. Flowers autumn to spring.

Tas.: Cape Barren Is., *J.S.Whinray* 437 (HO); Clarke Is., *J.S.Whinray* 2379 (MEL); Babel Is., *J.S.Whinray* 1753 (MEL).

This taxon, although here treated as a variety, appears to be a member of an intergrade involving *C. backhouseana*, *C. alba* and *C. reflexa* var. *reflexa*, and therefore few collections precisely match the type. A similar plant is found on the E coast of Tas. where a hybrid origin is apparent.



10. *Correa lawrenceana* Hook., *J. Bot. (Hooker)* 1: 254 (1834), as *Lawrenciana*

T: Tas., *R.W.Lawrence* 151; syn: K; Tas., *R.Gunn* 153; syn: K.

Shrub (or tree to 16 m high). Branchlets rusty-tomentose to -floculose. Leaves distinctly petiolate; lamina ovate to elliptic, 2–8 cm long, entire, rounded to acute, smooth and glabrous adaxially, tomentose abaxially (sometimes glabrous in var. *lawrenceana*). Flowers 1–3 (–7), pendulous, axillary or terminal; peduncle thick or slender, 0.5–5 cm long, with terminal bracts small and caducous; pedicels 5–10 mm long, with bracteoles filiform and usually caducous. Calyx shallowly hemispherical to deeply cup-shaped, thin, \pm glabrous to densely ferruginous-tomentose. Corolla cylindrical, 1.2–5 cm long, greenish yellow to red; lobes short, incurved or erect. Stamens exserted; filaments narrowly linear throughout; anthers narrowly cuneate, 2–3 mm long, with margins prominently reflexed after dehiscence and obscuring the narrow connective.

Found in far SE Qld, eastern N.S.W., Vic. and Tas.; typically a montane species. Eight varieties are recognised but these grade into each other and thus their delineation is imprecise.

Natural hybrids with other *Correa* species have not been noted.

- | | | |
|----|--|--------------------------------------|
| 1 | Leaves narrowly elliptic to elliptic or oblong-elliptic | |
| 2 | Leaves narrowly oblong-elliptic, rarely elliptic, 2–4 cm long, glabrous to thinly rusty tomentose abaxially; corolla pale green | 10a. var. <i>lawrenceana</i> |
| 2: | Leaves narrowly elliptic, 4–6 cm long, densely fawn to rusty-tomentose abaxially; corolla pink to dull red or with green lobes | 10c. var. <i>rosea</i> |
| 1: | Leaves elliptic or broadly elliptic to ovate-lanceolate, or broadly cordate, mostly cream- to rusty-tomentose abaxially; corolla cream to green or red | |
| 3 | Calyx \pm glabrous, green, 9–12 mm long including the lanceolate acuminate lobes 3–4 mm long | 10h. var. <i>genoensis</i> |
| 3: | Calyx (sparsely to moderately stellate-hairy to) densely fawn- or rusty-tomentose; margin truncate to shortly undulate-lobed or with linear lobes | |
| 4 | Leaves elliptic to ovate or broadly ovate to cordate, rounded at base | |
| 5 | Calyx cup-shaped, 4–5 mm long, undulate or dentate on margin; bracteoles at base of pedicel | 10f. var. <i>cordifolia</i> |
| 5: | Calyx deeply cup-shaped, 5–10 mm long; bracteoles subtending calyx | 10g. var. <i>macrocalyx</i> |
| 4: | Leaves elliptic or broadly elliptic, ovate or broadly ovate, cuneate or rounded at base | |
| 6 | Calyx shallowly hemispherical, c. 2 mm high, sparsely to moderately stellate-hairy; corolla pale greenish yellow | 10e. var. <i>glandulifera</i> |
| 6: | Calyx hemispherical to cup-shaped, densely tomentose; corolla green to cream, yellow-brown or red | |

- 7 Leaves coriaceous, to 4 cm long, velvety abaxially; corolla broadly cylindrical, cream-velvety to yellow-brown

10d. var. *grampiana*

- 7: Leaves papery, to 9 cm long, tomentose abaxially; corolla cylindrical, yellowish green (rarely reddish)

10b. var. *latrobeana*

10a. *Correa lawrenceana* Hook. var. *lawrenceana*

C. ferruginea Backh. in J.C.Ross, *Hobart Town Alm. and Van Diemen Land Ann.* 80 (1835). T: Mt Wellington, Tas., J.Backhouse; n.v.

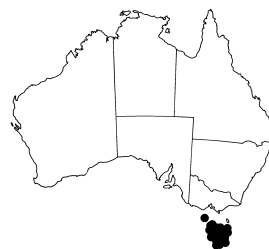
C. ferruginea Gunn ex Hook., *Companion Bot. Mag.* 1: 276 (1836), *nom. illeg. non* Backh.; *C. lawrenceana* var. *ferruginea* Hook.f., *Fl. Tasman.* 1: 62 (1855). T: Hobart Town, Tas., R.Gunn 557 (=457); holo: K.

C. lawrenceana var. *glabra* Hook.f., *Fl. Tasman.* 1: 62 (1855), *nom. illeg.*, includes type of *C. lawrenceana*.

Shrub to 4 m high. Leaves narrowly oblong-elliptic, rarely elliptic, 2–4 cm long, papery, glabrous or minutely ferruginous-pubescent abaxially. Flowers solitary, terminal; peduncle and pedicel together c. 5 mm long. Calyx very shortly cup-shaped, c. 3 mm high and 4 mm wide, undulate on margin, rusty-tomentose. Corolla narrowly cylindrical, 1.5–2 cm long, pale green, pubescent. Fig. 58A, B.

Found in Tas., including King Is., Bass Strait; principally in montane forest. Flowers in spring.

Tas.: Dismal Ra., *A.M.Buchanan 12418* (HO); Harford, *H.S.Hamilton 135* (CANB); Dazzler Ra., *F.E.Davies 1071* (CANB).



10b. *Correa lawrenceana* var. *latrobeana* (F.Muell. ex Hannaford) Paul G.Wilson, *Nuytsia* 12: 97 (1998)

C. latrobeana F.Muell. ex Hannaford, *Jottings in Australia* 40 (1856). T: Delatite R., Vic., 20 Mar. 1853, F.Mueller; lecto: MEL, *fide* P.G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 44 (1961).

Illustrations: N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 176, fig. 32a (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 291, fig. 4c (2002).

Shrub or small tree to 3 (–16) m high. Leaves elliptic to ovate, 3–6 (–9) cm long, cuneate to rounded at base, obtuse at apex, papery, ±glabrous adaxially, softly tomentose abaxially. Flowers 1–3, axillary or terminal to branchlets; peduncle to 5 mm long, with terminal bracts minute and caducous; pedicels 3–5 mm long; bracteoles basal, from minute and ±glabrous to 15 mm long and flocculose. Calyx cup-shaped, 4–7 mm high, undulate on margin or with linear lobes to 3 mm long, rusty-tomentose. Corolla cylindrical, 2.5–3 cm long, greenish yellow or reddish mauve. Fig. 58C.

Occurs in eastern Vic. and south-eastern N.S.W.; growing in open eucalypt forest. Flowers in spring.

N.S.W.: Upper Wadbilliga R., 13 Apr. 1961, *C.R.Dunlop* (CANB). Vic.: The Big Lift S of Bentleys Plains, 23 Feb. 1971, *A.C.Beaglehole 37006* (MEL); Mt Buck, *N.A.Wakefield 3548* (MEL).

This variety is circumscribed so as to encompass several intergrading variants, it is therefore to be recognised more by the absence of those features that characterise the other varieties than in the possession of any distinguishing attribute of its own. A variant found in the Otway Ra., Vic., is stated to form a tree 6 (–16) m high, another from the mountains of E Gippsland is a 2 m high shrub with red flowers and large densely flocculose calyces that have prominent linear lobes.



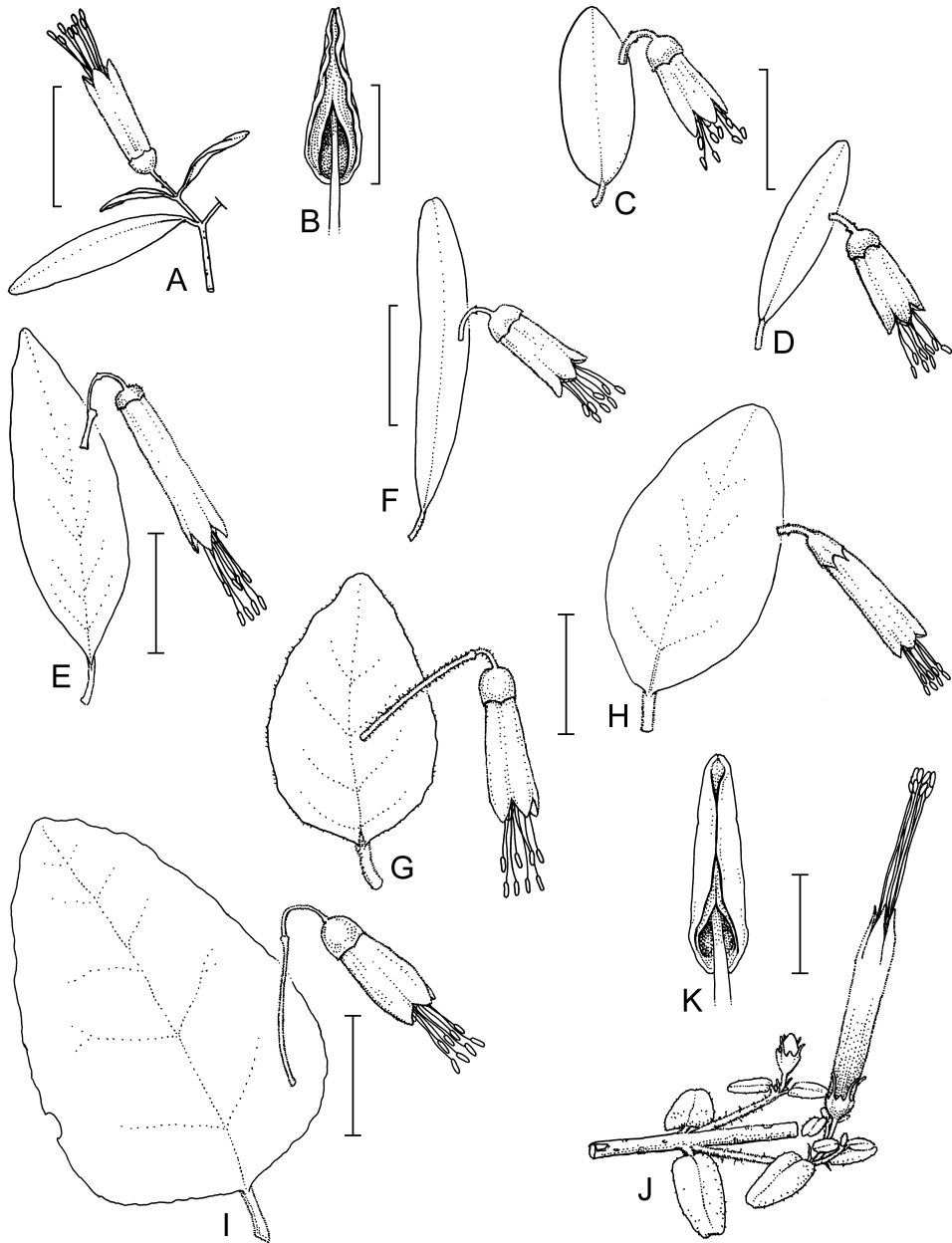


Figure 58. *Correa*. **A, B, C. *lawrenceana* var. *lawrenceana*. **A**, flowering branchlet; **B**, anther, abaxial view (**A, B**, A.M.Buchanan 12418, HO). **C**, *C. lawrenceana* var. *grampiana*, leaf & flower (D.E.Albrecht 2774, PERTH). **D**, *C. lawrenceana* var. *latrobeana*, leaf & flower (N.T.Burbidge 6343, PERTH). **E**, *C. lawrenceana* var. *glandulifera*, leaf & flower (A.R.Bean 7710, BRI). **F**, *C. lawrenceana* var. *rosea*, leaf & flower (J.I.Raine ANU10372, PERTH). **G**, *C. lawrenceana* var. *cordifolia*, leaf & flower (R.O.Makinson 848, PERTH). **H**, *C. lawrenceana* var. *genoensis*, leaf & flower (E.J.Carroll 88, PERTH). **I**, *C. lawrenceana* var. *macrocalyx*, leaf & flower (W.F.Blakeley 28 Aug. 1926, PERTH). **J, K**, *C. decumbens*. **J**, flowering branchlet; **K**, anther, abaxial view (**J, K**, H.J.Eichler 15503, AD). Scales bars: **A, C–I** = 20 mm; **B, K** = 1 mm; **J** = 10 mm. Drawn by A.Menadue.**

10c. *Correa lawrenceana* var. *rosea* Paul G. Wilson, *Trans. Roy. Soc. S. Australia* 85: 48 (1961)

T: Geehi R., Alpine Way, N.S.W., 10 Apr. 1958, *J. Vickery*; holo: NSW.

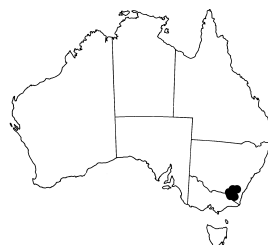
Illustration: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 291, fig. 4d (2002).

Spreading shrub to 3 m high. Leaves narrowly elliptic, to 6 cm long, acute to obtuse, glabrous adaxially, densely fawn to rusty-tomentose abaxially. Flowers usually solitary, terminal to branchlets or on short axillary peduncle; bracteoles minute, slender, caducous; pedicel 4–10 mm long, slender. Calyx hemispherical to shortly cup-shaped, 3–5 mm high, undulate on margin or very shortly dentate, rusty-tomentose. Corolla narrowly cylindrical, 1.2–2 cm long, pink to dull red or with green lobes; stellate hairs small and compact. Fig. 58F.

Occurs in the Snowy Mtns of N.S.W.; found in wet sclerophyll forest. Flowers principally in spring.

N.S.W.: Crackenback R., *J. Armstrong* 131 (NSW); Geehi Reservoir Substation, *P.N. Martens* 471 (NSW); Guthega, *A.M. Ashby* 1744 (AD).

This variety grades into the alpine element of var. *latrobeana*. It may be distinguished by its narrowly elliptic leaves, narrow red flowers, slender peduncles, and slender pedicels that have minute caducous bracteoles.



10d. *Correa lawrenceana* var. *grampiana* Paul G. Wilson, *Nuytsia* 12: 98 (1998)

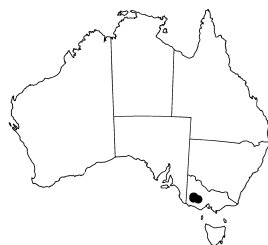
T: Saddle c. 0.8 km SSE of summit of Mt William, Vic., 8 Sept. 1986, *D.E. Albrecht* 2774; holo: MEL.

Illustration: N.G. Walsh & T.J. Entwisle (eds), *Fl. Victoria* 4: 176, fig. 32b (1999).

Shrub to 2.5 m high. Leaves elliptic or broadly elliptic, mostly 2–4 cm long, cuneate or rounded at base, obtuse at apex, coriaceous, glabrous adaxially, fawn-velvety abaxially. Flowers solitary, axillary; peduncle recurved, 2–5 mm long; bracteoles medial, c. 2 mm long, caducous, filamentous; pedicel c. 6 mm long. Calyx robust, deeply cup-shaped, 5–7 mm long, rusty-tomentose, prominently undulate or 4-dentate on margin. Corolla broadly cylindrical, 1.5–2.5 cm long, velvety with thick cream to yellow-brown tomentum. Fig. 58C.

Occurs in western Vic. in The Grampians and on Mt Langi Ghiran, c. 16 km E of Ararat; a montane plant growing among rocks. Flowers in spring.

Vic.: Mt Rosea, The Grampians, 13 Sept. 1961, *M.E. Phillips* (CANB); Mt William, The Grampians, *B.G. Briggs* 2889 (NSW); Major Mitchell Plateau, The Grampians, 8 Dec. 1962, *J.H. Willis* (MEL); Mt Langi Ghiran, c. 16 km E of Ararat, 14 Apr. 1970, *A.E. Millar* (MEL).



10e. *Correa lawrenceana* var. *glandulifera* Paul G. Wilson, *Trans. Roy. Soc. S. Australia* 85: 49 (1961)

T: Springbrook, Qld, 21 Sept. 1929, *C.T. White* 6274; holo: BRI.

Illustration: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 291, fig. 4e (2002).

Shrub to 3 m or tree to 12 m high. Leaves ovate to lanceolate, c. 4–8 cm long, narrowly cuneate at base, acute, ±glabrous adaxially, closely tomentose abaxially with minute stellate hairs. Flowers 1–5, principally terminal to short branchlets; peduncle c. 4 mm long, with caducous filamentous, terminal bracteoles to 3 mm long; pedicels 4–10 mm long. Calyx shallowly hemispherical, c. 2 mm high, undulate on margin, sparsely to moderately stellate-hairy. Corolla narrowly cylindrical, c. 2.5 cm long, pale greenish yellow. Fig. 58E.



Occurs in the mountains near the N coast of N.S.W. and in the Macpherson Ra. of far SE Qld; growing on the margin of rain forest. Flowers principally in spring.

Qld: Springbrook, *S.T.Blake 15895* (BRI). N.S.W.: Nightcap Ra., *P.Beesley 1102* (BRI); Gibraltar Range Natl Park, 13 July 1973, *R.Paine* (NSW); Mt Moonbill, *L.J.Webb & J.C.Tracey 13739* (BRI, CANB).

This variety may be distinguished by its leaf shape and by its shallowly hemispherical sparsely stellate-hairy calyx.

10f. *Correa lawrenceana* var. *cordifolia* Paul G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 47 (1961)

T: Mt Dromedary, N.S.W., 12 Sept. 1953, *E.F.Constable*; holo: NSW.

Shrub c. 2 m high. Leaves broadly ovate or subcordate, to 7 cm long, rounded at base, acute, papery, glabrous adaxially, thinly felty abaxially with fawn indumentum. Flowers 1–3, axillary; peduncle slender, 1–5 cm long; bracteoles basal, minute, filiform, caducous; pedicels c. 10 mm long. Calyx cup-shaped, c. 5 mm long, dentate or slightly undulate, rusty-tomentose. Corolla cylindrical, 2.5–3 cm long, pink with yellowish tip or sometimes entirely yellowish. Fig. 58G.

Found near the S coast of N.S.W. inland to near Braidwood and S to the far E of Vic.; often growing along creeks in rainforest.

N.S.W.: Currowan State Forest, *R.Pullen 4882* (CANB); 13 km W of Brooman, *L.G.Adams 3239* (CANB); Tomerong Ck, Tomerong, 11 June 1989, *R.Muston* (NSW). Vic.: Drummer State Forest, *T.J.Christensen 314* (MEL).

This variety evidently grades northwards into var. *macrocalyx*.



10g. *Correa lawrenceana* var. *macrocalyx* (Blakely) Paul G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 48 (1961)

C. macrocalyx Blakely, *Proc. Linn. Soc. New South Wales* 54: 681 (1929). T: Patonga Ck, N.S.W., Oct. 1923, *D.W.G.Shiress & W.F.Blakely*; holo: NSW.

Shrub 1–4 m high. Leaves ovate to broadly ovate, 4–8 cm long, rounded at base, obtuse, chartaceous, ±glabrous adaxially, loosely flocculose abaxially. Flowers axillary or terminal to short branchlets; peduncle slender, 1–3 cm long, with terminal bracts caducous; pedicels 5–10 mm long; bracteoles terminal, minute, filiform, caducous. Calyx deeply cup-shaped, 5–10 mm long, slightly undulate on margin, thin, sparsely to densely rusty-tomentose. Corolla cylindrical, 2–3 cm long, greenish yellow. Fig. 58 I.

Found from Taree to Nowra in eastern N.S.W.; usually on the margin of montane rainforest. Flowers principally in spring.

N.S.W.: 8 km W of Cooperook, 17 Sept. 1962, *C. & J.P.Burgess* (CANB); 16 km S of Kendall, 9 Sept. 1967, *R.G.Coveny s.n.* (NSW).

This variety is distinctive because of its deeply cup-shaped calyx which is directly subtended by a pair of caducous bracteoles.



10h. *Correa lawrenceana* var. *genoensis* Paul G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 50 (1961)

T: Genoa R., Vic., Sept. 1860, *F.Mueller*; holo: MEL.

Illustration. N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 176, fig. 32d (1999).

Shrub to 2 m high. Leaves ovate, 3–6 cm long, obtuse to rounded at base, obtuse at apex, ±glabrous adaxially, pale fawn-tomentose abaxially. Flowers axillary, mostly solitary; peduncle and pedicel together c. 1 cm long, medially with 2 or 4 filiform bracteoles. Calyx somewhat urceolate, 9–12 mm long including lanceolate-acuminate lobes 3–4 mm long, green, ±glabrous abaxially. Corolla narrowly cylindrical, 1.7–2.5 cm long, yellow-green. Fig. 58H.

Found along the Genoa R. and its tributaries in far south-eastern N.S.W. and far eastern Vic. A riparian plant. Flowers in spring.

N.S.W.: 'Redstone Ck', Nungatta Natl Park, *G.W.Carr* 9821-271 (PERTH).
Vic.: Genoa R., Wangarabell area, *D.E.Albrecht* 4879 (MEL); confluence of Genoa R. with upper lake of Mallacoota Inlet, 3 Mar. 1966, *E.Carroll* (MEL); E bank of Genoa R., 23 Mar. 1992, *A.Pollock* (MEL).

Listed as vulnerable under the EPBC Act, 1999.



11. *Correa baeuerlenii* F.Muell., *Proc. Linn. Soc. New South Wales* 9: 960 (1885), as *Bauerlenii*

T: The Clyde, N.S.W., Sept. 1884, *W.Baeuerlen* 1; lecto: MEL; ?isolecto: BRI, *fide* P.G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 51 (1961).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 292 (2002).

Shrub to 2.5 m high. Leaves shortly petiolate, narrowly ovate to ovate, 3–7 (12) cm long, entire, acuminate, chartaceous, glabrous adaxially, sparsely hairy to ±glabrous abaxially. Flowers mostly solitary and terminal to short branchlets, with terminal leaves or bracts caducous; pedicel c. 10 mm long, ferruginous-tomentose; bracteoles supra-basal, linear, caducous in bud. Calyx broadly cylindrical, c. 7 mm high, undulate and 4-dentate on margin, at base expanded into a horizontal saucer-shaped process c. 10 mm diam., thin, ±glabrous. Corolla cylindrical, 2–3 cm long, greenish yellow, shortly 4-lobed, persistent, abaxially covered with compact stellate hairs. Stamens: filaments slightly broadened at base; anthers prominently exserted, c. 2.4 mm long, with margins reflexed after dehiscence. *Chef's Cap*. Plate 37; Fig. 57H, I.

Occurs in the Clyde R. district of SE N.S.W.; often growing near streams in wet sclerophyll forest. Flowers mostly in spring.

N.S.W.: Mumbulla Mtn, *P.Gilmour* 5006 (MEL); 24 km inland from Batemans Bay, *R.Pullen* 4617 (AD); Deua Natl Park, *D.E.Albrecht* 4593 (MEL).

Listed as vulnerable under the EPBC Act, 1999.



Natural Hybrids

Correa × *rubra* Sm., *Exotic Bot.* 2: 25, 26, sub t. 72 (1806)

Smith provides a brief description and refers to an unpublished plate based on material collected by J.Banks and D.Solander at Botany Bay, N.S.W., 1770, and given the manuscript name *C. rubiginosa* by Solander (= J.Banks & D.Solander, *Illust. Austral. Pl.* t. 34 (1905)). Smith in A.Rees *Cyclop.* 10: (1807) provides a description and refers to dried specimens.

A portion of the collection from which the figure was drawn is in MEL (MEL237594). It appears to be a hybrid between *C. alba* and *C. reflexa* var. *speciosa*; see P.G.Wilson, *Trans. Roy. Soc. S. Australia* 85: 25 (1961).

Excluded Name

Correa grevillei Ettinghausen, *Blatt-Skel. Dikot.* 287 (1861)

This is a fossil plant.

Horticultural Names

Correa ×*bicolor* Paxton, *Paxton's Mag. Bot.* 7: 45 (1840)

Possibly a hybrid between *C. alba* and *C. pulchella*; see Paxton in *Paxton's Mag. Bot.* 9: 267 (1842), “It was generated a few years back among other hybrids, and is most probably the offspring of *C. pulchella* and *C. alba*, as it possesses the hue of the blossoms of both in a combined form”.

Correa ×*cordata* Paxton, *Paxton's Mag. Bot.* 6: 21 (1839)

Garden hybrid of undisclosed parentage.

Correa ×*curiosa* Paxton, *Paxton's Mag. Bot.* 14: 147, pl. fig. 3 (1848)

Garden hybrid of undisclosed parentage.

Correa ×*delicata* Paxton, *Paxton's Mag. Bot.* 12: 78, pl. fig. 3 (1846)

Stated to be a garden hybrid between *C. alba* and *C. rosea*.

Correa ×*densa* Paxton, *Paxton's Mag. Bot.* 7: 45 (1840)

Garden hybrid of undisclosed parentage.

Correa ×*ferruginea* Paxton, *Paxton's Mag. Bot.* 12: 78, pl. fig. 4 (1846), *nom. illeg. non* Backhouse (1835)

Stated to be a garden hybrid between *C. alba* and ‘*G. grevillii*’.

Correa ×*glabra* Seemann & J.A.Schmidt, *Flora* 27: 496 (1844), *nom. illeg. non* Lindl. (1838)

Indicated as being *C. bicolor* hort.

Correa ×*harrisii* Paxton, *Paxton's Mag. Bot.* 7: 79 (1840)

Stated to be a hybrid between *C. pulchella* and *C. speciosa*.

Correa ×*lindleyana* hort., *Fl. Cab.* 8: 56 (1840)

Parentage not indicated.

Correa ×*longiflora* Paxton, *Paxton's Mag. Bot.* 7: 20, 195 (1840)

Garden hybrid of undisclosed parentage.

Correa ×*magnifica* Paxton, *Paxton's Mag. Bot.* 14: 147, pl. fig. 6, 276 (1848)

Garden hybrid of undisclosed parentage.

Correa ×*milneri* hort., *Hort. J. Florists' Reg. & Roy. Lady's Mag.* 4: 1 & tab. (1835)

Garden hybrid, possibly between *C. pulchella* and *C. speciosa*.

Correa ×*pallida* Paxton, *Paxton's Mag. Bot.* 12: 77, 78, pl. fig. 5, 276 (1846)

Stated to be a garden hybrid between *C. alba* and *C. rufa*.

Correa ×*picta* Paxton, *Paxton's Mag. Bot.* 12: 77, 78, pl. fig. 1 (1846)

Stated to be a garden hybrid between *C. speciosa* and *C. virens*.

Correa ×*pulchella* var. *alba-superba* Morren, *Ann. Soc. Roy. Agric. Gand.* 1: 63, t. 8 (1845)

Garden hybrid of undisclosed parentage.

Correa ×*pulchella* var. *ochroleuca* Morren, *Ann. Soc. Roy. Agric. Bot. Gand.* 1: 63, t. 8 (1845)

Garden hybrid of undisclosed parentage.

Correa ×*pulchella* var. *triumphus-milneri* Morren, *Ann. Soc. Roy. Agric. Bot. Gand.* 1: 63, t. 8 (1945)

Garden hybrid of undisclosed parentage.

Correa ×*pumila* Paxton, *Paxton's Mag. Bot.* 7: 45 (1840)

Garden hybrid of undisclosed parentage.

Correa ×*rosea* Paxton, *Paxton's Mag. Bot.* 7: 45 (1840)

Garden hybrid of undisclosed parentage.

Correa ×*rosea-alba* Paxton, *Paxton's Mag. Bot.* 14: 147, pl. fig. 4, 276 (1848), without description, *nom. illeg.*

Garden hybrid of undisclosed parentage.

Correa ×*rosea-major* Paxton, *Paxton's Mag. Bot.* 7: 45 (1840)

Garden hybrid of undisclosed parentage.

Correa ×*rubescens* Paxton, *Paxton's Mag. Bot.* 12: 77, pl. fig. 2, 276 (1846)

Stated to be a garden hybrid between *C. lindleyana* and *C. speciosa*.

Correa ×*rubra* Paxton, *Paxton's Mag. Bot.* 14: 147, 276 (1848), *nom. illeg. non Sm.* (1806)

Garden hybrid of undisclosed parentage.

Correa ×*turgida* Paxton, *Paxton's Mag. Bot.* 7: 45 (1840)

Garden hybrid of undisclosed origin.

ERIOSTEMON

Paul G. Wilson

Eriostemon Sm., *Trans. Linn. Soc. London* 4: 221 (1798); from the Greek *erion* (wool) and *stemon* (stamen), with reference to the woolly stamens.

Crowea sect. *Eriostemon* (Sm.) Baill., *Dict. Bot.* 11: 277 (1886). T: *E. australasius* Pers.

Shrubs or small trees. Branchlets minutely stellate-lepidote or sometimes pilose. Leaves flat, estipulate. Flowers 5-merous, solitary, axillary; pedicel with 5–12 scattered sepaloïd bracteoles. Sepals coriaceous, imbricate. Petals imbricate, stellate-lepidote, multiveined. Stamens pyramidally arranged; filaments free, woolly-ciliate, swollen and verrucose at apex; anthers white-apiculate or blunt. Intrastaminal disc annular. Carpels free. Cocci rostrate or erostrate. Seed sessile, reniform, c. 6 mm long; outer testa ±coriaceous, black, glossy; sclerotesta smooth.

Two species endemic to eastern Australia. The *Eriostemon* species recorded from New Caledonia is generically distinct (*Neoschmidia pallida* T.G.Hartley).

M.J.Bayly *et al.*, Reinstatement of *Eriostemon banksii* (Rutaceae), with a report on the composition of leaf essential oils in *E. banksii* and *E. australasius* s. str., *Austral. Syst. Bot.* 11: 13–22 (1998).

Leaves narrowly oblong to elliptic; petals pink to red

1. *E. australasius*

Leaves ovate to elliptic or broadly elliptic; petals white

2. *E. banksii*

1. *Eriostemon australasius* Pers., *Syn. Pl.* 1: 465 (1805)

E. lanceolatus C.F.Gaertn., *Suppl. Carp.* 154, t. 210 (1807), as *lanceolatum*, nom. illeg., based on above. T: "Hab. in Australasia"; n.v. [possibly described from material received by Persoon from J.E.Smith and collected by J.White near Sydney, N.S.W.]

E. salicifolius Sm. in A.Rees, *Cycl.* 13: no. 1 (1809). T: Near Port Jackson, N.S.W., 1791, J.White; holo: LINN.

Illustrations: K.A.W.Williams, *Native Pl. Queensland* 1: 108 (1979); A.Farley & P.Moore, *Native Pl. Sydney District* pl. 831 (1989).

Shrub c. 1 m high. Branchlets angular, minutely stellate. Leaves thick, narrowly oblong to elliptic or obovate, 30 × 3.5–7 mm, entire, coriaceous, minutely stellate to glabrous. Flowers towards apex of branches; pedicel 4–12 mm long. Sepals deltate-orbicular, c. 2 mm long, densely stellate-lepidote. Petals elliptic, 10–14 mm long, pink to red, silky-stellate. Stamens: filaments narrowly oblong below, terete above, with a large apical verrucose swelling, densely ciliate; anthers ovate, c. 1.8 mm long, white-apiculate. Ovary glabrous; style pilose, ±equal to stamens. Cocci c. 9 mm high, erostrate. *n* = 17, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs on the E coast of SE Qld and N.S.W., from Fraser Is. S to Nowra. Flowers (July–) Aug.–Sept. (–Oct.).

Qld: Rainbow Beach, Cooloola Natl Park, J.H.Ross 3192 (MEL). N.S.W.: Hornsby, G.W.Althofer 96 (MEL); 6 km SE of Forster, J.H.Hemsley 7017 (MEL); Bulladelah, July 1923, H.M.R.Rupp (MEL).



2. *Eriostemon banksii* A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 15 (1837)

E. australasius subsp. *banksii* (A.Cunn. ex Endl.) Paul G.Wilson, *Nuytsia* 1: 24 (1970). T: Endeavour R. [Qld], July 1819, A.Cunningham; iso: CANB, K.

Illustration: M.Bayly *et al.*, *Austral. Syst. Bot.* 11: 15, figs 2–5 (1998).

Shrub or small tree to 6 m high. Branchlets angular, pilose and minutely stellate, rarely densely stellate-lepidote. Leaves thin, ovate to elliptic or broadly elliptic, 30–60 mm long, 7–12 mm wide, narrowly cuneate at base, obtuse, coriaceous, 5-nerved, ±glabrous. Flowers sparse; pedicel 4–8 mm long, thickened upwards, silky-stellate. Sepals very broadly ovate, 1–1.5 mm long, silvery stellate-lepidote, verrucose. Petals elliptic, c. 7 × 3 mm, white, silvery silky-stellate. Stamens: filaments linear-attenuate, densely ciliate; apex swollen, verrucose; anthers c. 0.8 mm long, obtuse (not apiculate). Ovary glabrous or pilose; style pilose. Cocci c. 7 mm high, shortly rostrate. Plate 39.

Occurs on or near the N and E coast of Cape York Penin., N Qld; growing in forest on sand dunes. Flowers (Feb.) Apr.–Sept.

Qld: Cape Flattery, P.Sharpe 1515 (BRI); Olive R., J.G.Tracey 14578 (BRI); Temple Bay, J.R.Clarkson 2165 (BRI); L. Wicheura, B.A.Barlow & K.R.Thiele 3882 (CANB).



11. CROWEA

Paul G. Wilson

Crowea Sm., *Trans. Linn. Soc. London* 4: 222 (1798), named in honour of James Crowe of Lakenham, near Norwich, England (1751–1807).

Eriostemon sect. *Crowea* (Sm.) F.Muell., *Pl. Victoria* 1: 119 (1862); *Crowea* [sect.] *Eucrowea* Baill., *Hist. Pl.* 4: 464 (1873), *nom. illeg.* T: *C. saligna* Andr.

Woody perennials; branchlets angular due to decurrent leaf-bases. Leaves alternate, simple, ±flat, chartaceous, glabrous. Flowers solitary, axillary or terminal to short branches; bracteoles several towards base of pedicel. Sepals 5, free, imbricate, suborbicular, coriaceous. Petals 5, free, imbricate, multiveined, glabrous, persistent. Stamens 10, free, pyramidally arranged; filament linear; anther dorsifixed by a firm attachment to apex of filament, oblong-cordate; thecae sparsely pilose and produced into a lanceolate, densely bearded apiculum 2–3 mm long. Disc a narrow lobed rim around ovary, glabrous. Carpels 5, glabrous, ±free, without sterile apices. Style short, inserted near apex of adaxial margin of carpels; stigma globular. *n* = 19, S. Smith-White, *Austral. J. Bot.* 2: 292 (1954).

An Australian endemic genus of 3 species, one from W.A. and two from the eastern States.

- | | | |
|----|---|----------------------------------|
| 1 | Leaves serrulate, the base decurrent as 2 narrow denticulate wings along stem | 1. <i>C. angustifolia</i> |
| 1: | Leaves entire, the base decurrent as a narrow wing or ridge | |
| 2 | Branchlets glabrous, acutely or narrowly winged | 2. <i>C. saligna</i> |
| 2: | Branchlets puberulous in narrow lines between obtusely angular ridges | 3. <i>C. exalata</i> |

1. *Crowea angustifolia* Sm. in A. Rees, *Cycl.* 10: no. 2 (1808)

T: King George Sound [W.A.], 1803, *A. Menzies*; holo: LINN.

C. angustifolia Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 13 (1849), *nom. illeg. non Sm.*; *Eriostemon turczaninowii* F.Muell., *Pl. Victoria* 1: 120 (1862). T: Swan River Colony, W.A., *J. Drummond III. no. 12*; holo: KW (photo seen); iso: K, MEL, NSW, PERTH, TCD.

Woody perennials 0.3–3 m high. Branches slender, glabrous, smooth, with narrow, entire to denticulate wings decurrent from each side of leaf base. Leaves linear to broadly elliptic or obovate, 2–5 cm long, serrulate to denticulate, obtuse to acute. Flowers axillary; pedicel 2–5 mm long, fleshy, glabrous. Sepals 1.5–2 mm long, glabrous. Petals ovate, c. 12 mm long, persistent, white to pink, darker with age. Stamens: filaments linear, glandular-verrucose at apex, sparsely pilose; anther thecae 2 mm long, pilose abaxially towards apex; apiculum c. 1.5 mm long, linear-lanceolate, pilose, white. Style pilose; stigma globular. Cocci erect, rounded at summit, c. 3.5 mm long. Seed subreniform, 2–2.5 mm long.

Occurs in the extreme SW of W.A.; common in Karri or mixed eucalypt forest but also found in coastal heath. Two varieties are recognised, distinguished principally on their leaf shape. Herbarium material suggests that there is complete intergradation between the two.

- | | |
|---|-------------------------------------|
| Leaves linear to narrowly oblong, margin recurved when dry; petals usually pink | 1a. var. <i>angustifolia</i> |
| Leaves elliptic to obovate, flat; petals usually white | 1b. var. <i>platyphylla</i> |

1a. *Crowea angustifolia* Sm. var. *angustifolia*

Leaves linear to narrowly oblong, 2–5 cm long; margin denticulate, recurved when dry. Flowers usually pink.

Occurs near the SW coast of W.A. from near Busselton to E of Albany. Flowers Aug.–Nov.

W.A.: Near Willyung Hill, *A.M. Ashby 1628* (PERTH); Peaceful Bay, *J. Boyd 46* (PERTH); Two Peoples Bay, *C.A. Gardner 3318* (PERTH); Lower Kalgan R., *R.D. Royce 3730* (PERTH).



1b. *Crowea angustifolia* var. *platyphylla* Benth., *Fl. Austral.* 1: 330 (1863)

T: Near the Franklin R., W.A., *G.Maxwell*; iso: MEL.

C. dentata R.Br. ex Benth., *loc. cit.*; *C. angustifolia* var. *dentata* (Benth.) Paul G.Wilson, *Nuytsia* 1: 16 (1970).
T: King George Sound, W.A., *W.Baxter*; holo: K.

Illustrations: R.Erickson *et al.*, *Fl. Pl. W. Australia*, rev. edn 58, fig. 148 (1979); J.Wheeler *et al.*, *Fl. South West* 2: 876 (2002).

Leaves elliptic to obovate, or orbicular, 1–4 cm long, flat. Flowers white or pale pink. *n* = 19, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs from near Pemberton to E of Albany, W.A. Flowers Nov.–Dec.

W.A.: 4 km E of Walpole, *A.R.Annels* 619 (PERTH); Mt Manypeaks, *C.A.Gardner* 3307 (PERTH); Pemberton, Sept. 1937, *M.Wendall* (PERTH).

**2. *Crowea saligna* Andrews, *Bot. Repos.* 2: t. 79 (1800)**

Eriostemon salignus (Andrews) Baill., *Hist. Pl.* 4: 387, sub f. 426 (1873). T: “New Holland...raised from seeds, in the year 1790.”; lecto: illustration in H.C.Andrews, *loc. cit.*, *fide* P.G.Wilson, *Nuytsia* 1: 16 (1970).

C. latifolia Lodd. ex G.Don, *Gen. Hist.* 1: 792 (1831). T: “Native of New Holland”; *n.v. ex desc.*

C. macrantha hort. ex F.Henrincq, *Hort. Franc.* 7: t. 6 (1857), in *icon.*, *nom. illeg.* (*C. latifolia* in text); *C. saligna* var. *macrantha* hort. ex Bois, *Dict. D'Hort.* 1: 398 (1893–1899).

Eriostemon crowei F.Muell., *Pl. Victoria* 1: 119 (1862), *p.p.*, *nom. illeg.* (based on *C. saligna*, *C. latifolia* and *C. exalata*).

C. saligna var. *major* hort., *J. Hort. Cottage Gard. Home Farmer* III. 30: 57, fig. 11 (1895). T: not indicated.

C. saligna var. *stricta* hort., *loc. cit.* T: not indicated.

Illustrations: A.Farley & P.Moore, *Nat. Pl. Sydney Distr.* t. 829 (1989); G.J.Harden (ed.), *Fl. New South Wales*, 2nd edn, 2: 300 (2002).

Shrub to 1.5 m high, glabrous. Branches smooth, with 1 narrow wing decurrent from each leaf base. Leaves narrowly to broadly elliptic, 30–60 mm long, 4–13 mm wide, entire, flat or slightly recurved on margins, acute to obtuse, apiculate. Flowers axillary; pedicel 5–13 mm long, 5-grooved, with 2 pairs of basal bracteoles c. 1 mm long. Sepals c. 3 mm long and 2.5 mm wide, ciliolate, otherwise glabrous. Petals elliptic, 12–20 mm long, 4–7 mm wide, pink to purple, chartaceous when dry. Stamens: filaments narrowly oblong, woolly-ciliate; anther apiculum 2–3 mm long, densely woolly. Stigma large, sessile or subsessile. Seed ovoid-reniform, 3.8–4.5 mm long. *n* = 19, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). Plate 42.

Occurs in eastern N.S.W. from Woy Woy S to Yerrinbool. Found in sclerophyll forest on sandstone. Flowers in spring.

N.S.W.: Frenchs Forest, *R.Coveny* 4797 (NSW); Springwood, 10 Mar. 1934, *D.O.Cross* (NSW); Vaucluse, 26 May 1926, *O.D.Evans* (CANB).

**3. *Crowea exalata* F.Muell., *Trans. Philos. Soc. Victoria* 1: 11 (1855)**

Eriostemon crowei var. *exalata* (F.Muell.) Maiden & E. Betche, *Census New South Wales Pl.* 115 (1916). T: Mitta Mitta R. near junction of Livingstone R., Vic., Feb. 1854, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 18 (1970).

Eriostemon crowei F.Muell., *Pl. Victoria* 1: 119 (1862), *p.p.*, *nom. illeg.* (based on *C. saligna*, *C. latifolia* and *C. exalata*).

Shrub to 2 m high. Branchlets obtusely angular to terete, puberulous in sunken lines between rounded leaf decurrences. Leaves linear to narrowly oblong or narrowly elliptic, rarely spatulate or obcordate, from 15–30 mm long and 1 mm wide to 75 mm long and 6 mm wide, flat or margins recurved, or revolute and then appearing terete, glabrous or sparsely puberulous; apex rounded to obtuse, apiculate to mucronate, or retuse, rarely obcordate.

Flowers terminal to main or lateral branchlets, subtended by 3–5 sometimes foliaceous bracteoles; pedicel 0.5–4 mm long, fleshy, glabrous to puberulous. Sepals sub-orbicular to broadly elliptic, 1.5–2.5 mm long, glabrous or puberulous. Petals narrowly to broadly ovate, 5–14 mm long, pink to pale mauve, sometimes becoming green, persistent, becoming chartaceous and broader in fruit. Stamens: filaments flattened, densely pilose on margins and on adaxial surface; anther apiculum 2–3 mm long, bearded.

Occurs in far SE Qld, eastern N.S.W., and central and eastern Vic., generally in rocky areas. Four subspecies are recognised.

This treatment is based on the revision by Gebert & Duretto (2008).

W.A.Gebert & M.F.Duretto, Geographic variation in *Crowea exalata* (Rutaceae) and the recognition of two new subspecies, *Telopea* 12: 193–213 (2008).

- | | | |
|----|--|------------------------------|
| 1 | Leaves obcordate, 9–11 mm long, length less than or equal to twice width | 3d. subsp. obcordata |
| 1: | Leaves narrowly oblong or narrowly elliptic, 10–75 mm long, length usually greater than three times width | |
| 2 | Leaves 10–75 mm long, 1.5–9.5 mm wide, with margin flat or slightly recurved | |
| 3 | Leaves narrowly oblong to oblanceolate, sometimes narrowly elliptic or spatulate, 10–60 mm long, 1.5–6 mm wide, obtuse to acute | 3a. subsp. exalata |
| 3: | Leaves narrowly elliptic, rarely narrowly oblong to oblanceolate, 20–75 mm long, 3–9.5 mm wide, mucronate to apiculate, rarely acute to obtuse or retuse | 3b. subsp. magnifolia |
| 2: | Leaves 13–23 mm long, 1.5–2.5 mm wide, with margin revolute | 3c. subsp. revoluta |

3a. *Crowea exalata* F.Muell. subsp. *exalata*

Illustrations: N.T.Burbidge & M.Gray, *Fl. Austral. Cap. Terr.* 241, fig. 234 (1970); G.R.Cochrane *et al.*, *Fl. Pl. Victoria & Tas.* rev. edn, 52, fig. 213 (1980).

Leaves narrowly oblong to oblanceolate, spatulate, or narrowly elliptic, 10–60 mm long, 1.5–6 mm wide; margins flat or slightly recurved; apex obtuse to acute. Pedicel 1–4 mm long. Petals 7–14.5 mm long, 3–7 mm wide.

Found from Sydney, N.S.W., S to eastern Vic.; growing in gorges, sandy capes, alpine regions and rocky escarpments. Flowers principally Dec.–Mar.

N.S.W.: Murrumbidgee R., c. 2 miles [c. 3 km] SW of Disaster Bay, *E.F.Constable* 7407 (PERTH). Vic.: Pine Mtn, Burrowa-Pine Mountain Natl Park, *F.E.Davies* 1810 (PERTH).



3b. *Crowea exalata* subsp. *magnifolia* Gebert, *Telopea* 12: 209 (2008)

T: Mt Byron, Mt Mee State Forest, Qld, 11 Apr. 1994, *P.Grimshaw* G601 and *Figg*; holo: BRI *n.v.*; iso: MEL *n.v.*

Leaves narrowly elliptic or rarely narrowly oblong to oblanceolate, 20–75 mm long, 3–9.5 mm wide; margins flat to slightly recurved; apex mucronate to apiculate, rarely acute or obtuse to retuse. Pedicel 1.5–4 mm long. Petals 7.5–14 mm long, 3.5–7 mm wide.

Found from SE Qld S to the S coast of N.S.W.; growing in moist but well-drained soil. Flowers principally Oct.–Apr.

Qld: Robinson Gorge, Expedition Range Natl Park, *P.I.Forster* 17742 (MEL). N.S.W.: Yalwal, *W.A.Gebert* 127 (MEL); 0.3 miles [0.5 km] E of Yalwal, c. 15 miles [24.2 km] WSW of Nowra, *R.Bisby* & *R.Coveny* 3992 (PERTH).

This subspecies may be distinguished by the leaves which have a strong aniseed or sarsaparilla scent and have large distinctive oil glands on their abaxial surfaces.



3c. *Crowea exalata* subsp. *revoluta* Paul G. Wilson, *Nuytsia* 11: 430 (1997)

T: 1 mile [c. 1.6 km] N of Lightning Hill near Eaglehawk, Vic., 18 Dec. 1916, *D.L.Paton*; holo: MEL.

Leaves narrowly oblong, 13–23 mm long, 1.5–2.5 mm wide; margins revolute; apex acute or rarely apiculate. Pedicel 0.5–1.5 mm long. Petals 5–8.5 mm long, 3–4.5 mm wide.

Occurs in Vic. between Bendigo and Kamarooka, also near St Arnaud. Found in ‘Whipstick Scrub’, a mallee community on ironstone ridges with clay and gravelly soils. Flowers July–Jan.

Vic.: Kamarooka State Park, *A.C.Beauglehole* 69683 (MEL); St Arnaud, May 1951, *L.G.Dale* (MEL).

**3d. *Crowea exalata* subsp. *obcordata*** Gebert, *Telopea* 12: 211 (2008)

T: Central Tablelands, Budthingeroo Ck, N.S.W., 12 Apr. 1992, *I.Olson* 3997; holo: NSW; iso: MEL.

Leaves obcordate, 9–11 mm long, 4–5.5 mm wide; margins flat. Pedicel 3.5 mm long. Petals 7–9 mm long, 4.5 mm wide.

Only known from the type collection. Found on the Boyd Plateau, Central Tablelands of N.S.W., growing near creeks. Flowers Apr.

**15. PHILOTHECA**

Paul G. Wilson

Philotheca Rudge, *Trans. Linn. Soc. London Bot.* 11: 298 (1816); from the Greek *philos* (a liking for), and *thece* (case), referring to the partially united staminal filaments of the type species.

Type: *P. australis* Rudge

Shrubs, glabrous or with minute simple hairs. Leaves alternate, sessile or shortly petiolate, fleshy, semiterete or narrowly oblong; black stipular excrescences often present. Inflorescences axillary or terminal, few-many-flowered cyme, cluster or raceme, or flowers solitary. Flowers 5-merous (4-merous in *P. virgata*). Sepals free, glabrous or pubescent. Petals imbricate (rarely valvate), free (united in lower half in *P. tubiflora* and *P. coccinea*), hairy or glabrous, uninerved. Stamens 10; filaments linear, free or united towards base, slender-terete towards apex; anthers minutely apiculate, either not glandular or 2-multi-glandular at apex (in sect. *Erionema*). Disc narrow (rarely broad). Carpels 5, free; style terete, divided at base where affixed to adaxial medial surface of carpels. Cocci usually shortly rostrate or apiculate. Seed reniform or ellipsoidal, 2–5 mm long; outer testa thin, transparent or hard; sclerotesta smooth or rugose.

A genus of 53 species, divided into 4 sections; endemic to Australia, found in all states and territories except the N.T.

The recognition that species placed in *Eriostemon* sect. *Eriostemon* are generically distinct from the other species in that genus was suggested by both Smith-White (1954) and Stace *et al.* (1993), who based their conclusions largely on chromosomal evidence. However, it was not until the publications of Bayly (1998) and Wilson (1998) that the morphological evidence supporting this distinction was implemented in producing a new classification for the group. The acceptance by Bayly and Wilson of the generic distinction of *Eriostemon* sect. *Eriostemon* was based principally on its distinct foliar anatomy, indumentum, petal

nervation and seed morphology, in addition to its chromosome number, while the decision to include the non-typical sections of *Eriostemon* in *Philotheca* was based on their similarity in indumentum, flower and seed morphology, as well as in their common chromosome number. Previously, *Philotheca* had been regarded as a small genus that could be distinguished from *Eriostemon* s. lat. by its staminal filaments being united in their lower half.

Philotheca is here recognised as containing 4 sections, of which sect. *Philotheca* with 33 species is the largest. This section is clearly distinct from the others, noticeably in seed and anther morphology and in the possession of linear sclereids in the leaves (see Wilson, 1998). These characters are also found in *Geleznovia*, a genus that has the same chromosome number but differs noticeably in the size of its leaves and the presence of large petaloid bracts which surround a terminal cluster of 1–4 flowers.

This classification appears to render *Philotheca* paraphyletic with regard to *Geleznovia*, which logically should either be included in *Philotheca*, where it would appear anomalous due to its general morphology, or the non-typical sections of *Philotheca* should be placed in a separate genus or separate genera. However, the apparent paraphyletic nature of *Philotheca* is adopted since it is considered that a major change to the taxonomy of the group should be supported by molecular studies and these have yet to be undertaken.

The treatment of those species in sect. *Erionema* that are closely related to *P. myoporoides* is based on the revisions of Bayly (1998) and Forster (2005).

S.Smith-White, Chromosome numbers in the Boronieae (Rutaceae) and their bearing on the evolutionary development of the tribe in the Australian flora, *Austral. J. Bot.* 2: 287–303 (1954); P.G.Wilson, A taxonomic revision of the genera *Crowea*, *Eriostemon* and *Phebalium* (Rutaceae), *Nuytsia* 1: 3–60 (1970); H.M.Stace *et al.*, Cytoevolutionary patterns in Rutaceae, *Pl. Syst. Evol.* 187: 1–28 (1993); M.J.Bayly, Notes on the *Eriostemon myoporoides* (Rutaceae) species complex, including new names and a new generic placement in *Philotheca*, *Muelleria* 11: 113–126 (1998); P.G.Wilson, A taxonomic review of the genera *Eriostemon* and *Philotheca* (Rutaceae: Boronieae), *Nuytsia* 12: 239–265 (1998); A.C.Rozefelds, The Tasmanian species of *Philotheca* (Rutaceae), *Muelleria* 15: 19–26 (2001); P.I.Forster, New species of *Philotheca* (Rutaceae) from Queensland, *Austrobaileya* 7: 175–181 (2005).

KEY TO SECTIONS

- 1 Flowers axillary and solitary or in few-flowered cymes, or terminal and either solitary or in few-flowered clusters; petals white to pink, mauve, or red, pubescent or papillose (all states)
- 2 Stem glabrous or hairy, if hairs in longitudinal lines then petals pubescent; flowers terminal or axillary, solitary or clustered
- 3 Hairs on stem (when present) scattered or in longitudinal lines, simple; stipular excrescences often present; flowers terminal or axillary, solitary or in few-flowered clusters; anthers without glands; seed thick, with deltate-shaped hilum and thin outer testa Sect. 1. *Philotheca*
- 3: Hairs on stem (when present) scattered, stellate or simple; stipular excrescences absent; flowers axillary, solitary or in cymes; anthers with 2 (rarely more) glands at base of white apiculum; seed laterally flattened with linear hilum and coriaceous outer testa Sect. 2. *Erionema*
- 2: Stem minutely pilose in furrows between decurrent leaf bases; flowers axillary or appearing terminal, solitary or in clusters of 1–3 (*P. pinoides*); petals minutely papillose adaxially, otherwise glabrous Sect. 3. *Corynonema*
- 1: Flowers terminal in compact many-flowered heads (the axis sometimes continuing growth during flowering) or racemes; petals thin, blue to pink, glabrous (or sparsely woolly abaxially on midrib) (W.A.) Sect. 4. *Cyanochlamys*

Sect. 1 *Philotheca*

Philotheca Rudge sect. *Philotheca*

Eriostemon sect. *Nigrostipulae* Paul G. Wilson, *Nuytsia* 1: 25 (1970). T: *E. difformis* A. Cunn. ex Endl.

Eriostemon sect. *Gymnanthos* Paul G. Wilson, *op. cit.* 59. T: *E. deserti* E. Pritz.

Branchlets glabrous or with simple hairs. Leaves often with small black stipules or stipular excrescences. Inflorescences axillary or terminal, few-flowered or flowers solitary; pedicels sessile (peduncle absent) in leaf axil or in a terminal head, with usually 2 minute bracteoles at base. Petals hairy or glabrous. Stamens free or variably connate towards base; filaments flattened, glabrous or hairy; anthers white-apiculate, not glandular. Carpels with solid, sterile apex. Cocci mostly shortly rostrate, erect or slightly spreading. Seed reniform, 2–4 mm long; outer testa very thin, transparent; sclerotesta smooth or irregularly rugose or transversely corrugate; hilum deltate.

A section of 33 species; widely distributed in Australia.

When present, the stipules in this section are initially delicate multicellular structures c. 0.2 mm in length that form on each side of the leaf base; they may bear a few unicellular hairs. As they mature the basal cells become filled with a dark-brown or black, brittle, resinous substance that often forms into a small hemispherical excrescence.

- 1 Flowers axillary
 - 2 Stipules or stipular excrescences present
 - 3 Leaves terete, semiterete, or clavate; flowers erect; petals white, c. 5 mm long (inland W.A.; S.A.; N.S.W.) **7. *P. linearis***
 - 3: Leaves thick, oblong, or if subterete then ±flattened adaxially
 - 4 Flowers erect; petals white, c. 5 mm long; leaves oblong, channelled abaxially (W.A.) **12. *P. pachyphylla***
 - 4: Flowers nutant; petals red to white (rarely yellow), 7–10 mm long
 - 5 Leaves compressed-clavate, glandular-bullate, flattened and channelled abaxially (W.A.) **11. *P. coccinea***
 - 5: Leaves clavate to subterete, verrucose, rounded abaxially, sometimes narrowly channelled adaxially (W.A.) **13. *P. nutans***
 - 2: Stipules or stipular excrescences absent
 - 6 Staminal filaments ciliate; disc narrow (W.A.) **9. *P. kalbarriensis***
 - 6: Stamens glabrous; disc broad
 - 7 Stamens pyramidally arranged (W.A.) **8. *P. wonganensis***
 - 7: Staminal filaments spreading (W.A.) **10. *P. deserti***
- 1: Flowers terminal
 - 8 Staminal filaments free or almost free
 - 9 Leaves with small black stipules or stipular excrescences
 - 10 Leaves acicular; petals c. 9 mm long; staminal filaments densely pilose (N.S.W.) **14. *P. ericifolia***
 - 10: Leaves fleshy or if thin then flattened
 - 11 Leaves flattened, elliptic to ovate or rhomboid, 2.5–7 mm long (E Australia) **15. *P. difformis***
 - 11: Leaves somewhat terete, obovoid, ellipsoid, or globular
 - 12 Petals glabrous abaxially
 - 13 Leaves and sepals with a dark-coloured apiculum; leaves semiterete (N.S.W.) **16. *P. brevifolia***

- 13: Leaves and sepals without a dark-coloured apiculum; leaf-shape variable
- 14 Leaves narrowly obovoid with a sunken dark-coloured terminal gland (Qld) 18. *P. sporadica*
- 14: Leaves variously shaped, without a marked terminal gland
- 15 Antisepalous staminal filaments abruptly narrowed near apex to a subulate tip, densely woolly-ciliate (S.A.; Vic.; possibly N.S.W.) 17. *P. angustifolia*
- 15: Staminal filaments evenly attenuate, sparsely ciliate to woolly-ciliate (W.A.) 19. *P. gardneri*
- 12: Petals variably puberulous abaxially
- 16 Sepals (and leaves) with a small to prominent black gland-like apiculum (W.A.)
- 17 Subtending leaves equal or almost equal to flowers 26. *P. apiculata*
- 17: Subtending leaves much shorter than flowers 27. *P. tomentella*
- 16: Sepals not black-apiculate
- 18 Leaves concave or channelled abaxially (E Australia) 15. *P. diffformis*
- 18: Leaves rounded abaxially, channelled adaxially (W.A.) 19. *P. gardneri*
- 9: Leaves without obvious stipules or stipular excrescences (if present extremely minute)
- 19 Leaves flattened, broadly elliptic to orbicular, 2–4 mm long; plants glabrous except for woolly-pilose staminal filaments (W.A.) 23. *P. rhomboidea*
- 19: Leaves ±terete, clavate, ellipsoid, or obovoid; or narrowly elliptic and deeply concave adaxially (*P. cymbiformis*); plants slightly and variably puberulous or glabrous
- 20 Leaves and sepals black-apiculate
- 21 Leaves minutely tomentose (W.A.) 27. *P. tomentella*
- 21: Leaves glabrous or glabrescent
- 22 Branchlets shortly pilose or glabrous beneath nodes (N.S.W.) 16. *P. brevifolia*
- 22: Branchlets minutely tomentose all round or glabrous (W.A.) 27. *P. tomentella*
- 20: Leaves and sepals not black-apiculate
- 23 Petals evenly silky-pubescent all over abaxially (W.A.) 29. *P. sericea*
- 23: Petals with abaxial surface glabrous or puberulous towards margins
- 24 Branchlets densely glandular-verrucose
- 25 Sepals acuminate (W.A.) 20. *P. falcata*
- 25: Sepals broadly ovate, obtuse (W.A.) 21. *P. langei*
- 24: Branchlets smooth or sparsely glandular-verrucose
- 26 Petals white with broad reddish brown medial strip abaxially, abaxially puberulous towards margins (W.A.) 28. *P. thryptomenoides*
- 26: Petals white or with reddish brown medial strip, abaxially glabrous
- 27 Branchlets sparsely puberulous at least when young (Qld) 33. *P. cuticularis*
- 27: Plant glabrous except for flowers (W.A.)
- 28 Branchlets with green decurrent leaf bases and brown to black intermediate strips 24. *P. glabra*

- 28: Branchlets without decurrent leaf bases
- 29 Leaves deeply concave adaxially 25. *P. cymbiformis*
- 29: Leaves flat to convex adaxially
- 30 Leaves greyish green, rounded to obtuse; sepals broadly triangular 31. *P. coateana*
- 30: Leaves glossy green, acute; sepals ovate to narrowly triangular 32. *P. eremicola*
- 8: Staminal filaments united towards base
- 31 Petals evenly silky all over abaxially (W.A.) 29. *P. sericea*
- 31: Petals with abaxial surface glabrous or puberulous towards margins
- 32 Petals united below into a narrow tube (W.A.) 6. *P. tubiflora*
- 32: Petals free
- 33 Anthers pilose at apex; petals mauve with darker central stripe (N.S.W.) 2. *P. reichenbachii*
- 33: Anthers glabrous
- 34 Leaves without stipular excrescences
- 35 Petals pale greenish yellow, glabrous abaxially (W.A.) 5. *P. citrina*
- 35: Petals white, sometimes with pink tips, puberulous towards margins abaxially
- 36 Leaves ciliate (N.S.W.; Qld) 4. *P. ciliata*
- 36: Leaves not ciliate (W.A.) 22. *P. basistyla*
- 34: Leaves with small or minute stipular excrescences (N.S.W.; Qld)
- 37 Leaves cuneate, flat, chartaceous (N Qld) 30. *P. acrolopha*
- 37: Leaves semiterete
- 38 Petals c. 5 mm long, white (N.S.W.; SE Qld) 4. *P. ciliata*
- 38: Petals 6–12 mm long, white to pink or mauve (E N.S.W.)
- 39 Leaves variably verrucose or smooth; petals glabrous abaxially along central keel 1. *P. salsolifolia*
- 39: Leaves with 4 prominent glands on each side of abaxial surface, petals puberulous all over 3. *P. papillata*

1. *Philotheca salsolifolia* (Sm.) Druce, *Bot. Soc. Exch. Club Brit. Isles* 4: 639 (1917)

Eriostemon salsolifolius Sm. in A.Rees, *Cycl.* 13: no. 3 (1809); *P. australis* Rudge, *Trans. Linn. Soc. London Bot.* 11: 298 (1816), *nom. illeg.* T: Port Jackson, N.S.W., 1795, *J.White*; syn: LINN (photo seen).

?*P. gaudichaudii* G.Don, *Gen. Hist.* 1: 792 (1831), *nom. subnud.* T: Port Jackson, N.S.W., *T.N.Baudin*; iso: K.

?*E. gracile* Graham, *Edinburgh New Philos. J.* 16: 175 (1834). T: “raised from seed imported by Mr Cunningham, at Comely Bank Nursery, Edinburgh”; *n.v.*

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 293 (2002).

Shrub to 2 m high. Branchlets glabrous or sparsely puberulous. Leaves crowded, erect or spreading, from semiterete, thick, blunt and 3–5 mm long, to slender, acute and to 12 mm long, entirely glabrous or sparsely ciliate on margins. Stipular excrescences minute. Flowers terminal, solitary or in clusters of 2 or 3; pedicels glabrous, turbinate and 1–2 mm long, or slender and c. 8 mm long. Sepals deltate to broadly ovate, c. 1.5 mm long. Petals narrowly elliptic, 6–12 mm long, pink to mauve with a dark central stripe, puberulous adaxially and towards margin abaxially. Stamens: filaments fused and glabrous in lower half, densely villous above; anthers c. 1.5 mm long, glabrous. Style swollen below, somewhat pilose. Cocci apiculate.

Occurs in eastern N.S.W. There are 2 subspecies.

Pedicels thick, 1–2 mm long

1a. subsp. *salsolifolia*

Pedicels slender, c. 8 mm long

1b. subsp. *pedicellata*

1a. *Philotheca salsolifolia* (Sm.) Druce subsp. *salsolifolia*

Illustrations: Rudge, *op. cit.* 297, t. 21, as *P. australis*; A.Farley & P.Moore, *Native Pl. Sydney Distr.* pl. 826 (1989); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 293 (2002).

Leaves semiterete, thick, blunt and 3–5 mm long, to slender, acute and 12 mm long, entirely glabrous or sparsely ciliate on margins. Pedicels fleshy, turbinate, 1–2 mm long. Cocci \pm erect. *n* = 14, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954).

Occurs in inland and coastal N.S.W. and the A.C.T. from near Bega N to near the Qld border and inland to West Wyalong and the Pilliga Scrub; growing in heathland, sclerophyll forest, and woodland. Flowers Sept.–Dec.

N.S.W.: Manly Dam, *M.J.Taylor* 61 (NSW); Pilliga scrub, *T.W.Taylor* 46 (NSW). A.C.T.: Jervis Bay, *F.A.Rodway* 1192 (NSW).

The typical variant with short, thick leaves, which is found principally near Sydney, appears not to differ in floral characters from the slender-leaved variant.

This subspecies is frequently confused with *P. ericifolia* which may be distinguished by its narrowly triangular acuminate sepals and its free stamens.



1b. *Philotheca salsolifolia* subsp. *pedicellata* Paul G.Wilson, *Nuytsia* 12: 255 (1998)

T: 1 mile [c. 1.6 km] from the coast and 4.5 miles [c. 7.2 km] S of Yamba, N.S.W., 30 June 1966, *L.P. & D.J.McGillivray* 2145; holo: NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 294 (2002).

Leaves linear, c. 10 mm long, acute, flat adaxially, glabrous. Pedicels slender, c. 8 mm long. Cocci spreading.

Known only from near Angourie (near Clarence R.) on the N coast of N.S.W.; growing on sand in coastal or near coastal situations. Flowers June–Nov.

N.S.W.: Angourie Bay, *B.Auld* 120484 (NSW); Angourie, 20 Sept. 1970, *M.E.Phillips* (BRI).



2. *Philotheca reichenbachii* Sieber ex Spreng., *Syst. Veg.* 4 (2): 253 (1827)

P. reichenbachiana Sieber ex Rchb., *Iconogr. Bot. Exot.* 200 (1828), *nom. illeg.*; *P. australis* var. *reichenbachii* (Spreng.) Maiden & Betche, *Proc. Linn. Soc. New South Wales* 29: 736 (1905), as *Reichenbachiana*. T: N.S.W., *F.W.Sieber* 308; iso: K, MEL, TCD.

P. longifolia Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 16 (1849). T: Nova Hollandia, *W.Stephenson* 147; holo: KW (photo seen).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 294 (2002).

Shrub to 1 m high. Branchlets ascending, hispidulous. Leaves crowded, erect, slender, semiterete, c. 10 mm long, acute, \pm hispidulous. Stipular excrescences minute. Flowers terminal, solitary or 2 or 3 together; pedicels turbinate and fleshy, c. 1.5 mm long, glabrous or hispidulous. Sepals broadly triangular to very broadly ovate, 1 mm long, minutely papillose. Petals narrowly elliptic, 12 mm long, mauve with darker central stripe, puberulous adaxially and towards margin abaxially. Stamens: filaments glabrous and fused in lower half, densely villous distally; anthers c. 2 mm long, pilose at apex. Style swollen towards base, pilose. Cocci blunt. *n* = 14, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954).



Occurs around Sydney, N.S.W.; growing on sandstone. Flowers Aug.–Nov.

N.S.W.: Loftus, Sept. 1896, *J.H.Camfield* (PERTH); Elouera, 9 Nov. 1966, *R.Coveny* (NSW); Belrose, *L.A.S.Johnson* 754 (NSW); Manly Dam, *M.J.Taylor* 61 (NSW).

3. *Philotheca papillata* I.Telford & L.M.Copel., *Telopea* 11: 106 (2006)

T: N.S.W., Sherwood Nature Reserve, 14 Sept. 2004, *I.R.Telford* 12786, *J.J.Bruhl* & *L.M.Copeland*; holo: NSW *n.v.*; iso: PERTH.

Illustration: I.Telford & L.Copeland, *op. cit.* 107, fig. 1.

Erect multistemmed shrub to 60 cm high, suckering from roots. Branchlets pilose, pale green. Leaves narrowly elliptic, incurved, inversely boat-shaped (hollowed abaxially), 9–12 mm long, 1–1.5 mm wide, acute, with c. 4 prominent glands on each side of abaxial surface, papillose all over. Stipules minute, black. Flowers terminal, solitary; pedicels c. 0.5 mm long. Sepals suborbicular, 1.5–2 mm long, puberulous. Petals elliptic, 7–10 mm long, white to pale pink, puberulous on both surfaces, sparsely verrucose abaxially on midrib. Stamens 6.5–8 mm long; filaments fused for basal 4–5 mm, pilose in distal half; anthers ovate, c. 1.2 mm long with small glabrous apiculum. Disc obscure. Ovary tomentose; style c. 4 mm long, slightly swollen and pilose on basal $\frac{3}{4}$; stigma capitate. Fruit not seen.

Recorded only from Sherwood Nature Reserve, north-coastal N.S.W. Occurs in a heath community on shallow sandy soil over sandstone. Flowers Sept.

N.S.W.: Sherwood Nat. Res., *L.M.Copeland* 2605 & *P.R.Sherringham* (NE).



4. *Philotheca ciliata* Hook. in T.L.Mitchell, *J. Exped. Trop. Australia* 347 (1848)

P. australis var. *parviflora* Benth., *Fl. Austral.* 1: 348 (1863). T: Mt Faraday [Qld], 10 Oct. 1846, *Stephenson* & *T.L.Mitchell*; syn: K (*T.Mitchell* 392, 395, photo seen), MEL (*T.Mitchell* s.n.), TCD (*T.Mitchell* s.n.).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 294 (2002).

Shrub to 2 m high. Branches minutely puberulous to hispidulous. Leaves erect, narrowly elliptic, semiterete, 4–6 mm long, acute, hispid to \pm glabrous, with margins \pm ciliate. Stipular excrescences minute or absent. Flowers terminal, solitary or 2 or 3 together; pedicels narrowly turbinate, 1–2 mm long, fleshy, glabrous. Sepals very broadly ovate, c. 1 mm long, glandular-verrucose, ciliate, otherwise glabrous. Petals narrowly elliptic, c. 5 mm long, white, puberulous adaxially and towards margin abaxially. Stamens: filaments fused and glabrous in basal $\frac{2}{3}$, free and sparsely to densely pilose towards apex; anthers broadly ovate, c. 0.7 mm long, minutely white-apiculate. Style narrowly bottle-shaped, sparsely pilose towards base. Cocci with terminal tuft of hairs, otherwise glabrous.

Occurs in inland SE Qld and inland N.S.W.; generally growing in sandy soil or over laterite. Flowers Aug.–Nov.

Qld: 40 km WNW of Surat, 2 May 1990, *P.Grimshaw* (BRI); Blackdown Tableland, *R.J.Henderson* 1100 (BRI). N.S.W.: West Wyalong, *G.M.Cunningham* 5452 (NSW); Pilliga East, *D.F.Mackay* 148 (NSW).



5. *Philotheca citrina* Paul G.Wilson, *Nuytsia* 8: 245 (1992)

T: Curbur Stn, W.A., 30 Aug. 1989, *R.C.Cranfield* 7665 & *S.Patrick*; holo: PERTH.

Illustration: P.G.Wilson, *op. cit.* 247.

Much-branched shrub to 1.3 m high. Branches minutely puberulous between decurrent leaf bases. Leaves dense, narrowly clavate, curved, c. 10 mm long, 1–1.5 mm wide, apiculate, flat adaxially, round abaxially, conspicuously verrucose, glabrous. Stipules absent. Flowers terminal, solitary; pedicel narrowly turbinate, 2–4 mm long, glabrous. Sepals broadly ovate, c. 3 mm

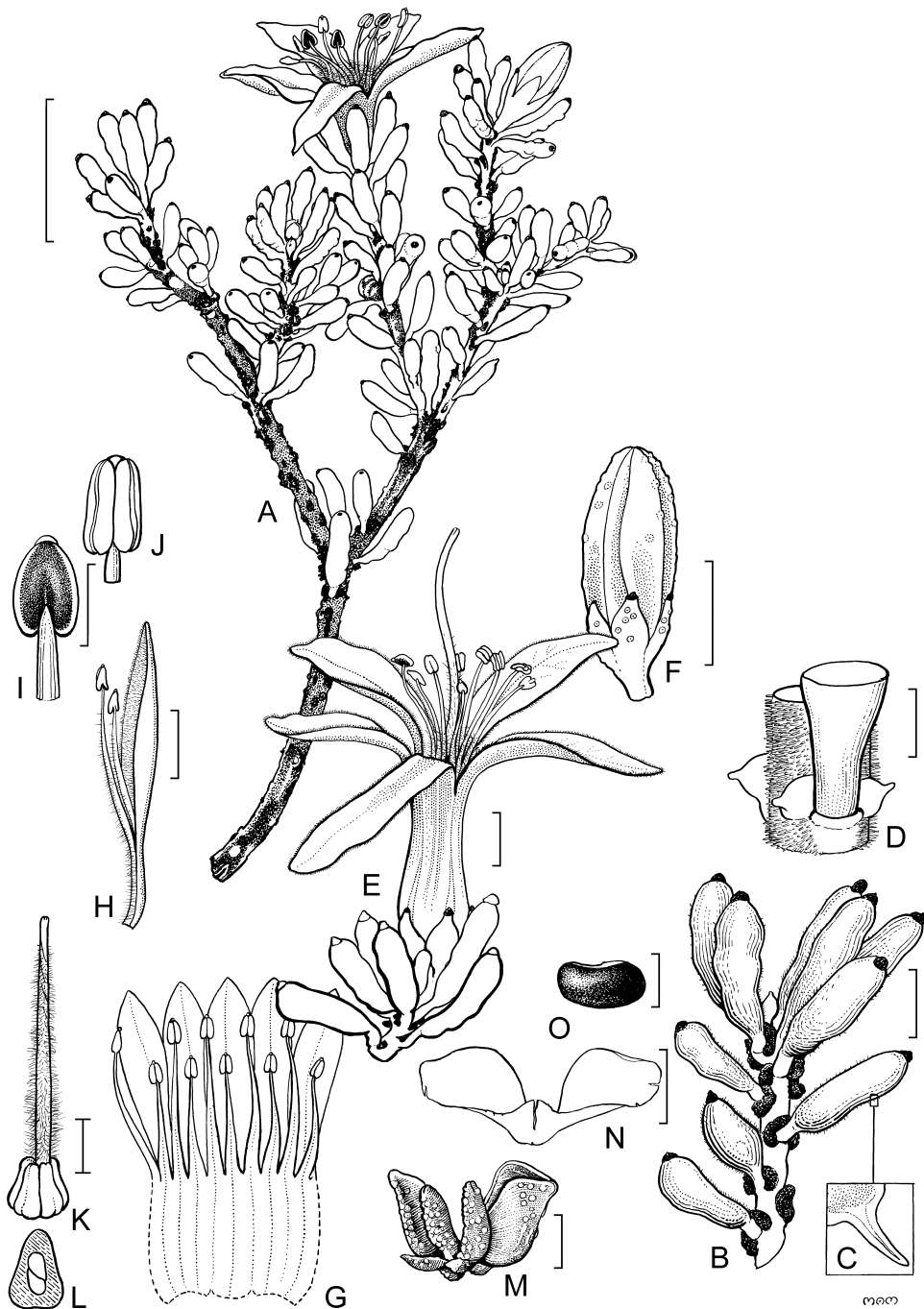


Figure 59. *Philotheca tubiflora*. A, habit; B, branch detail showing stipules; C, leaf margin detail; D, stipule detail; E, flower with subtending leaves; F, flower bud; G, corolla, inner surface showing attached stamens; H, corolla lobe, lateral view; I, anther, abaxial view; J, anther, adaxial view; K, pistil; L, carpel, L.S.; M, cocci (mature & sterile); N, endocarp; O, seed (A–O, drawn from fresh material, voucher not recorded). Scale bars: A = 5 mm; B, E, G, H, L, M, O = 2 mm; D, F, N = 1 mm; F = 0.5 mm. Drawn by M. Wilson.

long, acute to obtuse, glabrous. Petals broadly elliptic, c. 10 mm long, pale greenish yellow, puberulous adaxially, glabrous abaxially. Stamens: filaments united in basal $\frac{2}{3}$, densely woolly-pilose adaxially except towards tip, moderately pilose abaxially; anthers oblong-elliptic, c. 1.5 mm long, minutely white-apiculate. Style terete, glabrous. Fruit not seen.

Occurs E of Shark Bay in the Upper Murchison R. area of W.A.; growing in granite breakaway country. Flowers May–Sept.

W.A.: Curbur Stn, *A.L.Payne* 120 (PERTH).



6. *Philotheca tubiflora* A.S.George, *Nuytsia* 1: 208 (1971)

T: Near Point Kidman, W.A., 29 June 1963, *A.S.George* 4506; holo: PERTH; iso: CANB, MEL, NSW, PERTH.

Illustration: A.S.George, *op. cit.* 209.

Much-branched shrub to 0.5 m high. Branches minutely puberulous, grey to black with age. Leaves dense, semiterete, thick, c. 3 mm long, obtuse, with brown to black apiculus. Stipular excrescences black. Flowers terminal, solitary; pedicel 1–2 mm long, glabrous. Sepals ovate, 1.5 mm long, acute, brown-apiculate, glabrous. Petals narrowly elliptic, c. 10 mm long, spreading distally, connate towards base and fused to the glabrous united portion of the filaments into a narrow tube, white to pale pink, puberulous adaxially and towards margins abaxially. Stamens: filaments with free portion woolly-pilose except towards tip; anthers broadly oblong, 0.6 mm long, white-apiculate. Style terete, pilose. Cocci c. 3 mm high, minutely rostrate. Plate 41; Fig. 59.

Occurs near Laverton, W.A., on the western edge of the Great Victoria Desert; growing on rocky outcrops in the kaolinite of decomposing granite. Flowers June–Sept.

W.A.: White Cliffs Stn, *N.Harper* 10 (PERTH); Point Kidman, *N.G.Marchant* 75/278 (PERTH); Eristoun Stn, *H.Pringle* 2675 (PERTH).



7. *Philotheca linearis* () Paul G.Wilson, *Nuytsia* 12: 253 (1998)

Eriostemon linearis A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837). T: Barren ranges on the Lachlan R., N.S.W., 22 June 1817, *A.Cunningham*; ?iso: K (Peels Range, June 1817, *A.Cunningham* 161).

E. halmaturorum F.Muell., *Linnaea* 25: 376 (1853). T: Elders Ra, S.A., Oct. 1851, *F.Mueller*; holo: MEL.

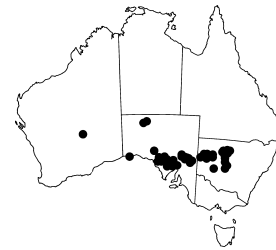
Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 251 (1991).

Small shrub. Branchlets glandular-verrucose, glabrous or minutely puberulous, without decurrent leaf bases. Leaves clavate, semiterete or terete, smooth or glandular-verrucose or glandular-punctate, glabrous, \pm flat and channelled adaxially, convex abaxially, from 0.8 cm long and fleshy with rounded apex, to 2 cm long and slender with acute apex. Stipules small, globular. Flowers axillary, solitary; pedicel 4–6 mm long, minutely puberulous. Sepals broadly ovate, 1 mm long, glabrous. Petals elliptic, 4–6 mm long, white, glandular, minutely tomentose adaxially and abaxially towards margin. Stamens free; filaments linear-attenuate, pilose; anthers 1 mm long, white-apiculate. Style terete, glabrous. Cocci prominently rostrate. *Rock Wallaby Shrub*.

Occurs on the western edge of the Great Victoria Desert in W.A., in the Everard, Gawler, and Flinders Ranges of S.A., and E to western N.S.W.; growing on or around rock outcrops. Flowers chiefly in spring.

W.A.: White Cliffs Stn, *H.Pringle* 2516 (PERTH). S.A.: Mt Aleck, 1 Sept. 1965, *R.A.Howard* (AD). N.S.W.: Mootwingie, *M.I.H.Brooker* 684 (PERTH); Gunderbooka Ra., *E.F.Constable* 4540 (PERTH).

This species exhibits little regional variation. However, specimens from Eyre Penin. and from the Flinders Ra. (*'E. halmaturorum'*)



have short, fleshy, verrucose leaves with rounded apices, while those from the Everard Ra. have long, slender, smooth leaves. Collections from other localities tend to be inter-mediate between these extremes in morphology.

8. *Philotheca wonganensis* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 12: 256 (1998)

Eriostemon wonganensis Paul G. Wilson, *Nuytsia* 4: 47 (1982). T: 13.5 km NE of Wongan Hills township, W.A., 1 Sept. 1980, *K.F. Kenneally* 7466; holo: PERTH.

Illustration: P.G. Wilson, *Nuytsia* 4: 49 (1982).

Shrub c. 1 m high, glabrous. Branchlets when young with green glandular-verrucose decurrent leaf bases separated by corky strips. Leaves slender, subterete, 5–10 mm long, obtuse to acute, glandular-verrucose or smooth, channelled but otherwise flat adaxially. Stipules absent. Flowers axillary, solitary, glabrous; pedicel slender-clavate, c. 5 mm long with a few small basal bracteoles. Sepals broadly ovate, c. 1 mm long, fleshy. Petals oblong-elliptic, c. 5 mm long, white with pink medial strip. Stamens free, pyramidally arranged; filaments linear-acuminate; anthers c. 1 mm long, shortly apiculate. Disc broad. Style slender-terete. Cocci c. 3 mm long, apiculate.

Occurs in SW W.A. at Wongan Hills and S of Northampton, growing on heavy soil over laterite. Flowers Aug.–Oct.

W.A.: 28 km S of Northampton, *R.J. Cranfield* 4069 (PERTH); Fowlers Gully, Wongan Hills, *J.H. Ross* 2840 (PERTH).

This species (and *P. deserti*) is distinctive in having all parts of the flower hairless while the apparently closely related *P. kalbarriensis* has ciliate staminal filaments. Listed as Endangered under the EPBC Act, 1999.



9. *Philotheca kalbarriensis* Paul G. Wilson, *Nuytsia* 12: 252 (1998)

T: Kalbarri Natl Park, W.A., 4 Aug. 1996, *G.J. Keighery* & *N. Gibson* 2034; holo: PERTH.

Shrub to 1 m high. Branchlets ascending, reddish brown except for short green decurrent leaf bases, sparsely puberulous when young, otherwise glabrous. Leaves ascending, crowded, narrowly fusiform, c. 4 mm long, grooved but otherwise flat adaxially, rounded abaxially and sparsely glandular-bullate. Stipules absent. Flowers axillary, solitary; pedicel 1–2 mm long. Sepals deltate, c. 0.7 mm long, fleshy, glabrous. Petals ovate, c. 3 mm long, 2 mm wide, obtuse, white, glabrous. Stamens free; filaments linear, moderately ciliate; anthers suborbicular, c. 0.5 mm long with a prominent rounded white apiculum c. 0.2 mm long. Disc narrow. Ovary glabrous; style terete, c. 0.5 mm long, glabrous; stigma capitate. Cocci almost square, shortly apiculate on outer angle.

Found from Kalbarri SE to near Mullewa, W.A., where growing in *Eucalyptus* and *Acacia* woodland. Flowers July–Sept.

W.A.: Coolcalalaya Stn, *A.H. Burbidge* 4541 (PERTH); 220 miles [c. 510 km] S of Carnarvon on Geraldton Rd., *I. Olsen* 575 (PERTH).

This species differs most noticeably from *P. wonganensis* in having ciliate staminal filaments and a narrower disc.



10. *Philotheca deserti* (E. Pritz.) Paul G. Wilson, *Nuytsia* 12: 248 (1998)

Eriostemon deserti E. Pritz., *Bot. Jahrb. Syst.* 35: 320, tab. 39 A–C (1904); *Phebalium deserti* (E. Pritz.) Ewart & B. Rees, *Proc. Roy. Soc. Victoria* ser. 2, 25: 111 (1912). T: Ghooli, W.A., Oct. 1901, *E. Pritzel* 868; holo: B, destroyed; iso: AD, K, MEL, NSW.

Eriostemon intermedius Ewart, *Proc. Roy. Soc. Victoria* ser 2, 19: 40 (1907), *nom. illeg. non* Hooker (1849). T: Cowcowing, W.A., Aug. 1904, *M. Koch* 1168; syn: MEL; between the sources of the Blackwood R. and L. Lefroy, 1893, *M. Cronin*; syn: MEL.

Erect undershrub 1–2 (–3) m high. Branchlets with green decurrent leaf bases and brown intermediate strips that soon become corky. Leaves slender-subulate and 20–30 mm long or

narrowly fusiform to narrowly obovoid and c. 5 mm long, acute, glandular-verrucose, narrowly channelled adaxially, glabrous. Stipules absent. Flowers axillary, solitary or rarely in clusters of 2 or 3; pedicels 0.5–5.5 mm long, with several small, basal bracteoles. Sepals suborbicular, c. 1 mm long, fleshy, glabrous. Petals spreading, ovate, c. 3 mm long, thin but with thickened midrib, white, glabrous. Stamens free; filaments spreading, linear-terete, glabrous; anthers suborbicular, minutely to prominently white-apiculate. Disc very broad, flat. Style terete, glabrous. Cocci \pm erect, c. 2.5 mm long, truncate and shortly apiculate.

Occurs in south-central W.A. from Kalgoorlie N to Menzies and W to Yalgoo; there are 2 subspecies.

Leaves slender, subulate, 20–30 mm long

10a. subsp. *deserti*

Leaves fusiform to narrowly obovoid, 3–5 mm long

10b. subsp. *brevifolia*

10a. *Philotheca deserti* (E.Pritz.) Paul G.Wilson subsp. *deserti*

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 538 (1998).

Leaves slender-subulate, 20–30 mm long, channelled adaxially.

Occurs in south central W.A. from Kalgoorlie W to Merredin and NW to Yalgoo. Flowers Apr.–Oct.

W.A.: 34.5 km NE of Wubin, *R.Coveny* 7874 (PERTH); 30 km W of Merredin, *R.J.Cranfield* 594 (PERTH); 34 km S of Mt Jackson HS, *G.J.Keighery* 4302 (PERTH).



10b. *Philotheca deserti* subsp. *brevifolia* Paul G.Wilson, *Nuytsia* 12: 249 (1998)

T: NW of Menzies [precise locality withheld], W.A., 9 Sept. 1988, *R.J.Cranfield* 7258; holo: PERTH.

Illustration: P.G.Wilson, *op. cit.* 250, fig. 4.

Leaves shortly petiolate, fusiform to narrowly obovoid, 3–5 mm long, acute to obtuse, smooth and \pm flat adaxially, rounded abaxially.

Occurs in central southern W.A., c. 70 km NW of Menzies; where growing on red sandy clay. Flowers Sept.

W.A.: NW of Menzies [precise locality withheld], *R.J.Cranfield* 7521 (PERTH).

This subspecies appears to differ from the typical only in the size and shape of the leaves. It is found about 100 km NE of the nearest recorded population of subsp. *deserti*.



11. *Philotheca coccinea* (C.A.Gardner) Paul G.Wilson, *Nuytsia* 12: 247 (1998)

Eriostemon coccineus C.A.Gardner, *Hooker's Icon. Pl.* 34: t. 3378 (1939). T: Near Koorarawalyee, W.A., Oct. 1931, *W.E.Blackall* 936; holo: PERTH.

Illustration: C.A.Gardner, *loc. cit.*

Shrub to 1.5 m high. Branchlets glandular-tuberculate, minutely pilose between decurrent leaf bases, soon erupting in corky patches. Leaves compressed-clavate, c. 10 mm long, 1.5 mm wide, obtuse, black-apiculate, glabrous, smooth and narrowly channelled adaxially, markedly channelled and glandular-bullate abaxially. Stipules black, globular. Flowers solitary, axillary, nutant; pedicel 6–8 mm long, glabrous. Sepals broadly ovate, 1.5 mm long, black-apiculate, fleshy, glabrous. Petals erect, forming a tube but spreading at apex, broadly oblong, 8 mm long, connate in lower half, red (rarely white), minutely tomentose adaxially, sparsely so abaxially towards margins. Stamens free; filaments narrowly oblong, abruptly narrowed at apex, densely woolly-ciliate; anthers 1 mm long, shortly white-apiculate. Style equal to stamens, terete, pilose. Cocci rounded at apex and shortly rostrate at outer angle.

Occurs from Southern Cross to Norseman, W.A.; in shrubland on yellow sand or gravel. Flowers June–Oct.

W.A.: Boorabbin, *W.E.Blackall* 4054 (PERTH); Duladgin Rock, *A.S.George* 9415 (PERTH).

A collection from 5 km N of Norseman (*P.G.Wilson* 3143, PERTH) has a glabrous corolla and a glabrous style, its status is unclear.

Some collections from Mt Jackson, which is about halfway between the recorded localities for *P. coccinea* and *P. nutans*, are intermediate in morphology between these two species which suggests clinal variation.

Philotheca coccinea is closely related to the following two species. They all differ from the majority of W.A. members of this section in having axillary flowers and long, pilose styles.



12. *Philotheca pachyphylla* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 254 (1998)

Eriostemon pachyphyllus Paul G.Wilson, *Nuytsia* 1: 27 (1970). T: 20 miles [32 km] W of Coolgardie, W.A., 17 Sept. 1962, *M.E.Phillips*; holo: AD.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 541 (1998).

Shrub to 1 m high. Branchlets minutely puberulous in grooves between decurrent leaf bases, sparsely glandular, developing black corky excrescences with age. Leaves fleshy, oblong, 3–5 mm long, 1.5–2 mm wide, obtuse, slightly convex and smooth adaxially, prominently glandular-bullate and deeply channelled abaxially. Stipules black. Flowers solitary, axillary, ascending; pedicel 2–3 mm long, glabrous. Sepals ovate, c. 1.5 mm long, fleshy, glabrous, almost smooth or glandular-verrucose. Petals erect, broadly oblong, c. 5 mm long, keeled, white, puberulous adaxially and towards margin abaxially. Stamens free; filaments linear-attenuate, densely woolly; anthers c. 0.6 mm long, prominently white-apiculate. Style long, terete, pilose. Cocci rounded at apex and shortly rostrate on outer angle.

Occurs c. 30 km W of Coolgardie and in the Bremer Ra., W.A.; growing on clay loam and over sandstone. Flowers May–Sept.

W.A.: N of Bulla Bulling, *J.S.Beard* 3327 (PERTH); 3.9 km WNW of Maggie Hays Hill, Bremer Ra., *N.Gibson & M.Lyons* 1880 (PERTH).

The Bremer Ra. population differs from the Bulla Bulling one chiefly in the plants having larger black-stipular excrescences and in the sepals being prominently glandular-verrucose (not almost smooth). They could be regarded as distinct subspecies.



13. *Philotheca nutans* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 253 (1998)

Eriostemon nutans Paul G.Wilson, *Nuytsia* 1: 28 (1970). T: Ninghan, W.A., 17 Aug. 1953, *C.A.Gardner* 12030; holo: PERTH.

Shrub to 1 m high. Branchlets terete, glandular-verrucose, variably puberulous. Leaves clavate and obtuse to subterete and acute, c. 11 mm long, glabrous, ±flattened and sometimes narrowly channelled adaxially, rounded and glandular-verrucose abaxially. Stipules prominent, black. Flowers solitary, axillary, nutant; pedicel slender, c. 8 mm long, puberulous. Sepals broadly ovate, c. 2.5 mm long, coriaceous, smooth, minutely puberulous. Petals broadly ovate forming a broadly cylindrical corolla, 7–10 mm long, pale yellow to pale red, puberulous on both surfaces. Stamens free; filaments narrowly oblong-attenuate, densely woolly-ciliate; anthers c. 1.4 mm long, minutely white-apiculate. Style long, terete, sparsely pilose. Fruit not seen.

Known from an area along and to the E of the Wubin–Paynes Find road, SW W.A.; growing on clayey sand in *Acacia/Eucalyptus* woodland. Flowers July–Sept.



W.A.: Wubin–Paynes Find road, *J.A.Armstrong* 7031 (PERTH); 32 km N of Beacon, *A.M.Ashby* 3614 (PERTH); near Mt Gibson, *B. & B.Backhouse* NG 15 (PERTH).

A variable species. Near Mt Gibson the leaves are curved, subclavate and obtuse, while the pedicels are puberulous. South-east of Mt Gibson towards Cleary the leaves are straight, semiterete, and acute, while the pedicels are almost glabrous. The petals deepen in colour with age. See also notes under *P. coccinea*.

14. *Philotheca ericifolia* (A.Cunn. ex Benth.) Paul G.Wilson, *Nuytsia* 12: 251 (1998)

Eriostemon ericifolius A.Cunn ex Benth., *Fl. Austral.* 1: 335 (1863). T: Liverpool Plains, N.S.W., May 1825, *A.Cunningham* 13; holo K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 251 (1991).

Shrub to 2 m high. Branchlets sparsely glandular-verrucose, puberulous; leaf bases not or indistinctly decurrent. Leaves crowded, acicular, 4–8 mm long, acute to obtuse, sparsely glandular-verrucose, channelled adaxially, glabrous or sparsely and minutely puberulous. Stipules small, black, acicular to globular. Flowers terminal, solitary or in clusters of 2–6; pedicels slender, 2–3 (–5) mm long, puberulous. Sepals triangular to narrowly triangular, 1.5–2 mm long, fleshy, glandular, glabrous but minutely ciliate. Petals elliptic, c. 9 mm long, white to pink, glandular-verrucose, puberulous adaxially and abaxially except for keeled midrib. Stamens free; filaments linear-attenuate, woolly below, densely pilose at apex; anthers oblong, c. 1.2 mm long, prominently white-apiculate. Style glabrous. Cocci apex rounded and abruptly attenuate to form a subulate beak, 2–3 mm long.

Found in the upper Hunter Valley and northern Pilliga Scrub, N.S.W.; growing in heath and sclerophyll woodland on sandstone. Flowers spring; fruits early summer.

N.S.W.: Eurow Mtns, 20 Sept. 1974, *A.Jones* (CANB); Pilliga, *E.C.Rolls* 27 (NSW); near Currant Mtn Gap, *I.R.Telford* 5095 (MEL).

This species is very similar to some forms of *P. salsolifolia*, from which it may be distinguished by the free stamens and by the triangular sepals. It is also similar to *P. difformis*, from which it may be distinguished by the above characters and by its acicular leaves. Listed as Vulnerable under the EPBC Act, 1999.



15. *Philotheca difformis* (A.Cunn. ex Endl.) Paul G.Wilson, *Nuytsia* 12: 249 (1998)

Eriostemon difformis A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 15 (1837). T: Lachlan R., N.S.W., 24 May 1817, *A.Cunningham* 163; iso: K.

E. rhombeus Lindl. in T.L.Mitchell, *J. Exped Trop. Australia* 293 (1848). T: Mantuan Downs [= Drummond Ra., Qld], 1 Sept. 1846, *T.L.Mitchell* 590; holo: CGE; iso: TCD.

E. parvifolius R.Br. ex Benth., *Fl. Austral.* 1: 335 (1863). T: Shoalwater Bay [Qld], 26 Aug. 1802, *R.Brown*; holo: K; iso: CANB, MEL.

Shrub 1–2 m high. Branchlets sparsely glandular-verrucose, ±puberulous all round, without obvious decurrent leaf bases. Leaves shortly petiolate; lamina either fleshy or coriaceous and flat but with slightly recurved margin, 3–8 mm long, glabrous or minutely puberulous. Stipules small, black, acicular to globular. Flowers terminal, solitary or in clusters of 2–4; pedicels puberulous, 2–3 mm long. Sepals obtusely triangular, c. 1 mm long, fleshy, ±glabrous. Petals oblong-elliptic, 4–5 mm long, white, puberulous on both sides except for the thick, glabrous midrib. Stamens free; filaments linear-acuminate, woolly-ciliate; anthers c. 0.8 mm long, shortly white-apiculate. Style terete, glabrous. Cocci truncate, variably rostrate.

Occurs in S.A., Qld, N.S.W., and Vic.; growing in rocky habitats. Two subspecies are recognised.

Leaves fleshy, convex adaxially, concave or channelled abaxially

15a. subsp. *difformis*

Leaves coriaceous, flat with slightly recurved margin

15b. subsp. *smithiana*

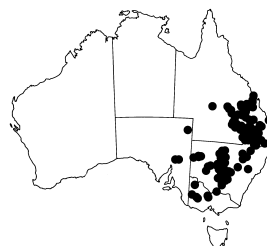
15a. *Philotheca difformis* (A.Cunn. ex Endl.) Paul G.Wilson subsp. *difformis*

Illustrations: T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 466, fig. 71 (1983); K.A.W.Williams, *Native Pl. Queensland* 2: 126 (1984); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 295, fig. 6a (2002).

Leaves thick, fleshy, subterete to ovate or rhomboid, 2.5–7 mm long, convex adaxially, concave or channelled abaxially; margin irregularly undulate due to the 1 or 2 glandular warts on each side. $2n = c. 30$, H.M.Stace & J.A.Armstrong, *Austral. Syst. Bot.* 5: 502 (1992).

Occurs principally in inland localities in SE Qld, inland N.S.W., NW Vic., and Flinders Ra. of S.A.; growing in rocky areas in woodland. Flowers and fruits throughout the year.

S.A.: Bibliando Stn, *M.D.Crisp* 902 (CANB). Qld: c 37 km SSE of Rolleston, *M.Lazarides & Story* 52 (PERTH). N.S.W.: Pilliga Forest, Sept. 1913, *E.H.F.Swain* (NSW). Vic.: Sandhurst, *R.Thorn* 33 (MEL).

**15b. *Philotheca difformis* subsp. *smithiana* (Benth.) Paul G.Wilson, *Nuytsia* 12: 251 (1998)**

Eriostemon difformis var. *smithianus* Benth., *Fl. Austral.* 1: 335 (1863); *E. difformis* subsp. *smithianus* (Benth.) Paul G.Wilson, *Nuytsia* 1: 30 (1970). T: Wide Bay, Qld, *W.Hill*; lecto: MEL, *fide* P.G.Wilson, *loc. cit.*

E. parvifolius R.Br. ex Benth., *loc. cit.* T: Shoalwater Bay passage [Qld], *R.Brown*; holo: K; iso: BRI, MEL, NSW.

Illustrations: T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 466 fig. 71 (1983); K.A.W.Williams, *Native Pl. Queensland* 3: 116 (1987); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 295, fig. 6b (2002).

Leaves coriaceous, oblong to broadly elliptic, c. 7 mm long, flat (or margin slightly recurved); margin almost entire to glandular-undulate or glandular-crenate with 4–6 undulations.

Occurs principally near the coast in SE Qld and NE N.S.W. S to near Singleton; often growing on rocky outcrops. Flowers throughout the year.

Qld: Swain Peak, *A.R.Bean* 5788 (PERTH); Mt Tinbeerwah, *G.P.Guymer* 1619 (MEL); Blackall Ra., *I.Telford* 720 (CBG). N.S.W.: 31 km SE of Denman, *R.Coveny* 5620 (NSW).

Philotheca difformis subsp. *smithiana* differs from subsp. *difformis* in having flat leaves and petals that are slightly less puberulous on the abaxial surface. The latter subspecies is an inland plant whereas subsp. *smithiana* is found near the coast; plants that in leaf form are intermediate between typical members of the two subspecies are found between Inglewood and Warwick in SE Qld, i.e. in a geographically intermediate locality.

**16. *Philotheca brevifolia* (A.Cunn. ex Endl.) Paul G.Wilson, *Nuytsia* 12: 246 (1998)**

Eriostemon brevifolius A.Cunn. ex Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 16 (1837). T: Peels Ra. [Cocoparra Ra.], N.S.W., June 1817, *A.Cunningham* 162; iso: K.

E. difformis var. *teretifolius* Benth., *Fl. Austral.* 1: 335 (1863). T: Peels Ra. [Cocoparra Ra.], N.S.W., June 1817, *A.Cunningham* 162; lecto: K, *fide* P.G.Wilson, *Nuytsia* 1: 31 (1970).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 295 (2002).

Shrub to 2 m high. Branchlets glandular-verrucose, ±shortly pilose or glabrous beneath nodes. Leaves sessile, semiterete, fleshy, 2–4 mm long, rounded at apex and minutely black-apiculate (when young), flat and channelled adaxially, rounded abaxially, glandular-verrucose, glabrous or nearly so. Stipules absent or minute. Flowers terminal, solitary or in clusters of 2–4; pedicels puberulous, 1–3 mm long. Sepals suborbicular, c. 1.2 mm long, with fleshy centre otherwise thin, black-apiculate, glabrous. Petals elliptic, 5 mm long, white to pink, glabrous or sparsely



puberulous adaxially, glabrous abaxially, thickened on midrib. Stamens free; filaments linear-attenuate, pilose; anthers 0.7 mm long, with prominent apiculum. Style glabrous. Cocci c. 3 mm long, shortly rostrate.

Known only from a small area near Griffith and the Cocoparra Ra., N.S.W. Usually found in mallee communities on red sandy soils. Flowers spring.

N.S.W.: Goolgowi, Oct. 1961 *A.Mitchell* (NSW); Cocoparra Ra., 16 Sept. 1973, *T.O.Rourke* (NSW); Arianah Park, *C.J.Shepherd* 860 (CANB).

17. *Philotheca angustifolia* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 246 (1998)

Eriostemon angustifolius Paul G.Wilson, *Nuytsia* 1: 31 (1970). T: Near Finnis R., S.A., 25 Aug. 1963, *D.N.Kraehenbuehl* 906; holo: AD.

Shrub to 1 m high. Branchlets glandular-verrucose, minutely pilose in narrow grooves which become corky. Leaves sessile, terete to clavate or fleshy and semiorbicular, 2–10 mm long, acute to rounded, not apiculate, glandular-verrucose, glabrous. Stipules small, black. Flowers terminal, solitary or in clusters of 2–4; pedicels 0.5–4 mm long, puberulous. Sepals suborbicular to triangular, c. 1 mm long, fleshy, glabrous. Petals elliptic, 5–9 mm long, white with thickened pink midrib, sparsely puberulous to glabrous adaxially, glabrous abaxially. Stamens free; filaments narrowly oblong, pilose towards apex, woolly-ciliate; antisepalous filaments with a subulate apex; anthers c. 0.6 mm long, prominently white-apiculate. Style terete, glabrous. Cocci c. 3 mm high, shortly rostrate.

Occurs in eastern S.A., western and central Vic., and south-central N.S.W. Two subspecies are recognised.

Leaves ±terete or clavate, channelled adaxially

17a. subsp. *angustifolia*

Leaves obovate, concave adaxially

17b. subsp. *montana*

17a. *Philotheca angustifolia* (Paul G.Wilson) Paul G.Wilson subsp. *angustifolia*

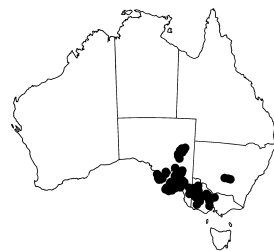
Illustrations: G.R.M.Dashorst & J.P.Jessop, *Pl. Adelaide Plains and Hills* 99, Pl. 42 (1990); N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 180, fig. 33d (1999), as *E. angustifolius* subsp. *angustifolius*; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 295 (2002).

Leaves terete or clavate, 2–10 mm long, channelled adaxially, rounded abaxially. Petals minutely pilose adaxially. *n* = 28, S.Smith-White, *Austral J. Bot.* 2: 292 (1954) as *Eriostemon brevifolius*.

Occurs in southern and eastern S.A., central and western Vic. and south-central N.S.W.; growing in woodland or heath in heavy soil or among rocks. Flowers spring.

S.A.: Mt Serle, *T.R.N.Lothian* 3141 (PERTH); S from Sandergrove Siding, *R.D.Pearce* 296 (PERTH). N.S.W.: Rankins Springs, Aug. 1953, *R.Jordan* (AD). Vic.: Wyperfeld Natl Park, *A.C.Beauglehole* 28290 (PERTH); 18 miles [29 km] NNE of Bendigo, *E.F.Constable* 5239 (PERTH).

The flower and leaf sizes are greatest in specimens from the Northern Flinders Ra., where some flowers have petals almost twice as long as those from more southern localities. In SE S.A. and western Vic. the leaves are short (c. 2 mm long), and thick.



17b. *Philotheca angustifolia* subsp. *montana* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 246 (1998)

Eriostemon angustifolius subsp. *montanus* Paul G.Wilson, *Nuytsia* 1: 32 (1970). T: NW slopes of Mt Difficult, Vic., 12 Oct. 1962, *T.B.Muir* 2647; holo: MEL; iso: CANB.

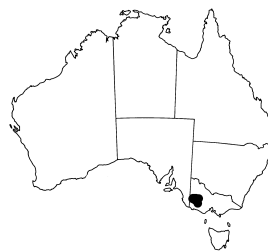
Illustration: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 180, fig. 33e (1999), as *E. angustifolius* subsp. *montanus*.

Leaves elliptic to broadly elliptic or broadly obovate, 2–5 mm long, thick, concave and smooth adaxially, convex and strongly glandular-bullate abaxially. Petals glabrous or nearly so adaxially.

Found in The Grampians, Vic.; growing on rocky outcrops. Flowers Aug.–Nov.

Vic.: E of Mt Zero, *A.C.Beauglehole* 30917 (PERTH); Black Ra., 6 Oct. 1929, *P.R.H.St.John* (MEL).

Philotheca angustifolia subsp. *montana* is similar to some forms of *P. difformis*. It differs from that species in having petals that are glabrous abaxially, in the nature of the stem indumentum, and in the stamen shape and indumentum. The areas of distribution of the two taxa are quite distinct.



18. *Philotheca sporadica* (Bayly) Paul G.Wilson, *Nuytsia* 12: 255 (1998)

Eriostemon sporadicus Bayly, *Austral. Syst. Bot.* 7: 275 (1994). T: 10 km SW of Kogan, Qld, 13 Sept. 1992, *M.J.Bayly* 149; holo: MEL n.v.; iso: BRI n.v., PERTH.

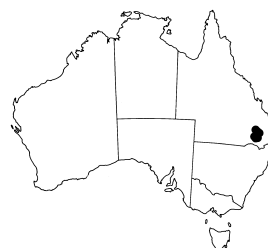
Illustration: *M.J.Bayly*, *op. cit.* 279, fig. 3.

Shrub to 1 m high. Branchlets sparsely glandular-verrucose, minutely pilose in grooves, erupting irregularly in corky excrescences. Leaves subsessile, narrowly obovoid, 2–3 mm long, rounded at apex with a sunken dark-coloured terminal gland, fleshy, glabrous, flat and channelled adaxially, rounded abaxially. Stipules globular, black. Flowers terminal, mostly solitary; pedicel 0.5–1 mm long. Sepals broadly triangular, c. 1 mm long, fleshy, glabrous. Petals elliptic, c. 6 mm long, white with thickened pink midrib, sparsely puberulous adaxially, glabrous abaxially. Stamens free; filaments narrowly oblong with subulate apex, woolly-ciliate, pilose towards apex; anthers c. 0.6 mm long, minutely white-apiculate. Style terete, glabrous. Fruit not seen.

Found in SE Qld; growing in sandy loam over laterite in open forest. Flowers Aug.–Nov.

Qld: 80 km W of Dalby, *S.L.Everist* 2161 (BRI); 10 km E of Kogan, *S.L.Everist* 3504 (CANB); 6 km from Kogan towards Dalby, 22 Aug. 1961, *M.E.Phillips* (CANB).

This species differs from *P. angustifolia* by the manner in which the cork develops sporadically all over the branchlets and by the narrowly obovoid leaves which have rounded apices and a small black terminal gland. Listed as Vulnerable under the EPBC Act, 1999.



19. *Philotheca gardneri* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 252 (1998)

Eriostemon gardneri Paul G.Wilson, *Nuytsia* 1: 33 (1970). T: Jerramungup, W.A., Sept. 1939, *C.A.Gardner* 5006; holo: PERTH.

Shrub to 1 m high. Branchlets puberulous except for glabrous decurrent leaf bases, becoming corky between them. Leaves congested, shortly petiolate, glabrous, terete to slender-clavate and 5–8 mm long or subglobular and 1.5–2 mm long, obtuse to rounded and with a small colourless to black terminal gland. Stipules black. Flowers terminal, usually solitary; pedicel fleshy, narrowly turbinate, 1–2 mm long. Sepals ovate, c. 1.5 mm long, fleshy with scarious margin, glabrous. Petals ovate, c. 6 mm long, white with prominent pink midrib, puberulous adaxially, glabrous abaxially or thinly puberulous towards margin. Stamens free; filaments linear-attenuate, sparsely ciliate to densely woolly-ciliate; anthers c. 0.5 mm long, white apiculate. Cocci 4 mm high, truncate, shortly apiculate.

Occurs in southern W.A. from Cheyne Bay E to Howick Hill and N to Lake King. Two subspecies are recognised that appear to grade into each other.

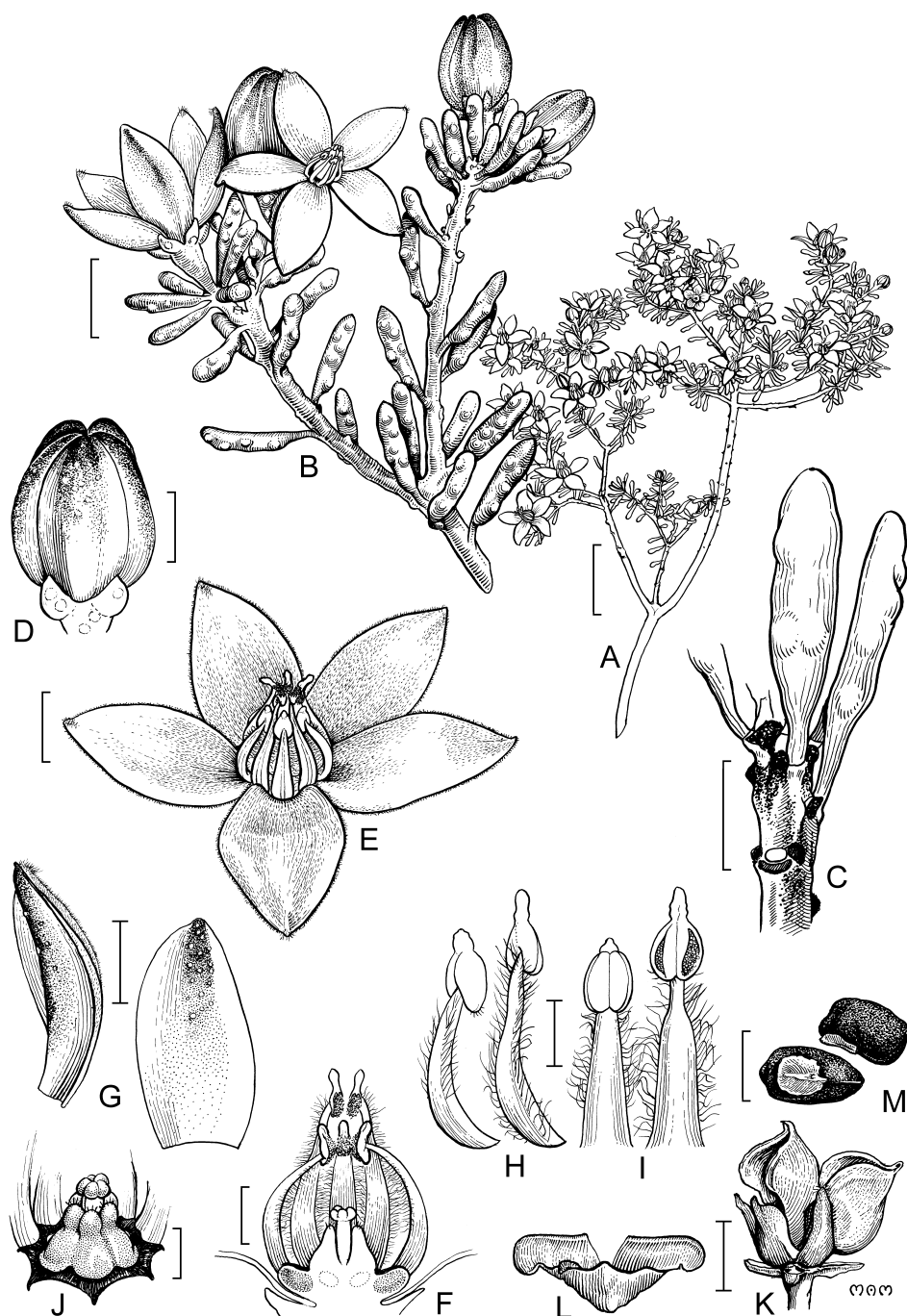


Figure 60. *Philotheca gardneri* subsp. *gardneri*. A, habit; B, flowering branch; C, leaves showing stipules; D, flower bud; E, flower; F, flower, L.S.; G, petals, lateral and abaxial view; H, antipetalous & antisepalous stamens, abaxial view; I, antipetalous & antisepalous stamens, adaxial view; J, pistil; K, cocci (mature & sterile); L, endocarp; M, seeds (A–M, drawn from fresh material, voucher not recorded). Scale bars: A, B = 10 mm; C–E, G, K–M = 2 mm; F, H–J = 0.5 mm. Drawn by M. Wilson.

Leaves terete or slender-clavate, 5–8 mm long

19a. subsp. *gardneri*

Leaves \pm globular, 1.5–2 mm long

19b. subsp. *globosa*

19a. *Philotheca gardneri* (Paul G.Wilson) Paul G.Wilson subsp. *gardneri*

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 542 (1998).

Leaves terete to slender-clavate, 5–8 mm long, obtuse. Fig. 60.

Occurs in southern W.A. from Wagin E to Howick Hill and N to Bruce Rock; growing in mallee or heath on sandy clay loam or on gravel, gneiss, or other rocky substrates. Flowers June–Sept.; fruits Sept.–Nov.

W.A.: 27 km W of Lake King, *D.E.Albrecht 4107* (PERTH); Fitzgerald R. area, *R.Coveny 3211* (PERTH); Howick Hill, *N.N.Donner 2840* (PERTH); 13 km NNW of Ravensthorpe, *J.Taylor 2313* (PERTH).



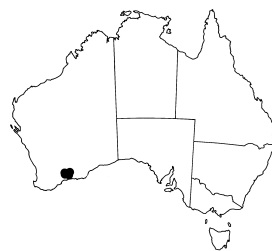
19b. *Philotheca gardneri* subsp. *globosa* Paul G.Wilson, *Nuytsia* 12: 252 (1998)

T: 110 km SW of Norseman, 11.5 km WSW of Dog Rock, W.A., 21 Sept. 1979, *J.Taylor 723*; holo: CANB; iso: PERTH.

Leaves globular or subglobular, 1.5–2 mm long, rounded at apex, fleshy.

Known from a small area between Ravensthorpe and Norseman, southern W.A.; growing on sand in heathland. Flowers June–Sept.

W.A.: 22.5 km ENE of Coujinup Hill, *M.A.Burgman 1535* (PERTH); 39 km SSW of Peak Eleanora, *M.A.Burgman 1928a* (PERTH); 40 km ENE of Muckinwobert Rock, *M.A.Burgman 2190a* (PERTH).



20. *Philotheca falcata* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 251 (1998)

Eriostemon falcatus Paul G.Wilson, *Nuytsia* 1: 34 (1970). T: Yellowdine, W.A., 4 Oct. 1931, *W.E.Blackall 917*; holo: PERTH.

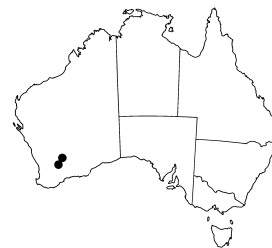
Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 543 (1998).

Small densely branched shrub. Branchlets densely glandular-verrucose, minutely puberulous in lines when young. Leaves shortly petiolate, slender-clavate, falcate, c. 6 mm long, rounded at apex, glandular-verrucose, glabrous. Stipules absent. Flowers terminal, solitary; pedicel c. 2 mm long. Sepals triangular-acuminate, c. 3 mm long, somewhat glandular-verrucose, glabrous. Petals elliptic, to 7 mm long, white, puberulous adaxially, glabrous abaxially (or minutely puberulous on margins); midrib not prominent. Stamens free; filaments linear-acuminate, pilose; anthers 0.5 mm long with a dark red oblong abaxial centre, minutely white-apiculate. Style terete, glabrous. Fruit not seen.

Known from the type gathering made near Southern Cross and a collection from near Holleton in Narembeen Shire, W.A. Evidently grows in *Eucalyptus* woodland on clay over laterite. Flowers Oct.

W.A.: Holleton, *C.Cox CC 885* & *R.Graham RG 01* (PERTH).

Listed as Critically Endangered under the EPBC Act, 1999.



21. *Philotheca langei* Mollemans, *Nuytsia* 9: 98 (1993)

T: NW of Chiddarcooping Hill, W.A., 25 Aug. 1991, *F.H. & M.P.Mollemans 4127*; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 543 (1998).

Shrub c. 1 m high. Branchlets very sparsely puberulous, glandular-verrucose, without marked decurrent leaf bases. Leaves narrowly to broadly clavate, 4–6 mm long, obtuse,

undulate due to prominent marginal glandular warts, flat and channelled adaxially, rounded abaxially. Stipules absent. Flowers terminal, solitary or 2 or 3 together; pedicels 3 mm long, glabrous or sparsely puberulous. Sepals very broadly ovate, 1 mm long, obtuse, fleshy with scarious margin, glabrous. Petals elliptic, 4 mm long, white with central pink stripe, puberulous adaxially and towards margin abaxially. Stamens free; filaments linear-attenuate, sparsely pilose towards apex; anthers 0.5 mm long, prominently white-apiculate. Cocci quadrangular, c. 3 mm high, acutely rostrate on outer angle.

Occurs near Chiddarcooping Hill, c. 50 km NW of Southern Cross, with one collection from the Merredin district, W.A.; growing in yellow sand in association with granite. Flowers Aug.; fruits Sept.–Nov.

W.A.: Merredin, 31 Aug. 1926, *J.B.Cleland* (AD); Chiddarcooping Hill, *F.H. & M.P.Mollemans* 3796 (PERTH).

This species probably has a very restricted distribution since the locality “Merredin”, where it is recorded as having been collected in 1926, is probably only approximate.



22. *Philotheca basistyla* Mollemans, *Nuytsia* 9: 101 (1993)

T: SSE of Trayning, W.A., 25 Aug. 1991, *F.H. & M.P.Mollemans* 4126; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 544 (1998).

Shrub to 1 m high. Branchlets smooth when young, sparsely puberulous, becoming corky between glabrous decurrent leaf bases. Leaves slender-clavate, c. 10 mm long, rounded at apex, flat adaxially, slightly glandular-verrucose, glabrous. Stipules absent. Flowers terminal, solitary; pedicel narrowly turbinate, c. 1 mm long, glabrous. Sepals very broadly ovate, c. 1 mm long, glabrous, fleshy with thin margin. Petals elliptic, c. 6 mm long, white with pink tip, puberulous adaxially, puberulous towards margin and glabrous in central glandular medial strip abaxially. Stamens: filaments $\frac{2}{3}$ united in a cylindrical tube, pilose; anthers c. 0.5 mm long, very minutely white-apiculate. Style expanded below, densely pilose. Fruit not seen.

Occurs c. 50 km NW of Southern Cross, SW W.A.; growing in dense scrub on yellow sand. Flowers Aug.–Oct.

W.A.: SE of Trayning, *M.J.Bayly et al.* 1924 (PERTH); SSE of Trayning, *F.H. & M.P.Mollemans* 3213 (PERTH).

Listed as Endangered under the EPBC Act, 1999.



23. *Philotheca rhomboidea* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 254 (1998)

Eriostemon rhomboideus Paul G.Wilson, *Nuytsia* 1: 34 (1970). T: 1 km N of Lake King township, W.A., 16 Sept. 1964, *P.G.Wilson* 3228; holo: AD; iso: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 543 (1998).

Shrub to 1 m high. Branchlets sparsely glandular, glabrous, without decurrent leaf bases, grey when young, corky excrescences forming with age. Leaves thick, broadly elliptic to obovate or orbicular, 2–4 mm long, undulate marginally, rounded at apex, glabrous, with 2 or 3 glandular warts abaxially. Stipules absent. Flowers terminal, solitary or 2 or 3 together; pedicels 2–3 mm long, glabrous. Sepals deltate, 1–1.5 mm long, thick, glabrous. Petals ovate, c. 5 mm long, white to pale pink, glabrous, with prominent midrib. Stamens free; filaments linear-attenuate, woolly-pilose towards apex; anthers c. 1 mm long, minutely white-apiculate, with a medial reddish zone abaxially. Style glabrous. Cocci c. 2.5 mm high, outwardly apiculate.



Occurs in SW W.A. from Wongan Hills to N of Esperance; growing in shrubland on yellow sand and gravel, often in association with granite or laterite. Flowers Aug.–Oct.; fruits Oct.–Nov.

W.A.: near Chidnup L., *K.Newbey* 2640 (PERTH); Mt Matilda, *B.H.Smith* 1348 (PERTH); 17 km N of Kondinin, *P.G.Wilson* 3440 (PERTH).

This species is distinctive for its leaf shape, its lack of hairs, and its greyish green appearance.

24. *Philotheca glabra* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 252 (1998)

Eriostemon glaber Paul G.Wilson, *Nuytsia* 1: 35 (1970). T: Cowcowing, W.A., Sept. 1904, *M.Koch* 1020; holo: NSW; iso: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 542 (1998).

Shrub to 50 cm high. Branchlets glabrous with prominent green decurrent leaf bases and brown intermediate strips that soon become corky. Leaves ellipsoid to clavate, 2–3 mm long, obtuse to rounded at tip, glandular-verrucose, flattened and channelled adaxially, glabrous. Stipules absent. Flowers terminal, solitary or 2 or 3 together; pedicels 1–4 mm long, glabrous. Sepals ovate to suborbicular, c. 1.5 mm long, glandular, glabrous. Petals elliptic, c. 7 mm long, white, tinged with pink abaxially, puberulous adaxially, glabrous abaxially. Stamens free; filaments linear-attenuate, woolly-ciliate, densely pilose at apex; anthers c. 1 mm long, prominently white-apiculate. Cocci c. 3 mm high, rounded at apex, not apiculate.

Found in inland SW W.A. from Mullewa S to Wubin; growing in heathland on yellow sand frequently over laterite. Flowers July–Oct.; fruits Oct.–Nov.

W.A.: 66 km NE of Wubin, *A.Fairall* 1775 (PERTH); Mt Gibson, *A.J.Gibson* 70 (PERTH); Mullewa, Sept. 1953, *R.Hill* (AD); Wilroy Res., *B.G.Muir* 363 (PERTH).



25. *Philotheca cymbiformis* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 248 (1998)

Eriostemon cymbiformis Paul G.Wilson, *Nuytsia* 1: 205 (1971). T: Fitzgerald River Res., W.A., 7 Oct. 1970, *P.G.Wilson* 10176; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 543 (1998).

Undershrub c. 50 cm high. Branchlets greyish, glabrous, without obvious decurrent leaf bases. Leaves fleshy, narrowly elliptic, concave adaxially, 6–10 mm long, obtuse to acute, smooth to slightly verrucose, greyish green when dry. Stipules absent. Flowers terminal, solitary, surrounded by uppermost leaves; pedicel obconical, c. 1.5 mm long. Sepals broadly triangular, 1.5 mm long, fleshy with narrow scarious margin, glabrous. Petals ovate, 6 mm long, white with reddish brown medial strip, sparsely puberulous adaxially, glabrous abaxially. Stamens free; filaments linear-acuminate, densely woolly towards base, reddish pilose distally; anthers 1 mm long, minutely apiculate. Style pilose. Fruit not seen.

Occurs near the S coast of W.A. between Bremer Bay and Hopetoun; grows in sand. Flowers Sept.–Nov.

W.A.: Near Twertup Quarry, *E.M.Canning* 68751 (PERTH); Mt Bland, *K.Newbey* 2649 (PERTH).



26. *Philotheca apiculata* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 246 (1998)

Eriostemon apiculatus Paul G.Wilson, *Nuytsia* 1: 35 (1970). T: Norseman, W.A., 17 Sept. 1965, *J.Bale* 185; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 542 (1998).

Undershrub c. 1 m high. Branchlets terete (not channelled), glabrous or sparsely puberulous when young, developing a scaly wax-like surface. Leaves narrowly clavate, slightly falcate, 4–8 mm long, prominently black-apiculate, glandular-verrucose, glabrous (or sparsely and shortly

hirsute adaxially). Stipular excrescences prominent. Flowers terminal, solitary or in clusters of 2–4, surrounded by foliage leaves, frequently overtopped by lateral branchlets; pedicels 0.5–1.5 mm long, glabrous. Sepals narrowly triangular to triangular, 2 mm long, fleshy, glabrous, black-apiculate. Petals narrowly oblong, boat-shaped, c. 6 mm long, white to pink, pubescent adaxially and towards margin abaxially. Stamens free; filaments linear-attenuate, woolly towards base, reddish pilose towards apex; anthers 0.8 mm long, shortly white-apiculate. Style terete, glabrous. Cocci c. 4 mm high, prominently rostrate (c. 1.5–2 mm) on outer angle.

Occurs in southern W.A. near Holleaton and Norseman; where growing on ultra-basic rocks. Flowers July–Sept.; fruits Nov.–Jan.

W.A.: Widgiemooltha, *P.G.Armstrong 88/138* (PERTH); Peninsula, NE of Norseman, *P.J.Barnes 7159* (PERTH).

A collection from Mt Buraminy, 180 km SE of Norseman, differs from specimens that come from the Norseman area in having leaves that are prominently channelled adaxially and sepals only 1 mm long; it should possibly be recognised as a distinct taxon.



27. *Philotheca tomentella* (Diels) Paul G. Wilson, *Nuytsia* 12: 256 (1998)

Eriostemon tomentellus Diels, *Bot. Jahrb. Syst.* 35: 320, fig. 39 G–J (1904). T: 5 km N Comet Vale, W.A., 5 July 1995, *R.J.Cranfield 9852*; neo: PERTH, *fide* P.G. Wilson, *Nuytsia* 12: 256 (1998).

E. stowardii S. Moore, *J. Linn. Soc., Bot.* 45: 166 (1920). T: Trayning, W.A., *F. Stoward 291*; isosyn: MEL; Nungarin, W.A., *F. Stoward 794*; syn: *n.v.*

Illustrations: F. Diels & E. Pritzel, *op. cit.* 321, fig. 39 G–J; B.J. Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 542 (1998).

Undershrub, minutely tomentose or rarely glabrous. Branchlets without decurrent leaf bases, slightly glandular-verrucose, sometimes with a wax-like scaly surface. Leaves clavate to subterete, fleshy, 2–3 (–6) mm long, rounded at apex and minutely black-apiculate, ±flat adaxially, rounded abaxially, glandular-verrucose, minutely tomentose. Stipules usually absent. Flowers terminal, solitary or in clusters of 2–4; pedicels 1.5–3 mm long. Sepals broadly deltate to sub-orbicular, 1 mm long, minutely black-apiculate, slightly glandular, puberulous. Petals ovate, 4–5.5 mm long, white with pale red central stripe, puberulous. Stamens free; filaments linear-attenuate, sparsely pilose; anthers c. 1 mm long with a prominent white apiculum. Style terete, glabrous. Cocci c. 3.5 mm high, rounded at apex with short apiculum on outer angle.

Occurs in inland SW W.A. from the Murchison R. S to L. Grace and E to Queen Victoria Spring; grows in shrubland on sand. Flowers Aug.–Oct.; fruits Oct.–Nov.

W.A.: Wyalkatchem, *A.M. Ashby 1473* (PERTH); Ningham, *C.A. Gardner 12480* (PERTH); 25 km NNE of Queen Victoria Spring, *D. Pearson 522* (PERTH); Edjudina Stn, *H. Pringle 2381* (PERTH); Narkal, *B.H. Smith 897* (PERTH).

Philotheca tomentella may be distinguished from related species by its minutely tomentose covering (occasionally absent), shortly clavate leaves, black glandular apiculum to leaves and sepals, and by the virtual absence of stipules. It is somewhat variable with the more obvious variants noted as follows:



A variant that is almost glabrous when mature corresponds to the type of *Eriostemon stowardii*.

A collection from near Mukinbudin has clavate minutely tomentose leaves to 12 mm long. This should possibly be recognised as a distinct taxon.

Specimens that come from near Comet Vale and from near Coolgardie have leaves that are relatively long and somewhat flattened adaxially while the stem is glaucous.

A plant that is intermediate in morphology between *P. gardneri* and *P. tomentella* has been collected from between Lake Grace and Lake King.

28. Philotheca thryptomenoides (S.Moore) Paul G.Wilson, *Nuytsia* 12: 255 (1998)

Eriostemon thryptomenoides S.Moore, *J. Linn. Soc., Bot.* 45: 166 (1920). T: Nungarin, W.A., *F.Stoward* 784; holo: BM n.v., *fide* P.G.Wilson, *loc. cit.*

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 544 (1998).

Shrub c. 50 cm high. Branchlets smooth, dark-coloured to black, without decurrent leaf bases, minutely pilose when young. Leaves narrowly obovoid to clavate, 1.5–3 mm long, rounded at apex, flat adaxially, sparsely glandular-punctate, glabrous. Stipules absent. Flowers terminal, solitary, sessile or with puberulous pedicel to 2 mm long. Sepals \pm glabrous, from ovate and c. 2 mm long to basally ovate but with a semiterete fleshy foliaceous apex and in all to 3 mm long. Petals narrowly ovate, c. 6 mm long, white with broad reddish brown abaxial medial strip, puberulous adaxially and abaxially towards margins. Stamens free; filaments linear-attenuate, densely pilose; anthers c. 1 mm long with broad reddish region on back, minutely white-apiculate. Style terete, pilose towards base. Cocci c. 1.5–2 mm high; apex obtuse and minutely pilose, not apiculate.

Occurs in the Merredin-Wubin area of inland SW W.A.; grows in shrubland on heavy soil. Flowers July–Sept.; fruits Nov.

W.A.: Wubin, *W.E.Blackall* 3789 (PERTH); Ninghan, *C.A.Gardner* 12005 (PERTH); 17 km NW of Kellerberrin, *B.G.Muir* 327 (PERTH); 16 km E of Ballidu, *R.D.Royce* 2152 (PERTH).

This species may be recognised by the smooth blackish branchlets which lack decurrent leaf bases, by the leaf shape, and by the broad dark median strips on the outside of the petals.

**29. Philotheca sericea** (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 255 (1998)

Eriostemon sericeus Paul G.Wilson, *Nuytsia* 1: 37 (1970). T: 15 miles [c. 24 km] E of Kalli, W.A., 22 July 1958, *N.H.Speck* 1041; holo: CANB; iso: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 545 (1998).

Shrub to 1.5 m high. Branchlets moderately puberulous all over, without decurrent leaf bases. Leaves ellipsoid to obovoid, 1.5–3 mm long, rounded at apex, fleshy, flat adaxially, rounded abaxially, glabrous. Stipules absent. Flowers terminal, usually solitary; pedicel c. 0.5 mm long, puberulous. Sepals broadly triangular to suborbicular, c. 2.5 mm long, fleshy in centre, narrowed to a green fleshy apex, smooth or slightly glandular, glabrous. Petals ovate, c. 10 mm long, white to pink, densely silky-pubescent on both sides. Stamens: filaments united towards base, attenuate upwards, densely and minutely pilose; anthers c. 1 mm long, shortly white-apiculate. Style terete, sparsely and minutely pilose. Cocci minutely pilose, oblong, c. 4 mm high, narrowed at apex and passing into a stout erect rostrum c. 2 mm long.

Occurs in SW W.A. from near Geraldton E to near Sandstone; grows in shrubland in gravel over laterite or granite. Flowers July–Sept.; fruits Sept.–Oct.

W.A.: 70 km S of Mileura, *T.E.H.Aplin* 2524 (PERTH); Mt Tallering, *J.Galbraith* 425 (PERTH); c. 84 km NE of Wubin, *K.Newbey* 2034 (PERTH); 97 km E of Ajana, *P.G.Wilson* 4138 (PERTH).

**30. Philotheca acrolopha** Paul G.Wilson, *Nuytsia* 12: 243 (1998)

T: Mt Tozer, Qld, 28 July 1986, *K.Hill* 1839, *P.Hind* & *D.Healey*; holo: BRI; iso: MEL, NSW.

Philotheca sp. Mt Tozer (*L.J.Brass* 19483), R.J.F.Henderson, *Queensland Pl. Names & Distrib.* 187 (1997).

Illustration: P.G.Wilson, *op. cit.* 245, fig. 3.

Shrub to 1 m high. Branchlets reddish, puberulous between glabrous decurrent leaf bases. Leaves congested, narrowly cuneate, flattened, 7–13 mm long, recurved on margins, orbiculate, minutely glandular-apiculate, firmly chartaceous, glabrous, smooth. Stipules resinous. Flowers terminal, solitary; pedicel c. 2.5 mm long, glabrous, fleshy. Sepals orbicular, c. 1.5 mm long, coriaceous,

glabrous. Petals narrowly ovate, c. 5 mm long, firm, with thickened midrib, cream to very pale pink, sparsely puberulous adaxially and towards margins abaxially. Stamens: filaments connate at base and adnate to petals, narrowly oblong-attenuate, long-ciliate; anthers suborbicular, c. 0.6 mm long, with minute, reddish apiculum. Style terete, pilose in lower half. Fruit not seen.

Only known from Mt Tozer, Cape York Penin., Qld, where growing on a granite hill in heathland. Flowers July.

Qld: Mt Tozer, *L.J.Brass* 19483 (CANB); *loc. id.*, *B.Foster* 47 (BRI); *loc. id.*, *P.I.Forster* 15433 (BRI); *loc. id.*, *K.Hill* 1839 (BRI); *loc. id.*, *M.B.Thomas* 302 (BRI).

This species is the most northerly member of the genus and is remarkable for its flat cuneate leaves that are crowded on the branchlets. It is listed as Vulnerable under the EPBC Act, 1999.



31. *Philotheca coateana* Paul G.Wilson, *Nuytsia* 12: 247 (1998)

T: 20 km S of Bulga Downs Stn boundary, W.A., 3 Aug. 1993, *K.H.Coate* 292; holo: PERTH.

Shrub to 50 cm high. Branchlets smooth, greyish green, glabrous. Leaves ellipsoid, 3–4 mm long, rounded to obtuse at apex, dull greyish green, flat adaxially, glandular-punctate, glabrous. Stipules absent. Flowers terminal, solitary; pedicel 1–3 mm long, glabrous. Sepals broadly triangular, c. 3 mm long, smooth, glabrous. Petals elliptic, 7–9 mm long, white with pink midrib, sparsely puberulous adaxially, glabrous abaxially. Stamens free; filaments linear-attenuate, woolly-ciliate; anthers c. 1.5 mm long, minutely white-apiculate. Style terete, glabrous. Cocci truncate with a slender apiculum c. 1.5 mm long.

Found near Menzies in southern inland W.A. Appears to flower and fruit opportunistically throughout the year.

W.A.: boundary of Perrinvale and Walling Rock Stns, *R.J.Cranfield* 7169 (CANB, PERTH); near Menzies, Sept. 1927, *C.A.Gardner* and *W.E.Blackall* (PERTH); c. 29 km W of Old Gidgee, *R.D.Royce* 10457 (PERTH).



32. *Philotheca eremicola* Paul G.Wilson, *Nuytsia* 12: 251 (1998)

T: Gibson Desert [precise locality withheld], W.A., 19 Sept. 1992, *D.J.Pearson* 2875; holo: PERTH; iso: PERTH.

Similar to *P. coateana* from which it differs as follows. Leaves congested, narrowly fusiform, c. 2.5 mm long, acute, glabrous, glossy green. Pedicels slender, c. 4 mm long. Sepals ovate to narrowly triangular, unequal in size, acute to acuminate, with prominent brown glands. Cocci not seen.

Only known from the type; growing in *Acacia aneura* shrubland on a rocky slope in red skeletal laterite. Flowers Sept.



33. *Philotheca cuticularis* Paul G.Wilson, *Nuytsia* 12: 248 (1998)

T: Grey-Gowan Ra., Qld, 9 Apr. 1984, *R.W.Purdie* 2075; holo: CANB; iso: BRI *n.v.*

Rounded shrub to 60 cm high. Branchlets glandular-verrucose, sparsely puberulous when young; cuticle soon separating as a pale tunic; corky eruptions lacking. Leaves crowded, very shortly petiolate (0.3 mm long), fleshy, subterete, 1.5–2 mm long, obtuse to rounded, glandular-verrucose, glabrous, somewhat flattened adaxially. Stipules extremely minute when young or absent. Flowers terminal, solitary; pedicel 0.5–1 mm long, very sparsely puberulous. Sepals glabrous, irregular in size and shape, from triangular, very fleshy with scarious margins and c. 1 mm long, to semiterete, obtuse, foliaceous and c. 2 mm long. Petals elliptic, c. 2.5 mm long, white, puberulous adaxially, glabrous abaxially. Stamens free;

filaments linear-attenuate, ciliate; anthers orbicular, minutely white-apiculate. Ovary sparsely pilose; style short, glabrous. Fruit not seen.

Found in the Gowan Ra. area of southern Qld; grows in shallow soil overlying laterite. Evidently flowers and fruits opportunistically throughout the year.

Qld: c. 53 km E of Adavale, 16 Sept. 1967, *L. Pedley* 2502 (CANB).

A vegetative collection made in 1883 from Koonenberry Mtn, N.S.W. [*P.H. MacGillivray* 965 (NSW)], appears to belong to this species.

Philotheca cuticularis is unusual in having sepals that markedly differ in size and shape in the same flower.



Sect. 2. *Erionema*

Philotheca sect. *Erionema* (F. Muell.) Paul G. Wilson, *Nuytsia* 12: 256 (1998)

Erlostemon sect. *Erionema* F. Muell., *Pl. Victoria* 1: 121 (1862). T: *E. myoporoides* DC.

Erlostemon sect. *Osmanthos* Paul G. Wilson, *Nuytsia* 1: 51 (1970). T: *E. brucei* F. Muell.

Branches glabrous or with scattered simple hairs (minutely stellate in *E. brucei*). Leaves exstipulate, usually coriaceous. Flowers axillary, solitary or in pedunculate or sessile few-flowered cymes; pedicels with 2 or more basal bracteoles. Petals glabrous or rarely sparsely hispidulous. Stamens free; filaments narrowly oblong, abruptly narrowed in upper $\frac{1}{3}$, usually pilose; anthers bi- (rarely multi-) glandular at the base of a thin white apiculum. Carpels usually with solid sterile apex. Cocci erect or sometimes spreading, usually rostrate. Seed flattened-ellipsoid, 3.5–5 mm long; outer testa somewhat coriaceous, smooth, brown to black, glossy; sclerotesta smooth; hilum linear.

A section of 15 species of which 14 are found in eastern Australia and 1 in W.A.

The species of this section differ from those of sect. *Philotheca* most noticeably in having 2 (or rarely several) glands at the base of the white anther apiculum, and in having a seed that is laterally flattened with a linear hilum and coriaceous outer testa. In sect. *Philotheca* the seed is thick, with a deltate-shaped hilum and a thin outer testa.

- 1 Stem glabrous or minutely puberulous with stellate hairs; pedicel sessile (peduncle absent), with several small imbricate bracteoles scattered near base **48. *P. brucei***
- 1: Stem glabrous or hispidulous to puberulous with simple hairs; pedicel pedunculate or sessile with a minute basal bract and 2–6 minute basal bracteoles
- 2 Stem and leaves glabrous
- 3 Flowers 4-merous **46. *P. virgata***
- 3: Flowers 5-merous
- 4 Carpels united on outer surface; cocci rounded at apex, not apiculate **47. *P. trachyphylla***
- 4: Carpels free to base; cocci variably apiculate or rostrate
- 5 Leaves obovate to obcordate; inflorescences 1 (–3)-flowered, shortly pedunculate
- 6 Leaves narrowly obovate to obcordate, ≤ 7 mm wide **43. *P. verrucosa***
- 6: Leaves broadly obovate to broadly obcordate, ≥ 8 mm wide **44. *P. freyciana***
- 5: Leaves narrowly oblong to elliptic, obovate or falcate; inflorescences 1–5-flowered; peduncle 0–20 mm long
- 7 Leaves 13–30 mm long, 5–10 mm wide; inflorescence 1 (–3)-flowered **34. *P. myoporoides***

- 7: Leaves and inflorescence not as above
- 8 Leaves strongly conduplicate when dry
 - 9 Leaves < 35 mm long or if longer then branchlets prominently glandular-verrucose and leaves > 10 mm wide 34. *P. myoporoides*
 - 9: Leaves mostly > 40 mm long, branchlets almost smooth; leaves 4–14 mm wide (NE N.S.W.; SE Qld) 35. *P. conduplicata*
- 8: Leaves flat or concave when dry
 - 10 Leaves oblong to obovate, flat or slightly concave, 20–52 mm long, 4–11 mm wide; inflorescences 1 (–5)-flowered; pedicels 4–12 mm long; staminal filaments long-pilose towards apex 37. *P. glasshousiensis*
 - 10: Plants without the above combination of features
 - 11 Leaves ±flat when dry
 - 12 Leaves oblong to elliptic; flowers in clusters of (2–) 3–8 (Vic. to eastern central N.S.W.) 34. *P. myoporoides*
 - 12: Leaves obovate to broadly obovate; flowers in clusters of 2–5 (NE N.S.W.; SE Qld) 38. *P. obovatifolia*
 - 11: Leaves variably concave when dry
 - 13 Leaves obovate to oblanceolate; apex of staminal filaments glabrous or sparsely hairy (NE N.S.W.; SE Qld) 36. *P. epilosa*
 - 13: Leaves narrowly oblong to oblong, elliptic or oblanceolate; apex of staminal filaments pilose
 - 14 Leaves (15–) 40–45 (–52) mm long, 2–8 mm wide, ±concave; inflorescences up to 5-flowered; peduncle to 7 mm long; staminal filaments woolly-ciliate or shortly ciliate 34. *P. myoporoides*
 - 14: Leaves 9–30 mm long, 1.5–7 mm wide, deeply concave when dry; flowers solitary; peduncle to 3 mm long; staminal filaments densely ciliate throughout (SE Qld) 39. *P. queenslandica*
- 2: Stems hispidulous or puberulous (rarely glabrous); leaves glabrous, hispidulous or puberulous
 - 15 Leaves concave adaxially or conduplicate; pedicel shortly pedunculate with a whorl of small deltate bracteoles at base 40. *P. scabra*
 - 15: Leaves ±flat or revolute, narrowly cuneate to orbicular (obovate or obcordate in *P. obovalis*), smooth to verrucose; peduncle short or absent
 - 16 Leaves narrowly cuneate to narrowly obovate, mucronate; margin revolute, glandular-crenate 42. *P. hispidula*
 - 16: Leaves ±flat, smooth or slightly verrucose
 - 17 Leaves broadly elliptic or obovate to orbicular, mucronate, flat or slightly concave adaxially 41. *P. buxifolia*
 - 17: Leaves broadly to very broadly obovate or obcordate, not mucronate, ±flat 45. *P. obovalis*

34. *Philotheca myoporoides* (DC.) Bayly, *Muelleria* 11: 118 (1998)

Eriostemon myoporoides DC., *Prodr.* 1: 720 (1824). T: “Nouv. Holl. côté orient”; holotype: G-DC.

Shrub or small tree. Branchlets terete, glandular-verrucose (to smooth), sometimes glaucous, glabrous. Leaves sessile, oblong to ovate, broadly elliptic or broadly obovate (falcate if conduplicate), 15–110 mm long, entire, flat or conduplicate (at least when dry), acute to rounded or slightly retuse, usually apiculate, chartaceous to coriaceous, glandular-verrucose, glabrous. Flowers solitary or in clusters of (2–) 4–6 (–8); peduncle 0.5–20 mm long or sometimes absent, glabrous; pedicels 2–10 mm long, with a small deltate bract and 2 minute basal

bracteoles. Sepals very broadly triangular, c. 1 mm long, 1.5–2 mm wide, coriaceous, glabrous. Petals broadly elliptic, c. 8 mm long, white to pink, glabrous, with prominent keel. Stamens: filaments sparsely to densely woolly-ciliate or shortly ciliate, often pilose towards apex; anthers c. 1 mm long, usually shortly white-apiculate. Cocci erect, narrowed towards apex, c. 7 mm long; rostrum straight or curved, c. 3 mm long. Seed narrowly lenticular, 4–4.5 mm long.

Occurs in central and eastern N.S.W. and eastern Vic.; 4 subspecies are recognised.

Philotheca myoporoides may be distinguished from related species by being completely glabrous, by the leaves ending in an almost cuspidate point, and by the presence of axillary peduncles (sometimes very reduced) bearing at the apex up to 5 (rarely more) flowers. Bayly, *op. cit.*, indicated that the complex may not be monophyletic. It may be divided into several fairly distinct morphological groups which largely occupy separate geographical areas. These are distinguished as the following subspecies.

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|--|--|
| <p>1 Leaves oblong-elliptic to obovate, 13–30 mm long, 5–10 mm wide; inflorescences of 1–3 flowers; peduncles to 2 mm long (sometimes obsolete); pedicels 4–8 mm long (SE N.S.W.)</p> <p>1: Characters not combined as above</p> <p>2 Leaves strongly conduplicate when dry, < 3.5 cm long</p> <p>2: Leaves flat or variably concave when dry, to 11 cm long</p> <p>3 Leaves oblong to broadly elliptic or obovate, ±flat when dry</p> <p>3: Leaves narrowly oblong to narrowly elliptic, slightly to deeply concave when dry</p> | <p>34c. subsp. brevipedunculata</p> <p>34d. subsp. euroensis</p> <p>34a. subsp. myoporoides</p> <p>34b. subsp. acuta</p> |
|--|--|

34a. *Philotheca myoporoides* (DC.) Bayly subsp. *myoporoides*

Eriostemon cuspidatus A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 331 (1825). T: Cox's R., N.S.W., Oct. 1822, *A.Cunningham* 54; holo: K.

E. nerifolius Sieber ex Spreng., *Syst. Veg.* 4/2: 164 (1827). T: "Nov. Holl.", *F.W.Sieber* 306; iso: K, MEL.

E. lancifolius F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 32 (1855). T: Mt McFarlan, Mt Tambo and the Upper Mitta Mitta [N.S.W. & Vic.], *F.Mueller*; syn: (Mt Tambo) K, MEL; (Mt McFarlan) MEL.

E. amplifolius F.Muell., *Australas. Chem. Druggist* 7: 64 (Dec. 1884); *Phebalium amplifolium* (F.Muell.) Maiden & Betche, *Census New South Wales Pl.* 116 (1916). T: Upper Genoa R. [N.S.W. or Vic.], *C.Walter*; n.v.

Illustrations: N.T.Burbidge & M.Gray, *Fl. Austral. Cap. Terr.* 241, fig. 233 (1970), as *E. myoporoides*; A.Farley & P.Moore, *Native Pl. Sydney District* fig. 429 (1989); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 296, fig. 10a (2002).

Shrub or small tree. Stems faintly to moderately verrucose. Leaves oblong to elliptic, or broadly elliptic to obovate, 2–11 cm long, slightly conduplicate or flat when dry, rounded to acute. Inflorescences of (2–) 3–8 flowers; peduncle 0.5–20 mm long; pedicels 4–10 mm long. Stamens: filaments ciliate or woolly-ciliate, slightly pilose towards apex; anthers white-apiculate. *n* = 14, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs mostly along the Great Dividing Ra., from the Qld/N.S.W. border to near Healesville, Vic.; growing in forest and heathland, usually along watercourses. Flowers mainly spring and autumn.

N.S.W.: Yarramundi, 31 Oct. 1960, *E.F.Constable* (NSW). Vic.: Lake Mtn, *E.M.Canning* 1353 (CANB).

This subspecies is extremely variable, the variability being largely confined to the leaf morphology which appears to grade from one form to another. The type variant is found in N.S.W. from near Denman in the north to Batemans Bay in the south; it has long, narrowly oblong-elliptic leaves and prominent peduncles which bear several flowers. In the Blue Mtns of N.S.W., in the A.C.T., and in the mountains of eastern Vic., is found a variant with coriaceous, broadly elliptic to obovate leaves; this montane form could be given infraspecific recognition, however the flowers are very similar to those of the type variant. On this 'mountain variant' was based the name



E. lancifolius (described from the Victorian Alps). In eastern Vic. a similar variant has thick, very broadly elliptic leaves with the edges purple-tinged; it was on such a plant that the name *E. amplifolius* was based.

Hybrids occur between subsp. *myoporoides* and *P. hispidula* where the two species grow together as in the Blue Mtns and at Tahmoor. Intergradation with *P. scabra* is discussed under that species.

34b. *Philotheca myoporoides* subsp. *acuta* (Blakely) Bayly, *Muelleria* 11: 120 (1998)

Eriostemon myoporoides var. *acutus* Blakely, *Contr. New South Wales Natl Herb.* 1: 124 (1941); *E. myoporoides* subsp. *acutus* (Blakely) Paul G. Wilson, *Nuytsia* 1: 40 (1970). T: 10 miles [c. 16 km] N of Grenfell, N.S.W., 1 May 1900, *R.H.Cambage*; holo: NSW; iso: PERTH.

E. affinis Sprague, *Gard. Chron.* ser. 3, 33: 307 (1903). T: cultivated Kew; holo: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 296, fig. 10d (2002).

Shrub to 2 m high. Branchlets densely verrucose. Leaves narrowly oblong or narrowly elliptic, 15 × 2 mm to 52 × 8 mm, ±concave adaxially when dry, acute to obtuse, mucronate. Inflorescences of 1–3 (–5) flowers; peduncle 0–7 mm long; pedicels 1–10 mm long. Stamens: filaments ciliate (sometimes sparsely so), somewhat pilose at apex; anthers minutely white-apiculate. Cocci spreading; rostrum long, acuminate.

Occurs in southern central N.S.W. from Lockhart district to S of Cobar; on rocky sandstone slopes of hills. Flowers mainly spring and autumn.

N.S.W.: Beelangra, *N.T.Burbidge* 6424 (CANB); Monia Gap, 29 Oct. 1947, *E.F.Constable* (NSW); 11 km ESE of Barmedman, *L.Haegi* 1578 (NSW).

This subspecies differs from subsp. *myoporoides* in having much smaller and usually oblong-elliptic leaves, which in the dried state are frequently concave adaxially. It is similar to subsp. *epilosa* but may be distinguished by the leaf-shape, length of pedicel and peduncle, and by the form of the staminal filaments.



34c. *Philotheca myoporoides* subsp. *brevipedunculata* Bayly, *Muelleria* 11: 121 (1998)

T: Deua Natl Park, 13 km WSW of Moruya, N.S.W., 23 Nov. 1992, *R.O.Makinson* 1239 & *G.Butler*; holo: MEL; iso: CANB, NE, NSW, PERTH.

Illustrations: M.J.Bayly, *op. cit.* 115, fig. 2; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 296, fig. 10c (2002).

Shrub to 1.8 m high. Branchlets densely verrucose, glabrous. Leaves oblong-elliptic to obovate, 10–30 mm long, 5–10 mm wide, flat or slightly concave adaxially, obtuse or truncate, apiculate, coriaceous. Inflorescences of 1 (–3) flowers; peduncle to 2 mm long, sometimes minute or absent; pedicel slender, 4–8 mm long. Staminal filaments ciliate, sparsely long-pilose towards apex. Cocci erect, prominently rostrate.

Found in SE N.S.W. where growing near the summits of mountains in skeletal soil on rhyolite. Flowers late winter–summer.

N.S.W.: Deua Natl Park, *D.E.Albrecht* 4586 (MEL); c. 5 km S of Sassafras, 20 Sept. 1961, *E.F.Constable* (NSW); 16 km WSW of Moruya, *N.G.Walsh* 1883 (MEL).

This subspecies may be distinguished from subsp. *myoporoides* by its short leaves and very short peduncles.



34d. *Philotheca myoporoides* subsp. *euroensis* Bayly, *Muelleria* 11: 122 (1998)

T: Garden Ra., Euroa, Vic., 20 May 1989, *R.Thomas* 108; holo: MEL.

Illustration: M.J.Bayly, *op. cit.* 116, fig. 3.

Shrub to 1 m high. Branchlets densely verrucose. Leaves broadly elliptic and falcate, 15–35 mm long, 6–12 mm wide, conduplicate, obtuse, apiculate, coriaceous. Inflorescences of 1–4 flowers; peduncle robust, 0.5–7 mm long; pedicels 3–6 mm long. Stamens: filaments ciliate, sparsely pilose or glabrous towards apex; anthers with short apiculum. Cocci prominently beaked.

Known only from the Garden Ra., SW of Euroa, Vic.; where it grows in shallow soil among granite boulders. Flowers winter to early summer.

Vic.: c. 11 km SE of Euroa, 12 July 1951, *J.H.Willis* (MEL).

**35. *Philotheca conduplicata* (Paul G.Wilson) P.I.Forst., *Austrobaileya* 7: 176 (2005)**

Eriostemon myoporoides subsp. *conduplicatus* Paul G.Wilson, *Nuytsia* 1: 41 (1970); *P. myoporoides* subsp. *conduplicata* (Paul G.Wilson) Bayly, *Muelleria* 11: 124 (1998). T: Howell, N.S.W., Aug. 1905, *J.H.Maiden* & *J.L.Boorman*; holo: NSW.

Illustrations: K.A.W.Williams, *Native Pl. Queensland* 2: 126 (1984); M.J.Bayly, *op. cit.* 114, fig. 1D; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 297, fig. 10f (2002).

Shrub to 2 m high, glabrous except for flowers. Branchlets almost smooth. Leaves somewhat clustered near stem apices, elliptic, somewhat falcate, 4–7 cm long, 4–14 mm wide, somewhat conduplicate when dry, obtuse to acute, smooth. Flowers solitary or in clusters of 2–4; peduncle thick, to 4 mm long; pedicels thick, 2–4 mm long, glandular-verrucose. Sepals broadly triangular with fleshy centre. Petals elliptic-oblong to oblanceolate, 6–11 mm long, 2.5–3.5 mm wide, white, papillose adaxially, glabrous abaxially, with verrucose glands towards apex. Staminal filaments moderately long-ciliate, sparsely pilose at apex. Cocci erect, 7–9 mm long, prominently rostrate.

Found in the border ranges in the granite belt of NE N.S.W. and SE Qld; growing amongst boulders in decomposed granite. Flowers July–Sept.

Qld: Mt Jibbinbar, *L.C.Ball* 94 (BRI); Wyberba, *F.D.Hockings* 3 (BRI). N.S.W.: Howell, Aug. 1905, *J.H.Maiden* & *J.L.Boorman* (NSW); Tenterfield, Oct. 1918, *J.F.Thomas* (NSW).

**36. *Philotheca epilosa* (Paul G.Wilson) P.I.Forst., *Austrobaileya* 7: 177 (2005)**

Eriostemon myoporoides subsp. *epilosus* Paul G.Wilson, *Nuytsia* 1: 41 (1970); *P. myoporoides* subsp. *epilosa* (Paul G.Wilson) Bayly, *Muelleria* 11: 120 (1998). T: Wallangarra, Qld, Nov. 1906, *S.L.Boorman*; holo: NSW.

Illustrations: T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 466, fig. 71 (1983); K.A.W.Williams, *Native Pl. Queensland* 3: 118 (1987); G.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 297, fig. 10e (2002).

Compact shrub to 1 m high, glabrous except for flowers. Branchlets densely verrucose. Leaves congested near stem apices, obovate to oblanceolate, strongly concave when dry, 4–25 mm long, 2.2–8 mm wide; apex obtuse to rounded, strongly mucronate, often recurved. Flowers usually solitary; peduncle 1–3 mm long; pedicel 2–5 mm long, glandular-verrucose. Sepals semiorbicular, c. 0.7 mm high, 1.2 mm wide, fleshy in centre. Petals elliptic-oblong to obovate, 5–8 mm long, 2–3.5 mm wide, cream or tinged pink, papillose adaxially, abaxially glabrous with scattered verrucose glands towards apex. Stamens: filaments eciliate or sparsely ciliate with short, stiff bristles, epilose or almost so at apex; anthers blunt. Cocci erect, 5–7 mm long, prominently rostrate.

Occurs in far NE N.S.W. and SE Qld on the border mountains near Stanthorpe; growing among granite outcrops in heath and sclerophyll forests. Flowers Aug.–Sept.

Qld: Amiens, 21 Nov. 1956, *T.J.Bowen* (BRI); Mt Norman, *I.R.Telford* 3130 (PERTH). N.S.W.: Bald Rock Mtn, *E.F.Constable* 2071 (NSW); 6.4 km NNE of Boonoo Boonoo, *R.Coveny* 3896 (NSW).

This species is almost sympatric with *P. conduplicata*, however no hybrids between the two taxa have been recorded.



37. *Philotheca glasshousiensis* (Domin) P.I.Forst., *Austrobaileya* 7: 178 (2005)

Eriostemon glasshousiensis Domin, *Biblioth. Bot.* 89: 286 (1926). T: slopes of Mt Coonowrin, Glasshouse Mts, Qld, Sept. 1909, *C.T.White*; ?iso: BRI.

E. trachyphyllus var. *leichhardtii* Benth., *Fl. Austral.* 1: 333 (1863); *E. myoporoides* subsp. *leichhardtii* (Benth.) Paul G.Wilson, *Nuytsia* 1: 42 (1970); *P. myoporoides* subsp. *leichhardtii* (Benth.) Bayly, *Muelleria* 11: 124 (1998). T: “From Brroa” [Mt Beerwah, Glasshouse Mts, Qld], 2 Sept. 1843, *L.Leichhardt*; holo: K; iso: MEL.

Illustration: M.J.Bayly, *Muelleria* 11: 114, fig. 1C (1998).

Shrub to 1 m high, glabrous except for flowers. Branchlets ±densely glandular-verrucose. Leaves densely clustered near stem apices, oblanceolate to oblong-obcuneate, 20–52 mm long, 5–11 mm wide, ±flat, rounded to truncate, abruptly apiculate. Flowers solitary or in clusters of 2–5; peduncle to 5 mm long; pedicels 4–12 mm long, sparsely glandular-verrucose. Sepals semiorbicular. Petals elliptic-oblong, 6–8.5 mm long, 2.5–3 mm wide, cream-coloured, papillose adaxially, abaxially glabrous with scattered glands towards apex. Stamens: filaments woolly-ciliate for entire length but becoming densely long-pilose at apex; anthers shortly white-apiculate. Cocci erect, 7–11 mm long, prominently rostrate.

Found near the summits of the Glasshouse Mtns, Qld, N to Mt Cooroora, Cania Gorge, and Kroombit Tops; growing on rocky outcrops of sandstone, trachyte and rhyolite. Flowers Feb.–Apr.

Qld: Kroombit Tops, *P.I.Forster* 16249 (BRI); Mt Beerwah, *D.A.Goy* 59 (BRI); Cruickneck, 24 May 1935, *D.A.Goy* (NSW); Mt Ngun Ngun, *I.R.Telford* 3391 (CANB).

Although growing in close proximity to *P. queenslandica* there is no evidence of any introgression between them. Possibly most closely related to *P. obovatifolia* (*fide* P.I.Forster, *op. cit.*), however the latter species has larger leaves while the staminal filaments have only a few scattered hairs at the apex.



38. *Philotheca obovatifolia* (Bayly) P.I.Forst., *Austrobaileya* 7: 179 (2005)

P. myoporoides subsp. *obovatifolia* Bayly, *Muelleria* 11: 123 (1998). T: Mt Ernest, Moreton District, Qld, 10 Nov. 1992, *P.I.Forster* 12364 & *G.Leiper*; holo: BRI; iso: MEL.

Illustrations: M.J.Bayly, *op. cit.* 117, fig. 4; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2:296, fig. 10b (2002).

Subshrub to 1 m high, glabrous except for flowers. Branchlets sparsely glandular-verrucose. Leaves densely clustered near stem apices, broadly obovate, 28–60 mm long, 14–30 mm wide, ±flat, obtuse to slightly retuse, shortly mucronate. Flowers solitary or in clusters of 2–5; peduncle conspicuous, to 10 mm long; pedicels 5–9 mm long, sparsely glandular-verrucose. Sepals broadly deltate. Petals elliptic-oblong, 8–9 mm long, 3.5–4 mm wide, cream tinged with pink, papillose adaxially, abaxially glabrous with verrucose glands towards apex. Staminal filaments ciliate for entire length with scattered longer hairs at apex. Fruit not seen.

Found on Mt Barney, Mt Lindesay, and Mt Ernest in SE Qld, and on Mt Werrikimbe in NE N.S.W.; growing in heath or woodland on rhyolite. Flowers late spring.

Qld: Mt Barney, *S.L.Everist* 1390 (BRI); Mt Ernest, *P.I.Forster* 12364 (BRI); Mt Lindesay, *N.Michael* 2218 (BRI). N.S.W.: Mt Werrikimbe, *L.M.Copeland* 1042 (BRI).

Similar to *P. myoporoides* but differs in having larger obovate leaves in which the midrib is strongly raised abaxially while the apex is rounded and distinctly mucronate.



39. *Philotheca queenslandica* (C.T.White) P.I.Forst., *Austrobaileya* 7: 180 (2005)

Eriostemon queenslandica C.T.White, *Proc. Roy. Soc. Queensland* 53: 207 (1942); *E. myoporoides* subsp. *queenslandicus* (C.T.White) Paul G.Wilson, *Nuytsia* 1: 41 (1970); *P. myoporoides* subsp. *queenslandica* (C.T.White) Bayly, *Muelleria* 11: 125 (1998). T: Caloundra, Qld, Aug. 1933, *S.L.Everist* 454; holo: BRI.

Illustrations: K.A.W.Williams, *Native Pl. Queensland* 1: 108 (1979); M.J.Bayly, *op. cit.* 114, fig. 1.

Wiry shrub to 1 m high, glabrous except for flowers, often rhizomatous. Branchlets sparsely glandular-verrucose. Leaves densely clustered near branch apices, narrowly elliptic to narrowly obovate, 9–30 mm long, 1.5–7 mm wide, attenuate to cuneate at base, flat to concave, obtuse to acute and shortly mucronate. Flowers solitary; peduncle to 3 mm long; pedicel 3–6 mm long, sparsely verrucose. Sepals semiorbicular. Petals elliptic-oblong, 4–10 mm long, 1.5–4 mm wide, cream tinged with pink, papillose adaxially, glabrous abaxially with a few glands towards apex. Staminal filaments densely ciliate for entire length with dense longer hairs at apex. Cocci erect, 5–8 mm long, bluntly apiculate to shortly rostrate.

Found in SE Qld from Boonooroo S to Bribie; growing in lowland, wallum heathlands in boggy or sandy soils seasonally moist to inundated. Flowers sporadically throughout the year.

Qld: Tin Can Bay, Sept. 1946, *M.S.Clemens* (BRI); 10 km S of Caloundra, *R.Hill* 990 (AD); Currimundi, 13 Aug. 1963, *M.E.Phillips* (CANB).



40. *Philotheca scabra* (Paxton) Paul G.Wilson, *Nuytsia* 12: 259 (1998)

Eriostemon scaber Paxton, *Paxton's Mag. Bot.* 11: 190 (1844). T: "cult. Messrs Henderson; from the gardens of Baron Huegel in Vienna"; *n.v.*

E. scaber Gérard, *Hortic. Universel*. ser. 2, 7: 131 (1846), *nom. illeg.* T: not designated.

E. scaber A.DC., *Not. Pl. Rar.* 10: 8 (1848), as *scabrum*, *nom. illeg.* T: "Cette espece introduite dans les jardins de Belgique, a ete presentee par M. Muzy dans une exposition de fleurs, le 22 avril 1846, a Geneve"; *n.v.*

Shrub to 0.6 m high. Branchlets terete, verrucose to smooth, \pm hispidulous. Leaves either conduplicate and semiterete or narrowly oblong-elliptic and concave adaxially, 10–15 (–25) mm long, acute, mucronate, smooth adaxially, verrucose and rounded abaxially, minutely hispidulous or glabrous. Flowers solitary; peduncle 0.5–2 mm long; pedicel 2–5 mm long, bracteolate at base. Sepals semiorbicular, c. 1 mm high, fleshy with thin margins, glabrous. Petals elliptic, 7–8 mm long, white to pink, glabrous; keel thickened and glandular. Stamens: filaments linear, subulate towards apex, \pm long-ciliate; anthers broadly oblong, c. 1 mm long. Style terete, glabrous. Cocci erect, narrowed towards apex, c. 7 mm long; rostrum straight or curved, c. 3 mm long.

Occurs in N.S.W., from the Nowra district N to near Sydney; growing in dry sclerophyll forest and heath. Two subspecies are recognised.

Branchlets \pm smooth, hispidulous; leaves subterete due to conduplicate margins

40a. subsp. *scabra*

Branchlets markedly verrucose, minutely hispidulous or glabrous; leaves oblong-elliptic

40b. subsp. *latifolia*

40a. *Philotheca scabra* (Paxton) Paul G. Wilson subsp. *scabra*

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 297, fig. 11a (2002).

Stems \pm smooth, hispidulous. Leaves subterete due to the conduplicate margin, 10–25 mm long, 1–2 mm wide, minutely hispidulous or glabrous. Stamens: filaments moderately ciliate; anthers with a short attenuate white apiculum.

Occurs near Sydney, N.S.W.; growing over sandstone, often in moist gullies. Flowers spring.

N.S.W.: Como, Sept. 1916, *J.Boorman* (NSW); Appin, Sept. 1898, *J.H.Maiden* (PERTH); 10 km S of Nowra, *F.A.Rodway* 15739 (NSW).



40b. *Philotheca scabra* subsp. *latifolia* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 12: 259 (1998)

Eriostemon scaber subsp. *latifolius* Paul G. Wilson, *Nuytsia* 1: 44 (1970). T: Bundanoon, N.S.W., 27 Sept. 1957, *J.C.R.Holford* 259; holo: NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 297 fig. 11b (2002).

Stems markedly verrucose, minutely hispidulous to glabrous. Leaves coriaceous, slightly verrucose, oblong-elliptic, c. 12 mm long, 3–5 mm wide, concave adaxially, glabrous or sparsely hispidulous. Stamens: filaments sparsely ciliate; anthers minutely white apiculate.

Occurs from Bundanoon to Nerriga, N.S.W.; growing over sandstone. Flowers spring.

N.S.W.: Braidwood to Nowra, 13 Oct. 1969, *C.Burgess* (PERTH); 15 km W of Tianjara Falls, *S.Donaldson* 204 (CANB); Pigeon House Ra., *R.D.Hoogland* 10042 (MEL).

The typical subspecies hybridises with *P. buxifolia* where the two grow together between Botany Bay and Waterfall. Further south, near Bulli, plants have been collected which match the *P. buxifolia* \times *P. scabra* cross and it is possible that these plants have the same hybrid origin.



The subspecies *latifolia* apparently hybridises with *P. myoporoides* subsp. *myoporoides* in the Pigeon House Ra. and with *P. buxifolia* near Jervis Bay. Near Nowra some collections suggest that the two subspecies of *P. scabra* grade into each other, the typical subspecies developing to the north and subsp. *latifolia* to the south.

41. *Philotheca buxifolia* (Sm.) Paul G. Wilson, *Nuytsia* 12: 258 (1998)

Eriostemon buxifolius Sm. in A.Rees, *Cycl.* 13: (1809). T: Port Jackson, N.S.W., *J.White*; lecto: LINN, Smith herb. no. 755.3 left-hand specimen, *fide* P.G. Wilson, *op. cit.* 259.

Shrub to 1.3 m high. Branchlets smooth, hispidulous. Leaves orbicular to broadly elliptic or obovate, 6–12 mm long, cuneate to cordate at base, entire or crenate and sometimes slightly recurved, \pm flat to concave or strongly conduplicate adaxially, rounded and mucronate at apex, coriaceous, smooth, keeled and glandular abaxially, \pm glabrous or sparsely hispid. Flowers solitary; peduncle absent or to 2 mm long, hispidulous; pedicel 2–4 mm long, glabrous or hispidulous. Sepals very broadly triangular, 1–1.5 mm high, fleshy with thin margin, glabrous. Petals broadly elliptic, 8–15 mm long, white (to pink), glabrous. Stamens: filaments linear, stiffly ciliate, abruptly narrowed above and sparsely long-pilose; anthers c. 1 mm long, white-apiculate. Style glabrous. Cocci erect, narrowed towards apex, c. 7 mm long; rostrum straight or curved, c. 3 mm long. *n* = 14, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs in the Sydney area of N.S.W. and Jervis Bay area of the A.C.T. Three subspecies are recognised which intergrade with each other and hybridise with some other species in the section.

The lectotype of *Eriostemon buxifolius* is the specimen of the unnamed variety described by Smith (1809) as having elliptic leaves; this taxon corresponds to G.Don's *E. buxifolius* var. *ellipticus*, the description given by Don being based on that given by Smith. In its typical form *P. buxifolia* subsp. *buxifolia* is found from just south of Broken Bay to just south of Port Hacking. Around Jervis Bay a variant is found with longer leaves and flowers and with hispidulous pedicels.

To the north of Broken Bay *P. buxifolia* has narrower leaves and becomes the subsp. *obovata*. This subspecies appears to represent a cline between *P. buxifolia* subsp. *buxifolia* to the south and *P. hispidula* to the north. Subsp. *obovata* is therefore variable and could be equally well considered a subspecies of *P. hispidula* or, alternatively, *P. hispidula* could be considered a subspecies of *P. buxifolia*.

Around Botany Bay and Port Hacking *P. buxifolia* grades into *P. scabra* and at Jervis Bay it grades into *P. scabra* subsp. *latifolia*.

The hybrid *P. buxifolia* × *P. myoporoides* is reported by Beadle *et al.*, *Handb. Vasc. Pl. Sydney Dist.* 320 (1963), to occur in the lower Hawkesbury area.

1 Leaves circular to broadly elliptic, cordate or narrowed at base, entire

2 Leaves not strongly conduplicate-falcate; cordate at base

41a. subsp. **buxifolia**

2: Leaves strongly conduplicate-falcate; base narrowed

41b. subsp. **falcata**

1: Leaves obovate, cuneate at base, glandular-crenate on margins

41c. subsp. **obovata**

41a. *Philotheca buxifolia* (Sm.) Paul G.Wilson subsp. **buxifolia**

Eriostemon buxifolius var. *ellipticus* G.Don, *Gen. Hist.* 1: 792 (1831). T: based on lectotype of species.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 297, fig. 12a (2002).

Leaves orbicular to broadly elliptic, almost flat, 6–12 mm long, 3.5–12 mm wide, cordate at base, entire, smooth abaxially. Pedicels glabrous or rarely hispidulous.

Occurs near Sydney, N.S.W., and Jervis Bay, A.C.T.; growing in heathland on dunes or on sandstone. Flowers winter–spring.

N.S.W.: Dobroyd Point, Sydney, *J.Armstrong* 933 (NSW). A.C.T.: Beecroft Penin., Jervis Bay, *A.M.Lyne* 377 (NSW).



41b. *Philotheca buxifolia* subsp. **falcata** Paul G.Wilson, *Nuytsia* 12: 258 (1998)

T: Caves Beach Rd, SW of Jervis Bay, A.C.T., 12 Oct. 1971, *R.Coveny* 3720; holo: NSW; iso: PERTH.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 298, fig. 12b (2002).

Leaves strongly conduplicate-falcate, narrowed at base, glandular-punctate abaxially. Pedicels glabrous or finely hispid.

Found in the Jervis Bay area of the A.C.T. Flowers winter–spring.

A.C.T.: Beecroft Penin., *A.M.Lyne* 377 *et al.* (CBG, PERTH).



41c. *Philotheca buxifolia* subsp. **obovata** (G.Don) Paul G.Wilson, *Nuytsia* 12: 259 (1998)

Eriostemon buxifolius var. *obovatus* G.Don, *Gen. Hist.* 1: 792 (1831); *E. buxifolius* subsp. *obovatus* (G.Don) Paul G.Wilson, *Nuytsia* 1: 45 (1970). T: Port Jackson, N.S.W., 1795, *J.White*; holo: LINN, Smith herb. no 755.3 right-hand specimen.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 298, fig. 12c (2002).

Leaves obovate, c. 12 mm long, 4 mm wide, narrowly cuneate at base, strongly glandular-crenate and slightly recurved, rounded and mucronate at apex, sparsely hispidulous; midrib indented adaxially, very prominent and glandular-verrucose abaxially. Pedicels sparsely hispidulous.

Occurs in the Mangrove Ck, Sydney–Gosford region and near Ulladulla, N.S.W. Flowers winter–spring.

N.S.W.: Somerby, 15 Oct. 1945, *D.O. Cross* (PERTH); near Central Mangrove, *M.E. Phillips 511* (PERTH); North Sydney, 1913, *B.T. Goadby* (PERTH).



42. *Philotheca hispidula* (Sieber ex Spreng.) Paul G. Wilson, *Nuytsia* 12: 259 (1998)

Eriostemon hispidulus Sieber ex Spreng., *Syst. Veg.* 4/2: 164 (1827). T: N.S.W., *F.W. Sieber 305*; iso: K, MEL (2 sheets), TCD.

Illustration: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 298 (2002).

Shrub c. 1 m high. Branchlets terete, slightly verrucose, hispidulous. Leaves narrowly obovate to narrowly cuneate, 10–20 (–35) mm long, 3–4 mm wide, revolute, obtuse to rounded, mucronate, glandular-crenate on margin, often sparsely hispidulous. Flowers usually solitary; peduncle hispidulous, 1–5 (–15) mm long; pedicel 3–5 mm long, hispidulous. Sepals semi-orbicular, c. 1 mm long, fleshy with thin margin, ±glabrous. Petals broadly elliptic, c. 6.5 mm long, white or pale pink on keel; keel prominently glandular and sometimes sparsely hispidulous. Stamens: filaments narrowly oblong, abruptly tapering above, sparsely long-ciliate; anthers c. 1 mm long, shortly white-apiculate. Style glabrous. Cocci spreading, narrowed towards apex, c. 7 mm long; rostrum c. 3 mm long. *n* = 14, S. Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs in the Blue Mtns and near Sydney, N.S.W.; growing in dry sclerophyll forest on sandstone. Flowers spring.

N.S.W.: Glenbrook, Oct. 1920, *J.L. Boorman* (NSW); Wisemans Ferry, 16 Sept. 1961, *C. Burgess* (CANB); Penang, Oct. 1902, *J.H. Maiden* (PERTH); Thirlmere Lakes Natl Park, *A.V. Slee 2304* (CANB).

See under *P. buxifolia* for comments on intergradation.

In the Blue Mtns and at Tahmoor hybrids between *P. hispidula* and *P. myoporoides* have been collected where the 2 species grow together.



43. *Philotheca verrucosa* (A. Rich.) Paul G. Wilson, *Nuytsia* 12: 260 (1998)

Eriostemon verrucosus A. Rich., *Voy. Astrolabe Bot.* pt. 2, *Atlas*, tab. 26 (1833). T: “Moreton Bay” [Qld]; holotype: *P. n.v.* [the plant illustrated must have come from Tasmania and Dumont D’Urville, commander of the corvette L’Astrolabe, visited Hobart in December 1827 when it could have been collected.]

? *E. dolabratus* Rehb., *Iconogr. Bot. Exot.* 2: 36 (1828). T: “E Nova Hollandia”; *n.v.*

E. obcordatus A. Cunn. ex Hook., *J. Bot. (Hooker)* 1: 254 (1834). T: “About Hobart Town - Mr Cunningham, Mr Lawrence, 1831, (n. 153) R.C. Gunn, (n. 14)”; syn: K (*A. Cunningham 17*).

Illustrations: G.R. Cochrane *et al.*, *Fl. & Pl. Victoria & Tasmania*, rev. edn, 71, fig. 324 (1980), as *E. verrucosus*; J.P. Jessop & H.R. Toelken (eds), *Fl. S. Australia* 4th edn, 2: 772, fig. 413B (1986); N.G. Walsh & T.J. Entwistle (eds), *Fl. Victoria* 4: 180, fig. 33g (1999).

Shrub 0.3–0.6 (–2.5) m high. Branchlets terete, prominently glandular-verrucose, glabrous. Leaves sessile, thick, narrowly to broadly obcordate or obovate, 6–15 mm long, 4–7 mm wide, ±flat to conduplicate, coriaceous, smooth adaxially, glandular-verrucose abaxially, glabrous, blue-green. Flowers mostly solitary; peduncle 0.5–2 mm long, glabrous; pedicel 1–4 mm long, glabrous. Sepals semi-orbicular, 1 mm long, fleshy with thin margins, glabrous. Petals elliptic, c. 6 mm long, white (pink in bud), glabrous. Stamens: filaments narrowly oblong, attenuate, ciliate; anthers orbicular-cordate, c. 1 mm long, minutely white-apiculate. Style glabrous. Cocci somewhat spreading, shortly to prominently rostrate.

Occurs in Mt Lofty Ra. in S.A., the Grampians, Bendigo district, and Gippsland in Vic., and eastern Tas.; growing on rocky hills in open forest or woodland, also on sand in heathland in the Little Desert of Vic. Flowers Aug.–Oct.

S.A.: Tothill Ra., *D.N.Kraehenbuehl* 1091 (AD). Vic.: Mt Arapiles, *R.Hill* 1187 (AD). Tas.: Freycinet Penin., 31 Jan. 1962, *M.E.Phillips* (AD).

In Tas. the leaves tend to be narrower than on plants from the mainland.



44. *Philotheca freyciana* Rozefelds, *Muelleria* 15: 23 (2001)

T: Mt Amos, Freycinet Natl Park, Tas., Oct. 1970, *anon.*; holo: HO.

Illustration: A.Rozefelds, *op. cit.* 25, figs. 1H, 4.

Erect glabrous shrub to 40 cm high. Branches prominently glandular-verrucose. Leaves sessile, almost imbricate, broadly obcordate-obovate, 9–13 mm long, 8–13 mm wide, conduplicate, coriaceous, smooth adaxially, prominently glandular-verrucose abaxially, tinged red on margins. Flowers solitary; peduncle 1–2 mm long; pedicel 3–4 mm long with 4 caducous bracteoles at base. Sepals semiorbicular, c. 1 mm long, 1.5 mm wide. Petals broadly elliptic, 8–10 mm long, 4–5 mm wide, white (pink in bud). Stamens: filaments flattened, sparsely ciliate, 2.7–4 mm long; anthers c. 1 mm long, with apex biglandular and apiculate. Style c. 1 mm long. Cocci c. 4 mm long, 3.5 mm wide, rounded with acute apex, sparsely glandular, weakly rugose.

Occurs on Freycinet Penin., E coast of Tas., where it grows on skeletal sandy soil. Flowers have been observed in Apr.–May and also Sept.–Oct.

Tas.: Mt Amos, Freycinet Penin., 31 Jan. 1962, *M.E.Phillips* (AD).

Listed as Endangered under the EPBC Act, 1999.



45. *Philotheca obovalis* (A.Cunn.) Paul G.Wilson, *Nuytsia* 12: 259 (1998)

Eriostemon obovalis A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 331 (1825). T: Blue Mtns, N.S.W., Oct. 1822, *A.Cunningham* 45; holo: K; iso: BRI, CANB, MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 298 (2002).

Shrub to 1 m high. Branchlets terete, pubescent, scarcely verrucose. Leaves broadly to very broadly obovate or obcordate, c. 7 mm long and 4–6 mm wide, ±flat, rounded and sometimes emarginate at apex, coriaceous, smooth adaxially, slightly verrucose abaxially, glabrous or with puberulous margin. Flowers solitary; peduncle absent; pedicel 2–3 mm long, glabrous. Sepals semiorbicular, 1 mm long, glabrous. Petals elliptic, c. 6 mm long, white tinged with pink, glabrous. Stamens: filaments narrowly oblong, c. 3.5 mm long, ±pilose, abruptly narrowed in upper 1/3; anthers cordate, c. 0.8 mm long, with minute, white, glandular-punctate apiculum. Carpels 3 or 4; style glabrous. Cocci erect, c. 4.5 mm long with horizontal costae; apiculum short, rounded. *n* = 14, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs in the Blue Mtns and on Mt Kydra near Kybeyan (SE of Cooma), N.S.W.; growing in heathland on sandstone. Flowers spring.

N.S.W.: Wolgan Gap, 13 Nov. 1960, *B.G.Briggs* (NSW); Kydra Peaks, 11 Jan. 1970, *J.H.Willis* (MEL).

This species is probably most closely related to *P. virgata*, which has similar anthers and also has a reduced number of carpels. It shows little morphological variation and appears not to intergrade with any other species.



46. *Philotheca virgata* (Hook.f.) Paul G.Wilson, *Nuytsia* 12: 260 (1998)

Eriostemon virgatus Hook.f., *J. Bot. (Hooker)* 2: 417 (1840). T: Rocky Cape, Tas., 1837, *R.C.Gunn* 485; lecto: K, *fide* P.G.Wilson, *Nuytsia* 1: 50 (1970); ?isolecto: NSW.

Illustrations: M.Stones & W.Curtis, *Endemic Fl. Tasmania* pt 1: no. 10 (1967); G.R.Cochrane *et al.*, *Fl. & Pl. Victoria & Tasmania*, rev. edn 124, fig. 627 (1980), both as *E. virgatus*.

Erect shrub 1–2 m high. Branchlets verrucose, glabrous. Leaves sessile, narrowly cuneate to oblong-elliptic or narrowly oblong, 10 × 2 mm to 20 × 4 mm, somewhat recurved or flat, acute to rounded at apex, thinly coriaceous or chartaceous, glabrous, ±smooth. Flowers solitary, 4-merous; peduncle absent; pedicel slender, 4–6 mm long. Sepals ±semiorbicular, c. 1 mm long, fleshy, glabrous. Petals broadly elliptic, c. 5.5 mm long, white or pale pink, glabrous. Stamens: filaments oblong-elliptic, c. 3 mm long, ciliate, pilose towards apex; anthers cordate, c. 1 mm long; apiculum rounded, minutely glandular-punctate. Cocci slightly spreading, c. 5 mm high, rounded to truncate, shortly rostrate. $2n = c. 28$, H.M.Stace & J.A.Armstrong, *Austral. Syst. Bot.* 5: 503 (1992).

Occurs in extreme SE N.S.W., extreme E Vic., and near the coast in Tas.; growing in heathland and dry sclerophyll forest. Flowers summer.

N.S.W.: Mt Imlay Natl Park, *J.D.Briggs* 1967 & *D.Albrecht* (CANB). Vic.: Mt Kaye, *A.C.Beauglehole* 34089 (PERTH). Tas.: Snug Falls Track, *G.Kantvilas* & *S.J.Jarman* 12 (HO); road to Coles Bay, 15 Nov. 1960, *M.E.Phillips* (AD).

This species differs from the other members of the genus in having 4-merous flowers.



47. *Philotheca trachyphylla* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 260 (1998)

Eriostemon trachyphyllus F.Muell., *Defin. Austral. Pl.* 22 (1855). T: Snowy R. near the Pinch Ra., N.S.W., *F.Mueller*; holo: MEL; iso: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 254 (1991).

Shrub or small tree 2–7 m high. Branchlets terete, verrucose, blue-green, glabrous. Leaves oblong-elliptic to narrowly obovate, mostly to 3–5 cm long, 5–9 mm wide, narrowed towards base, acute to rounded at apex, mucronulate, chartaceous, glabrous; margin wrinkled due to small warts. Flowers solitary or in clusters of 2 or 3; peduncle absent; pedicels slender, 6–12 mm long, glabrous. Sepals suborbicular, c. 1 mm long, somewhat fleshy, glabrous. Petals elliptic, 6–7 mm long, white, glabrous. Stamens: filaments linear-attenuate, pilose; anthers c. 1 mm long, with a minute, blunt, white apiculum. Carpels united at periphery; style glabrous. Capsule spherical, c. 5 mm high; cocci eventually separating and slightly spreading, not apiculate.

Occurs in SE Vic. and near-coastal SE N.S.W. as far N as Singleton; growing in sclerophyll forest in moist gullies and on hillsides. Flowers spring.

N.S.W.: 8 km SW of Nerigundah, *B.G.Briggs* 3087 (NSW); Mother Woila, *R.G.Coveny* 5954 (NSW); 1.6 km S of Terry Ck, Oct. 1963, *C.Debenham* (PERTH). Vic.: Ensay, *A.Meebold* 21525 (PERTH); Bruthen–Omeo road, 20 Oct. 1963, *J.H.Willis* (MEL).

This species is unique in having peripherally united carpels which have rounded (not apiculate or rostrate) apices.



48. *Philotheca brucei* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 257 (1998)

Eriostemon brucei F.Muell., *Fragm.* 7: 38 (1869). T: near L. Barlee, W.A., 1869, *J.Forrest*; holo: MEL.

Shrub to 2 m high, glabrous and glaucous to closely stellate-tomentose. Branchlets erect, glandular-verrucose or smooth. Leaves terete and channelled adaxially to narrowly oblong or narrowly obovoid and concave adaxially, 1.5–18 mm long. Flowers solitary; peduncle absent; pedicel 0.5–4 mm long, multi-bracteolate towards base. Sepals suborbicular, 1 mm long,

fleshy, glabrous or pubescent. Petals broadly ovate, 4.5 mm long, white to pink or pale mauve, glabrous. Stamens: filaments narrowly oblong, attenuate towards apex, subglabrous to pilose and woolly-ciliate; anthers 0.6–1 mm long. Style glabrous. Cocci oblong, c. 6 mm long, almost smooth, shortly divaricate-rostrate.

Occurs in central southern W.A.; 3 subspecies are recognised.

- | | | |
|----|--|-------------------------------|
| 1 | Leaves subterete to narrowly oblong, 5–18 mm long | |
| 2 | Leaves subterete, glabrous (at least when mature) | 48a. subsp. brucei |
| 2: | Leaves narrowly oblong, concave adaxially, densely stellate-tomentose | 48c. subsp. cinerea |
| 1: | Leaves broadly elliptic to suborbicular (sometimes caducous), to 1.5 mm long, densely stellate-tomentose | 48b. subsp. brevifolia |

48a. *Philotheca brucei* (F.Muell.) Paul G.Wilson subsp. *brucei*

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 540 (1998).

Shrubs often with grey, wax-like surface to leaves and branchlets. Leaves subterete, 5–18 mm long, acute, flat, channelled, or concave adaxially, glabrous at least when mature. Pedicel 3–4 mm long. Petals white to pink.

Occurs in southern W.A. from Kalbarri and Moora E to Laverton and S to Coolgardie; growing on gravelly loam or on stony outcrops. Flowers July–Oct.

W.A.: 1.5 km S of Jingermarra HS, *R.J.Cranfield 5251* (PERTH); Ninghan, *C.A.Gardner 2220* (PERTH); 10 km NW of Broad Arrow, *R.Melville 4044* (PERTH).



48b. *Philotheca brucei* subsp. *brevifolia* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 257 (1998)

Eriostemon brucei subsp. *brevifolius* Paul G.Wilson, *Nuytsia* 1: 52 (1970). T: 34 miles [c. 55 km] E of Mt Magnet, W.A., 27 Aug. 1957, *J.W.Green 1618*; holo: PERTH.

E. brucei var. *aphyllus* Blackall, *How to know W. Austral. Wildfl.* 258 (1954), *nom. inval.*

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 540 (1998).

Stem and leaves minutely and densely stellate-puberulous. Leaves broadly elliptic to suborbicular, to 1.5 mm long and wide, concave adaxially, sometimes caducous. Flowers very shortly pedicellate. Petals white to pink or mauve, mauve in bud.

Occurs in inland central W.A. from Paynes Find to Sandstone; growing on rocky outcrops. Flowers July–Oct.

W.A.: 18.5 km ENE of Yuinmery HS, *J.Dell 135* (PERTH); Sandstone, 23 July 1927, *C.A.Gardner* (PERTH); 140 km N of Wubin, *E.Wittwer 1254* (PERTH).



48c. *Philotheca brucei* subsp. *cinerea* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 258 (1998)

Eriostemon brucei subsp. *cinereus* Paul G.Wilson, *Nuytsia* 1: 53 (1970). T: Ejah, between Mileura and Nookawarra Stations, W.A., 2 June 1961, *S.J.J.Davies*; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 540 (1998).

Branchlets, leaves, and pedicels minutely stellate-tomentose. Leaves narrowly oblong, c. 15 × 2 mm, obtuse to rounded at apex, deeply concave adaxially. Pedicel 1–3 mm long. Petals mauve to white.



Occurs in the upper Murchison R. area, W.A.; growing on stony hills and breakaways. Flowers June–Aug.

W.A.: 4 km N of Curbur HS, *R.J.Cranfield 7671A* (PERTH); Mt Gould, *H.Demarz 3827* (PERTH); Ejah Breakaway, *P.de Rebeira 102* (PERTH).

Some collectors have noted that the plant has a lavender-like fragrance.

Sect. 3. *Corynonema*

Philotheca sect. *Corynonema* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 260 (1998)

Eriostemon sect. *Corynonema* Paul G.Wilson, *Nuytsia* 1: 53 (1970). T: *E. pungens* Lindl.

Branchlets minutely pilose or minutely hirsute in furrows between glabrous decurrent leaf bases. Leaves exstipulate, linear or terete. Flowers 1–3, axillary or seemingly terminal; peduncle absent; pedicels minutely bracteolate at base. Petals minutely papillose adaxially, otherwise glabrous. Stamens free; filaments thick, shortly apiculate, glabrous or pilose; anthers minutely white-apiculate, not glandular. Carpel apex solid. Cocci divaricate, shortly rostrate. Seed somewhat reniform, plump, 2–4 mm long; testa black, longitudinally striate, not easily separable into 2 layers, with sclerotesta dominant; hilum short, narrowly oblong, in centre of adaxial face.

A section of 3 species, 2 of which occur in W.A. and 1 in S.A. and Vic.

- 1 Leaves smooth or scabridulous, mucronate; stamens pilose
- 2 Petals imbricate, pale red to red (W.A.) **49. *P. pinoides***
- 2: Petals valvate, white or pink abaxially at tip, white or pink in bud (S.A.; Vic.) **50. *P. pungens***
- 1: Leaves glandular-verrucose, ±obtuse to rounded; stamens glabrous or almost so (W.A.) **51. *P. fitzgeraldii***

49. *Philotheca pinoides* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 261 (1998)

Eriostemon pinoides Paul G.Wilson, *Nuytsia* 1: 54 (1970). T: Summit of Mt Peron, W.A., 26 Aug. 1949, *C.A.Gardner 9408*; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 541 (1998).

Woody perennial 0.3–0.6 m high. Branchlets minutely verrucose, puberulous between prominent, glossy, decurrent leaf bases. Leaves sessile, acicular, slightly twisted, c. 1 cm long, minutely mucronate, smooth, minutely ciliate otherwise glabrous, channelled adaxially, rounded abaxially. Flowers 1–3 in axil of a terminal leaf, the branch continuing growth after flowering; pedicels 4–7 mm long, glabrous. Sepals broadly and obtusely deltate, 1.5 mm long, fleshy, glabrous. Petals imbricate, obovate, c. 6 mm long, pale pink or red. Stamens: filaments narrowly oblong towards base, truncate beneath a very short terete stipe; anti-petalous ones ±terete towards apex, c. 3.3 mm long, sparsely pilose and abruptly apiculate; antisepalous ones flattened towards base, narrowly winged and pilose towards apex, with 2 deep lateral depressions and an adaxial medial ridge; anthers c. 1 mm long. Style slender, glabrous. Cocci c. 6 mm long, shortly and divaricately rostrate.

Occurs in SW W.A. between Eneabba and Badgingarra; growing on sand over laterite in heathland. Flowers Aug.–Oct.

W.A.: 16 km E of Eneabba, *A.S.George 7843* (PERTH); Tathra Natl Park, *E.A.Griffin 2190* (PERTH); 8 km E of Dinner Hill, *R.D.Royce 5143* (PERTH).

The shape of the staminal filaments in this species is unique in the genus.

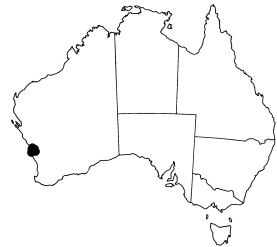




Plate 37. *Correa baeuerlenii*.
 Photograph — M.Fagg.

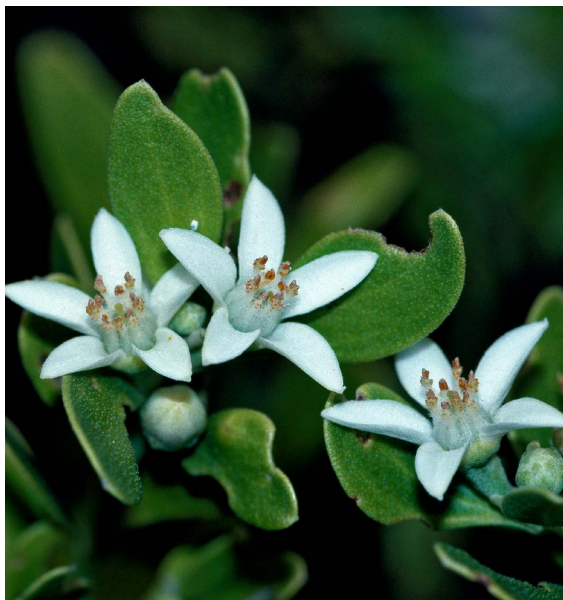


Plate 39. *Eriostemon banksii*.
 Photograph — B.Gray © CSIRO.



Plate 38. *Neobyrnesia suberosa*.
 Photograph — M.Bayly.



Plate 40. *Philotheca spicata*.
 Photograph — M.Bayly.



Plate 41. *Philotheca tubiflora*.
 Photograph — M.Bayly.



Plate 42. *Crowea saligna*.
 Photograph — A.S.George.



Plate 43. *Asterolasia correifolia*.
 Photograph — M.Fagg.



Plate 44. *Geleznowia verrucosa*.
 Photograph — F.Humphries.



Plate 45. *Drummondita hassellii*.
 Photograph — M.Fagg.



Plate 46. *Leonema ralstonii*.
 Photograph — M.Fagg.



Plate 47. *Leonema lamprophyllum* subsp. *obovatum*.
 Photograph — M.Fagg.



Plate 48. *Nematolepis squamea* subsp. *retusa*.
 Photograph — M.Fagg.



Plate 49. *Rhadinothamnus rudis* subsp. *rudis*.
 Photograph — M.Fagg.



Plate 50. *Muiriantha hassellii*.
 Photograph — A.S.George.



Plate 51. *Chorilaena quercifolia*.
 Photograph — M.Bayly.



Plate 52. *Phebalium glandulosum* subsp. *glandulosum*.
 Photograph — M.Fagg.

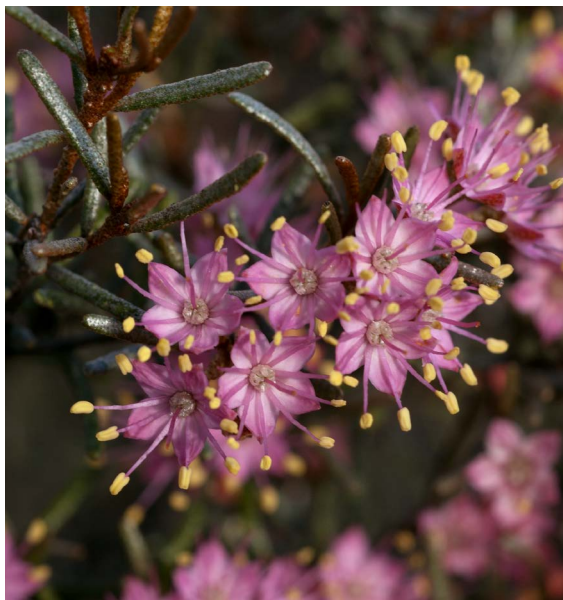


Plate 53. *Phebalium canaliculatum*.
Photograph — M.Fagg.



Plate 54. *Microcybe multiflora* subsp. *multiflora*.
Photograph — M.Fagg.



Plate 55. *Diplolaena andrewsii*.
Photograph — M.Fagg.



Plate 56. *Micromelum minutum*.
Photograph — R.Barrett.



Plate 57. *Glycosmis trifoliata*.
 Photograph — B.Gray © CSIRO.



Plate 58. *Clausena brevistyla*.
 Photograph — B.Gray © CSIRO.



Plate 59. *Murraya paniculata*.
 Photograph — B.Gray © CSIRO.

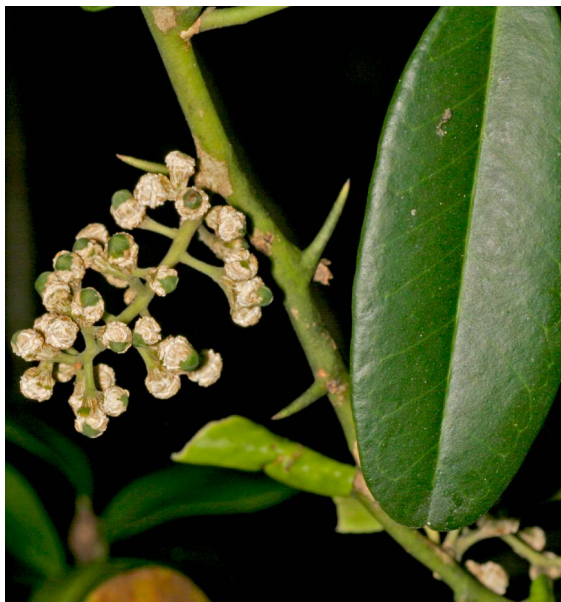


Plate 60. *Luvunga monophylla*.
 Photograph — R.Barrett.



Plate 61. *Citrus glauca*.
 Photograph — M.Fagg.



Plate 62. *Peganum harmala*.
 Photograph — D.Agnew © SA Arid Lands.



Plate 63. *Nitraria billardiarei*.
 Photograph — A.S.George.



Plate 64. *Nitraria billardiarei*.
 Photograph — A.S.George.



Plate 65. *Tribulopsis pentandra*.
Photograph — R.Barrett.



Plate 66. *Tribulus cistoides*.
Photograph — R.Barrett.



Plate 67. *Zygophyllum auranticum* subsp. *auranticum*.
Photograph — M.Fagg.



Plate 68. *Tribulus hirsutus*.
Photograph — M.Fagg.

50. *Philotheca pungens* (Lindl.) Paul G.Wilson, *Nuytsia* 12: 261 (1998)

Eriostemon pungens Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 156 (1838); *Phebalium pungens* (Lindl.) Benth., *Fl. Austral.* 1: 338 (1863). T: Mt Hope [Vic.], 28 June 1836, *T.L.Mitchell* 202; holo: CGE; iso: MEL.

Illustration: G.R.Cochrane *et al.*, *Fl. & Pl. Victoria & Tasmania*, rev. edn, 39, fig. 132 (1980), as *E. pungens*.

Undershrub to 60 cm high. Branchlets minutely hirsute, principally in grooves between broad decurrent leaf bases. Leaves shortly petiolate, linear to narrowly oblong or acicular, 8–12 (–25) mm long, glabrous or scabridulous, flat adaxially, prominently keeled abaxially. Flowers axillary, mostly solitary; pedicel 3–5 mm long, glabrous; bracteoles lanceolate. Sepals semiorbicular, c. 1 mm long, fleshy, glabrous. Petals valvate, ovate, c. 4 mm long, inflexed at tip, fleshy, white or with pink abaxially. Stamens: filaments semiterete, flattened towards base, rounded at apex and with a short terete tip, pilose; anthers c. 0.5 mm long including the white, rounded apiculum. Style glabrous. Cocci strongly divaricate and \pm horizontal, 4–6 mm long, apiculate.

Occurs in S and SE S.A. and in central and W Vic.; growing in heathland on sand. Flowers Aug.–Nov.

S.A.: 1.6 km E of Malinong Hall, *M.C.R.Sharrad* 409 (AD); Scorpion Springs Conservation Park, *D.E.Symon* 8614 (AD); Boston Point, *C.Wilhelmi* (TCD). Vic.: 62 km S of Murrayville, *M.G.Corrick* 6779 (MEL); Hopetoun, *M.B.Williamson* 580 (MEL).



This species is the only member of the genus that has valvate petals.

51. *Philotheca fitzgeraldii* (C.R.P.Andrews) Paul G.Wilson, *Nuytsia* 12: 261 (1998)

Eriostemon fitzgeraldii C.R.P.Andrews, *J. W. Austral. Nat. Hist. Soc.* 1: 37 (May 1904). T: N of Esperance, W.A., Oct. 1903, *C.R.P.Andrews*; syn: PERTH.

E. apricus Diels, *Bot. Jahrb. Syst.* 35: 321 (Oct. 1904); *Phebalium apricum* (Diels) Ewart & B.Rees, *Proc. Roy. Soc. Victoria* ser. 2, 25: 111 (1912). T: Near Gilmores, W.A., *L.Diels* 5267; iso: PERTH.

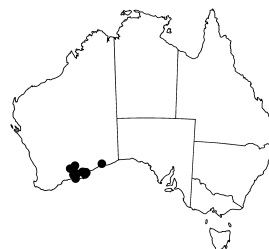
E. gibbosus Luehm. ex Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 20: 79 (1907). T: Near Norseman, W.A., 1897, *J.D.Batt*; holo: MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 541 (1998).

Compact shrub 30–60 cm high. Branchlets minutely hirsute between broad decurrent leaf bases. Leaves shortly petiolate, semiterete, 3.5–5 × 1 mm, obtuse to rounded, glandular-verrucose, glabrous, flattened and channelled adaxially, rounded and verrucose abaxially. Flowers terminal and axillary, solitary; pedicel 1–2 mm long, glabrous; bracteoles triangular. Sepals semicircular, c. 1 mm long, coriaceous, glabrous. Petals thick, slightly imbricate, ovate, c. 4 mm long, inflexed at apex, white. Stamens: filaments erect, fleshy, angular-terete, truncate and shortly apiculate at apex, sparsely glandular-punctate, glabrous or almost so; anthers c. 0.5 mm long, minutely white-apiculate. Style thick, glabrous. Cocci divaricate, c. 3.5 mm long, apiculate.

Found in SE W.A. from Norseman E to Caiguna; in woodland or heath on loam or sand, often over limestone. Flowers June–Oct.

W.A.: near Clyde Hill, *M.A.Burgman* 1400 (PERTH); Kumarl, *L.A.Horbury* 151 (PERTH); SW of Caiguna, *G.J.Keighery* 1835 (PERTH); 40 km W of Daniell, *P.G.Wilson* 3167 (AD).



Sect. 4. Cyanochlamys

Philotheca sect. *Cyanochlamys* (Bartl. ex F.Muell.) Paul G.Wilson, *Nuytsia* 12: 261 (1998)

Eriostemon subg. *Cyanochlamys* Bartl. ex F.Muell., *Pl. Indig. Col. Victoria* 1: 119 (1862); *E.* sect. *Cyanochlamys* (Bartl. ex F.Muell.) F.Muell., *Fragm.* 9: 110 (1875). T: *E. spicatus* A.Rich.

Branchlets glabrous or stellate-hairy. Leaves exstipulate, sessile. Inflorescences of numerous flowers in terminal clusters or leafless racemes; pedicels with a pair of basal bracteoles or bracteoles gland-like. Petals thin, glabrous or sparsely woolly abaxially on midrib. Stamens free; filaments flattened, pilose or ciliate; anthers white-apiculate, not glandular. Cocci erect, shortly rostrate. Seed subreniform, c. 2 mm long; abaxial margin convex; outer testa membranous; sclerotesta smooth; hilum superficial, linear.

A section of 2 species, both endemic to W.A.

Flowers in a leafless raceme

52. *P. spicata*

Flowers in a compact head (the axis sometimes growing out before flowering is over)

53. *P. nodiflora*

52. *Philotheca spicata* (A.Rich.) Paul G.Wilson, *Nuytsia* 12: 264 (1998)

Eriostemon spicatus A.Rich., *Voy. Astrolabe Bot.* pt. 2, *Atlas* tab. 27 (1833). T: Nova-Hollandia; holo: P n.v.

E. racemosus Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 15 (1837). T: Swan-River Colony, W.A., *K.Huegel*; holo: W n.v.

E. ebracteatus Endl., *loc. cit.* T: King George Sound, W.A., *K.Huegel*; holo: W n.v.

E. effusus Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 14 (1849). T: W.A., *J.Gilbert* 95; holo: KW.

Illustrations: R.Erickson *et al.*, *Fl. Pl. W. Australia* rev. edn, 32, fig. 60 (1979); N.G.Marchant *et al.*, *Fl. Perth Region* 1: 488, fig. 196 (1987); J.R.Wheeler *et al.*, *Fl. South West* 2: 877 (2002).

Slender woody perennial, 30–60 cm high, sparsely stellate-woolly or glabrous. Branchlets smooth. Leaves ascending to spreading, linear to narrowly elliptic, 6–20 mm long, acute or obtuse, concave adaxially, sparsely lanate to glabrous. Inflorescence a many-flowered leafless raceme to 15 cm (or more) long, sparsely to densely woolly; bracts broadly elliptic, c. 4 mm long, caducous; pedicels slender, c. 7 mm long; bracteoles nearly always minute. Sepals narrowly to broadly triangular, c. 1.5 mm long, sparsely woolly. Petals broadly elliptic, c. 4.5 mm long, pink or mauve or blue, glabrous (rarely sparsely woolly along abaxial midrib). Stamens: filaments linear-attenuate, 2–2.5 mm long, silky-ciliate; anthers suborbicular, c. 0.8 mm long. Style 0.5–1 mm long, glabrous; stigma capitate. Cocci c. 3 mm high, obtuse with erect bidentate apex. *n* = 28, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). Frontispiece; Plate 40; Fig. 61A–F.

Occurs in SW W.A. from Eneabba S to Albany; growing in sand, or in loam over laterite. Flowers Aug.–Nov.

W.A.: Donnybrook, *M.Carter* 496 (PERTH); 20 km E of Armadale, *W.Greuter* 22690 (PERTH); Watheroo Natl Park, *N.Hoyle* 823 (PERTH); Waterloo, *G.J.Keighery* 6822 (PERTH).

One collection from near Fremantle has caducous bracteoles c. 1.5 mm long whereas in all other material examined the bracteoles are minute, gland-like, and persistent. Occasionally the flowers are 6- or even 7-merous. A number of variants of this species have been observed of which some may warrant formal recognition.



53. *Philotheca nodiflora* (Lindl.) Paul G.Wilson, *Nuytsia* 12: 263 (1998)

Eriostemon nodiflorus Lindl., *Sketch Veg. Swan R.* 17 (1839). T: Swan River Colony, W.A., 1839, *J.Drummond* s.n.; holo: CGE.

Weak shrub to 60 cm high. Branchlets erect, smooth, sparsely stellate-hairy when young. Leaves erect, slender, semiterete, 5–15 mm long, acute to obtuse, glabrous (or sparsely pilose

when young), \pm concave adaxially, rounded abaxially. Flowers in compact heads 1–3 cm diam., the axis sometimes growing out before flowering is over; bracts foliar and herbaceous or scarious and suborbicular; pedicels 1–4 mm long, pilose; bracteoles boat-shaped. Sepals linear-attenuate to triangular, 2–5 mm long, pilose or glabrous. Petals elliptic to broadly obovate, 5–9 mm long, slightly thickened at apex, otherwise thin, blue to pink, glabrous or pilose. Stamens: filaments linear-attenuate, 4–5 mm long, prominently long-ciliate; anthers broadly elliptic, 0.5–1 mm long, minutely white-apiculate. Style 0.5–1 mm long, glabrous. Cocci c. 3 mm long, with short erect rostrum, \pm glabrous.

Endemic to SW W.A. 4 subspecies are recognised.

1 Flowerheads 2–3 cm diam.; petals elliptic or broadly elliptic

2 Sepals pilose or sparsely pilose

3 Petals glabrous abaxially

3: Petals long-pilose abaxially

2: Sepals glabrous except for ciliate margins

1: Flowerheads 1–1.5 cm diam.; petals obovate to broadly obovate

53a. subsp. **nodiflora**

53b. subsp. **latericola**

53c. subsp. **calycina**

53d. subsp. **lasiocalyx**

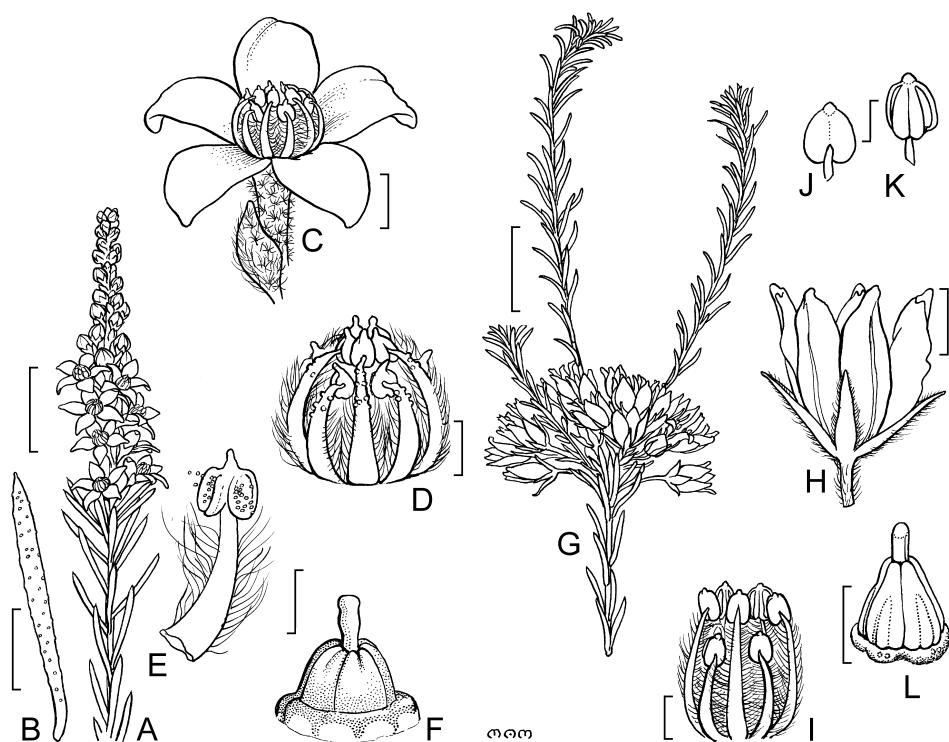


Figure 61. *Philotheca*. A–F, *P. spicata*. A, habit; B, leaf; C, flower; D, flower (sepals & petals removed); E, stamen, adaxial view; F, pistil (A–F, drawn from fresh material, voucher not recorded). G–L, *P. nodiflora* subsp. *nodiflora*. G, habit; H, flower; I, flower (sepals & petals removed); J, anther, abaxial view; K, anther, adaxial view; L, pistil (G–L, drawn from fresh material, voucher not recorded). Scale bars: A, G = 10 mm; B, H = 2 mm; C, I, L = 1 mm; D–F, J, K = 0.5 mm. Drawn by M. Wilson. Reproduced with permission from N.G. Marchant *et al.*, *Fl. Perth Region* 1: figs 195, 196 (1987).

53a. *Philotheca nodiflora* (Lindl.) Paul G. Wilson subsp. *nodiflora*

Eriostemon nodiflorus var. *subglabriflorus* Domin, *Vestn. Král. České Společn. Nauk, Tř. Mat.-Přir.* 2: 54 (1923). T: not indicated.

Illustration: N.G. Marchant *et al.*, *Fl. Perth Region* 1: 488, fig. 195 (1987), as *E. nodiflorus*.

Leaves 5–15 mm long. Flowers in heads 2–3 cm diam. which often become lateral due to the continued growth of the branchlet. Pedicels (1.5–) 2–4 mm long. Sepals linear-lanceolate, 4–5 mm long, sparsely pilose. Petals broadly elliptic, 6–9 mm long, cucullate at apex, blue to pink, glabrous. Carpels almost glabrous. Fig. 61G–L.

Occurs between Chittering and Bindoon in the Darling Ra., W.A.; growing along creeks or in seasonal swamps. Flowers Sept.–Nov.

W.A.: Chittering, *A. Ashby* 459 (PERTH); 20 km S of New Norcia, *L.A. Craven & C. Chapman* 6938 (PERTH).



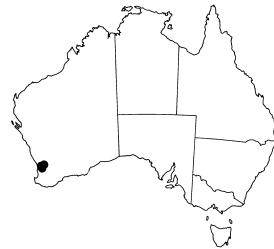
53b. *Philotheca nodiflora* subsp. *latericola* Paul G. Wilson, *Nuytsia* 12: 263 (1998)

T: near York, W.A., 28 Sept. 1921, *P.A. Sargent*; holo: PERTH

Similar to subsp. *nodiflora* but with petals long-pilose on abaxial surface.

Occurs in the Darling Ra. between York and Bannister, W.A.; growing on laterite and ironstone. Flowers Sept.–Nov.

W.A.: 13 km S on Watershed Rd off Brookton Hwy, *R.J. Cranfield* 1977 (PERTH).



53c. *Philotheca nodiflora* subsp. *calycina* (Turcz.) Paul G. Wilson, *Nuytsia* 12: 263 (1998)

Eriostemon calycinus Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 14 (1849). T: W.A., *J. Drummond* 4th coll. 93; holo: KW; iso: TCD.

Similar to subsp. *nodiflora* but with leaves 5–7 mm long; sepals triangular, 3–4 mm long, ciliate but otherwise glabrous.

Found near Wooroloo and Wagin in SW W.A.; growing in gravelly soil. Flowers Aug.–Oct.

W.A.: off the Toodyay Rd, *H. Demarz* 6163 (PERTH); Wagin, *C.A. Gardner* 991 (PERTH).



53d. *Philotheca nodiflora* subsp. *lasiocalyx* (Domin) Paul G. Wilson, *Nuytsia* 12: 263 (1998)

Eriostemon nodiflorus var. *lasiocalyx* Domin, *Vestn. Král. České Společn. Nauk, Tř. Mat.-Přir.* 2: 54 (1923); *E. nodiflorus* subsp. *lasiocalyx* (Domin) Paul G. Wilson, *Nuytsia* 1: 58 (1970). T: W.A., Cranbrook to Warrungup, sandy plains; Mt Toolbrunup, *A.A. Dorrien-Smith*; *n.v.*

Leaves 5–6 (–13) mm long. Flowers in compact heads 1–1.5 cm diam. Pedicels 1–2 mm long. Sepals triangular, 2–3 mm long, silky-pilose. Petals obovate to broadly obovate, c. 5 mm long, shortly apiculate, blue, glabrous. Carpels densely pilose distally.

Occurs in southern W.A. from near Busselton E to Duke of Orleans Bay; growing in heathland on sandy loam. Flowers July–Nov.

W.A.: Tenterden, *W.H. Atkins* 33 (PERTH); Dillon Bay, *M.G. Corrick* 7715 (PERTH); Chester Pass, *A.R. Fairall* 551 (PERTH); Duke of Orleans Bay, *R.J. Hnatiuk* 760997 (PERTH).



Doubtful Names

Eriostemon intermedius hort. ex Hook., *Bot. Mag.* 75: tab. 4439 (1849)

Eriostemon myoporoides var. *minor* Benth., *Fl. Austral.* 1: 333 (1863), based on above. T: “from Robert Barclay, Esq., of Knotts Green, Leyton”; holo: K (photo seen).

This may be the hybrid *P. buxifolia* × *P. myoporoides*.

Eriostemon pulchellus hort. ex Lem., *Jard. Fleur.* 4: tab. 396 (1854)

T: “dans les serres de M. Auguste Van Geert, ... un charmant *Eriostemon* qu’il avait reçu d’Angleterre, comme un hybride, obtenu par une fécondation croisée.”; *n.v.*

The illustration and description suggest that this plant was a hybrid between *P. hispidula* and another member of *Philothea* sect. *Erionema*.

GELEZNOWIA

Paul G. Wilson

Geleznovia Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 12 (1849); named after Nicolai Iwanowitsch Zhelezow (1816–1877) professor of agronomy at Moscow University.

Type: *G. verrucosa* Turcz.

Sanfordia J.Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 53 (1855). T: *S. calycina* J.Drumm. ex Harv.

Glaucous verrucose undershrubs. Leaves small, scattered and crowded, rigid, simple, entire. Flowers 1 or more in terminal clusters often surrounded by petaloid bracts. Sepals 5, free, imbricate, larger than petals and resembling bracts. Petals imbricate, similar to sepals but thicker. Stamens 10, free, shorter than petals, glabrous; anthers versatile, apically retuse. Disc absent. Carpels 5, free, with no sterile apex; style terete, glabrous, inserted just below apex of carpels; stigma peltate. Seed reniform, thick, c. 5 mm long; sclerotesta slightly verrucose; hilum circular; raphe large filling the concave adaxial margin with the chalaza on lower edge of concavity.

A monotypic genus endemic to SW W.A.

L.M.Broadhurst *et al.*, Patterns of morphological variation and allelic distribution across a zone of overlap between two subspecies of *Geleznovia verrucosa* (Rutaceae), *Austral. J. Bot.* 49: 451–458 (2001).

***Geleznovia verrucosa* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 13 (1849)**

Eriostemon geleznovii F.Muell., *Fragm.* 1: 107 (1859), based on above. T: south-western W.A., *J.Drummond III*: 8; holo: KW (photo seen); iso: K, MEL, TCD.

Sanfordia calycina J.Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 54 (1855); *E. sandfordii* F.Muell., *Fragm.* 1: 107 (1859); *G. calycina* (Harv.) Benth., *Fl. Austral.* 1: 348 (1863). T: near the Hill and Irwin Rivers, W.A., *J.Drummond VI*: 83; holo: K; iso: MEL, PERTH, TCD.

G. macrocarpa Benth., *Fl. Austral.* 1: 347 (1863). T: Murchison R., W.A., *A.Oldfield*; holo: K.

Undershrub to 1 m high. Branchlets erect, terete, glandular-verrucose, puberulous. Leaves subsessile, elliptic or obovate, sometimes broadly so, 3–10 mm long, rounded at apex, thick and coriaceous, glabrous to minutely puberulous, concave and smooth adaxially, verrucose below. Flowers 1–4; surrounding petaloid bracts equal to or exceeding flowers; pedicels 1–6 mm abaxially, puberulous to pilose, with a pair of basal bracteoles. Sepals elliptic to broadly elliptic, 5–12 mm long, flat, obtuse, yellow to red, glabrous or sometimes puberulous. Petals broadly elliptic, c. 5 mm long, obtuse, cucullate, coriaceous, yellow to red, glabrous or sometimes puberulous. Stamens equal to or shorter than petals; anthers oblong, c. 1.5 mm

long. Style glabrous, equal to stamens. Cocci verrucose, blunt. $x = 14$, S.Smith-White, *Austral. J. Bot.* 2: 287–303 (1959). Plate 44.

Found in SW W.A. from Dowerin N to Shark Bay, growing on sand, frequently over laterite. Flowering (June–) July–Oct. (–Dec.).

W.A.: Dowerin, *S.Patrick* 505 (PERTH); Kalbarri Natl Park, *A.Strid* 20816 (PERTH); 10 km W of Mullewa, *B.G.Briggs* 6439 (PERTH).



This species exhibits considerable variation in indumentum, in the size of the leaves, and in the flowers with their surrounding bracts. It is likely that several infraspecific taxa should be recognised.

ASTEROLASIA

Paul G. Wilson

Asterolasia F.Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854); from the Greek *asterios* (starry) and *lasios* (woolly), referring to the hairy surface to the spreading petals.

Type: *A. trymalioides* F.Muell.

Phebalium a. *Correoides* Endl., *Gen. Pl.* 1156 (1840); *Phebalium* sect. *Correoides* (Endl.) Pfeiff., *Nomencl. Bot.* 2: 669 (1874). T: based on *A. correifolia* (A.Juss.) Benth. and *A. hexapetala* (A.Juss.) Druce

Urocarpus Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 54 (1855); *Asterolasia* sect. *Urocarpus* (Harv.) Benth., *Fl. Austral.* 1: 350, 352 (1863). T: *U. phebalioides* Harv.

Actinostigma Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 32(1): 259 (1859). T: *A. lanceolatum* Turcz.

Pleurandropsis Baill., *Adansonia* 10: 305 (1872). T: *P. phebalioides* (F.Muell.) Baill.

Undershrubs, stellate-hairy. Leaves alternate, simple, entire. Flowers 5-merous, in terminal and apparently axillary umbels subtended by leafy or petaloid bracts. Sepals small, minute or absent. Petals free, induplicate-valvate in bud, elliptic, glabrous adaxially, stellate or lepidote abaxially. Stamens 10 (–25 in W.A.), free, slightly shorter than petals, glabrous (rarely stellate); filaments filiform; anthers broadly oblong-elliptic, basifixed, with or without a small terminal gland. Disc minute. Carpels 1–5, stellate or glabrous, contiguous on adaxial margin in lower half; style arising from middle of adaxial margin of carpel; stigma lobed, fleshy, recurved. Cocci beaked or blunt. Seed reniform; testa smooth; hilum short and linear; raphe minute.

An endemic genus of 16 species in temperate mainland Australia; 5 in SW W.A., the remaining species occurring from S.A. to SE Qld.

The petals are induplicate-valvate and the indumentum is restricted to that portion of the abaxial side of the petals that is visible in the bud. Therefore in those species that are strongly induplicate the indumentum occupies only a central strip on the outside.

P.G.Wilson, Nomenclatural notes and new taxa in the genera *Asterolasia*, *Drummondita* and *Microcybe* (Rutaceae: Boronieae), *Nuytsia* 12: 83–88 (1998); B.J.Mole *et al.*, Variation within *Asterolasia asteriscophora sensu lato* (Rutaceae: Boronieae) and the recognition of new taxa in eastern Australia, *Muelleria* 16: 87–112 (2002).

1 Carpels 1–4 (W.A.; S.A.)

2 Petal hairs of flat, fimbriate scales; petals yellow

1. *A. squamuligera*

2: Petal hairs stellate; petals yellow, or white to mauve

3 Petal hairs flat-stellate; petals white

2. *A. drummondii*

3: Petal hairs not flat-stellate; petals white to mauve or yellow

4 Petal hairs with slender branches radiating in all directions; petals white or yellow

- 5 Leaves flat, smooth or somewhat scabridulous; petals white (W.A.) **3. *A. pallida***
- 5: Leaves recurved, muricate above; petals yellow (S.A.) **6. *A. muricata***
- 4: Petal hairs thick and truncate forming an armour-like cover to bud; petals white or pink to mauve
- 6 Petals pink to mauve, 8–15 mm long **4. *A. grandiflora***
- 6: Petals white, 8–10 mm long **5. *A. nivea***
- 1: Carpels 5 (S.A.; Vic.; N.S.W.; Qld)
- 7 Flowers solitary, sessile or subsessile (rarely pedicels to 2 mm long in *A. buckinghamii*); cocci rounded or beaked
- 8 Ovary glabrous; carpels glabrous except for adaxial contiguous margin **12. *A. buxifolia***
- 8: Ovary stellate-tomentose
- 9 Leaf margin recurved; adaxial leaf surface glossy, glabrous, sparsely hispidulous or sparsely stellate **15. *A. trymalioides***
- 9: Leaf margin not recurved; adaxial leaf surface dull
- 10 Leaves broadly obovate, glabrous or sparsely stellate adaxially **7. *A. buckinghamii***
- 10: Leaves cuneate-obcordate, densely stellate-tomentose adaxially **16. *A. phebaloides***
- 7: Flowers 1–several, pedicellate; cocci beaked (fruit not seen in *A. rivularis*)
- 11 Leaves narrowly oblong to narrowly oblong-cuneate, deeply sulcate adaxially with lateral halves convex, muricate adaxially **10. *A. rivularis***
- 11: Leaves variable in shape, flat, stellate or glabrous adaxially
- 12 Leaves obtuse to acuminate, 3–14 cm long
- 13 Leaves adaxially above when mature; petals c. 6 mm long **11. *A. correifolia***
- 13: Leaves sparsely stellate adaxially when mature; petals 8–14 mm long **14. *A. elegans***
- 12: Leaves obtuse to rounded, obcordate or obdeltate, 0.5–6 cm long
- 14 Leaves obcordate to obdeltate, 0.9–2.0 mm long, emarginate (rarely truncate); petals yellow **9. *A. rupestris***
- 14: Leaves 0.5–6 cm long, obtuse or rounded at apex; petals yellow or white
- 15 Leaves oblong-cuneate, obovate, or elliptic, 0.5–3.5 cm long; petals yellow (rarely white) **8. *A. asteriscophora***
- 15: Leaves oblong-elliptic, 3–6 cm long; petals white **13. *A. hexapetala***

1. *Asterolasia squamuligera* (Hook.) Benth., *Fl. Austral.* 1: 352 (1863)

Phebalium squamuligerum Hook., *Hooker's Icon. Pl.* 8: t. 727 (1848); *Eriostemon hookeri* F. Muell., *Fragm.* 1: 104 (1859); *Urocarpus squamuliger* (Hook.) Paul G. Wilson, *Nuytsia* 1: 207 (1971). T: Swan R. to King George Sound, W.A., *J. Drummond s.n.*; holo: K (photo seen).

Slender woody perennial to 50 cm high. Leaves sessile to prominently petiolate, narrowly to broadly obovate, 10–20 mm long, leathery, sparsely stellate or glabrous. Umbels terminal and axillary, sessile, 5–10-flowered; pedicels slender, to 15 mm long. Petals elliptic, c. 6 mm long, yellow, covered with flat fimbriate scales abaxially. Stamens c. 10, glabrous; anthers 0.9 mm long, with minute terminal gland. Carpels 2 (or 3), covered with peltate scales; style glabrous; stigma lobes thick, recurved. Fruit not seen.

Occurs in SW W.A. from Augusta E to L. Grace and from Beverley S to Mt Barker; in loam, often over laterite. Flowers Aug.–Nov.



W.A.: Tarin Rock, *A.M.Ashby* 244 (PERTH); Boyagin Rock, *J.S.Beard* 1804 (PERTH); 33 miles [52.8 km] E of Dumbleyung, *H.Demarz* 1558 (PERTH); Dryandra State Forest, *G.J.Keighery* 6569 (PERTH).

The scales on the petals are flat with a fimbriate margin and tend to be shed with age.

2. *Asterolasia drummondii* Paul G.Wilson, *Nuytsia* 6: 8 (1987)

Urocarpus phebalioides J.Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 55 (1855); *Eriostemon drummondii* F.Muell., *Fragm.* 1: 105 (1859), *nom. illeg.*; *Asterolasia phebalioides* (Harv.) Benth., *Fl. Austral.* 1: 352 (1863), *nom. illeg. non* F.Muell. T: Mt Lesueur, W.A., *J.Drummond s.n.*; holo: K, iso: MEL, TCD.

Woody perennial to 50 cm high. Leaves shortly petiolate, narrowly to broadly ovate, 10–20 mm long, somewhat leathery, sparsely stellate when young, glabrous at maturity. Umbels mainly terminal, sessile, 5–10-flowered; pedicels slender, 1–2 cm long, rusty-stellate. Sepals broadly deltate, c. 0.5 mm long. Petals broadly elliptic, c. 6 mm long, white, with rusty flat-stellate hairs abaxially. Stamens c. 10, glabrous; anthers c. 0.9 mm long, with minute terminal gland. Carpels 2, stellate-pilose; style glabrous; stigma lobes fleshy, recurved. Cocci with horizontal beaks to 3 mm long.

Found in the Mt Lesueur area, W.A.; growing on lateritic soil. Flowers July.–Sept.

W.A.: Cataby, *J.D'alonzo* 52 (PERTH); Mt Lesueur, *C.A.Gardner* 9359 (PERTH).

This species is similar to *A. squamuligera* but differs in having white petals with flat stellate hairs.



3. *Asterolasia pallida* Benth., *Fl. Austral.* 1: 352 (1863)

Eriostemon pallidus (Benth.) F.Muell., *Fragm.* 7: 22 (1869); *Urocarpus pallidus* (Benth.) Paul G.Wilson, *Nuytsia* 1: 207 (1971). T: W.A., *J.Drummond* 42 & 112; syn: K, MEL.

Asterolasia dielsii C.A.Gardner, *J. Roy. Soc. W. Australia* 19: 84 (1933). T: Near Glen Forrest, W.A., 3 Aug. 1924, *C.A.Gardner* 819a; holo: PERTH.

Woody perennial to 1 m high, sometimes rhizomatous. Leaves petiolate, elliptic to broadly elliptic, 10–25 mm long, somewhat leathery, sparsely stellate-hairy above when young, somewhat scabridulous when mature, variably stellate-tomentose below. Umbels terminal and axillary, sessile, 3–6-flowered; pedicels slender, 3–10 mm long. Sepals stellate and insignificant or glabrous and 0.5 mm long. Petals elliptic, 4–8 mm long, white, covered abaxially with colourless or rufous stellate hairs radiating in all directions. Stamens c. 15–25, glabrous; anthers c. 0.8 mm long, with terminal gland not apparent. Carpels 1–3, stellate-tomentose; style glabrous; stigma lobes short, ovoid and fleshy. Cocci with prominent horizontal beaks. *n* = 13, S.Smith-White, *Austral. J. Bot.* 2: 287 (1954).

Found in W.A. in the Darling Ra. from near Perth S to Manjimup; growing on laterite. There are 2 subspecies.

Petals with rufous and colourless hairs abaxially

3a. subsp. **pallida**

Petals with a few colourless hairs only

3b. subsp. **hyalina**

3a. *Asterolasia pallida* Benth. subsp. **pallida**

Illustration: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 478, fig. 184 (1987), as *A. pallida*.

Sepals scarcely observable, rufous-stellate. Petals with rufous and colourless stellate hairs abaxially. Fig. 62.

Found in W.A. in the Darling Ra. from near Perth S to Manjimup and Augusta. Flowers June–Nov.

W.A.: Gleneagle Forest, *M.G.Corrick* 7856 (PERTH); 50 km W of Manjimup, *D.J.E.Whibley* 5099 (PERTH); Mt Dale, *E.Wittwer* 649 (PERTH).



The variant that grows in the Darling Ra. near Perth has flowers with broadly elliptic petals c. 8 mm long, and 2 or 3 carpels. A southern variant, found between Augusta and Manjimup, has flowers with very broadly elliptic petals 4–5 mm long, and 1 or 2 carpels; it is sometimes rhizomatous.

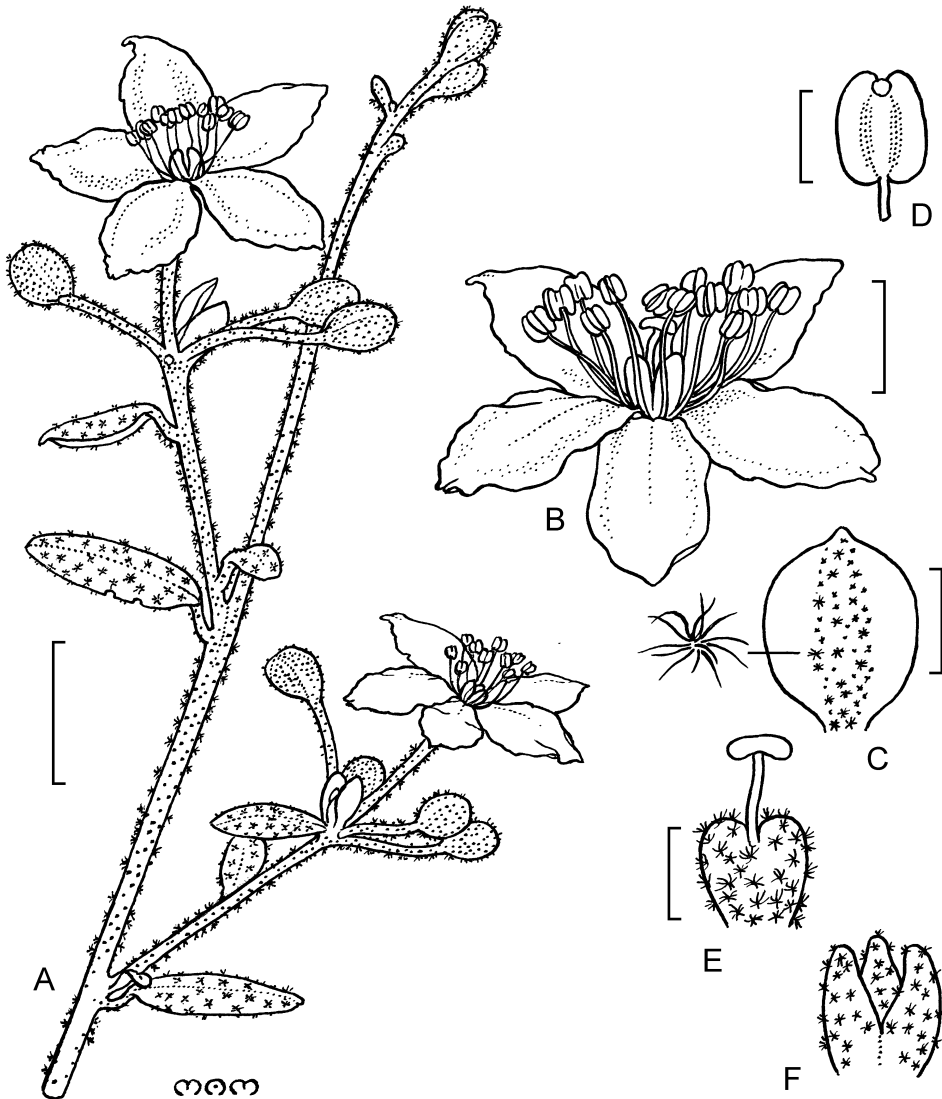


Figure 62. *Asterolasia pallida* subsp. *pallida*. **A**, habit; **B**, flower; **C**, petal, abaxial side, with hair detail; **D**, anther; **E**, pistil; **F**, carpels (immature) (**A–F**, drawn from fresh material, voucher not recorded). Scale bars: **A** = 10 mm; **B** = 5 mm; **C** = 2 mm; **D–F** = 1 mm. Drawn by M. Wilson. Reproduced with permission from N.G. Marchant *et al.*, *Fl. Perth Region 1*: 478, fig. 184 (1987).

3b. *Asterolasia pallida* subsp. *hyalina* Paul G. Wilson, *Nuytsia* 12: 84 (1998)

T: Dryandra [forest], W.A., 5 Sept. 1992, *G.J. Keighery* 12276; holo: PERTH.

Sepals broadly triangular, 0.4 mm long, glabrous or almost so. Petals sparsely stellate abaxially with weak colourless hairs.

Occurs near Dryandra Forest, c. 130 km SE of Perth, W.A.; growing in *Eucalyptus wandoo* woodland over granite. Flowers Aug.–Sept.

W.A.: Dryandra Forest, *G.J. Keighery* 12284 (PERTH).



4. *Asterolasia grandiflora* (Hook.) Benth., *Fl. Austral.* 1: 352 (1863)

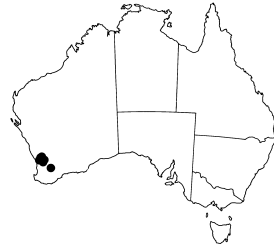
Phebalium grandiflorum Hook., *Icon. Pl.* 8: t. 724 (1848); *Eriostemon grandiflorus* (Hook.) F. Muell., *Fragm.* 1: 105 (1859); *Urocarpus grandiflorus* (Hook.) Paul G. Wilson, *Nuytsia* 1: 207 (1971). T: W.A., *J. Drummond* 12; holo: K.

Weak, open shrub, 0.2–0.6 (–0.8) m high. Leaves petiolate, oblong to broadly ovate or elliptic, 10–15 mm long, chartaceous, scabridulous, sparsely stellate; margins often recurved. Umbels terminal or axillary, sessile, c. 3-flowered; pedicels slender, to 15 mm long, with stellate thick-centred hairs. Sepals semicircular, c. 0.2 mm long, glabrous. Petals ovate, 10–15 mm long, pink to mauve, closely covered abaxially with thick-centred, pale yellow, stellate hairs that form an armour-like cover to the flower bud. Stamens 12–15, glabrous; anthers c. 1.2 mm long, with minute terminal gland. Carpels 2–4, stellate-tomentose; style glabrous; stigma lobes fleshy, slightly recurved. Cocci with beak c. 2.5 mm long.

Found in W.A. between Toodyay and York, with an isolated occurrence near Dumbleyung; on lateritic gravel. Flowers July–Oct.

W.A.: York, *C. Andrews* 60 (PERTH); Wongamine, *G.J. Keighery* 7256 (PERTH).

This species grades into *A. nivea*, which typically has white petals up to 10 mm long. The two species differ from other W.A. members of the genus in the petal hairs which are like globular crystals from which short branches radiate in all directions.



5. *Asterolasia nivea* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 6: 8 (1987)

Urocarpus niveus Paul G. Wilson, *Nuytsia* 3: 211 (1980). T: Near Bindoon, W.A., 19 Sept. 1979, *P.G. Wilson* 11704; holo: PERTH.

Illustration: P.G. Wilson, *Nuytsia* 3: 212 (1980).

Weak subshrub c. 50 cm high. Leaves shortly petiolate, narrowly oblong to oblong or narrowly elliptic, to 12 mm long, flat or with recurved margins, leathery, scabridulous, stellate. Umbels axillary and terminal, sessile, c. 3-flowered; pedicels to 15 mm long, with stellate thick-centred hairs. Sepals semicircular, c. 0.2 mm long, white. Petals elliptic, 8–10 mm long, white, covered abaxially with solid subspherical echinate trichomes that form an armour-like cover to the flower bud. Stamens 15–20, glabrous; anthers c. 1.2 mm long, with terminal gland not apparent. Carpels 3 or 4, stellate-tomentose; style glabrous; stigma lobes fleshy. Cocci with a slender beak c. 3 mm long. *Bindoon Starbush*.

Found between New Norcia and Bindoon, W.A., on lateritic gravel. Flowers Aug.–Oct.

W.A.: New Norcia, *H.F. & M. Broadbent* 1333 (PERTH); near Bindoon, *C.A. Gardner* 12742 (PERTH).

Listed as vulnerable under the EPBC Act, 1999.



6. *Asterolasia muricata* J.M.Black, *Trans. & Proc. Roy. Soc. S. Australia* 36: 22 (1912)

Urocarpus muricatus (J.M.Black) Paul G.Wilson, *Nuytsia* 1: 207 (1971). T: Near Mt Thisbe, Kangaroo Is., S.A., 20 Oct. 1908, *H.H.D.Griffith*; holotype: AD; isotype: MEL.

Illustrations: J.M.Black, *Fl. S. Australia* 2nd edn, 2: 497, fig. 667 (1948); J.Jessop & H.Toelken, *Fl. S. Australia* 4th edn, 2: 772, fig. 413H (1986).

Erect shrub to 1 m high. Leaves shortly petiolate, oblong, 7–15 mm long, obtuse, prominently recurved, leathery, muricate adaxially from the stout, persistent hair bases, stellate-tomentose abaxially. Umbels axillary and terminal, sessile, 1–3-flowered; pedicels 0.5–8 mm long. Calyx lobes minute. Petals broadly elliptic, c. 5 mm long, yellow, rusty-stellate abaxially, the hairs with slender branches radiating in all directions. Stamens 10, glabrous; anthers c. 1 mm long, lacking terminal gland. Carpels 2, stellate-tomentose; style glabrous; stigmas subglobular, minutely verrucose. Cocci shortly rostrate (not seen mature).

Occurs in Kangaroo Is. and on the southern tip of Fleurieu Penin., S.A.; in sandy heathland. Flowers Aug.–Nov.

S.A.: Eumalla, Sept. 1933, *J.B.Cleland* (AD); Kangaroo Is., 11 Oct. 1964, *G.Gardner* (PERTH); D'Estrees Bay Rd, *U.Johnson* 75/59 (NSW); Flinders Chase Natl Park, *B.M.Overton* 04 (MEL).

**7. *Asterolasia buckinghamii* (Blakely) Blakely, *Austral. Naturalist* 11: 12 (1941)**

Phebalium buckinghamii Blakely, *Austral. Naturalist* 10: 246 (1940). T: Gold Gully, Penrose, N.S.W., 15 Oct. 1938, *W.F.Blakely, J. & W.J.Buckingham & E.Murphy*; lectotype: NSW, *fide* B.J.Mole *et al.*, *Muelleria* 16: 101 (2002); isotype: CANB, MEL.

Slender shrub to 2 m high. Leaves shortly petiolate, broadly obovate, 4–10 mm long, slightly conduplicate, rounded at apex, papery, glabrous or sparsely stellate adaxially, tomentose abaxially. Flowers terminal to very short branchlets, solitary; pedicel 0–2 mm long. Sepals deltate, c. 0.5 mm long. Petals broadly elliptic, 5–6 mm long, yellow, rusty-stellate abaxially. Stamens 10, glabrous?; anthers c. 1 mm long, with terminal gland; connective glandular. Carpels 5, stellate-pilose; style glabrous; stigma subglobular, verrucose. Cocci beaked.

Occurs near Mittagong, Penrose and Wingello, Central Tablelands of N.S.W.; evidently in damp places. Flowers spring.

N.S.W.: Penrose, *W.F.Blakely et al.* 2214 (CANB, NSW); Nattai R., near Mittagong, *S.Donaldson* 560 *et al.* (CANB).

**8. *Asterolasia asteriscophora* (F.Muell.) Druce, *Bot. Soc. Exch. Club Brit. Isles* 4: 606 (1917)**

Phebalium asteriscophorum F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 31 (1855); *Asterolasia muelleri* Benth., *Fl. Austral.* 1: 350 (1863), *nom. illeg.*; *A. correifolia* var. *muelleri* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 26: 80 (1901). T: Mt Disappointment, Vic., Oct. 1852, *F.Mueller*; lectotype: MEL, *fide* P.G.Wilson, *Nuytsia* 12: 83 (1998).

Erect shrub to 2 m high. Leaves shortly petiolate, oblong-cuneate, obovate or elliptic, 5–35 mm long, flat, obtuse to rounded at apex, papery, sparsely stellate adaxially, tomentose abaxially. Umbels terminal to main or short axillary branches, 3–8-flowered; peduncles 3–11 mm long; pedicels c. 5 mm long in flower, to 15 mm in fruit. Sepals narrowly triangular to linear, c. 1 mm long. Petals broadly elliptic, 4–9 mm long, yellow (rarely white), rusty-stellate abaxially. Stamens 10, glabrous; anthers c. 1.5 mm long, with minute terminal gland. Carpels 5, stellate; style glabrous; stigma subglobular, verrucose. Cocci beak erect, 0.5–2 mm long.

Widely distributed along the Great Dividing Ra. from Macedon in Vic. to the Tumut district in N.S.W., frequently on basic rocks. There are 2 subspecies.

Petals bright yellow

8a. subsp. *asteriscophora*

Petals white, rarely pale lemon

8b. subsp. *albiflora*

8a. *Asterolasia asteriscophora* (F.Muell.) Druce subsp. *asteriscophora*

Illustration: B.J.Mole *et al.*, *Muelleria* 16: 104, Fig. 9a–f (2002).

Leaves 6–35 mm long. Petals elliptic, 4–9 mm long, bright yellow.

Occurs on the Great Dividing Ra., from near Tumut, SE N.S.W. to eastern Vic. near Melbourne, with a disjunct population in NE N.S.W. at Mount Kaputar Natl Park. Flowers Oct.–Nov.

N.S.W.: Kosciusko Natl Park, *A.M.Ashby* 4415 (AD); Mount Kaputar Natl Park, 27 Nov. 1987, *J.M.Fox* (NSW); Springside, 10 Oct. 1948, *W.E.Giles* (NSW). Vic.: near Toolangi, *N.G.Walsh* 2172 (MEL).



8b. *Asterolasia asteriscophora* subsp. *albiflora* B.J.Mole in B.J.Mole *et al.*, *Muelleria* 16: 103 (2002)

T: Vic., Near Emerald, 8 Oct. 1998, *B.J.Mole* 73; holo: MEL; iso: CANB, MEL, MELU, NE, NSW.

Eriostemon spathulifolius Gand., *Bull. Soc. Bot. France* 60: 458 (1913). T: Victoria ad Esmerald [probably Emerald], *MacLennan*; ?holo: LY.

Illustration: B.J.Mole *et al.*, *op. cit.* 104, Fig. 9g–h.

Differs from the typical subspecies in its smaller leaves and flowers, and white (rarely pale lemon) petals.

Found only in the Emerald to Avonsleigh area E of Melbourne, Vic., where all the populations are threatened by urban development. Flowers Oct.–Nov.

Vic.: near Gladysdale, 19 Oct. 1971, *M.E.Phillips* (NSW).

This subspecies flowers from early Oct., several weeks earlier than subsp. *asteriscophora* growing in the same area.



9. *Asterolasia rupestris* B.J.Mole in B.J.Mole *et al.*, *Muelleria* 16: 105 (2002)

T: N.S.W., walking track to the Governor, Mount Kaputar Natl Park, 27 Nov. 1987, *J.M.Fox s.n.*; holo: CANB.

Erect shrub to 1.5 m high. Leaves sessile to shortly petiolate, obcordate or obdeltate, 9–20 mm long, 6–15 mm wide, emarginate or sometimes truncate, slightly conduplicate, flat or with recurved margins, papery, densely stellate-hairy adaxially, cobwebby abaxially. Umbels terminal or axillary, 3–6-flowered; peduncle 4–9 mm long; pedicels 6–15 mm long. Sepals 0.5–1 mm long. Petals elliptic, 5–9 mm long, yellow, rusty-stellate abaxially. Stamens 10, glabrous; anthers 1–2 mm long, with minute terminal gland. Carpels 5, stellate-tomentose; style glabrous; stigma hemispherical. Cocci beaked.

Occurs in NE NSW, in Mount Kaputar Natl Park and near Parlour Mtn NW of Armidale. There are 2 subspecies.

Leaf margins not recurved

9a. subsp. *rupestris*

Leaf margins strongly recurved

9b. subsp. *recurva*

9a. *Asterolasia rupestris* B.J.Mole subsp. *rupestris*

Illustration: B.J.Mole *et al.*, *op. cit.* 104, Fig. 9i–k.

Leaves flat. Umbels 3–5-flowered; peduncle 4–6 mm long; pedicels 7–10 mm long. Petals 5–8 mm long.

Now found only in Mount Kaputar Natl Park, NE N.S.W.; confined to trachyte outcrops. Flowers Sept.–Nov.

N.S.W.: Devils Hole, Towac, 8 Nov. 1960, *E.F.Constable* (NSW); the Governor, Mount Kaputar Natl Park, *R.Coveny 8937* & *S.K.Roy* (CANB, NSW); Eckards Lookout, Mount Kaputar Natl Park, *J.M.Fox 87/111* (CANB); the Governor, Mount Kaputar Natl Park, *B.J.Mole 41* & *W.A.Geibert* (CANB, MEL, MELU, NE, NSW).

This subspecies was also collected near Mt Carabolas in the 1950s, but the population there has not been relocated.



9b. *Asterolasia rupestris* subsp. *recurva* B.J.Mole in B.J.Mole *et al.*, *op. cit.* 106

T: N.S.W., NW of Armidale, 4.2 km NE of Parlour Mtn, 20 Oct. 1998, *B.J.Mole 171* & *C.A.Mole*; holo: MEL; iso: CANB, MEL, MELU, NE, NSW.

Illustration: B.J.Mole *et al.*, *op. cit.* 104, Fig. 9l–q.

Leaf margins recurved. Umbels 3–6-flowered; peduncle 4–8 mm long; pedicels 8–15 mm long. Petals 6–7 mm long.

Known only from the type locality. Flowers Sept.–Nov.



10. *Asterolasia rivularis* Paul G.Wilson, *Nuytsia* 12: 85 (1998)

T: Avon Dam district, N.S.W., 27 July 1947, *E.F.Constable*; holo: NSW.

Erect shrub to 1.5 m high. Leaves very shortly petiolate, narrowly oblong to narrowly oblong-cuneate, c. 15 mm long, 2.5 mm wide, obtuse, leathery, deeply sulcate adaxially with lateral halves convex, muricate adaxially, densely stellate-tomentose abaxially. Umbels axillary and terminal, sessile, 1–3-flowered; pedicels to 3 mm long in flower. Sepals triangular, c. 1 mm long. Petals broadly elliptic, c. 6 mm long, yellow, rusty-stellate abaxially. Stamens 10, glabrous; anthers c. 1.5 mm long, with small terminal gland. Carpels 5, glabrous; style glabrous; stigma subglobular, minutely verrucose. Fruit not seen.

Occurs on the central coast of N.S.W. near Buxton, along streams. Flowers early spring.

N.S.W.: Little R., Buxton, *T.M.Whaite 1080* (NSW).



11. *Asterolasia correifolia* (A.Juss.) Benth., *Fl. Austral.* 1: 350 (1863)

Phebalium correifolium A.Juss., *Mem. Soc. Hist. Nat. Paris* 2: 130, t. 10 (1825), as *correaefolium*; *Eriostemon correifolius* (A.Juss.) F.Muell., *Fragm.* 1: 105 (1859). T: "... in herbario Musei parisiensis, in quo praeter specimina plura ex portu Jackson relata, extat aliud e Paramata ... (ex notula manuscripta Riedlei)"; *n.v.*

Actinostigma lanceolatum Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 32(1): 259 (1859). T: Australia, *Brogden*; holo: KW (photo seen).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 264 (1991).

Erect shrub to 2 m high. Leaves petiolate, ovate to elliptic or broadly elliptic, 3–14 cm long, flat, obtuse to acute or acuminate, papery, glabrous adaxially, tomentose abaxially. Umbels axillary, several-flowered; peduncle 0–18 mm long; pedicels slender, 3–15 mm long. Sepals triangular, 0.5–1 mm long. Petals broadly elliptic, c. 6 mm long, white, rusty-stellate abaxially. Stamens 10, glabrous; anthers c. 1 mm long, with small terminal gland and narrow glandular connective. Carpels 5, stellate-tomentose; style glabrous; stigma lobes short and thick, verrucose. Cocci stellate-spinose; beak erect, 1–3 mm long. Plate 43.



Found in Qld, near Carnarvon, and in N.S.W., principally coastal and in the coastal ranges of the NE south to Narrabeen; in wet forest. Flowers spring.

Qld: Carnarvon Ra., Sept. 1938, *J.E.Young* (BRI). N.S.W.: Gibraltar Range Natl Park, *R.Coveny* 2209 (NSW); Sherwood Ck, *H.Streimann* 8120 (NSW); Narrabeen, *M.J.Taylor* 295 (NSW).

12. *Asterolasia buxifolia* Benth., *Fl. Austral.* 1: 351 (1863)

Eriostemon cunninghamii F.Muell., *Fragm.* 9: 107 (1875), as *Cunninghami*. T: Bells Rd, Blue Mtns, N.S.W., 1834, *R.Cunningham*; lecto: K, *fide* P.G.Wilson, *Nuytsia* 12: 84 (1998).

Shrub c. 1 m high. Leaves shortly petiolate, obovate, 10–15 mm long, flat, rounded at apex, coriaceous, glabrous above, stellate-tomentose below. Flowers axillary, solitary; pedicel 1–1.5 mm long, with petaloid basal bracts. Sepals linear and c. 1 mm long or absent. Petals elliptic, c. 8 mm long, yellow, abaxially with golden stellate hairs that have a thick solid spherical centre. Stamens 10, glabrous; anthers c. 1.6 mm long, with minute terminal gland. Carpels 5, glabrous except for adaxial contiguous margin; style glabrous; stigma hemispherical, verrucose. Cocci with a short blunt beak.

Restricted to a small area of the Blue Mtns, N.S.W. Flowers Oct.

N.S.W.: Blue Mtns, *N.Vicary* (MEL).

This species is distinctive in having petal hairs with thick solid centres and almost glabrous carpels.



13. *Asterolasia hexapetala* (A.Juss.) Druce, *Bot. Soc. Exch. Club Brit. Isles* 4: 606 (1917)

Phelialium hexapetalum A.Juss., *Ann. Sci. Nat. (Paris)* 4: 472 (1825); *Mem. Soc. Hist. Nat. Paris* 2: 131, t. 11 f. 1 (1825); *Asterolasia mollis* Benth., *Fl. Austral.* 1: 351 (1863), *nom. illeg.*; *Eriostemon mollis* F.Muell., *Syst. Census Austral. Pl.* 11 (1882), *nom. illeg.*; *Asterolasia correifolia* var. *mollis* Maiden & Betche, *Proc. Linn. Soc. New South Wales* 27: 55 (1902). T: “Vidi sicc. sp. a D. Gaudichaud communicatam, ex Nova-Hollandia orientali”; ? iso: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 264 (1991).

Shrub to 3 m high. Leaves petiolate, oblong-elliptic, 3–6 cm long, flat, obtuse, sparsely stellate above, somewhat stellate-tomentose below. Umbels terminal and axillary, sessile, few-flowered, with petaloid basal bracts; pedicels slender, 5–20 mm long, to 30 mm in fruit. Sepals triangular, c. 0.5–1 mm long. Petals elliptic, c. 8 mm long, white to yellow or brown stellate-tomentose abaxially. Stamens 10; anthers 1.4–2 mm long, with terminal gland and narrow glandular connective. Carpels 5, stellate-tomentose; style stellate-hairy; stigma lobes thick, verrucose. Cocci with a spreading beak c. 2 mm long.

Found in the Warrumbungle Ra., N.S.W., particularly along water courses. Flowers spring.

N.S.W.: Warrumbungle Natl Park, *G.Harden* 13 (NSW); Timor Rock, *H.Streimann* 602 (CBG).

Very similar to *A. correifolia* from which it is possibly only artificially separated. It differs in having generally larger petals and anthers and smaller obtuse leaves that are moderately stellate-hairy above and below.



14. *Asterolasia elegans* L.McDougall & M.F.Porteners, *Telopea* 4: 139 (1990)

T: Near Maroota, N.S.W., 25 Oct. 1989, *L.McDougall* 122; holo: NSW; iso: PERTH.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 264 (1991).

Slender shrub to 3 m high with coarse rusty tomentum. Leaves petiolate, narrowly elliptic, 4–13 cm long, acuminate, flat, sparsely stellate adaxially, densely stellate abaxially. Umbels axillary and terminal, sessile, 1–9-flowered, subtended by brown tomentose bracts; pedicels at first minute, extending to 18 mm in fruit. Sepals not apparent. Petals elliptic, 8–14 mm long, white, densely stellate abaxially. Stamens 10; anthers c. 2.5 mm long, with terminal gland

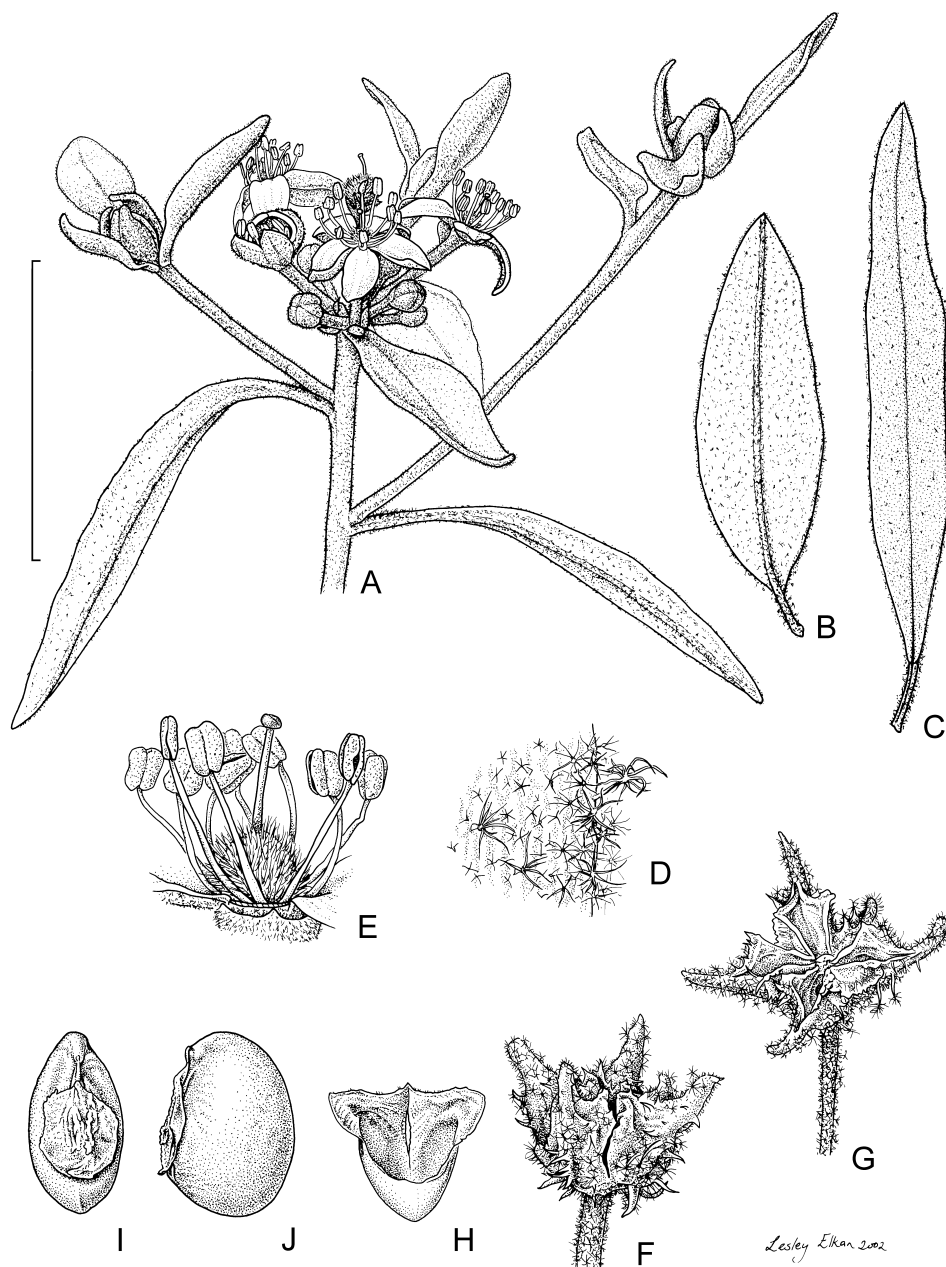


Figure 63. *Asterolasia elegans*. **A**, habit; **B**, leaf, abaxial surface; **C**, leaf, adaxial surface; **D**, leaf hair detail; **E**, flower (sepals & petal not drawn); **F**, fruit, rehydrated; **G**, fruit, dry, dehiscent; **H**, endocarp; **I**, seed, dorsal view; **J**, seed, lateral view (**A**, from fresh material; **B**, G. Whitmont 29, NSW; **C**, **D**, J.A.Scott, 25 Aug. 1993, NSW; **E**, P.G.Kodala 90, NSW; **F**–**J**, L.McDougall 139 *et al.*, NSW). Scale bar: **A**–**C** = 5 cm; **D**, **H**–**J** = 0.4 mm; **E** = 10 mm; **F**, **G** = 20 mm. Drawn by L.Elkan. ©Royal Botanic Gardens & Domain Trust. Reproduced with permission.

not apparent. Carpels 5, stellate-tomentose; style glabrous; stigma verrucose. Cocci c. 10 mm long, constricted at apex, shortly beaked. Fig. 63.

Only known now from near Maroota, Central Coast of N.S.W., on hillside with open *Eucalyptus* forest. Flowers spring.

N.S.W.: Near Maroota, 23 Sept. 1979, *B.May* (NSW); near Richmond, Oct. 1875, *W.Woolls* (MEL).

Similar to *A. correifolia* but with coarser indumentum and generally larger leaves and flowers. Listed as endangered under the EPBC Act, 1999.



15. *Asterolasia trymalioides* F.Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854)

Eriostemon trymalioides (F.Muell.) F.Muell., *Fragm.* 1: 106 (1859); *Pleurandropsis trymalioides* (F.Muell.) Ewart, *Fl. Victoria* 703 (1931). T: Summit of Mt Cobberas, Vic., Feb. 1854, *F.Mueller*; holo: MEL.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2: 264 (1991); N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 196, fig. 36c ((1999).

Prostrate to erect shrub to 1 m high. Leaves shortly petiolate, narrowly elliptic to circular, obtuse, c. 5 mm long, recurved, leathery, glossy, glabrous or sparsely stellate or hispidulous adaxially, densely tomentose abaxially. Flowers terminal to short branchlets, solitary, sessile, subtended by several foliage leaves. Sepals ovate, 0.5–2 mm long, glabrous or stellate-pilose. Petals obovate, attenuate in lower half, 4–8 mm long, yellow, finely brown-stellate abaxially. Stamens 10, glabrous; anthers c. 1.5 mm long, lacking terminal gland. Carpels 5, stellate-tomentose; style glabrous or sparsely stellate; stigma compact and hemispherical or of thick tuberculate recurved lobes. Cocci not beaked.

Found in the Snowy Mtns of southern N.S.W. and eastern Vic., in alpine heaths. Flowers early summer.

N.S.W.: 2 km S of Mt Kelly, *A.M.Lyne* 714 (NSW); 4 km W of Tianjara Falls, *P.Ollerenshaw* 1743 (NSW). Vic.: Mt Latrobe, 1854, *F.Mueller* (MEL); Holmes Plain, *N.W.Walsh* 978 (MEL).

The calyx of this species is unusual and the sepals vary greatly in size on the same flower. The leaves range from narrowly elliptic in Vic. to subcircular in N.S.W.



16. *Asterolasia phebaliioides* F.Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854)

Eriostemon pleurandroides F.Muell., *Fragm.* 1: 106 (1859), *nom. illeg.*; *Asterolasia pleurandroides* Benth., *Fl. Austral.* 1: 351 (1863), *nom. illeg.*; *Pleurandropsis phebaliioides* (F.Muell.) Baill., *Adansonia* 10: 306 (1872). T: Grampians, Vic., Nov. 1854, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 12: 85 (1998).

Illustrations: G.R.Cochrane *et al.*, *Fl. & Pl. Victoria* 42, fig. 98 (1968); N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 196, fig. 36d ((1999).

Open to compact shrub to 50 cm high, densely stellate when young. Leaves densely crowded on short branchlets, sessile, cuneate-obcordate, 5–7 mm long, tending to conduplicate, leathery, densely stellate all over. Flowers terminal to short and long branches, solitary, sessile, closely subtended by leafy or scarious bracts. Sepals absent. Petals broadly elliptic, c. 7 mm long, yellow, stellate abaxially. Stamens 10, glabrous or stellate; anthers 1.5 mm long, lacking terminal gland. Carpels 5, rounded, stellate-tomentose; style glabrous or stellate; stigmas lobes verrucose, short and clavate or long and slender, 0.5–1.5 mm long, Cocci rounded, not beaked. *Downy Starbush*.

Occurs in the Grampians and Little Desert regions of Vic. and on Kangaroo Is., S.A.; growing in sandy loam. Flowers Sept.–Dec.



S.A.: Flinders Chase, Kangaroo Is., *B.M.Overton* 327 (PERTH). Vic.: near Little Desert Natl Park, *B.M. & D.S.Overton* 1037 (PERTH); Black Ra., *B.M. & D.S.Overton* 1038 (PERTH).

The 5 leafy to scarious bracts that subtend the flower occur in an inter-petaline position and may represent sepals. Evidently most closely related to *A. trymalioides* q.v. Listed as vulnerable under the EPBC Act, 1999.

12. DRUMMONDITA

Paul G. Wilson

Drummondita Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 53 (1855); named after the brothers James Drummond (1784–1863) and Thomas Drummond (1780–1835), the i for James and the t for Thomas.

Philotheca sect. *Drummondita* (Harv.) F.Muell., *S. Sci. Rec.* 3: 3 (1883). T: *D. ericoides* Harv.

Undershrubs, glabrous or with simple hairs. Leaves alternate, scattered, simple, very shortly petiolate or sessile, ±terete or semiterete. Flowers 5-merous, terminal, usually solitary, sessile or shortly pedicellate; bracteoles present or absent. Sepals free, imbricate, broadly elliptic to suborbicular, coriaceous, often fleshy in centre, glabrous apart from marginal cilia, or rarely shortly pilose. Petals free, imbricate, erect and forming a tube, ovate-oblong, 2–4 times sepal length, subcoriaceous, glabrous. Stamens 5, antipetalous, exceeding petals, alternating with 5 slightly longer staminodes; filaments $\frac{3}{4}$ -united into a narrow cylinder, variably pilose adaxially, densely sericeous abaxially; anthers dorsifixed, included within filaments, minutely apiculate. Disc narrow. Ovary rounded; carpels 5, free, without a sterile apex, usually glabrous; style slender; stigma exserted, subglobular to patelliform. Seeds reniform, c. 3 mm long; sclerotesta smooth; hilum a large cavity in centre of adaxial margin; axial endocarp persistent.

An endemic Australian genus of 9 species, one in N.T. and Qld and 8 in SW W.A.

The young leaves often have small (c. 0.3 mm long) acicular hairs within and lateral to the leaf base, and these sometimes become dark and resinous.

- | | | |
|----|--|----------------------------------|
| 1 | Leaves > 14 mm long, acuminate or apex rounded with a short mucro | |
| 2 | Flowers sessile; sepals c. 8 mm long | 5. <i>D. longifolia</i> |
| 2: | Flowers shortly pedicellate; sepals c. 4 mm long | 9. <i>D. calida</i> |
| 1: | Leaves < 12 mm long or if longer then with a rounded apex | |
| 3 | Leaves 10–15 mm long with rounded apex; sepals minutely tomentose | 3. <i>D. miniata</i> |
| 3: | Leaves to 12 mm long; calyx glabrous or ciliate (rarely hispidulous in <i>D. hassellii</i>) | |
| 4 | Branchlets initially appressed-puberulous; sepals glandular-verrucose | |
| 5 | Leaves ascending | 1. <i>D. ericoides</i> |
| 5: | Leaves spreading | 2. <i>D. rubroviridis</i> |
| 4: | Branchlets glabrous or sparsely puberulous; sepals not or scarcely glandular-verrucose | |
| 6 | Flowers in terminal clusters of 1–3, shortly pedicellate | 4. <i>D. wilsonii</i> |
| 6: | Flowers solitary, sessile or shortly pedicellate | |
| 7 | Leaves sessile; sepals with raised fleshy ridge in centre | 7. <i>D. microphylla</i> |
| 7: | Leaves with a short (c. 0.4 mm) erect petiole; sepals various | |
| 8 | Leaves crowded, 3–12 mm long, apiculate | 6. <i>D. hassellii</i> |
| 8: | Leaves densely congested, 2–3.2 (–3.6) mm long, minutely apiculate | 8. <i>D. fulva</i> |

1. Drummondita ericoides Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 53 (1855)

Philotheca ericoides (Harv.) F.Muell., *Fragm.* 7: 21 (1869). T: White Peak, W.A., *J.Drummond*; iso: K.

Much branched shrub to 0.5 m high. Branchlets smooth, sparsely appressed-puberulous when young. Leaves subsessile, congested, ascending, slender and semi-terete, c. 8 mm long, obtuse with black apiculum, sulcate adaxially, sparsely woolly-ciliate when young otherwise glabrous. Stipules present when very young, minute, hair-like, reddish brown. Flowers solitary; pedicel thick, 1–1.5 mm long, fleshy; bracteoles basal, linear, c. 2 mm long, fleshy, caducous. Sepals \pm equal, suborbicular, 3–4 mm long, glabrous, green but reddish brown with age, glandular-verrucose. Petals narrowly oblong, 10–15 mm long, keeled, white to yellow with green tips. Stamens: tube white; free portion of filaments violet-sericeous; anthers c. 3.5 mm long.

Occurs near Geraldton, W.A.; on hills in grey loam over granite, laterite, or sandstone. Flowers Sept.–Dec.

W.A.: Near Geraldton, June 1901, *E.Pritzel* 409 (PERTH); *loc. id.*, *C.A.Gardner* 2054 (PERTH).

Listed as endangered under the EPBC Act, 1999.

**2. Drummondita rubroviridis** R.A.Meissn. in R.A.Meissner & A.S.Markey, *Nuytsia* 17: 277 (2007)

T: Koolanooka Hills, W.A., 12 Oct. 2005, *R.Meissner* & *Y.Caruso* 69; holo: PERTH.

Illustration: R.A.Meissner, *op.cit.* 279, fig. 4; 280, fig. 5.

Erect, straggly, branching shrub to 1.5 m high. Branchlets sparsely puberulous when young, with glossy glandular-verrucose ridges from decurrent leaf bases. Leaves sessile, spreading, clavate, 4–9 mm long, rounded at apex with black apiculum, flattened and sulcate adaxially, ciliate on margin otherwise glabrous. Flowers solitary, 13–17 mm long; pedicel to 1 mm long, fleshy. Sepals \pm equal, broadly elliptic, 2.4–3.8 mm long, sparsely ciliate otherwise glabrous, glossy, fleshy with chartaceous margin, glandular-verrucose, green turning red with age. Petals ovate-oblong, 11–15 mm long, yellow towards base, red medially, with apices green becoming black with age, minutely ciliate. Stamens: tube densely silky, white turning red with age; anthers 2.4–3.2 mm long.

Restricted to the Koolanooka Hills, E of Morawa, W.A.; in open mallee forests on the slopes and crests of banded ironstone. Flowers Sept.–Oct.; fruit recorded in Oct.

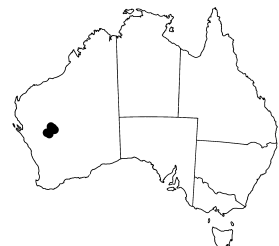
W.A.: Koolanooka Hills, *R.Meissner* & *Y.Caruso* 70 (PERTH).

**3. Drummondita miniata** (C.A.Gardner) Paul G.Wilson, *Nuytsia* 1: 206 (1971)

Philotheca miniata C.A.Gardner, *J. Roy. Soc. W. Australia* 14: 79 (1928). T: E of Cue, W.A., July 1927, *C.A.Gardner s.n.*; lecto: PERTH, *fide* P.G.Wilson, *loc. cit.*

Illustration: C.A.Gardner, *op. cit.* 83.

Divaricately branched undershrub c. 1 m high. Branchlets verrucose. Leaves sessile, slender-clavate, ascending, 10–15 mm long, rounded at apex with a black rounded apiculum, rugulose when dry, minutely tomentose when young. Stipules present when very young, minute, hair-like, reddish brown. Flowers 1–3; pedicels thick, c. 2 mm long, minutely woolly; bracteoles linear, c. 1 mm long, black-apiculate, minutely woolly. Sepals unequal, suborbicular, 4–7 mm long, minutely tomentose, orange-red. Petals narrowly oblong-ovate, c. 20 mm long, orange to red, glabrous. Stamens: filaments exceeding petals, red, with grey to violet indumentum; anthers c. 2.2 mm long, obtuse.



Occurs in the Cue to Meekatharra area of W.A.; growing on lateritic hills. Flowers June–Oct.

W.A.: Cue, *E.Wittwer 1268* (PERTH); 3 km W of Meekatharra, *A.A.Mitchell 1542* (PERTH).

4. *Drummondita wilsonii* F.H.Mollemans, *Nuytsia* 9: 96 (1993)

T: Parker Range South [precise locality withheld], W.A., 15 June 1990, *F.H.Mollemans 2761*; holo: PERTH.

Illustration: F.Mollemans, *op. cit.* 97.

Shrub to 1 m high. Branchlets erect, reddish brown to black, glabrous. Leaves very shortly petiolate, crowded, ascending, semiterete, 2–5 mm long, obtuse with a prominent black apiculum, fleshy, minutely woolly ciliate, flattened and sulcate above, minutely black-stipulate when young. Flowers 1–3; pedicels turbinate, c. 1 mm long, fleshy, subtended by small resinous red ciliate bracteoles. Sepals somewhat unequal, suborbicular, c. 4 mm long, glabrous, green. Petals narrowly oblong-elliptic, c. 11 mm long, glabrous, yellow to red with age. Stamens: filaments exceeding petals, pink- to red-sericeous except towards base; anthers c. 4 mm long.

Endemic to the Parker Range South, W.A.; growing on quartzite rocks. Flowers June–Nov.

W.A.: Parker Range South, *F.H. & M.P.Mollemans 3157* (PERTH).



5. *Drummondita longifolia* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 86 (1998)

D. hassellii var. *longifolia* Paul G.Wilson, *Nuytsia* 1: 206 (1971). T: Peak Charles, W.A., 15 June 1929, *C.A.Gardner and G.L.Throssell*; holo: PERTH.

Spreading shrub to 1 m high. Branchlets glabrous, smooth and cream-coloured when young, becoming resinous in lines. Leaves shortly petiolate, crowded, ascending, terete, slender, c. 16 mm long, rounded at apex with a short mucro, rugulose, glossy, glabrous. Flowers solitary, sessile. Sepals \pm equal, suborbicular, c. 8 mm long, glabrous, resinous. Corolla constricted below middle; petals narrowly oblong, c. 15 mm long, fawn-coloured below, dark red towards apex, glabrous. Stamens: filaments united to near apex, c. 20 mm long; free portion of filaments densely sericeous, dark red; anthers c. 4.5 mm long.

Known with certainty only from the type locality in SW W.A. where it grows on a granitic hill, but possibly also found near Trayning. Flowers sporadically throughout the year.

W.A.: Peak Charles, *S.D.Hopper 2268* (PERTH); ? Billacatting Hill Nat. Res., Trayning Shire, *W.Johnston 017* (PERTH).

The plant found at Billacatting Hill near Trayning is similar to the plant found at the type locality and it also grows in crevices between granite outcrops. However, Billacatting Hill is about 370 km WNW of Peak Charles (the type locality) and further studies are required to establish the plant's identity.



Listed as vulnerable under the EPBC Act, 1999.

6. *Drummondita hassellii* (F.Muell.) Paul G.Wilson, *Nuytsia* 1: 206 (1971)

Philothea hassellii F.Muell., *S. Sci. Rec.* 3: 3 (1883). T: NE of Janamonjup [Jerramungup], W.A., *A.Y.Hassell s.n.*; holo: MEL.

Spreading shrub c. 0.5 m high, frequently resinous. Branchlets grey to black, glabrous or sparsely puberulous. Leaves crowded, ascending or spreading with a short (c. 0.4 mm) erect petiole, from semi-obovoid with rounded apex and c. 3 mm long to slender, semiterete, mucronate and 12 mm long, sulcate adaxially, smooth, often ciliate. Flowers usually solitary, sessile. Sepals \pm equal, suborbicular, concave, c. 4 mm long, coriaceous or if fleshy then without a ridge, ciliate, otherwise glabrous (rarely shortly hispid), pale red. Petals c. 8 mm

long, yellow or red, often with green tips. Stamens: filaments exceeding petals, densely white-to mauve-sericeous, often dark red at tips; anthers c. 2 mm long. Plate 45.

Occurs in inland SW W.A., mainly in a broad band from Carnamah SE to Ravensthorpe; frequently growing on sand. Flowers sporadically throughout the year.

W.A.: c. 13 km E of Ballidu, *R.D.Royce 2154* (PERTH); 7 km E of Noongar, *D.J.McGillivray 3446* (PERTH); Frank Hann Natl Park, *D.Monk 421* (PERTH).

As circumscribed here this species varies considerably in habit, in the size and shape of the leaves, and in the colour of the flowers. It is likely that further study will indicate that a number of taxa should be discriminated. Some plants from near Southern Cross are particularly distinct in having sepals that are shortly hispid and long-ciliate.



7. *Drummondita microphylla* Paul G.Wilson, *Nuytsia* 12: 86 (1998)

Type: Bulga Downs Stn, W.A., 23 Aug. 1993, *K.H.Coate 295*; holo: PERTH.

Much-branched shrub, c. 1.5 m high. Branchlets glossy and white when young with short raised rounded glandular-verrucose glabrous ridges from decurrent leaf-bases. Leaves crowded and sub-imbricate, sessile, subterete, thick, 2–3 mm long, rounded at apex, smooth, fleshy, glabrous, sulcate adaxially. Flowers solitary; pedicel turbinate, c. 1.5 mm long, fleshy, glandular-verrucose, glabrous; bracteoles absent. Sepals unequal, triangular to suborbicular, 2–4 mm long; sparsely ciliate otherwise glabrous, red; margin thin; centre prominently raised, fleshy and glandular. Petals narrowly oblong-ovate, c. 13 mm long, glabrous, blood-red. Stamens: tube 1.5–2 cm long, densely silky, red; anthers 3 mm long.

Known from two areas in inland southern W.A., NE of Paynes Find and NE of L. Barlee; growing on breakaways. Flowers winter–spring.

W.A.: Between Fields Find and Yalgoo, 24 Aug. 1990, *K.Coate s.n.* (PERTH); 30 km SE of Bulga Downs HS, *P.G.Wilson 13055* (PERTH).



8. *Drummondita fulva* A.S.Markey & R.A.Meissn. in R.A.Meissner & A.S.Markey, *Nuytsia* 17: 275 (2007)

Type: Karara Stn, W.A., 16 Sept. 2005, *A.Markey & S.Dillon 3359*; holo: PERTH.

Illustration: R.A.Meissner & A.S.Markey, *op. cit.* 276, fig. 2; 277, fig. 3.

Erect shrub to 1.5 m high. Branches glabrous, glossy and tawny when young, with short, raised, rounded, glandular-verrucose ridges from decurrent leaf bases. Leaves crowded, with short (c. 0.4 mm) erect petiole, fleshy, clavate, flattened and channelled adaxially, 2–3.2 (–3.6) mm long, 0.8–1.1 mm wide, rounded with a minute reddish brown apiculus, sparsely long-ciliate on margin at least when young. Flowers solitary, 10–17 mm long; pedicel turbinate, fleshy, to 1.5 mm long. Sepals unequal, suborbicular, (2.6–) 3.2–4.5 (–5.2) mm long, ciliate, otherwise glabrous, chartaceous with fleshy centre, green turning red with age. Petals narrowly oblong-ovate, 9–14 mm long, red. Stamens: tube c. 10 mm long, densely white silky on upper $\frac{1}{3}$, turning red with age; anthers 1.5–2.5 mm long.

Restricted to hills between Perenjori, Paynes Find and Yalgoo, W.A.; generally found growing on the slopes of banded ironstone and associated metasedimentary bedrock. Flowers and fruits Sept.–Oct.

W.A.: Yilgarn Ra. (precise localities withheld), *A.Markey & S.Dillon 3361* (PERTH); *loc. id.*, *A.L.Payne 3804* (PERTH).



The hills where this species is found are under threat from mining.

This species is similar to *D. microphylla* which differs in having leaves which do not pass into a discernible petiole and sepals which have a prominent fleshy centre.

9. *Drummondita calida* (F.Muell.) Paul G. Wilson, *Nuytsia* 1: 206 (1971)

Philotheca calida F.Muell., *Fragm.* 7: 21 (1869). T: Gilbert R., Qld, *R. Daintree*; holotype: MEL, isotype: BRI, K.

Dense shrub to 0.5 m high, glabrous except flowers. Branchlets smooth, cream-coloured. Leaves crowded, slender, trigonous or semiterete, c. 16 mm long, acuminate, glossy, sulcate adaxially. Flowers solitary; pedicel c. 1.5 mm long, fleshy; bracteoles absent. Sepals \pm equal, orbicular, c. 4 mm long, leathery, ciliate but otherwise glabrous, green. Petals narrowly oblong, c. 14 mm long, white to pink with orange tips, glabrous. Stamens: filaments exceeding petals, white-sericeous; anthers c. 2.5 mm long.

Occurs in northern N.T. and northern Qld; on mesa-like plateaus with leached soil. Flowering and fruiting material has been collected in April.

N.T.: Kakadu Natl Park, *K.A. Menkhorst 364* (PERTH). Qld: Wall Ck, 1985, *anon.* (BRI).

This species is a typical member of the genus although geographically disjunct from other species.



LEIONEMA

Paul. G. Wilson

Leionema (F.Muell.) Paul G. Wilson, *Nuytsia* 12: 270 (1998); from the Greek *leios* (smooth) and *nema* (thread) alluding to the glabrous staminal filaments.

Eriostemon sect. *Leionema* F.Muell., *Pl. Victoria* 1: 125 (1862); *Phebalium* sect. *Leionema* (F.Muell.) Benth., *Fl. Austral.* 1: 337–8 (1863). T: *Leionema bilobum* (Lindl.) Paul G. Wilson

Eriostemon sect. *Chorilaenopsis* F.Muell., *op. cit.* 131. T: *E. phyllicoides* F.Muell.

Shrubs, glabrous or with simple, branched or stellate hairs. Leaves simple, alternate, sessile or shortly petiolate. Flowers in few-many-flowered cymes or corymbs, rarely solitary, 5-merous. Sepals valvate, slightly united at base and continuous with pedicel apex. Petals valvate, usually free (united in *L. sympetalum*), usually glabrous; apex inflexed. Stamens 10, free; filaments terete, glabrous; anthers cream to yellow (rarely pink), versatile, deeply retuse; terminal gland or apiculus usually absent (present in *L. ellipticum*). Ovary usually supported on a short gynophore. Carpels usually 5, with sterile apex; style slender, glabrous; stigma minutely lobed. Cocci apiculate to shortly rostrate. Seed subreniform, c. 3 mm long; adaxial margin \pm straight; outer testa thin, smooth; sclerotesta smooth; hilum linear to narrowly elliptic; raphe fleshy, basal or subbasal, with a thin leathery to crustaceous glossy covering; chalazal opening basal or subbasal, obscured by raphe; placental endocarp thick, persistent.

A genus of 24 species in eastern Australia and one in New Zealand.

The relationship of this genus to other genera in the tribe Boronieae has been studied by Mole *et al.* (2004); they considered that it formed a sister group to a clade comprising *Muiriantha*, *Drummondita* and *Asterolasia*.

P.G. Wilson, New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae), *Nuytsia* 12: 267–288 (1998); B.J. Mole *et al.*, Molecular phylogeny of *Phebalium* (Rutaceae: Boronieae) and related genera based on the nrDNA regions ITS 1 + 2, *Pl. Syst. Evol.* 249: 197–212 (2004).

- 1 Anthers minutely mucronulate; leaves elliptic, to 5 cm long **24. *L. ellipticum***
- 1: Anthers retuse; leaves various, to 10 cm long
- 2 Petals 5–8 mm long (or more), not spreading; stamens considerably exceeding petals
- 3 Petals united into a cylindrical greenish yellow corolla; plant becoming glabrous with age **21. *L. sympetalum***
- 3: Petals free
- 4 Branchlets glabrous, strongly angular **20. *L. ralstonii***
- 4: Branchlets pilose or tomentose, ±terete or weakly angled
- 5 Leaves divaricate, narrowly to broadly ovate or lanceolate, 5–12 mm long, obtuse; branchlets pilose **19. *L. carruthersii***
- 5: Leaves ±erect, narrowly oblong to elliptic to slightly oblanceolate, 20–40 (–65) mm long, obtuse to retuse to bilobed; branchlets stellate-pubescent to tomentose
- 6 Branchlets ±terete; leaves 20–40 mm long, entire; inflorescences nodding; coccus beak 1.5 mm long **22. *L. viridiflorum***
- 6: Branchlets weakly angled; leaves 24–65 mm long, frequently serrulate; inflorescence erect; coccus beak 1.5–3 mm long **23. *L. scopulinum***
- 2: Petals to 7 mm long, ±spreading; stamens ±equal to or slightly longer than petals
- 7 Leaves broadly oblong-elliptic, 6–10 cm long; base amplexicaul with rounded lobes **18. *L. ambiens***
- 7: Leaves smaller or narrower than above; base not amplexicaul
- 8 Underside of leaves minutely white stellate-puberulous
- 9 Leaves linear to narrowly oblong to narrowly obovate, 4–8 cm long, denticulate; axillary cymes slender; ovary glabrous **3. *L. dentatum***
- 9: Leaves oblong-elliptic to subterete due to the revolute margins, 8–21 (–30) mm long, entire; axillary cymes small and compact or flowers solitary (*L. lachnaeoides*); ovary glabrous or variously hairy
- 10 Ovary obovoid to subspherical, white stellate-puberulous (rarely glabrous); cocci obtuse to apiculate, to 3.5 mm long; leaves smooth **4. *L. phylicifolium***
- 10: Ovary rostrate, glabrous, pilose or villous; cocci variably apiculate, 6 mm or more long; leaves minutely scabridulous (or smooth in *L. lachnaeoides*)
- 11 Inflorescences (1–) 3-flowered; leaves straight, (8–) 12–21 (–30) mm long, underside apparent **5. *L. ceratogynum***
- 11: Inflorescences 1-flowered; leaves slightly upcurved, 7–15 mm long, underside mostly obscured by revolute margins **6. *L. lachnaeoides***
- 8: Underside of leaves glabrous, pilose, or coarsely stellate
- 12 Leaves pilose or coarsely stellate abaxially **7. *L. diosmeum***
- 12: Leaves glabrous or minutely stellate-scabridulous abaxially at maturity
- 13 Branchlets strongly angular, glabrous (sometimes minutely verrucose); leaves chartaceous
- 14 Leaves narrowly elliptic to narrowly oblong or spatulate, 2.5–5 cm long, obtuse to rounded **9. *L. obtusifolium***
- 14: Leaves elliptic, 5–7 cm long, acute **17. *L. coxii***

- 13:** Branchlets \pm terete, usually stellate-puberulous; leaves chartaceous, leathery or fleshy
- 15** Leaves terete or clavate, fleshy; flowers solitary on short pedicels in upper leaf axils (Tas.) **1. *L. montanum***
- 15:** Leaves neither terete nor fleshy
- 16** Leaves leathery, oblong to oblong-elliptic, elliptic, obovate, or subterete with revolute margins, to 17 mm long, entire or crenulate at apex
- 17** Flowers in compact terminal cymes (Tas.) **2. *L. oldfieldii***
- 17:** Flowers in upper axils
- 18** Flowers mostly in clusters of 3 or 4 on axillary peduncles (SE N.S.W.; E Vic.) **4. *L. phyllicifolium***
- 18:** Flowers solitary on a slender pedicel (SE Qld) **10. *L. gracile***
- 16:** Leaves chartaceous to subcoriaceous or if leathery then not oblong-elliptic or entire
- 19** Leaves spatulate to narrowly oblong, narrowly or broadly obovate, flat, chartaceous, 1.5–2.5 cm long, apex obtuse to rounded sometimes slightly retuse; pedicels slender **8. *L. elatius***
- 19:** Leaves variable but not as above; pedicels slender or short and fleshy
- 20** Branchlets minutely pilose in lines between decurrent ribs, verrucose (SE Qld) **10. *L. gracile***
- 20:** Branchlets glabrous, pilose, or stellate-hairy, sometimes minutely so, smooth or verrucose
- 21** Leaves bilobed, retuse, or \pm truncate; carpels 2–5; pedicels slender
- 22** Leaves denticulate or serrate, smooth adaxially (Vic.; Tas.) **11. *L. bilobum***
- 22:** Leaves entire, slightly scabrid adaxially (or smooth in *L. hillebrandii*) (S.A.)
- 23** Leaves shortly cordate-obcuneate to ovate-obcuneate to ovate or oblong, 3–17 mm long; carpels 2–4 **12. *L. hillebrandii***
- 23:** Leaves transversely oblong to suborbicular, 1–3.5 mm long; carpels 4 or 5 **13. *L. equestre***
- 21:** Leaf apex acute to rounded; carpels 5; pedicels slender or short and fleshy
- 24** Branchlets verrucose, variably stellate; leaves elliptic to broadly obovate or suborbicular, entire or minutely erose near apex, flat or convex, smooth (N.S.W.; Vic.) **15. *L. lamprophyllum***
- 24:** Branchlets smooth, stellate-hairy or glabrous; leaf-shape variable
- 25** Leaves broadly ovate to subcordate, 3–5 mm long, flat or with recurved margins, glabrous or minutely stellate-scabridulous (S.A.; Vic.) **14. *L. microphyllum***
- 25:** Leaves broadly obovate to orbicular, 6–10 mm long, flat, glabrous, \pm imbricate when dry (Qld; N.S.W.) **16. *L. rotundifolium***

1. *Leionema montanum* (Hook.) Paul G. Wilson, *Nuytsia* 12: 275 (1998)

Phebalium montanum Hook., *J. Bot. (Hooker)* 1: 255 (1834); *Eriostemon montanus* (Hook.) F. Muell., *Pl. Victoria* 1: 129 (1862). T: Western Mountains, Tas., *R. Gunn* 283 & *R. Lawrence* 321; syn: K.

Illustrations: M. Stones & W. Curtis, *Endemic Fl. Tasmania* pt 1, no. 11 (1967), and pt 6, no. 248 (1978).

Compact decumbent shrub. Branchlets terete, stellate-puberulous in lines between prominent decurrent leaf bases. Leaves crowded, terete or clavate, to 1 cm long, obtuse, fleshy, ±flattened and somewhat channelled adaxially, rounded abaxially, smooth, glabrous abaxially. Flowers solitary in axils of uppermost leaves; pedicel 1.5–3 mm long, fleshy and swollen below calyx, glabrous or sparsely stellate-puberulous; bracteoles 2 or 3, close to calyx, sepal-like. Calyx lobes deltate, c. 0.7 mm long, fleshy, glabrous. Petals spreading, elliptic, c. 4 mm long, white or pink, glabrous. Stamens slightly exceeding petals. Gynophore c. 0.2 mm high, narrower than ovary, purple(?). Carpels 5; ovary subspherical, c. 1 mm high, irregularly corrugate, glabrous. Cocci rounded at apex and shortly rostrate on outer angle.

Occurs in the mountains of NE Tas.; growing in exposed and rocky situations. Flowers Nov.–Jan.

Tas.: Ben Lomond, *F.E.Davies* 1203 (NSW); Ironstone Ra., Dec. 1900, *F.A.Rodway* (NSW); Mt Barrow, *H.M.R.Rupp* 38 (NSW).



2. *Leionema oldfieldii* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 276 (1998)

Eriostemon oldfieldii F.Muell., *Fragm.* 1: 3 (1858); *Phebalium oldfieldii* (F.Muell.) F.Muell. ex Benth., *Fl. Austral.* 1: 340 (1863). T: Mt La Perouse, Tas., 27 Feb. 1857, *A.Oldfield* & *C.Stuart* 1875; holo: MEL; iso: K. Illustration: M.Stones & W.Curtis, *Endemic Fl. Tasmania* pt 5, no. 168 (1975).

Compact shrub c. 1 m high. Branchlets ±terete, ±stellate-puberulous all round. Leaves oblong-elliptic to obovate, 7–15 mm long, 2.5–6 mm wide, flat with slightly recurved margins, entire or minutely crenate towards rounded apex, leathery, glabrous, glossy; midrib impressed adaxially. Inflorescence compact, terminal; pedicels c. 2.5 mm long, fleshy, glabrous, with 2 short bracteoles near base. Calyx lobes deltate, c. 0.5 mm long, fleshy, glabrous. Petals spreading, elliptic, c. 4 mm long, pale pink to white, glabrous. Stamens slightly exceeding petals. Gynophore c. 0.3 mm high, fleshy, somewhat broader than ovary. Carpels 5; ovary subspherical, c. 1 mm high, corrugate, glabrous. Cocci rounded at apex and shortly rostrate on outer angle.

Endemic to the mountains near the W and S coasts of Tas. Flowers Nov.–Jan.; fruits Mar.–May.

Tas.: Cradle Mtn, Dec. 1915, *F.A.Rodway* (NSW); Adamsons Peak, Dec. 1894, *L.Rodway* (MEL).



3. *Leionema dentatum* (Sm.) Paul G.Wilson, *Nuytsia* 12: 272 (1998)

Phebalium dentatum Sm. in A.Rees, *Cycl.* 27 (1814). T: “Brought by Gen. Grose from some part of New Holland, and communicated to us by A.B.Lambert Esq”; holo: LINN.

P. salicifolium A.Juss., *Ann. Sci. Nat. (Paris)* 4: 472 (1825). T: Port Jackson, N.S.W., *anon.*; *n.v.*

Eriostemon umbellatus Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 22/2: 15 (1849); *P. umbellatum* (Turcz.) Turcz., *op. cit.* 25/2: 160 (1852). T: 125 miles from Sydney, N.S.W., *W.Stephenson*; holo: KW (photo seen).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 260 (1991).

Shrub or small tree to 6 m high. Branchlets ±terete, minutely stellate. Leaves linear to narrowly oblong or narrowly obovate, to 8 cm long, 2–8 mm wide, recurved to revolute, denticulate, acute to truncate or retuse and bidentate at apex, chartaceous, smooth and glabrous above, white stellate-puberulous below. Cymes axillary, to ½ length of subtending leaf, arranged along branches; flowers c. 10; pedicels slender, c. 4 mm long, subtended by a small caducous bract and with a pair of minute persistent bracteoles in lower half. Calyx lobes broadly deltate, c. 0.3 mm high, ±glabrous. Petals spreading, elliptic, c. 3.5 mm long, pale yellow



to white, glabrous. Stamens \pm equal to or slightly longer than petals. Gynophore c. 0.2 mm high, much narrower than ovary. Carpels 5; ovary spherical, smooth, glabrous. Cocci with apex rounded and very shortly outwardly apiculate. $n = 16$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs in N.S.W., chiefly near the coast, from Illawarra N to Port Stephens, also in the Gibraltar Ra. Flowers spring; fruits late spring.

N.S.W.: Wollemi Natl Park, *L.Haegi* 2012 (NSW); Manly Dam, *M.J.Taylor* 73 (NSW); Gibraltar Range Natl Park, 15 Sept. 1976, *J.B.Williams* (NSW).

4. *Leionema phyllicifolium* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 276 (1998)

Phelialium phyllicifolium F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 32 (1855); *Eriostemon phyllicifolius* (F.Muell.) F.Muell., *Fragm.* 1: 105 (1859). T: Munyang Mtns [Snowy Mts], also on the Snowy R., N.S.W., Jan. 1855, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 102 (1970); isolecto: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 260 (1991).

Compact shrub to 1.5 m high. Branchlets \pm terete (slightly angular when young), stellate-puberulous. Leaves spreading, oblong-elliptic or subterete with revolute margins, 8–17 mm long, 1.5–2.5 mm wide, entire, leathery, smooth and glabrous adaxially, white stellate-puberulous (or rarely glabrous) abaxially. Inflorescence a cymose cluster of (1–) 3 or 4 flowers, subsessile or on peduncles to 4 mm long in axils of distal leaves; pedicels 1–3 mm long, \pm fleshy, \pm glabrous, with minute ovate bracteoles. Calyx lobes deltate, 0.5 mm long, glabrous. Petals spreading, narrowly elliptic, 3.5–4 mm long, pale yellow. Stamens shortly exceeding petals. Gynophore inconspicuous. Carpels 5; ovary obovoid to spherical, white stellate-puberulous or rarely glabrous. Cocci apex rounded, outwardly very shortly rostrate.

Occurs in the mountains of eastern Vic. and of the extreme SE of N.S.W. Flowers spring; fruits late spring–early summer.

N.S.W.: Dainers Gap, Snowy Mtns, *I.R.Telford* 3822 (CANB); Pipers Ck valley, Kosciuszko Natl Park, *J.Thompson* 2273 (NSW). Vic.: Moroka R., *J.Westaway* 642 (MEL); Lake Mtn, *N.G.Walsh* 909 (MEL).



5. *Leionema ceratogynum* N.G.Walsh, *Telopea* 10: 805 (2004)

T: N.S.W., Wadbilliga Natl Park, 28 Oct. 1993, *T.R.Lally* 185; holo: CANB; iso: MEL, NSW.

Illustrations: N.G.Walsh, *op. cit.* 806, fig. 1; 808, figs 2, 3; 809, fig. 4.

Dense shrub to 2.5 m high. Branchlets strongly ridged by decurrent leaf bases when young, stellate-puberulous. Leaves with petiole 1.5–3 mm long, oblong-elliptic, (8–) 12–21 (–30) mm long, 1.3–2.5 mm wide, entire, revolute, acute to obtuse or shortly apiculate; adaxial surface minutely scabridulous and somewhat tuberculate, glabrous or glabrescent; abaxial surface smooth, white stellate-puberulous. Inflorescence compact, axillary, (1 or) 3-flowered, on distal 5–15 cm of branches; peduncle 0–1 mm long, glabrous; pedicels 1–2 mm long with 1 or 2 bracteoles c. 0.5 mm long in lower half. Calyx 1–1.5 mm long, glabrous; lobes deltate, 0.5–0.7 mm long. Petals spreading, narrowly elliptic, 4.5–5 mm long, pale yellow, glabrous. Gynophore not apparent. Carpels 5, ending in a linear rostrum 1.5–2 mm long; ovary glabrous or sparsely pilose, rarely villous. Cocci erect, ellipsoid, with narrow rostrum 3–4 mm long.

Occurs in SE N.S.W. where restricted to the Wadbilliga Natl Park, E and NE of Kybean. Growing in open eucalypt forest, heath and scrub. Flowers spring; fruits summer.

N.S.W.: Wadbilliga Natl Park, *A.M.Lyne* 1248 (AD, BRI, HO, MEL, PERTH); *loc. id.*, *I.R.Telford* 3660 (BRI, CANB, MEL, NSW).



6. *Leionema lachnaeoides* (A.Cunn.) Paul G.Wilson, *Nuytsia* 12: 275 (1998)

Phebalium lachnaeoides A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 332 (1825); *Eriostemon phyllicifolius* var. *lachnaeoides* (A.Cunn.) F.Muell. ex C.Moore, *Handb. Fl. New South Wales* 43 (1893), *nom. illeg.* T: Blackheath, Blue Mtns, N.S.W., 1822, *A.Cunningham* 56; holo: K, iso: BRI, MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 261 (1991).

Shrub to 1.5 m high. Branchlets stellate-puberulous when young. Leaves shortly petiolate, slightly upcurved, closely revolute and almost terete, c. 8 mm long, 7–15 mm long, 1 mm wide, entire, acute, leathery, smooth and glabrous adaxially, white stellate-puberulous abaxially. Flowers solitary in upper leaf axils; peduncle c. 1.5 mm long, stellate-puberulous; pedicel c. 2 mm long, fleshy, glabrous, with 4 minute bracteoles at base. Calyx lobes deltate, c. 0.5 mm long, glabrous. Petals spreading, narrowly elliptic, c. 5 mm long, glabrous. Stamens shortly exceeding petals. Gynophore short-cylindrical, c. 0.5 mm high. Carpels 5, narrow, the upper $\frac{2}{3}$ forming a long sterile apex; ovary narrowly ovoid, c. 2 mm long, glabrous. Cocci rounded with prominent beak 2–3 mm long.

A rare species occurring on rocky outcrops in the Blue Mtns, N.S.W. Flowers late spring; fruits early summer.

N.S.W.: near Katoomba, *B.Wieck* (NSW 239840).

This species is similar to some variants of *L. phyllicifolium* and is distinguished principally by having solitary axillary flowers and glabrous attenuate carpels.



7. *Leionema diosmeum* (A.Juss.) Paul G.Wilson, *Nuytsia* 12: 272 (1998)

Phebalium diosmeum A.Juss., *Ann. Sci. Nat. (Paris)* 4: 472 (1825); *P. phyllicoides* Sieber ex Spreng., *Syst. Veg.* 4(2): 164 (1827), *nom. superfl.* based on above; *Eriostemon phyllicoides* F.Muell., *Fragm.* 1: 107 (1859), *nom. illeg.* T: Port Jackson, N.S.W., *comm. J.Gay*; iso: K.

Chorilaena angustifolia F.Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854), as *angustifolio*. T: Argyle County (i.e. Goulburn district), N.S.W., *anon.* 826; holo: MEL; iso: K, MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 261 (1991).

Shrub to 2 m high. Branchlets angular when young, shortly hirsute. Leaves subterete due to the strongly revolute margins (rarely narrowly ovate), 4–18 mm long, 1–1.5 mm wide, obtuse, glabrous or shortly hirsute adaxially, pilose abaxially. Inflorescence a compact terminal head, with several flowers in axils of linear bracts; pedicels 1–2 mm long, fleshy, shortly pilose. Calyx turbinate, pilose, passing into pedicel; lobes linear-lanceolate, c. 2 mm long. Petals spreading, narrowly obovate, 4–7 mm long, creamy-yellow, sparsely pilose or glabrous. Stamens shortly exceeding petals. Gynophore absent. Carpels 5, subterete, (2–) 2.5–3.7 mm long, the upper $\frac{3}{4}$ sterile; ovary shortly pilose. Cocci with an erect subulate rostrum 4–5.5 mm long arising from outer angle. $n = 16$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs near the SE coast of N.S.W.; found in heath and dry sclerophyll forest over sandstone. Flowers late winter; fruits spring.

N.S.W.: 24 km NE of Timbillica, *E.F.Constable* 4339 (NSW); Upper Shoalhaven Gorge, *P.Gilmour* 5220 (NSW).



8. *Leionema elatius* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 273 (1998)

Eriostemon elatior F.Muell., *Fragm.* 1: 181 (1859); *Phebalium elatius* (F.Muell.) Benth., *Fl. Austral.* 1: 340 (1863). T: Near Tenterfield, N.S.W., *C.Stuart* 153; holo: MEL.

Shrub to 5 m high. Branchlets \pm terete, glabrous or stellate-puberulous, smooth or glandular-verrucose. Leaves narrowly spatulate to narrowly oblong to very broadly obovate, 10–25 mm long, 3–10 mm wide, flat, minutely crenulate towards the obtuse to rounded or sometimes

slightly retuse apex, chartaceous, glabrous, smooth and glossy adaxially. Inflorescence terminal, scarcely exceeding leaves; peduncle and pedicels slender, minutely stellate; pedicel c. 3 mm long with minute caducous bract and bracteoles in lower half. Calyx lobes broadly deltate, c. 0.5 mm long, fleshy, sparsely stellate. Petals spreading, oblong-elliptic, 3–4.5 mm long, white to pale yellow, glabrous, glandular. Stamens slightly exceeding petals. Gynophore c. 0.5 mm high, slightly narrower than ovary. Carpels 5; ovary subspherical, 1–1.5 mm high, smooth or rugulose, glabrous. Cocci outwardly shortly rostrate or erostrate.

Occurs in NE N.S.W. and extreme SE Qld. Two subspecies are recognised.

Leaves narrowly obovate to obovate, 10–25 mm long, 3–10 mm wide; cocci erostrate

8a. subsp. elatius

Leaves very broadly obovate, c. 10 mm long, 8 mm wide; cocci shortly rostrate

8b. subsp. beckleri

8a. *Leionema elatius* (F.Muell.) Paul G.Wilson subsp. *elatius*

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 261 (1991).

Shrub to 2 m high. Branchlets glandular-verrucose. Leaves narrowly obovate to obovate, 10–25 mm long, 3–10 mm wide, obtuse to rounded or slightly retuse. Cocci erostrate.

Occurs in ranges in NE N.S.W. N of Bulahdelah, and in extreme SE Qld. Flowers and fruits spring.

Qld: Warrie Natl Park, *G.L.Webster & R.Hildreth 15034* (NSW). N.S.W.: Upper Copmanhurst, Oct. 1909, *J.L.Boorman* (NSW); Whian Whian State Forest, *E.F.Constable 6493* (NSW); Lansdowne State Forest, *P.Gilmour 5867* (NSW).



8b. *Leionema elatius* subsp. *beckleri* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 273 (1998)

Eriostemon beckleri F.Muell., *Fragm.* 9: 109 (1875); *Phebalium beckleri* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III. 4: 141 (1896); *P. elatius* subsp. *beckleri* (F.Muell.) Paul G.Wilson, *Nuytsia* 1: 106 (1970). T: Mr Lennan's Ck, Clarence R., N.S.W., *H.Beckler*; holo: MEL; iso: NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 261 (1991).

Shrub to 5 m high. Branchlets almost smooth. Leaves very broadly obovate, c. 10 × 8 mm, rounded and retuse. Cocci shortly rostrate.

Only known from Mt Lindesay in the McPherson Ra., Qld; growing over basalt. Flowers and fruits spring.

Qld: Mt Lindesay, *P.I.Forster 12173* (BRI).

A plant from Hungryway Ck, Colo, N.S.W., referred to as “*Phebalium* species A” by Weston & Porteners in G.J.Harden (ed.), *Fl. New South Wales* vol. 2 (1991) and as “*Leionema* sp. ‘Colo River’ (Weston 2423)” in vol. 2 of the 2nd edition (2002) may be a hybrid since it has deformed flowers and apparently sterile anthers. Although it most closely resembles *L. elatius* that species has not been recorded from the Colo area.



9. *Leionema obtusifolium* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 276 (1998)

Phebalium obtusifolium Paul G.Wilson, *Nuytsia* 1: 107 (1970). T: Upper reaches of Alice Ck. c. 8 miles [c. 13 km] N of Helidon, Qld, Aug. 1963, *F.D.Hockings*; holo: BRI.

Glabrous, glossy shrub to 1 m high. Branchlets flattened with prominent acute angles, minutely verrucose. Leaves sessile, narrowly elliptic to narrowly oblong to spatulate, 25–50 mm long, 3–6 mm wide, minutely crenulate towards the obtuse to rounded apex, chartaceous, smooth. Inflorescence a terminal cyme of 10–20 flowers; pedicels slender, 4–8 mm long, subtended by minute caducous bract and bracteoles towards base. Calyx hemispherical, 0.5 mm long; lobes broadly deltate, 0.25 mm long. Petals spreading, narrowly obovate, c. 4 mm long,

yellowish white. Stamens \pm equal to petals. Gynophore shortly cylindrical, c. 0.5 mm high, slightly narrower than ovary. Carpels 5, sterile at extreme apex; ovary subspherical, c. 1 mm high. Fruit not seen.

Occurs in the Helidon and Ravensbourne areas of SE Qld; on sandstone hills. Flowers spring.

Qld: 10 km ESE of Murphys Ck, *P.I.Forster* 7083 (MEL); Helidon, Nov. 1964, *G.Ward* (NSW).

Listed as vulnerable under the EPBC Act, 1999.



10. *Leionema gracile* (C.T.White) Paul G.Wilson, *Nuytsia* 12: 274 (1998)

Phebalium gracile C.T.White, *Proc. Roy. Soc. Queensland* 50: 69 (1939). T: Mt Greville, Qld, Mar. 1934, *C.T.White* 9947; holo: BRI.

Shrub to 1.5 m high. Branchlets \pm terete or slightly angular, shortly pilose between ribs, verrucose. Leaves \pm spreading, oblong to oblong-elliptic, 5–10 mm long, 1.5–2.5 mm wide, entire, with margin slightly recurved, obtuse to rounded at apex, leathery, \pm glabrous. Flowers solitary in uppermost axils; pedicel c. 5 mm long, \pm glabrous; bracteoles filamentous, c. 0.5 mm long, caducous. Calyx lobes deltate, c. 0.5 mm long, glabrous. Petals spreading, oblong, c. 5 mm long, acute, white. Stamens \pm equal to petals. Gynophore shortly cylindrical, c. 0.5 mm high. Carpels 5; ovary cylindrical, c. 1.5 mm high, glabrous. Cocci c. 4 mm long, shortly rostrate.

Occurs in extreme SE Qld, apparently restricted to the summits of Mt Moon and Mt Greville; growing on rhyolitic rocks. Flowers autumn and spring.

Qld: Mt Moon, *P.I.Forster* 6624 (MEL); Mt Greville, *P.Sharpe* 370 (NSW).



11. *Leionema bilobum* (Lindl.) Paul G.Wilson, *Nuytsia* 12: 271 (1998)

Phebalium bilobum Lindl. in T.L.Mitchell, *Three Exped. Australia* 2: 177 (1838); *Eriostemon hillebrandii* F.Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854), *nom. illeg.* based on preceding. T: Mt William [Vic.], 15 July 1836, *T.Mitchell* 249; holo: CGE; iso: K, MEL.

Shrub c. 1 m high (to 4 m tree), variably stellate. Branchlets slender, \pm terete, smooth, minutely or coarsely stellate. Leaves ovate-oblong and constricted below apex (Grampians and Tas.) or narrowly elliptic-oblong or oblong (Gippsland), 6–55 mm long, 2–10 mm wide, flat, or with slightly recurved margins (Grampians), \pm serrate or denticulate to entire, truncate to strongly retuse or bilobed, leathery, smooth adaxially, glabrous (at least abaxially). Inflorescence corymbose or of axillary pedunculate clusters; pedicels slender, 2–8 mm long. Calyx lobes deltate, c. 0.5 mm long. Petals spreading, narrowly elliptic, 3–5 mm long, red to white. Stamens equal to petals. Gynophore shortly cylindrical, 0.2–0.4 mm high. Carpels 2 or 3 (4); ovary glabrous or rarely hirsute. Cocci c. 5 mm long, with rostrum c. 1 mm long.

Occurs in Tas. and in Vic. from the Grampians to E Gippsland. There are 4 subspecies.

Leionema bilobum has evident affinities to *L. hillebrandii*, with which it shares a reduced carpel number. It may be distinguished from that species by its larger size, serrate leaves, yellow anthers, absence of an abrupt apiculum on the carpels, and by the fruit shape. In each of the four major areas of distribution a morphologically distinct race is found: these are treated as subspecies by Duretto *et al.*, *Muelleria* 23: 7–14 (2006). This Flora account is based on that revision.

- 1 Margin of leaves serrate, sometimes only slightly and then distinctly bilobed at tip
- 2 Base of leaves usually truncate, sometimes slightly cordate or rounded; rays of hairs on branchlets 0.5–1 mm long
- 2: Base of leaves cuneate or attenuate; hairs on branchlets to 0.25 mm long

11a. subsp. *bilobum*

- 3 Leaves 12–25 mm long, l:w at broadest point 1.2–4 (–7); shrub 0.5–2 m tall **11b. subsp. truncatum**
- 3: Leaves 16–52 mm long, l:w at broadest point 4–7; shrub or small tree to 4 m high **11c. subsp. serrulatum**
- 1: Margin of leaves entire (not serrate); leaf apex truncate, obtuse, or slightly retuse **11d. subsp. thackerayense**

11a. *Leionema bilobum* (Lindl.) Paul G. Wilson subsp. *bilobum*

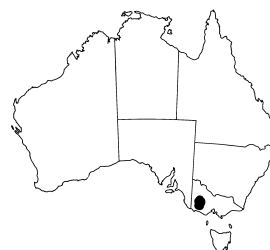
Eriostemon hillebrandii var. *longifolius* F. Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854). T: Mt William, Vic., Nov. 1853, *F. Mueller*; syn: MEL 4608, 4616, 4617.

Illustration: M.F. Duretto *et al.*, *Muelleria* 23: 10, fig. 1 a–c (2006).

Shrub to 0.6 (2.5) m high; rays of hairs on branchlets 0.5–1 mm long. Leaves narrowly lanceolate, constricted below apex, 9–19 mm long, 2–8 mm wide, l:w 1.5–5 (–9), usually truncate at base, serrate, strongly obcordate or retuse. Pedicels 2–8 mm long, glabrous or glabrescent or sparsely and minutely stellate. Sepals 0.5–0.75 mm long, usually with tuft of hairs at tip. Petals 3–5 mm long, white. Carpels glabrous to densely pilose.

Found in the eastern part of the Grampians Natl Park, Vic. Grows in heath and *Eucalyptus* or *Banksia* woodland on sandstone. Flowers May–Nov.; fruits Dec.–Feb.

Vic.: Wallaby Rocks, *A.C. Beauglehole* 25270 (MEL); c. 2 km SW from Halls Gap at the Grand Canyon, 11 May 1992, *V. Stajsic* (MEL); Mt Difficult, 9 Nov. 1963, *J.H. Willis* (MEL).



11b. *Leionema bilobum* subsp. *truncatum* (Hook.f.) Duretto & K.L. Durham in M.F. Duretto *et al.*, *Muelleria* 23: 11 (2006).

Phebalium truncatum Hook.f., *Fl. Tasman.* 1: 64, t. 9 (1855). T: Tas., Schouten Is., Aug. 1844, [*J. Milligan?*] *Gunn* 1947; lecto: K, *vide* M.F. Duretto *et al.*, *op. cit.* 12.

Illustrations: J.D. Hooker, *Fl. Tasman.* 1: t. 9 (1855); M.F. Duretto *et al.*, *op. cit.*, fig. 1e, f.

Shrub 0.5–2 m high; branch hairs with rays to 0.25 mm long. Leaves ovate-oblong to narrowly oblong-ovate, 12–25 mm long, 3–10 mm wide, l:w 1.2–4 (–7), usually cuneate at base, serrate, truncate to strongly obcordate. Pedicels 2.5–5 mm long, glabrescent. Sepals c. 0.5 mm long with dense tuft of hairs at tip. Petals 3–4 mm long, white. Carpels glabrous.

Found in Tas. on Flinders and Cape Barren Is and in northern and eastern regions. Usually growing on rocky, mostly granitic areas in woodland, shrubland and heath. Flowers Sept.–Nov.; fruits Oct.–Jan.

Tas.: Cethana, *A.M. Buchanan* 12639 (HO); Mt Tanner, Flinders Is., *M.P. Cameron* & *W.M. Curtis* (HO); Bay of Fires, Sept. 1990, *E.B. Clayton* (HO); Cape Barren Is., *P. Collier* 3588 (HO).



11c. *Leionema bilobum* subsp. *serrulatum* (F. Muell.) Duretto & K.L. Durham in M.F. Duretto *et al.*, *Muelleria* 23: 13 (2006).

Eriostemon serrulatus F. Muell., *Fragm.* 1: 4 (1858). T: Vic., Eastern Highlands, Bunip-Bunip Creek, *F. Mueller*; holo: MEL; iso: K.

Illustration: M.F. Duretto *et al.*, *op. cit.*, fig. 1g.

Dwarf shrub or small tree to 4 m high, often suckering from roots; branch hairs with rays to 0.25 mm long. Leaves narrowly elliptic-oblong or oblong, 16–52 mm long, 4–8 mm wide, l:w 4–7, cuneate to attenuate at base, serrate, slightly truncate or retuse. Pedicels 2–7 mm long, sparsely to somewhat densely pubescent.



Sepals c. 0.5 mm long; outer surface with scattered stellate hairs. Petals 4–5 mm long, white, sometimes faintly pink. Carpels glabrous.

Found in Vic. in the southern part of the Eastern highlands and the Gippsland Highlands. Usually growing in wet sclerophyll forest or riparian forest, often on steep slopes. Flowers Sept.–Nov.; fruits Nov.–Jan.

Vic.: Upper Yarra Water Catchment, S40, *A.C.Beauglehole* 71720 (MEL); Bunyip State Park, *C.M.Edwards* 31 (MEL); N of Labertouche on Tea Tree Rd, *T.B.Muir* 1283 (MEL).

11d. *Leionema bilobum* subsp. *thackerayense* Durretto & K.L.Durham in M.F.Durretto *et al.*, *Muelleria* 23: 11, fig. 1d (2006).

T: Vic., Grampians, Victoria Range Rd, D/18/C/11d, 25 Oct. 1976, *P.G.Mathews*; holo: MEL.

Shrub 0.2–1.5 m high; rays of hairs on branchlets to 0.25 (–0.5) mm long. Leaves narrowly elliptic-oblong to slightly lanceolate, 7–33 mm long, 2–6 mm wide, l:w ratio 3.5–6.2, \pm cuneate at base, entire, slightly truncate or retuse to obtuse. Pedicels 3–7 mm long, glabrous or glabrescent. Sepals c. 0.5 mm long, glabrous or slightly hairy at tip. Petals 3–4 mm long, white. Carpels glabrous.

Found in The Grampians of western Vic., particularly in the Victoria Ra. and the Black Ra. Usually found growing in rocky areas in eucalypt forest. Flowers Aug.–Oct.

Vic.: Mt Thackeray, Victoria Ra., *J.A.Armstrong* 5084 (MEL); Castle Rock, Victoria Ra., *A.C.Beauglehole* 15885 (MEL).



12. *Leionema hillebrandii* (J.H.Willis) Paul G.Wilson, *Nuytsia* 12: 274 (1998)

Eriostemon hillebrandii var. *brevifolius* F.Muell., *Trans. Philos. Soc. Victoria* 1: 10 (1854), *nom. illeg.*; *Phebalium hillebrandii* J.H.Willis, *Victorian Naturalist* 73: 195 (1957). T: Mt Lofty Ranges, S.A., F.Mueller; lecto: MEL, *fide* J.H.Willis, *loc. cit.*

Illustration: J.P.Jessop & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 2: 772, fig. 413G (1986).

Woody perennial 30–60 cm high. Branchlets terete, slender, minutely and sparsely stellate-hairy. Leaves shortly cordate-obcuneate to ovate-obcuneate to ovate or oblong, (3–) 5–17 mm long, 2–2.5 mm wide, entire, recurved on margin, truncate and mucronate to acutely bilobed or retuse, chartaceous, glabrous, smooth to minutely scabrid adaxially. Inflorescence a terminal cyme of (2–) 4–10 (–16) flowers; pedicels slender, 4–10 mm long. Calyx lobes deltate, c. 0.5 mm high, sparsely stellate. Petals spreading, narrowly elliptic, 3.5–5 mm long, pink towards apex, glabrous. Stamens \pm equal to petals; anthers pink. Gynophore cylindrical, c. 0.5 mm long. Carpels 2–4; ovary c. 1 mm high, glabrous. Cocci erect, obovoid, 4 mm high; apex rounded and shortly rostrate on outer angle.

Occurs in the Mt. Lofty Ranges of S.A. Flowers Aug.–Oct.

S.A.: Mt Lofty Ra., *P.G.Wilson* 3563 (AD).



13. *Leionema equestre* (D.A.Cooke) Paul G.Wilson, *Nuytsia* 12: 274 (1998)

Phebalium equestre D.A.Cooke, *J. Adelaide Bot. Gard.* 10: 241 (1987). T: Kangaroo Is., S.A., 3 Oct. 1986, *B.M.Overton* 435; iso: PERTH.

Illustration: D.A.Cooke, *op. cit.* 242.

Spreading shrub to 30 cm high. Stems divaricately branched; branchlets \pm terete, slender, smooth, stellate-puberulous. Leaves shortly petiolate, suborbicular to transversely oblong (saddle-shaped), 1–3.5 mm long, 2–4 mm wide, cordate at base, entire, recurved, somewhat leathery, scabrous adaxially, glabrous abaxially. Flowers 1–3 in terminal sessile cymes; pedicels 2–4 mm long, slender, reddish. Calyx lobes deltate, c. 0.3 mm long. Petals spreading, narrowly elliptic, c. 3 mm long, pink, more pronounced towards apex, glabrous.

Stamens \pm equal to petals; anthers pale yellow, rarely pink. Gynophore c. 0.5 mm long, red. Carpels 4 or 5; ovary 1 mm high. Cocci spreading, c. 3 mm long, minutely apiculate.

Endemic to the Hundred of Haines, Kangaroo Is., S.A.; where it is found growing in sandy or lateritic soils in eucalypt woodland. Flowers Aug.–Oct.

S.A.: Kangaroo Is., *G.Jackson 444* (MEL); Kangaroo Is., *F.E.Davies 1475a* (PERTH).

Listed as endangered under the EPBC Act, 1999.



14. *Leionema microphyllum* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 275 (1998)

Eriostemon microphyllus F.Muell., *Trans. Philos. Soc. Victoria* 1: 99 (1855). T: "In montibus humilibus orariis prope Coffin Bay", S.A., Feb. 1852, [*C.Wilhelmi*]; and Encounter Bay, S.A., Sept., [*F.Mueller*]; syn: K, MEL.

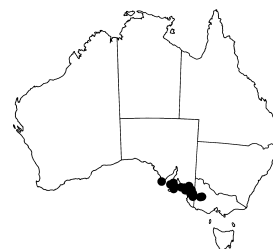
Phebalium brachyphyllum Benth., *Fl. Austral.* 1: 341 (1863); *Eriostemon brachyphyllus* (Benth.) Tate, *Handb. Fl. Extratrop. S. Australia* 24 (1890). T: Encounter Bay and near Coffin Bay, S.A., *F.Mueller*; syn: K, MEL.

Shrub to 40 cm high. Branchlets \pm terete, smooth, minutely stellate (rarely glabrous). Leaves ovate to broadly ovate or subcordate, 3–5 mm long, 2–4 mm wide, flat or with recurved margins, entire, acute to rounded, leathery, minutely stellate-scabridulous or glabrous. Inflorescence terminal, 3–10 flowered; pedicels thick, (2–) 3–4 mm long. Calyx lobes deltate, c. 0.5 mm long, thick, glabrous. Petals spreading, narrowly obovate, c. 4 mm long, white tinged with pink, glabrous. Stamens equal to petals; anthers pink. Gynophore shortly cylindrical, c. 1 mm high. Carpels 5; ovary subspherical, c. 1 mm high, glabrous. Cocci c. 4 mm high, finely corrugate; apex rounded and apiculate on outer angle.

Occurs in southern Eyre Penin., S.A., E to far western Vic. Flowers spring.

S.A.: 16 km E of Tintinara, *R.Hill 1188* (AD); Warooka, Yorke Penin., 1930, *G.Pritchard* (AD). Vic.: 10 km N of Mt Arapiles, *A.C.Beaglehole 7021* (MEL).

Leionema microphyllum is closely related to *L. hillebrandii* from which it differs principally in leaf shape and texture and in carpel number. It is also very similar to the form of *L. lamprophyllum* found in N.S.W. that has rounded leaves and which grades into the typical form of *L. lamprophyllum* from Vic. *Leionema microphyllum* differs most noticeably from the last species in having smooth branchlets and a more prominent gynophore.



15. *Leionema lamprophyllum* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 275 (1998)

Eriostemon lamprophyllus F.Muell., *Quart. J. Pharm. Soc. Victoria* 2: 43 (1859); *Phebalium lamprophyllum* (F.Muell.) Benth., *Fl. Austral.* 1: 340 (1863). T: Mountains on the Macalister R., Vic., Jan. 1859, *F.Mueller*; lecto: MEL, *vide* F.M.Anderson, *Muelleria* 12: 229 (1999); isolecto: AD, K, MEL, NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 262 (1991).

Compact shrub to 2 m high. Branchlets \pm terete, glandular-verrucose, stellate-puberulous or stellate-pilose. Leaves elliptic to broadly obovate or suborbicular, 2–11 (–14) mm long, (1.5–) 2–4 (–5.5) mm wide, flat or convex, entire or erose near apex, acute to rounded, chartaceous to subcoriaceous, smooth, glabrous or minutely pilose on margin or midrib. Inflorescence terminal; peduncle (when present) 1–6 mm long; pedicels slender or fleshy, 1.5–5 mm long. Calyx lobes deltate, 0.3–0.6 mm long, fleshy. Petals spreading, narrowly elliptic, 2–4 mm long, white to pink, glabrous. Stamens \pm equal to petals; anthers pink or yellow. Gynophore shortly cylindrical, c. 0.5 mm high, red. Carpels 5; ovary subspherical to \pm cylindrical, 1–1.8 mm high, glabrous. Cocci obliquely ovoid, 2–4 mm high, minutely apiculate to shortly (1.5 mm) rostrate.

Occurs in the Dividing Ra. of eastern N.S.W. from Rylstone S to eastern Vic.; 3 subspecies are recognised.

The following text is adapted from a revision of this species by F.M.Anderson, *Muelleria* 12: 229–234 (1999).

- 1 Leaves elliptic to broadly obovate, 4–11 mm long, acute to obtuse
- 2 Leaves elliptic, 7.5–11 mm long, acute; margin entire or minutely erose towards apex; petals 3.5–4.5 mm long; pedicel 3.5–5.0 mm long **15a. subsp. *lamprophyllum***
- 2: Leaves obovate to broadly obovate, 4.0–6 mm long, obtuse (rarely subacute); margin entire to minutely erose or crenulate toward apex; petals 2.5–4.0 mm long; pedicel 1.5–3 mm long **15b. subsp. *obovatum***
- 1: Leaves suborbicular to orbicular, 2.5–3.5 mm long, rounded to minutely mucronate **15c. subsp. *orbiculare***

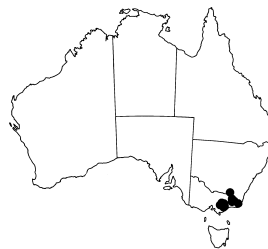
15a. *Leionema lamprophyllum* (F.Muell.) Paul G.Wilson subsp. *lamprophyllum*

Illustration: F.M.Anderson, *op. cit.* 231, fig. 2 a, e, h.

Branchlets minutely pilose to pilose with simple or stellate hairs in lines between glabrous decurrent leaf bases. Leaves elliptic, 7–12 mm long, attenuate at base, entire or minutely erose toward apex, acute and glabrous to minutely pilose. Peduncle 3–6 mm long. Pedicels 3–5 mm long. Sepals c. 0.3–0.6 mm long. Petals 3.5–4.2 mm long. Stamens 3.5–4.5 mm long. Style 2–2.5 mm long. Cocci minutely apiculate to shortly rostrate, 3–4 mm long; apiculum 0.5–1.7 mm long.

Found in the Eastern highlands and East Gippsland regions of Vic. and on the N.S.W. border from Erica E to Mt Tingaringy. Occurs on rocky excarpments and skeletal soils in subalpine shrubland or woodland. Flowers winter–spring; fruits spring–summer.

Vic.: Wellington R., c. 8 km N of Licola, *F.M.Anderson* 7-10 (MEL); Little River Gorge Lookout, *A.C.Beauglehole* 33156 (MEL); Reedy River Gorge, 13 Nov. 1964, *J.H.Willis* (MEL).



15b. *Leionema lamprophyllum* subsp. *obovatum* F.M.Anderson, *Muelleria* 12: 233 (1999)

T: A.C.T., Namadgi Natl Park, 20 Oct. 1991, *A.M.Lyne* 447; holo: MEL; iso: CANB, NSW, PERTH.

Illustration: F.M.Anderson, *op. cit.* 231, fig. 2b, c, f, e.

Branchlets minutely pilose to pilose with simple and stellate hairs in lines between glabrous decurrent leaf bases. Leaves obovate to broadly obovate, 3–6 mm long, subobtusate to attenuate at base, minutely erose or crenulate towards apex or entire, obtuse (to sub-acute), glabrous or minutely pilose. Peduncle 1–3 mm long. Pedicels 1.5–3 mm long. Sepals 0.3–0.6 mm long. Petals 2–4 mm long. Stamens 2.5–4 mm long. Style 2–3.5 mm long. Plate 47.

Found in the Tidbinbilla Ra., A.C.T.; Brindabella Ra.; N.S.W.; and in Vic. in the Brisbane Ra. and Werribee Gorge, at Pine Mtn and in the far E at the Upper Genoa R. and Mt Tingaringy. Growing in a variety of habitats, shrubland and rocky escarpments in open woodland. Flowers winter–spring; fruits spring–summer.

N.S.W.: 15 km SSE of Tumut, *N.Taws* 301 (CANB, NSW); Brindabella Bridge, *T. & J.Whaite* 3535 (NSW). A.C.T.: Upper Cotter Dam, Oct. 1958, *L.D.Pryor* (CANB). Vic.: Brisbane Range Natl Park, *E.G.Errey* 1447 (MEL); Upper Genoa R., 17 Oct. 1948, *J.H.Willis* (MEL).



15c. *Leionema lamprophyllum* subsp. *orbiculare* F.M.Anderson, *Muelleria* 12: 232 (1999)

T: N.S.W., Currant Mtn Gap c. 24 km E. of Rylstone, 10 Aug. 1975, *R.Coveny 6609* & *P.Hind*; holo: NSW; iso: CANB, PERTH.

Illustration: F.M.Anderson *op. cit.* 231, fig. 2d, g, j.

Branchlets covered with pilose to minutely pilose stellate hairs. Leaves suborbicular to orbicular, 2–3.5 mm long, obtuse at base, entire, rounded to minutely mucronate at apex and often minutely pilose, otherwise glabrous. Peduncle 1.5–3.5 mm long. Pedicels 1.5–3.5 mm long. Petals 2.5–3.5 mm long. Stamens 3–4 mm long. Style 2.5–2.5–3.5 mm long. Cocci c. 2.5 mm long with apiculum c. 0.5 mm long.

Found in N.S.W. along the Great Dividing Ra. from Rylstone to Lithgow. Confined to exposed rocky sites in open shrubland and woodland. Flowers winter–spring.

N.S.W.: Kandos Weir, *A.D.Chapman 1469* (CANB, NSW); Coricudgy Ck, 30 Aug. 1957, *L.A.S.Johnson* (MEL); Hills E of Rylstone, June 1950, *S.Smith-White* & *H.S.McKee* (NE).

**16. *Leionema rotundifolium*** (Endl.) Paul G.Wilson, *Nuytsia* 12: 276 (1998)

Eriostemon rotundifolius Endl. in S.F.L.Endlicher *et al.*, *Enum. Pl.* 15 (1837); *Phebalium rotundifolium* (Endl.) Benth., *Fl. Austral.* 1: 341 (1863). T: Mt Dangar, Hunters R., N.S.W., *A.Cunningham 55*; iso: K, MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 262 (1991).

Dense shrub to 2 m high. Branchlets terete, smooth, minutely stellate with glabrous decurrent leaf bases. Leaves shortly petiolate, somewhat imbricate, broadly obovate to orbicular, 6–10 mm long, 6 mm wide, flat, leathery, entire or minutely erose towards rounded apex, smooth, glabrous. Flowers in a terminal compact, globular cluster; pedicels fleshy towards summit, c. 1.5 mm long. Calyx lobes broadly deltate, c. 0.5 mm high, glabrous. Petals spreading, narrowly elliptic, 5 mm long, white to yellow, glabrous. Stamens shortly exceeding petals. Gynophore absent. Carpels 5; ovary cylindrical, c. 2 mm high, glabrous. Cocci 4–6 mm long, shortly rostrate.

Occurs in the Howell and Torrington districts of NE N.S.W. and extreme SE Qld; on granite outcrops. Flowers late winter–spring.

Qld: 3.3 km SE of Glen Aplin, *C.Gittens 2803* (NSW); Jollys Falls, *J.H.Ross 3118* (MEL). N.S.W.: Howell, *B.J.Conn 839* (MEL); Torrington, *R.Coveny 2258* (NSW).

This species differs from *L. lamprophyllum* in having a smooth stem, and from both *L. microphyllum* and *L. lamprophyllum* in its leaf shape, compact inflorescence, and the absence of a gynophore. Listed as endangered under the EPBC Act, 1999.

**17. *Leionema coxii*** (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 272 (1998)

Eriostemon coxii F.Muell., *Australas. Chem. Druggist* 7: 62 (1884); *Phebalium coxii* (F.Muell.) Maiden & Betche, *Census New South Wales Pl.* 116 (1916). T: Braidwood district, N.S.W., *W.Baeuerlen 199*; holo: MEL; iso: NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 262 (1991).

Pyramidal shrub or small tree 1–5 m high. Branchlets strongly angular, glabrous, smooth. Leaves narrowly elliptic, 5–7 cm long, 1–1.5 cm wide, serrulate, acute, chartaceous, smooth, glossy, glabrous. Flowers 10–30 in a compact rounded terminal corymb; pedicels c. 5 mm long. Calyx lobes broadly deltate, c. 0.8 mm high, thick, glabrous. Petals spreading, narrowly ovate, c. 5 mm long, cream to pale yellow, glabrous. Stamens \pm equal to petals. Gynophore shortly cylindrical, c. 0.5 mm high. Carpels 5; ovary barrel-shaped, c. 2 mm high, minutely rugulose, glabrous. Cocci erect, not corrugate, c. 5 mm high; apex outwardly shortly rostrate.



Occurs chiefly in the Budawang Ra. in SE N.S.W.; along creek banks and on ridges. Flowers spring–summer.

N.S.W.: E of Big Badja Hill, *M.D.Crisp* 2383 (NSW); Mt Budawang, 14 Oct. 1971, *I.R.Telford* (NSW).

Some collectors have noted that the leaves give out a strong fruity odour when crushed.

18. *Leionema ambiens* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 271 (1998)

Eriostemon ambiens F.Muell., *Fragm.* 6: 166 (1868); *Phebalium ambiens* (F.Muell.) Maiden & Betche, *Census New South Wales Pl.* 116 (1916). T: near Timbarra, N.S.W., Nov., *C.Stuart* 570; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 113 (1970).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 262 (1991).

Shrub to 2.5 m high, glabrous. Branchlets terete or slightly angular, smooth. Leaves sessile, amplexicaul, broadly oblong-elliptic, 6–10 cm long, 2–4 cm wide, with rounded basal lobes, serrulate, flat, obtuse to acute, chartaceous, smooth. Flowers 20–200 or more in a terminal rounded compound cyme; pedicels angular, c. 2 mm long. Calyx fleshy, glabrous; lobes broadly deltate, c. 0.5 mm long. Petals spreading, narrowly obovate, c. 4.5 mm long, white. Stamens \pm equal to petals. Gynophore short, narrower than ovary. Carpels 5; ovary subspherical, c. 1.2 mm high, smooth. Cocci \pm erect, c. 3 mm high, rounded at apex and very shortly rostrate on outer angle. *Fruit Salad Bush*; *Forest Phebalium*.

Occurs in the Guyra district in extreme NE N.S.W. and near Wallangarra in SE Qld. Confined to crevices amongst granitic rocks. Flowers spring.

Qld: Wallangarra, 4 Sept. 1964, *G.Ward* (AD). N.S.W.: Bald Rock, 6.5 km NW of Boonoo Boonoo, *W.E.Fisher* 211 (NSW).

The leaves of this plant are strongly aromatic.

Plants intermediate in character between *L. ambiens* and *L. rotundifolium* has been found where the two species grow together in the border mountains near Wallangarra, Qld. e.g. *C.R.Frazier* (NSW 96028); Mt Norman, *W.J.F.McDonald* 460 (BRI).



19. *Leionema carruthersii* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 272 (1998)

Eriostemon carruthersii F.Muell., *Victorian Naturalist* 7: 46 (1890); *Phebalium carruthersii* (F.Muell.) Maiden & Betche, *Census New South Wales Pl.* 116 (1916). T: Moruya, N.S.W., July 1887, *W.Bauerlen* 564; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 115 (1970); isolecto: MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 262 (1991).

Shrub to 1 m high. Branchlets terete, pilose. Leaves divaricate, narrowly to broadly ovate, lanceolate, or narrowly triangular, 5–12 mm long, 1.5–5 mm wide, truncate to slightly cordate at base, entire, recurved to revolute, obtuse, smooth, sparsely pilose. Flowers 4–10 in a terminal nodding cyme; pedicels 2–5 mm long, sparsely pilose, with 2 linear bracteoles c. 5 mm long at apex. Calyx c. 5 mm long, including narrowly triangular lobes c. 3 mm long, sparsely pilose. Petals erect to spreading, narrowly oblong-elliptic, c. 8 mm long, keeled, yellowish green, sparsely pilose. Stamens \pm twice length of petals; filaments dark red (rarely green). Gynophore c. 0.6 mm long, equal in width to ovary. Carpels 5, with minute sterile retuse apex; ovary shortly cylindrical, c. 1 mm high, glabrous. Cocci c. 5.5 mm high, minutely bicornute at outer angle, pilose.

Occurs in the Batemans Bay to Bega district of SE N.S.W.; growing on granite outcrops. Flowers sporadically throughout the year.

N.S.W.: 2 km ESE of Mumbulla Mtn, *J.Armstrong* 1291 (NSW); Deua Natl Park, *P.Gilmour* 4639 (NSW).



20. *Leionema ralstonii* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 276 (1998)

Eriostemon ralstonii F.Muell., *Fragm.* 2: 101, t. 14 (1860); *Phebalium ralstonii* (F.Muell.) Benth., *Fl. Austral.* 1: 339 (1863). T: Twofold Bay, N.S.W., *F. Mueller*; holo: MEL; iso: K, MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 263 (1991).

Shrub c. 1 m high. Branchlets strongly angular, smooth, glabrous. Leaves sessile, elliptic, c. 30 × 8 mm, entire, recurved when dry, obtuse, slightly emarginate, chartaceous, smooth, glabrous. Inflorescence compact, terminal, 4–7-flowered, glabrous; peduncle recurved; pedicels fleshy, c. 3 mm long, with linear bracteoles c. 1 mm long near base. Calyx hemispherical, fleshy; lobes deltate, c. 1 mm long. Petals erect, oblong-elliptic, c. 8 mm long, pale green, somewhat leathery. Stamens twice length of petals; filaments green. Gynophore c. 0.3 mm high. Carpels 5; ovary shortly cylindrical, c. 1.5 mm high, glabrous. Cocci 4–5 mm high, apiculate at outer angle. Plate 46.

Occurs in the Bega to Eden district of SE N.S.W.; growing along creeks and ridges, generally on rhyolite. Flowers chiefly in winter.

N.S.W.: 4 km W of Lochiel, *D.E. Albrecht* 2646 (NSW); The Sugarloaf, *J. Saunders* 1 (NSW); 8 km SSE of Wyndham, *I.R. Telford* 3592 (NSW).

Listed as vulnerable under the EPBC Act, 1999.

**21. *Leionema sympetalum* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 277 (1998)**

Phebalium sympetalum Paul G.Wilson, *Nuytsia* 1: 116 (1970). T: Near Olinda, N.S.W., 2 Sept. 1951, *L.A.S. Johnson*; holo: AD; iso: NSW, PERTH.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 263 (1991).

Shrub 2–3 m high. Branchlets angular, smooth, stellate-puberulous when young. Leaves narrowly cuneate, 15–35 mm long, 4–8 mm wide, slightly recurved at margin, ±serrulate towards retuse apex, chartaceous, smooth, glabrous. Flowers 1–3 in a pedunculate terminal cluster, often nodding; pedicels slender, c. 7 mm long. Calyx fleshy, hemispherical, glabrous; lobes broadly deltate, c. 1 mm long. Corolla tubular, to 15 mm long, greenish yellow, splitting towards apex into erect acute lobes. Stamens somewhat longer than petals; filaments green. Gynophore c. 0.2 mm high. Carpels 5; ovary barrel-shaped, c. 2 mm high, glabrous. Cocci c. 4 mm high, shortly rostrate on outer angle. *n* = 16, *S. Smith-White*, *Austral. J. Bot.* 2: 292 (1954), as *P. ralstonii* var. *Rylstone Bell*.

Occurs in the ranges near Rylstone, N.S.W.; where it grows on rocky outcrops in dry sclerophyll forests. Flowers winter–spring.

N.S.W.: Near Gosper's Mtn, *A. Rodd & R. Coveny* 284 (NSW).

This is the only species of *Leionema* that has united petals.
Listed as vulnerable under the EPBC Act, 1999.

**22. *Leionema viridiflorum* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 277 (1998)**

Phebalium viridiflorum Paul G.Wilson, *Nuytsia* 1: 117 (1970). T: Beloungery Mtn, Warrumbungle Ra., N.S.W., 28 May 1948, *E.F. Constable*; holo: NSW; iso: MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 263 (1991).

Shrub 1 (–2) m high. Branchlets ±terete, stellate-tomentose. Leaves ±erect, narrowly oblong to oblong-elliptic, ±erect, 20–40 mm long, 4–8 mm wide, cuneate at base, entire, ±recurved or revolute when dry, shortly bilobed, chartaceous, smooth, sparsely stellate to ±glabrous adaxially, ±stellate-tomentose abaxially. Inflorescence a terminal 6–12-flowered nodding cyme; pedicels 4–8 mm long, stellate. Calyx hemispherical, fleshy; lobes deltate, c. 1.5 mm long, stellate-puberulous. Petals erect, narrowly oblong-lanceolate, c. 10 mm long, pale yellow-green, sparsely stellate-puberulous. Stamens to twice petal length. Gynophore c. 0.5 mm

high. Carpels 5; ovary shortly cylindrical, c. 2 mm high, glabrous. Cocci c. 6 mm high, prominently rostrate on outer angle.

Occurs in Mt Kaputar and Warrumbungle Range Natl Parks, N.S.W.; on trachyte outcrops. Flowers winter–early spring.

N.S.W.: Warrumbungle Ra., *H.Streimann* 76 (PERTH).



23. *Leionema scopulinum* B.M.Horton & Crayn in B.M.Horton *et al.*, *Telopea* 10: 815 (2004)

T: Wollemi Natl Park, 28 Aug. 2003, *D.Crayn* 595, *J.Allen*, *H.Washington* & *P.Weston*; holo: NSW; iso: CANB, K, MEL, PERTH.

Illustrations: B.J.Horton *et al.*, *Telopea* 10: 818, 819, figs 1, 2 (2004).

Erect shrub 0.5–3 m high. Branchlets angled due to decurrent leaf bases, sparsely to densely stellate-hairy. Leaves narrowly elliptic to slightly oblanceolate, 24–65 mm long, 4.5–10 mm wide, entire to serrulate, obtuse to emarginate, usually glabrous or stellate hairy along midrib near base, dark green and glossy adaxially, somewhat duller abaxially. Inflorescence cymose, 9–32-flowered; pedicels 3.5–8 mm long, stellate-hairy; bracteoles c. 0.5 mm long, inserted near centre of pedicel. Sepals deltate, 1–1.5 mm long, stellate-pubescent. Petals erect, elliptic-lanceolate, 5–8 mm long, glabrous, yellow. Stamens to twice length of petals; filaments yellow. Carpels 5, with sterile apex rounded; ovary cylindrical; c. 1.5 mm high, glabrous. Cocci erect, c. 6 mm long, transversely corrugate; apex rounded and prominently rostrate on outer angle, 1.5–3 mm long.

Occurs in the Wollemi Natl Park, N.S.W. Found in shallow sandy soils in heath and in open eucalypt woodland. Flowers Apr.–Sept.; fruits Dec.

N.S.W.: Wollemi Natl Park, 19 June 2003, *S.Clarke* (NSW); *loc. id.*, 21 Aug. 2003, *H.Washington* (NSW).



24. *Leionema ellipticum* Paul G.Wilson, *Nuytsia* 12: 273 (1998)

T: Mountain in NE Qld [precise locality withheld], 25 Dec. 1991, *K.R.McDonald*; holo: BRI.

Shrub to 2 m high. Branchlets ±terete, smooth, glossy, glabrous. Leaves elliptic, to c. 5 cm long, to 2 cm wide, narrowed at base, entire, obtuse, papery, glabrous. Inflorescence terminal, cymose, multiflowered, c. 2 cm long; pedicels 1–2 mm long, sparsely puberulous with simple and fasciculate hairs; bracteoles caducous. Sepals very shortly united at base, fleshy, deltate, c. 0.8 mm long. Petals narrowly oblong, c. 4.5 mm long, strongly keeled, white, glabrous. Stamens shortly exceeding petals; filaments slender, terete; anthers cordate, c. 1.2 mm long, bluntly and minutely apiculate. Gynophore 0.5 mm high, deeply 10-grooved. Carpels 5; ovary barrel-shaped, c. 1.3 mm high, terminal $\frac{1}{3}$ solid. Cocci not seen.

Recorded from the top of a mountain in NE Qld [precise locality withheld]. Flowers Dec.–Jan.

The flowers of *L. ellipticum* are similar to those of other species in the genus except for the anthers which are bluntly mucronulate and not deeply indented, and the gynophore which is deeply 10-grooved. Mole *et al.*, *Pl. Syst. Evol.* 249: 197–212 (2004) determined that *L. ellipticum* was sister to all other species of *Leionema* that were sampled and that it may warrant recognition in a distinct subgenus or as a separate, although closely related, genus.



RUTACEAE

21. MUIRIANTHA

J.A.Armstrong

Muiriantha C.A.Gardner, *J. Proc. Roy. Soc. W. Australia* 27: 181 (1943); in honour of Thomas Muir, a farmer near Borden and the Stirling Ra., plus the Greek *anthos* (a flower).

Muiria C.A.Gardner, *op. cit.* 19: 83 (1934), *nom. illeg. non* N.E.Br. (1927). T: *M. hassellii* (F.Muell.) C.A.Gardner

Undershrub, with soft, fine, stellate and simple hairs. Leaves alternate, simple, subsessile. Inflorescence a condensed, 2–4-flowered terminal or axillary cyme or reduced to a single flower. Flowers 5-merous, yellow, subtended by lanceolate, foliaceous bracts. Sepals free, imbricate. Petals free, imbricate. Stamens 10, free; filaments slender with a small densely pilose scale just above base on inner side; anthers versatile, slightly retuse; dehiscence introrse. Disc intrastaminal, small, crenate. Carpels 5, ±free from base; styles slender, each with a tuft of hairs on inner side above base, united above; stigma capitate, shortly 5-lobed. Cocci slightly spreading, bluntly apiculate. Seed subreniform; adaxial margin straight; outer testa membranous; sclerotesta smooth; hilum superficial, linear; raphe small.

A monotypic genus endemic to SW W.A.

Muiriantha hassellii (F.Muell.) C.A.Gardner, *J. Proc. Roy. Soc. W. Australia* 27: 209 (1943)

Chorilaena hassellii F.Muell., *Victorian Naturalist* 6: 87 (1889); *Muiria hassellii* (F.Muell.) C.A.Gardner, *J. Proc. Roy. Soc. W. Australia* 19: 83 (1934). T: Western side of Stirling Ra., W.A., *s. dat.*, *A.Y.Hassell*; holo: MEL.

Slender undershrub to 30 cm high. Branchlets pilose and sparsely stellate-hairy. Leaves erect, narrowly elliptic, 10–15 mm long, leathery, sparsely pilose, glabrescent. Flowers pendulous; pedicels c. 3 mm long. Sepals narrowly ovate, c. 4 mm long, sparsely pilose. Corolla cylindrical, 2–2.5 cm long, slightly funnelform above; petals narrowly oblong-elliptic, obtuse, lime-yellow with green or purple medial stripe, sparsely pilose towards apex. Stamens: filaments linear-filiform, equal to petals, pilose at base; anthers cordate-orbicular, c. 1 mm long. Ovary villous; style equal to stamens. Seed c. 4 mm long. Plate 50.

Only known from the Stirling Ra. and Mt Manypeaks, W.A., in eucalypt woodland over heath. Flowers recorded throughout the year.

W.A.: Mt Mondurup, Oct. 1961, *A.Gray* (PERTH); Mt Trio, *G.J.Keighery* 3452 (PERTH); Bluff Knoll, *A.Muir* 21 (PERTH).



NEMATOLEPIS

Paul G.Wilson

Nematolepis Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25(2): 158 (1852); from the Greek words *nema* (a thread) and *lepis* (a scale), in reference to the hairy scale near the base of the staminal filaments in *N. phebaloides*.

Type: *N. phebaloides* Turcz.

Phebalium sect. *Eriostemoides* Endl., *Gen. Pl.* 1156 (1840). T: *Eriostemon squameus* Labill.

Symphypetalon J.Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 54 (1855). T: *S. corraeoides* J.Drumm. ex Harv.

Lepidote shrubs or small trees. Leaves alternate, ±flat. Flowers axillary, in cymose inflorescences or solitary, 5-merous; pedicels bibracteolate, merging into fleshy receptacle. Sepals free,

imbricate. Petals free except in *N. phebaloides*, imbricate, lepidote or glabrous. Stamens 10, free; filaments glabrous or stellate-hairy; anthers slightly retuse. Disc prominent. Carpels 5, free, with short, sterile apex; style terete with basal branches affixed to adaxial medial surface of carpels; stigma scarcely lobed. Seed broadly ellipsoid to subreniform, 2–2.5 mm long; adaxial margin straight; axial endocarp thin, caducous; aril linear; outer testa thin, smooth, glossy; sclerotesta smooth; hilum superficial, narrowly elliptic; raphe small, thin, covered by outer testa; chalazal opening on lower adaxial face.

A genus of 7 species endemic to temperate Australia, one in W.A., the rest in E Australia from SE Qld to Tas.

P.G.Wilson, New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae), *Nuytsia* 12: 267–288 (1998); B.J.Mole *et al.*, Molecular phylogeny of *Phebalium* (Rutaceae: Boronieae) and related genera based on the nrDNA regions ITS 1+2, *Pl. Syst. Evol.* 24: 197–212 (2004).

- | | | |
|----|--|-----------------------------------|
| 1 | Corolla cylindrical; sympetalous | 1. <i>N. phebaloides</i> |
| 1: | Petals free, spreading | |
| 2 | Ovary glabrous | |
| 3 | Leaves ovate and c. 3 cm long to elliptic and 10 cm long; cymes 1–20-flowered. | 2. <i>N. squamea</i> |
| 3: | Leaves broadly obcordate, to 12 mm long; cymes 1–3-flowered | 6. <i>N. rhytidophylla</i> |
| 2: | Ovary lepidote or hairy | |
| 4 | Leaves narrowly elliptic, acute, to 8 cm long; petals lepidote outside | 4. <i>N. wilsonii</i> |
| 4: | Leaves oblong-elliptic to broadly ovate, to 3.5 cm long; petals glabrous | |
| 5 | Ovary densely stellate-hairy; staminal filaments stellate-hairy near base | 7. <i>N. frondosa</i> |
| 5: | Ovary silvery-lepidote; staminal filaments glabrous | |
| 6 | Leaves c. 20–35 mm long, chartaceous, elliptic or oblong-elliptic, obtuse to emarginate; bracteoles linear, in middle of pedicel | 3. <i>N. elliptica</i> |
| 6: | Leaves c. 10 mm long, coriaceous, broadly ovate, obtuse; bracteoles sepal-like below flower | 5. <i>N. ovatifolia</i> |

1. *Nematolepis phebaloides* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25(2): 158 (1852)

T: W.A., *J.Drummond 5th coll. n. 194*; holo: KW (photo seen); iso: K, PERTH, TCD.

Symphypetalon corraeoides J.Drumm. ex Harv., *Hooker's J. Bot. Kew Gard. Misc.* 7: 54 (1855). T: near Middle Mount Barren, W.A., *J.Drummond 194*; holo: TCD; iso: K, PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 552 (1998).

Erect shrub to 3 m high. Branches ascending, lepidote. Leaves shortly petiolate, elliptic to broadly elliptic, c. 15 mm long, rounded at apex, leathery, glabrous and glossy adaxially, grey-lepidote abaxially. Flowers solitary, spreading to nodding; pedicel c. 3 mm long; bracteoles small, lepidote, boat-shaped, appressed to base of calyx. Sepals deltoid to orbicular, c. 1.5 mm long, glabrous or sparsely lepidote. Corolla cylindrical, 10–15 mm long, red with short green or yellow lobes, glabrous. Stamens: filaments slender-terete with a flattened, glandular, stellate-hairy scale on adaxial surface towards base, otherwise glabrous; anthers shortly exserted, cordate-ovate. Ovary glabrous; style equal to stamens. Cocci c. 5 mm high, truncate, transversely rugulose, shortly apiculate on outer angle.

Occurs towards the S coast of W.A. from Dumbleyung E to Israelite Bay. Flowers throughout the year but principally in winter.

W.A.: 6 km SW of Mt Ragged, *J.Armstrong 7047* (PERTH); Kukerin, *W.E.Blackall 3165* (PERTH); Ravensthorpe Ra., *A.S.George 209* (PERTH).



2. Nematolepis squamea (Labill.) Paul G.Wilson, *Nuytsia* 12: 279 (1998)

Eriostemon squameus Labill., *Nov. Holl. Pl. Sp.* 1: 111, tab. 141 (1806); *Phebalium argenteum* Sm. in A.Rees, *Cyclop.* 27: n. 3 (1814), as to name only, *nom. illeg.*; *P. billardierei* A.Juss., *Mem. Soc. Hist. Nat. Paris* 2: 134 (1825), as *Billardierii*, *nom. illeg.*; *P. squameum* (Labill.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3/4: 141 (1896). T: "capite Van-Diemen" [Tas.], *J.J.H.de Labillardière*; (?)iso: MEL.

Shrub, or tree to 12 m high. Branchlets somewhat verrucose or smooth. Leaves shortly petiolate, ovate and c. 3 cm long to elliptic and 10 cm long, 0.8–2.2 cm wide, entire, acuminate to rounded or retuse, smooth, glabrous and glossy adaxially, silvery-lepidote abaxially. Flowers 1–20, in compact or loose cymes $\frac{1}{3}$ – $\frac{2}{3}$ length of leaf; peduncle angular, silvery-lepidote; pedicels 1–5 mm long; bracteoles medially placed, ovate to linear, 0.5–1 mm long. Sepals deltate, c. 1 mm long, glabrous. Petals elliptic, 5 mm long, thin, white, glabrous. Stamens \pm equal to petals; filaments glabrous or \pm hirsute. Disc thick, \pm equal in width to ovary. Ovary broadly pyramidal to subspherical, c. 1 mm high, glabrous. Cocci rounded at apex and minutely apiculate on outer angle. *Satinwood*.

Widespread in eastern Australia. Two subspecies are recognised.

Branchlets smooth; leaves chartaceous, elliptic, to 10 cm long, obtuse to acuminate; cymes (3–) 5–20-flowered

2a. subsp. *squamea*

Branchlets glandular-verrucose or smooth; leaves chartaceous to coriaceous, ovate or elliptic, often broadly so, to 3.5 cm long, rounded to truncate or retuse; cymes (1–) 2 or 3 (–6)-flowered

2b. subsp. *retusa*

2a. Nematolepis squamea (Labill.) Paul G.Wilson subsp. ***squamea***

Phebalium elatum A.Cunn. in B.Field, *Geog. Mem. New South Wales* 331 (1825). T: Spring Wood, N.S.W., A.Cunningham; holo: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 305 (1991).

Shrub, or tree to 12 m high. Branchlets angular, smooth. Leaves narrowly to broadly elliptic, to 10 \times 2.2 cm, obtuse to acuminate, chartaceous. Cymes (3–) 5–20-flowered, from $\frac{1}{3}$ as long to as long as leaves. Sepals thick and glandular. Staminal filaments sparsely to densely stellate-hairy or hirsute in lower half (rarely glabrous). $n = 16$, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954). *Satinwood*, *Lancewood*.

Occurs in SE Qld, coastal N.S.W., Vic., and Tas. Flowers spring.

Qld: Quoin Is., *T.Y.Stead* (NSW 69970). N.S.W.: Diamond Head to Crowdy Head, *R.Coveny* 9894 (NSW); Seal Rocks, *A.N.Rodd* 3369 (NSW). Vic.: Mt Buck, 20 Sept. 1975, *F.C.Fagg* (MEL). Tas.: 2 km W of Zeehan, *S.Jacobs* 2037 (NSW).

This subspecies is distributed from the Macpherson Ra. in SE Qld to southern Tas. Compared with the mainland plant the southern Tas. form has smaller and less acute leaves, and shorter cymes. The staminal filaments change from being densely long-hirsute in Qld to sparsely stellate-hairy or glabrous in Tas. The subspecies otherwise exhibits little variation throughout its range.

**2b. Nematolepis squamea** subsp. ***retusa*** (Hook.) Paul G.Wilson, *Nuytsia* 12: 279 (1998)

Phebalium retusum Hook., *J. Bot. (Hooker)* 1: 254 (1834); *P. billardierei* var. *retusum* (Hook.) Hook.f., *Fl. Tasman.* 1: 63 (1855); *P. squameum* subsp. *retusum* (Hook.) Paul G.Wilson, *Nuytsia* 1: 94 (1970). T: Tas., 1831, *T.Scott & R.W.Lawrence*; syn: K (photo seen).

Phebalium squameum subsp. *coriaceum* Paul G.Wilson, *Nuytsia* 1: 94 (1970); *Nematolepis squamea* subsp. *coriacea* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 279 (1998). T: Between Haidinger Ra. and Mt Wellington, Vic., March 1861, *F.Mueller*; holo: MEL; iso: K.

Shrub to 4 m high. Branchlets smooth or glandular-verrucose. Leaves ovate or elliptic, often broadly so, 2–3.5 cm long, 0.8–1.5 cm wide, rounded to truncate or retuse at apex, chartaceous to coriaceous. Cymes short, (1–) 2 or 3 (–6)-flowered; peduncle and pedicels thick and lepidote, with pedicel passing into floral base; bracts subfoliaceous, reduced

towards apex of branch, caducous; bracteoles minute and linear, in middle of short (1–2 mm long) pedicel, caducous. Sepals gland-dotted. Staminal filaments glabrous or sparsely stellate-hairy near base. Cocci quadrate, c. 3 mm high, very shortly apiculate. Plate 48.

Found in E Vic. in the catchments of the upper Macalister and Wonnangatta R. and the Snowy R. near Wulgulmerang, also in Tas. In Vic. it is found in cliffline scrubs while in Tas. it inhabits forest or woodland, sometimes in exposed rocky areas. Flowers in spring and summer.

Vic.: Wulgulmerang Ck, 16 Oct. 1969, *K.C.Rogers* (MEL); The Watchtower, NE of Mt Arbuckle, *N.G.Walsh* 1766 (MEL). Tas.: Launceston, Dec. 1915, *F.A.Rodway* (NSW); Cataract Gorge, *H.M.R.Rupp* 4 (NSW).

This subspecies grades into the form of the typical subspecies that is found in NE Tas. Superficially similar to *N. ovatifolia*, it differs in having a glabrous (not lepidote) ovary and in not having sub-floral bracteoles that grade into the sepals.



3. *Nematolepis elliptica* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 278 (1998)

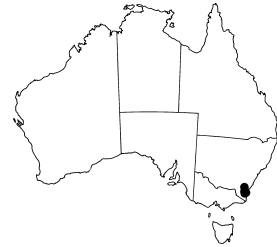
Phebalium ellipticum Paul G.Wilson, *Nuytsia* 1: 341 (1974). T: Big Badja Mtn, N.S.W., 27 Oct. 1972, *J.P.Baker* 907; holotype: NSW, isotype: CANB, K, MEL, PERTH.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 260 (1991).

Bushy shrub to 1.5 m high. Branches terete, lepidote, glandular-verrucose. Leaves shortly petiolate, elliptic or oblong-elliptic, 20–35 mm long, 8–15 mm wide, obtuse to emarginate, chartaceous, glabrous adaxially, closely silvery-lepidote abaxially. Flowers 2–5, in short cymes c. 5 mm long; peduncle and pedicels thick and lepidote, with pedicel passing into floral base; bracts subfoliaceous, reduced in size towards apex of branch, caducous; bracteoles minute and linear, in middle of short (c. 2 mm long) pedicel, caducous. Sepals deltate, c. 1 mm long, glabrous or almost so. Petals elliptic, c. 5 mm long, white, glabrous. Stamens glabrous. Ovary silvery-lepidote; style glabrous. Cocci quadrate, c. 3 mm high, very shortly apiculate.

Occurs on rocky outcrops in ranges E of Cooma, N.S.W. Flowers Sept.–Nov.

N.S.W.: Wadbilliga area, 14 Jan. 1974, *L.Costermans* (NSW); Gaurock Ra., 25 Nov. 1990, *J.A.Gibson* (PERTH).



4. *Nematolepis wilsonii* (N.G.Walsh & Albr.) Paul G.Wilson, *Nuytsia* 12: 280 (1998)

Phebalium wilsonii N.G.Walsh & Albr., *Muelleria* 6: 399 (1988). T: Near Mt Grant, Vic., 6 Nov. 1983, *N.G.Walsh* 1494; holotype: MEL, isotype: BRI, HO, PERTH.

Illustrations: N.G.Walsh & D.E.Albrecht, *op. cit.* 400; N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 192, fig. 35e (1999).

Shrub or tree to 10 m high. Branchlets terete, somewhat verrucose, silvery-lepidote. Leaves shortly petiolate, narrowly elliptic, 30–80 mm × 5–15 mm, acute, chartaceous, smooth and glabrous adaxially except along impressed midrib, smooth and silvery-lepidote abaxially. Flowers 2–8, in lepidote cymes up to 1/2 length of leaf; pedicels 2–7 mm long; bracteoles small, subopposite, caducous. Sepals deltate, c. 1 mm long, lepidote abaxially. Petals elliptic, c. 4 mm long, white, lepidote abaxially. Staminal filaments linear, acuminate, sparsely stellate-hairy near base. Ovary subglobular, silvery-lepidote. Cocci obliquely ovoid, c. 4 mm long, obtuse.

Known only from the type locality near Marysville and from Woods Point (where now extinct) in the Central Highlands of Vic.; growing in tall open forest. Flowers spring–summer.

Vic.: O'Shannessy catchment, 8 Nov. 1990, *K.Ough* & *G.Lucas* (MEL, PERTH).



This plant is similar in appearance to *N. squamea* subsp. *squamea* but differs from that taxon in having lepidote sepals, petals and ovary. Listed as vulnerable under the EPBC Act, 1999.

5. *Nematolepis ovatifolia* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 278 (1998)

Phebalium ovatifolium F.Muell., *Trans. Philos. Soc. Victoria* 1: 99 (1855); *Eriostemon ovatifolius* (F.Muell.) F.Muell., *Fragm.* 1: 103 (1859). T: In the alpine parts of the Munyang Mts, N.S.W., *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 95 (1970).

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2: 260 (1991).

Low compact shrub. Branchlets lepidote. Leaves shortly petiolate, broadly elliptic, 9–11 mm long, 5–8 mm wide, obtuse, coriaceous, smooth, glabrous and glossy adaxially, silvery-lepidote abaxially. Flowers 1 (–3) in congested cymes; peduncle and pedicel thick, flattened, together 2–4 mm long; bracts oblong-ovate, 1–1.5 mm long; bracteoles grading into sepals; flower base continuous with pedicel. Sepals suberect, deltate, 2 mm long, glabrous (or 1 sepal lepidote). Petals elliptic, c. 4 mm long, white (pink in bud), glabrous. Stamens glabrous. Ovary silvery-lepidote; style glabrous. Cocci c. 2.5 mm high, rounded at apex and outwardly shortly apiculate.

Occurs in alpine regions of the Kosciuszko Natl Park of N.S.W.; in low woodland on granite ridges. Flowers in summer.

N.S.W.: Grey Mare Ra., *A.Rodd* 709 (NSW); Perisher, *J.Thompson* 252 (NSW).



6. *Nematolepis rhytidophylla* (Albr. & N.G.Walsh) Paul G.Wilson, *Nuytsia* 12: 279 (1998)

Phebalium rhytidophyllum Albr. & N.G.Walsh in N.G.Walsh & D.E.Albrecht, *Muelleria* 6: 402 (1988). T: Wog Wog Mtn, N.S.W., 18 Dec. 1985, *D.E.Albrecht* 2333; holo: MEL, iso: NSW, PERTH.

Illustrations: N.G.Walsh & D.E.Albrecht, *op. cit.* 403; G.J.Harden (ed.), *Fl. New South Wales* 2: 260 (1991).

Dense shrub to 3 m. high. Branchlets angular, coppery-lepidote, glandular-verrucose. Leaves shortly petiolate, broadly obcordate, 3–12 mm long, 3–10 mm wide, coriaceous, glabrous and smooth adaxially when fresh, wrinkled when dry, lepidote abaxially. Flowers 1–3, in cymes 2–7 mm long; peduncle and pedicels angular to flattened, lepidote with coppery scales; bracteoles 0–2, narrowly triangular, c. 0.5 mm long, concave. Sepals deltate, 0.5–1 mm long, glabrous or with a few scales towards base. Petals elliptic, c. 4 mm long, white, glabrous. Stamens glabrous. Ovary hemispherical, glabrous. Cocci quadrate, c. 3 mm high, very shortly apiculate on outer angle.

Occurs on the plateau between Wog Wog and White Rock Mtns in far SE N.S.W.; growing on rocky sites in sclerophyll shrubland. Flowers in spring and summer.

N.S.W.: Wog Wog, *D.E.Albrecht* 3064 (MEL); Nalbaugh Plateau, *R.O.Makinson* 338 (PERTH).



Listed as vulnerable under the EPBC Act, 1999.

7. *Nematolepis frondosa* (N.G.Walsh & Albr.) Paul G.Wilson, *Nuytsia* 12: 278 (1998)

Phebalium frondosum N.G.Walsh & Albr., *Muelleria* 6: 405 (1988). T: Mt Elizabeth, Vic., 14 Oct. 1986, *D.E.Albrecht* 2875; holo: MEL.

Illustrations: N.G.Walsh & D.E.Albrecht, *op. cit.* 406; N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 192, fig. 35f (1999).

Dense conical shrub, to 7 m high. Branches and branchlets horizontal; branchlets angled, lepidote. Leaves horizontally spreading; petiole 2–5 mm long; lamina ovate, 8–23 mm long, 6–15 mm wide, obtuse or emarginate, chartaceous, glabrous, glossy and smooth adaxially when fresh, silvery-lepidote and smooth abaxially. Flowers solitary or in 2- or 3-flowered cymes;

peduncle and pedicels decurved, together 6–12 mm long; bracts 2–5 mm long, incurved, lepidote below; bracteoles below calyx, minute, caducous. Sepals triangular, 1–2 mm long, silvery-lepidote but glabrous with age. Petals elliptic, 4–6 mm long, white, glabrous. Staminal filaments stellate-hairy near base. Ovary densely stellate-hairy; style glabrous. Cocci obliquely obovoid, c. 4 mm long, bluntly apiculate at outer angle.

Known only from the upper slopes of Mt Elizabeth in eastern Vic. Growing in open eucalypt forest, grading to mixed shrubland at the summit. Flowers spring.

Vic.: Summit of Mt Elizabeth, 16 Nov. 1968, *J. Galbraith* (PERTH); Mt Elizabeth, *N. G. Walsh 1440* (MEL).

This is the only species in the genus that has stellate hairs on the ovary. Listed as vulnerable under the EPBC Act, 1999.



23. RHADINOTHAMNUS

Paul G. Wilson

Rhadinothamnus Paul G. Wilson, *Nuytsia* 1: 197 (1971); from the Greek *rhadinós* (slender) and *thamnós* (a shrub).

Type: *R. euphemiae* (F. Muell.) Paul G. Wilson

Phebalium sect. *Goniocladus* Paul G. Wilson, *Nuytsia* 1: 96 (1970). T: *R. anceps* (DC.) Paul G. Wilson

Silvery-lepidote shrubs. Leaves alternate. Inflorescences axillary or rarely terminal, cymose, few-flowered or reduced to a single flower; pedicels 2- or 4-bracteolate. Sepals united into a patelliform or hemispherical calyx; margin undulately lobed. Petals valvate (in *R. euphemiae* at first coherent), lepidote. Stamens 10, free; filaments flat; anthers obtuse, white, with a non-glandular apiculum. Disc short. Carpels free, glabrous or lepidote, with or without a short sterile apex. Cocci erect, blunt or shortly rostrate. Seed narrowly reniform or bluntly ellipsoid; aril linear, fleshy, situated between 2 cartilaginous strands, easily detached; outer testa thin, dark brown; sclerotesta smooth; hilum superficial, narrowly elliptic; raphe shrunken, subbasal, covered by outer testa only.

A genus of 3 species endemic to southern W.A.

The seed in this genus has 2 persistent cartilaginous strands on the adaxial face between which the aril is attached. Such seeds are also found in the genus *Chorilaena*, which shows other similarities to *Rhadinothamnus* e.g. the hemispherical calyx, valvate petals, and the non-glandular anther apiculum.

P.G. Wilson, New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae), *Nuytsia* 12: 267–288 (1998); B.J. Mole *et al.*, Molecular phylogeny of *Phebalium* (Rutaceae: Boronieae) and related genera based on the nrDNA regions ITS 1 + 2, *Pl. Syst. Evol.* 249: 197–212 (2004).

1 Corolla cylindrical, the petals adherent by their margins

1. *R. euphemiae*

1: Petals free, spreading

2 Leaves 7–12 cm long, elliptic; branchlets strongly angular

2. *R. anceps*

2: Leaves 0.7–3.5 cm long, linear to narrowly to broadly obcordate or suborbicular; branchlets terete to angular

3. *R. rudis*

1. *Rhadinotheramnus euphemiae* (F.Muell.) Paul G.Wilson, *Nuytsia* 1: 198 (1971)

Nematolepis euphemiae F.Muell., *Fragm.* 3: 149, t. 25 (Apr. 1863); *Phebalium euphemiae* (F.Muell.) C.A.Gardner, *Enum. Pl. Austral. Occ.* 70 (1931). T: Near Cape Arid, W.A., *G.Maxwell*; iso: K.

Phebalium baxteri Benth., *Fl. Austral.* 1: 345 (May 1863); *Nematolepis baxteri* (Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3/4: 145 (1896) as *paxteri*. T: south coast, W.A., *W.Baxter*; holo: K.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 552 (1998).

Slender shrub to 1 m high. Branchlets terete, slender, erect, densely silvery-lepidote. Leaves principally on short lateral branches, dense, narrowly obcuneate passing into a slender petiole, in all 1–2 cm long, revolute, divergently bilobed, coriaceous, glabrous or sparsely lepidote adaxially, sometimes scabrous, stellate-tomentose abaxially. Flowers axillary, solitary on dwarf branchlets 1–2 mm long subtended by 2 or 4 linear bracts. Calyx silvery-lepidote; tube hemispherical, c. 3 mm long; lobes triangular, 1–2 mm long. Corolla cylindrical; petals narrowly oblong-elliptic, c. 15 mm long, initially coalescing by their minutely woolly margins, glabrous and purple adaxially, greenish-lepidote abaxially, persistent. Stamens glabrous, \pm equal to corolla; filaments linear; anthers narrowly cordate-ovate, c. 1 mm long. Disc narrow, crenate. Ovary oblong, rounded at apex, lepidote; style filamentous, glabrous, almost equal to stamens; stigma small, globular. Cocci narrow, c. 5 mm long, obtuse. Fig. 64.

Occurs near the S coast of W.A. from the Eyre Ra. E to Mt Ragged; usually found on rocky hills. Flowers throughout the year.

W.A.: Mt Le Grand, *J.Armstrong* 7050 (PERTH); Eyre Ra., *A.S.George* 9297 (PERTH); Mt Ragged, *P.G.Wilson* 10094 (PERTH).

**2. *Rhadinotheramnus anceps* (DC.) Paul G.Wilson, *Nuytsia* 12: 286 (1998)**

Phebalium anceps DC., *Prodr.* 1: 719 (1824); *Eriostemon anceps* (DC.) Spreng., *Syst. Veg.* 2: 322 (1825). T: "Nouvelle Hollande, cote orientale" [Port du Roi Georges, W.A., *fide* A.L.de Jussieu, *Mem. Soc. Hist. Nat. Paris* 2: 134 (1825)]; holo: G-DC (microfiche seen).

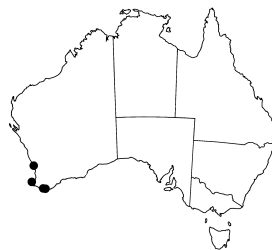
Illustrations: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 489 (1987), as *P. anceps*; B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 550 (1998).

Slender shrub to 3 m high. Branchlets strongly angular, smooth. Leaves shortly petiolate, elliptic, 7–12 cm long, 1.1–3.3 cm wide, chartaceous, smooth, glabrous or sparsely lepidote. Flowers in axillary and terminal lepidote cymes; pedicels 4–12 mm long; bracteoles minute, medial. Calyx silvery-lepidote; tube shortly hemispherical, c. 1.5 mm high, smooth; lobes triangular. Petals broadly elliptic, c. 6 mm long, 3 mm wide, white, silvery-lepidote abaxially, not persistent. Stamens glabrous, slightly shorter than petals; filaments linear-lanceolate; anthers broadly elliptic, c. 0.8 mm long, minutely apiculate. Disc prominent, dark purple, continuous with base of ovary, c. 0.3 mm high. Ovary hemispherical, 1–2 mm high, silvery-lepidote; style terete, c. 0.5 mm high, glabrous; stigma hemispherical, slightly wider than style. Cocci 3 mm high, smooth; apex rounded with divaricate apiculum. *Blister Bush*.

Occurs in SW W.A. from Yanchep to E of Albany, growing along margins of creeks and swamps. Flowers May–Dec.; fruits Nov.–Jan.

W.A.: Yanchep, May 1938, *W.E.Blackall* (PERTH); Torndirrup Natl Park, *E.J.Croxford* 4635 (PERTH); Yalgorup Natl Park, *A.Strid* 21359 (PERTH).

The sap of this species can cause blistering of the skin.



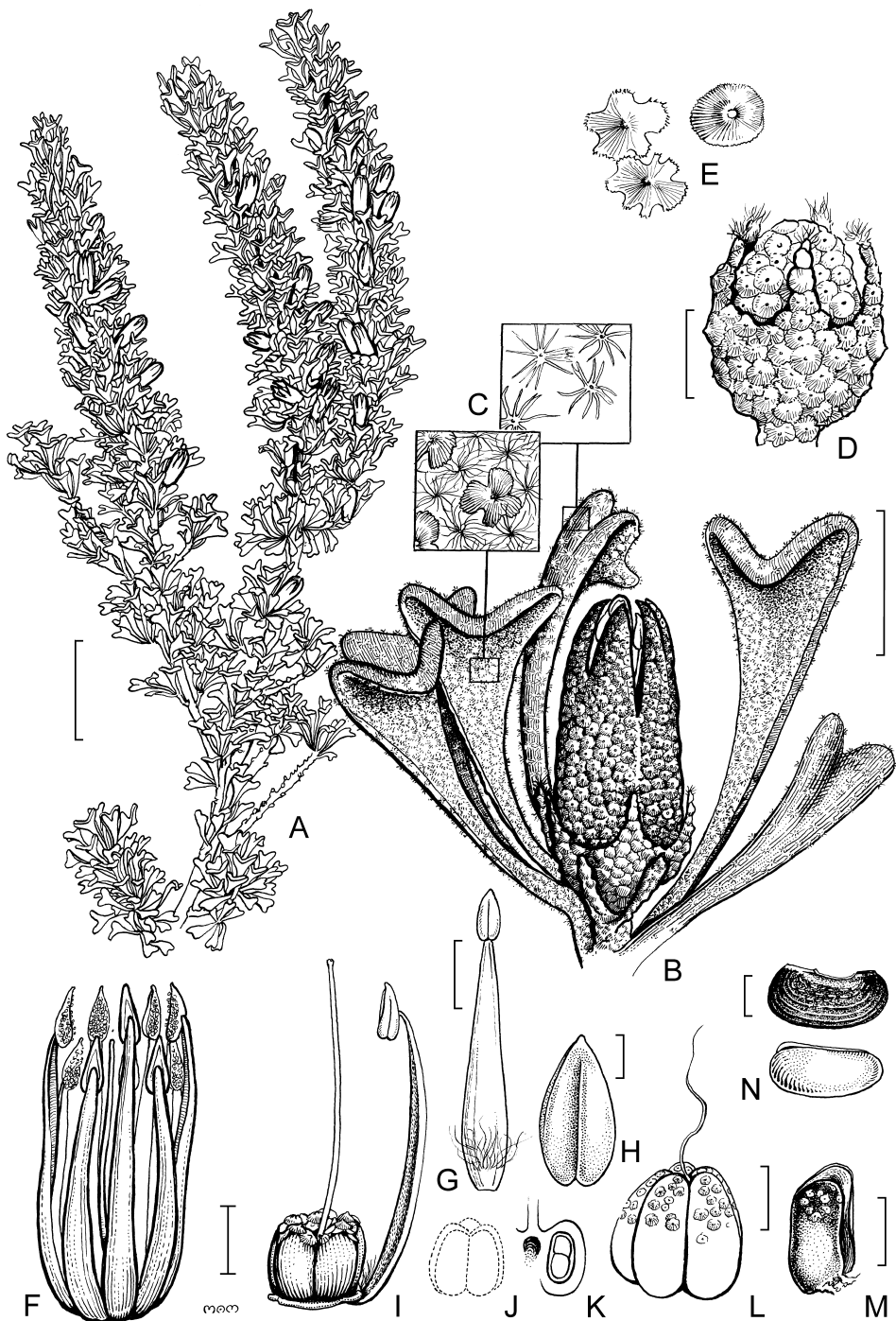


Figure 64. *Rhadinotheramnus euphemiae*. A, flowering branch; B, flower with subtending leaves; C, leaf indumentum details; D, flower bud; E, flower indumentum detail; F, flower with calyx & corolla removed; G, stamen, adaxial view; H, anther, adaxial view; I, pistil with attached stamen; J, carpel outline; K, carpel, L.S.; L, immature fruit; M, dehiscent coccus; N, seeds (the lower immature) (A–N, N.Lander 1065, PERTH.). Scale bars: A = 20 mm; B, F, G, I = 4 mm; D, L, N = 1 mm; M = 2 mm. Drawn by M.Wilson.

3. *Rhadinotheramnus rudis* (Bartl.) Paul G. Wilson, *Nuytsia* 12: 287 (1998)

Phebalium rude Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 172 (1844–45). T: Baldhead, W.A., *L. Preiss* 2038; iso: MEL.

P. bilobum Bartl., *loc. cit.*, *nom. illeg. non* Lindl. (1838); *Eriostemon bilobum* F. Muell., *Fragm.* 1: 102 (1859). T: Konkoberuphills [Mt Melville], W.A., *L. Preiss* 2039; iso: MEL.

Small shrub to 1.5 m high. Branchlets terete to angular. Leaves shortly petiolate, linear to narrowly or broadly obcordate or suborbicular, 7–35 mm long, entire, chartaceous to coriaceous, smooth, becoming glabrous. Flowers axillary, solitary; pedicel angular, 3–10 mm long, silvery-lepidote, minutely 2 (or 4)-bracteolate. Calyx patelliform, 0.7–1.5 mm high, undulate or with short triangular lobes, silvery-lepidote abaxially. Petals elliptic, 4.5–6.5 mm long, 2.5–3 mm wide, white, silvery-lepidote abaxially. Stamens slightly shorter than petals; filaments oblong-attenuate; anthers spherical, c. 0.7 mm long. Disc equal in width to and \pm continuous with ovary. Ovary broadly ovoid, 2 mm high, glabrous or silvery-lepidote; style 0.5–1 mm long, glabrous; stigma \pm equal in width to style. Cocci erect, c. 5 mm high, almost smooth; apex rounded, shortly apiculate or bluntly rostrate.

Occurs near the S coast of W.A. from Albany E to near Esperance. Three subspecies are recognised.

1 Ovary lepidote

3a. subsp. *rudis*

1: Ovary glabrous

2 Leaves narrowly cuneate to obcordate

3b. subsp. *amblycarpus*

2: Leaves linear, with rounded apex

3c. subsp. *linearis*

3a. *Rhadinotheramnus rudis* (Bartl.) Paul G. Wilson subsp. *rudis*

Illustration: B.J. Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 551 (1998).

Branchlets prominently angular when young. Leaves obcordate to suborbicular, 7–35 mm long, 5–17 mm wide. Ovary lepidote. Cocci often shortly rostrate. Plate 49.

Occurs near the S coast of W.A. between Point Irwin and Cape Arid, frequently growing over limestone. Also recorded, in 1898, from Mt Barker. Flowers and fruits throughout the year.

W.A.: East Mt Barren Ra., *H. Demarz* 1071 (PERTH); Pallinup Estuary, *K. Newbey* 3546 (PERTH); Middle Is., Recherche Archipelago, *R.D. Royce* 6270 (PERTH).

**3b. *Rhadinotheramnus rudis* subsp. *amblycarpus* (F. Muell.) Paul G. Wilson, *Nuytsia* 12: 287 (1998)**

Eriostemon amblycarpus F. Muell., *Fragm.* 1: 102 (1859); *Phebalium amblycarpum* (F. Muell.) Benth., *Fl. Austral.* 1: 345 (1863); *P. rude* subsp. *amblycarpum* (F. Muell.) Paul G. Wilson, *Nuytsia* 1: 98 (1970). T: Fitzgerald R., W.A., *G. Maxwell* 935; holo: MEL.

Illustration: B.J. Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 551 (1998).

Branchlets slightly to prominently angular when young. Leaves linear-cuneate to narrowly obcordate to obcordate, 15–17 mm long, 4–9 mm wide. Ovary glabrous. Cocci rounded at apex, sometimes bluntly rostrate.

Occurs near the S coast of W.A., and somewhat inland, from Nyabing E to near Esperance. Flowers and fruits throughout the year.

W.A.: Ravensthorpe Ra., *J. Armstrong* 7053 (PERTH); Fitzgerald River Res., *R.D. Royce* 8909 (PERTH); Lucky Bay – Le Grand road, *I. Solomon* 383 (PERTH).

The subspecies *rudis* and *amblycarpus* generally retain the association of a particular leaf shape with a particular indumentum of the ovary (glabrous or lepidote), and they generally have



separate even if adjacent areas of distribution; however, in the Fitzgerald R. area are found plants with the foliage typical of subsp. *amblycarpus* but with lepidote ovaries; these plants may represent an intergrade between the 2 subspecies.

3c. Rhadinotheramnus rudis subsp. **linearis** (C.A.Gardner) Paul G.Wilson, *Nuytsia* 12: 287 (1998)

Phebalium lineare C.A.Gardner, *J. Roy. Soc. W. Australia* 27: 180 (1942); *P. rude* subsp. *lineare* (C.A.Gardner) Paul G.Wilson, *Nuytsia* 1: 98 (1970). T: Mt Ragged, W.A., 22 Oct. 1931, C.A.Gardner 2864; holotype: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2:551(1998).

Similar to subsp. *amblycarpus* but with the following differences: Leaves thick, linear, narrowing slightly towards base, c. 20 mm long, 1–1.5 mm wide, rounded at apex. Cocci ±truncate, minutely apiculate.

Known from the Russell Ra., near Israelite Bay, W.A., where growing in skeletal soil over granite. Flowers and fruits throughout the year.

W.A.: Mt Ragged, R.D.Royce 10108 (PERTH).



20. CHORILAENA

J.A.Armstrong

Chorilaena Endl., *Enum. Pl.* 17 (1837); from the Greek words *chori* (separate) and *(ch)laena* (a cloak).

Type: *C. quercifolia* Endl.

Chorichlaena Post & Kuntze, *Lex. Gen. Phan.* (1903), orth. var.

Shrub with stellate indumentum. Leaves alternate, simple, petiolate. Inflorescence an axillary, pedunculate, 6-flowered umbel. Flowers bibracteolate, 5-merous. Calyx deeply lobed, valvate. Petals free, valvate. Disc small, lobed. Stamens 10, free; filaments thickened and bearded on adaxial side towards base, otherwise glabrous, slender above; anthers oblong, minutely apiculate. Carpels 5, fused in lower half, with short and solid apex, stellate-pilose on radial walls; ovary pyramidal; style slender, attached to medial adaxial margin of carpels; stigma shortly 5-lobed. Cocci slightly spreading, rounded at apex, ±glabrous at maturity. Seed reniform; sclerotesta smooth; hilum narrowly elliptic, in centre of adaxial margin and with pale strand on either side; raphe short, shrivelled; chalaza towards base of adaxial margin.

A monotypic genus endemic to SW W.A.

This genus is closely related to *Rhadinotheramnus* as is evident most obviously from the seed morphology.

R.Classen-Bockhoff *et al.*, The inflorescences of the Australian genera *Diplolaena* R.Br. and *Chorilaena* Endl. (Rutaceae), *Austral. J. Bot.* 39: 31–42 (1991); B.J.Mole *et al.*, Molecular phylogeny of *Phebalium* (Rutaceae: Boronieae) and related genera based on the nrDNA regions ITS 1 + 2, *Pl. Syst. Evol.* 249: 197–212 (2004).

Chorilaena quercifolia Endl., *Enum. Pl.* 17 (1837)

Eriostemon quercifolius (Endl.) F.Muell., *Pl. Victoria*. 1: 132 (1860). T: King George Sound, W.A., K.Huegel; holotype: W? n.v.

C. hirsuta Benth., *Fl. Austral.* 1: 357 (1863). T: Swan R. W.A., J.Drummond; syn: K? n.v.; Flinders Bay, W.A., A.Collie; syn: K; Wilson Inlet, W.A., A.F.Oldfield; syn: MEL.

Illustration: J.Wheeler *et al.*, *Fl. South West* 2: 875 (2002).

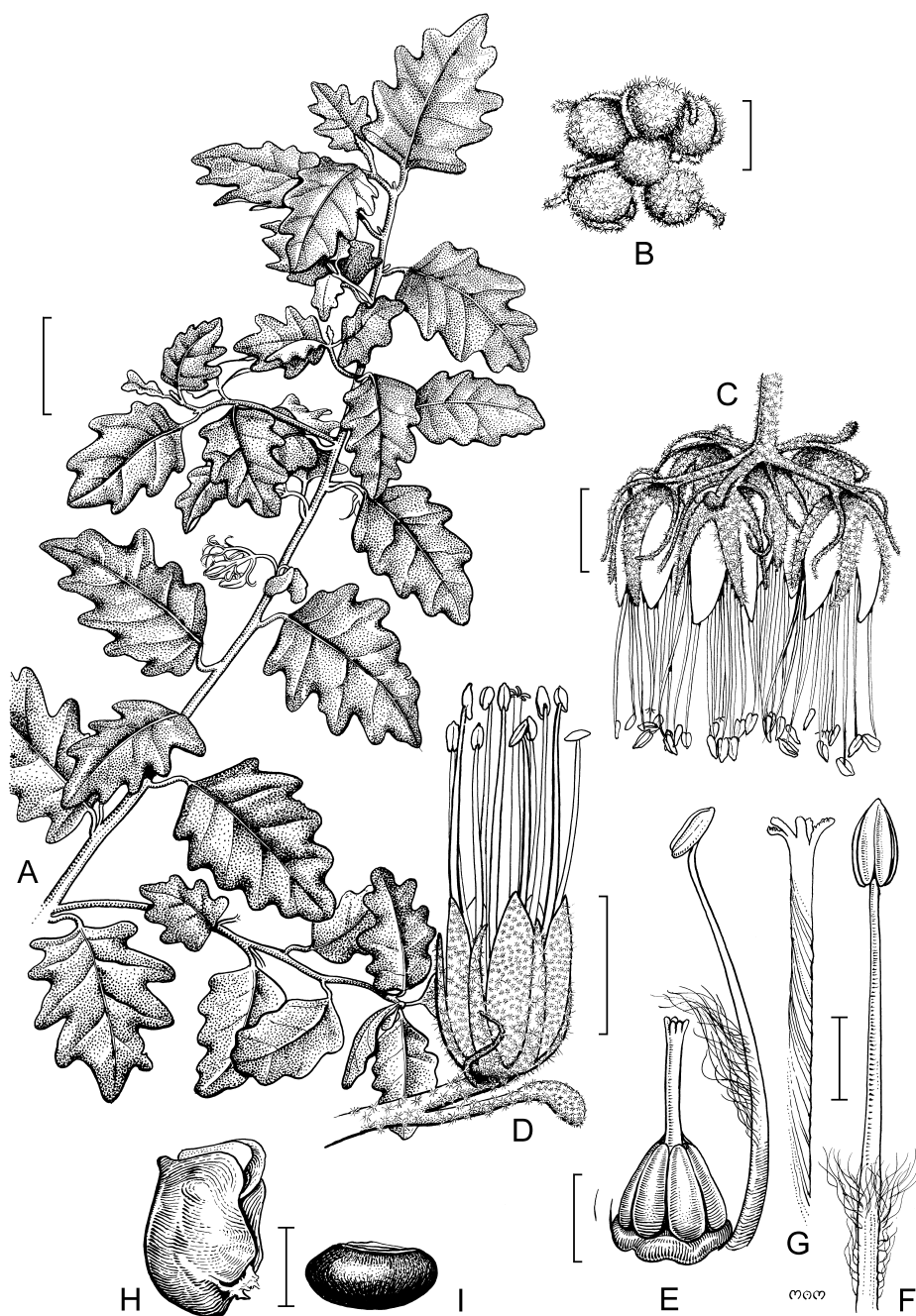


Figure 65. *Chorilaena quercifolia*. A, flowering branch; B, inflorescence in bud; C, inflorescence; D, flower; E, pistil with one stamen attached; F, stamen, adaxial surface; G, mature style; H, coccus with endocarp erupting; I, seed (A–I, drawn from fresh material, voucher not recorded). Scale bars: A = 2 cm; B–D = 5 mm; E, H, I = 2 mm; F, G = 1 mm. Drawn by M. Wilson.

Bushy shrub to 5 m high. Leaves well-spaced; petiole slender, c. 1 cm long; lamina broadly ovate, 30–55 mm long, deeply sinuate, papery. Umbels usually reflexed; peduncle c. 1 cm long terminating in a sessile central flower surrounded by 5 horizontally spreading pedicels c. 4 mm long, each bearing a flower; bracts filiform to spatulate, \pm equal to flowers and partially adnate to pedicels; bracteoles 2, similar to bracts and subtending calyx. Calyx lobes narrowly triangular, c. 6 mm long, stellate-tomentose abaxially. Petals erect, narrowly oblong-elliptic, 7–8 mm long, stellate-pilose abaxially. Stamens 2–3 times length of petals. Seed c. 3 mm long. Plate 51; Fig. 65.

Occurs in SW W.A. between Cape Naturaliste and Bald Is, E of Albany, within 60 km of the sea and sometimes on the coast, often in Karri (*Eucalyptus diversicolor*) forest. Flowers mainly Oct.–Feb.; fruits Dec.–Feb.

W.A.: Pemberton, J.R.Cannon 611202 (CANB, PERTH); Bald Is., 14 Dec. 1963, A.R.Main (PERTH); Cape Leeuwin, A.N.Rodd 4885 & G.Fensom (NSW, PERTH).

This plant is pollinated by birds.



Excluded Name

Chorilaena myoporoides Endl. ex Heynh., *Nom. Bot. Hort.* 2: 140 (1846), *nom. subnud.*

From the brief description, this appears to be based on a blue-flowered species of *Boronia* in cultivation.

19. PHEBALIUM

Paul G. Wilson

Phebalium Vent., *Jard. Malmaison* 2: 102 (1805); from the Greek *phibaleon*, a name which, according to J.Bauhin (1650), was used by some comic Greek poets for the myrtle (*Myrtus communis* L.); Ventenat placed this genus in the Myrtaceae.

Eriostemon sect. *Phebalium* (Vent.) F.Muell., *Pl. Victoria* 1: 129 (1862); *Crowea* sect. *Phebalium* (Vent.) Baill., *Dict. Bot.* 2: 277 (1881). T: *P. squamulosum* Vent.

Phebalium sect. *Euphebalium* Benth., *Fl. Austral.* 1: 337 (1863), *nom. inval.*

Shrubs or small trees \pm covered when young with a lepidote indumentum. Branches terete, often glandular-verrucose. Leaves alternate, simple, sessile or shortly petiolate, glandular-punctate, often glandular-verrucose. Flowers terminal to branches, solitary or in umbels. Bracteoles at base of pedicel and mostly insignificant. Calyx hemispherical to cup-shaped, 5 (–8)-lobed or -toothed or occasionally entire, lepidote abaxially. Petals 5 (–8), free, elliptic to obovate or spatulate, white, yellow, or pink to mauve, lepidote abaxially. Stamens 10 (–16); filaments slender, terete; anthers basifixed, glandular-apiculate. Carpels usually 5 (–8 in *P. nottii*), free or shortly fused at base, lepidote; apically united; style terete at base with branches arising from adaxial medial margin of carpels; stigma small with short, spreading lobes; ovules 2 per carpel. Seed oblong-reniform; axial endocarp thin, caducous; aril linear; sclerotesta longitudinally rugulose; hilum linear; raphe small, shrunk.

A genus of 28 species endemic to Australia, 14 species in southern W.A., the remainder found from southern S.A. to SE Qld with 1 species in Tas., and 1 in tropical NE Qld.

Thirteen of the Western Australian species (no. 2 *P. microphyllum* to no. 14 *P. laevigatum*) vary considerably in morphology over their geographic ranges. Wherever two or more of these species grow in the same vicinity, intermediates between them exist and it is impracticable to apply to each a distinctive specific or infraspecific name. The whole group can be referred to

as ‘the *Phebalium microphyllum* complex’ (*P. microphyllum* being the earliest species name in the group).

Phebalium is closely related to *Microcybe*, which may be distinguished by its heads of sessile flowers and its fewer carpels per flower. *Microcybe ambigua* is in these characters somewhat intermediate between the two genera.

P.G.Wilson, *Phebalium*, *Nuytsia* 1: 60–92 (1970); P.G.Wilson, New species and nomenclatural changes in *Phebalium* and related genera (Rutaceae), *Nuytsia* 12: 267–288 (1988); B.Mole *et al.*, Molecular phylogeny of *Phebalium* (Rutaceae: Boronieae) and related genera based on nrDNA regions ITS 1+2, *Plant Syst. Evol.* 249: 197–212 (2004); R.L.Giles *et al.*, Variation in *Phebalium glandulosum* subsp. *glandulosum*: morphometric and anatomical evidence (Rutaceae), *Austral. Syst. Bot.* 21: 271–288 (2008).

- 1 Flowers sessile or subsessile, solitary
- 2 Leaves spreading, abruptly clavate or turbinate; flowers sessile **1. *P. clavatum***
- 2: Leaves appressed to branch; flowers subsessile **12. *P. appressum***
- 1: Flowers pedicellate, solitary or 2 or more forming a terminal umbel
- 3 Leaves terete or clavate
- 4 Leaves not revolute
- 5 Petals pink adaxially; branchlets tuberculate; leaves silvery-lepidote and glossy all over, usually channelled adaxially **3. *P. canaliculatum***
- 5: Petals yellow or white adaxially; branchlets smooth; leaves dull silvery- and ferruginous-lepidote abaxially, ±glabrous adaxially, not channelled **4. *P. filifolium***
- 4: Leaves closely revolute, ±terete or obcuneate
- 6 Calyx c. 1 mm high (N.S.W.; Vic.; S.A.) **28. *P. stenophyllum***
- 6: Calyx 2–4 mm high
- 7 Branches not tuberculate (Vic.; S.A.) **16. *P. lowanense***
- 7: Branches tuberculate
- 8 Leaves terete, 4–7 mm long (W.A.) **5. *P. tuberosum***
- 8: Leaves obcuneate, c. 2 mm long (W.A.) **6. *P. brevifolium***
- 3: Leaves not terete or clavate
- 9 Branchlets smooth
- 10 Leaves medially channelled adaxially
- 11 Petals pink to mauve (Qld; N.S.W.) **24. *P. nottii***
- 11: Petals cream to yellow
- 12 Leaves elliptic to narrowly oblong-elliptic to linear; apex rounded
- 13 Leaves narrowly oblong, not recurved or revolute; calyx c. 1.5 mm diam. (W.A.) **8. *P. lepidotum***
- 13: Leaves oblong-elliptic to elliptic, flat or slightly recurved; calyx 2–6 mm diam. (Qld)
- 14 Calyx lobes < 1 mm long; corolla yellow (Qld) **22. *P. whitei***
- 14: Calyx lobes 1–5 mm long; corolla white or pink
- 15 Calyx 2–3 mm diam., obturbinate, 5-lobed; petals white or pink (Qld) **23. *P. woombye***
- 15: Calyx 5–6 mm diam., cup-shaped, 6–8-lobed; petals pink (Qld) **24. *P. nottii***
- 12: Leaf-shape variable; apex retuse or bilobed
- 16 Leaves obovate to obcordate, 2–3.5 mm long; calyx 0.5–1 mm high (N.S.W.) **26. *P. obcordatum***

- 16: Leaves oblong-cuneate or Y-shaped, 10–14 mm long; calyx 0.9–1.6 mm high
- 17: Leaves narrowly oblong-cuneate, to 20 mm long, recurved to revolute, with apex retuse or bilobed; calyx c. 1.5 mm high (Tas.) **21. *P. daviesii***
- 17: Leaves Y-shaped, to 14 mm long, revolute; calyx 0.9–1.6 mm long (N.S.W.) **25. *P. bifidum***
- 10: Leaves not channelled adaxially
- 18: Calyx 2–2.5 mm high; leaves elliptic to obovate with both surfaces convex (W.A.) **9. *P. obovatum***
- 18: Calyx 0.5–1.5 mm high; leaves not biconvex or thickened along medial strip
- 19: Leaves 7–70 mm long linear to oblong, elliptic, obovate or subterete; calyx 0.5–1.2 mm high (Qld; N.S.W.; Vic.) **18. *P. squamulosum***
- 19: Leaves 3–5 mm long; calyx c. 1 mm high (W.A.)
- 20: Leaves oblong, 3–4 mm long, 1.5 mm wide **2. *P. microphyllum***
- 20: Leaves oblong to elliptic, obovate or obcordate, 2–5 mm long **10. *P. drummondii***
- 9: Branchlets glandular-tuberculate
- 21: Leaves channelled above
- 22: Leaf apex retuse to obcordate
- 23: Pedicel evenly slender up to rounded base of calyx (Qld; N.S.W.; Vic.) **17. *P. glandulosum***
- 23: Pedicel becoming broader towards apex (W.A.)
- 24: Leaves 7–15 mm long, with apex obcordate; calyx 3.5–4.5 mm high (W.A.) **7. *P. megaphyllum***
- 24: Leaves c. 5–15 mm long, with apex retuse; calyx 1–1.5 mm high
- 25: Leaves narrowly oblong, 10–15 mm long, ±flat (W.A.) **11. *P. brachycalyx***
- 25: Leaves broadly cuneate, c. 5 mm long, 2–3 mm wide, recurved (W.A.) **13. *P. elegans***
- 22: Leaf apex rounded or truncate
- 26: Leaves very narrowly oblong-cuneate, usually V-shaped in cross-section (S.A., Vic.) **15. *P. bullatum***
- 26: Leaves linear to broadly oblong-cuneate, not V-shaped in cross-section
- 27: Tree; petals cream-coloured (Qld) **19. *P. distans***
- 27: Shrub; petals cream or yellow
- 28: Leaves linear to oblong-cuneate
- 29: Leaf margin undulate, markedly glandular (Qld; N.S.W.; Vic.) **17. *P. glandulosum***
- 29: Leaf margin entire or somewhat sinuate to minutely crenate towards apex
- 30: Leaf lamina 5–25 mm long, length/width ratio 3–7.7 (Qld; N.S.W.; Vic.) **18. *P. squamulosum***
- 30: Leaf lamina 14–62 mm long, length/width ratio 7.7–15.5 (Qld) **19. *P. distans***
- 28: Leaves narrowly elliptic to narrowly oblanceolate
- 31: Leaves cuneate at base; corolla yellow; petals 1.8–2 mm wide (Qld; N.S.W.; Vic.) **18. *P. squamulosum***
- 31: Leaves attenuate at base; corolla cream; petals 1.5–1.8 mm wide (Qld) **20. *P. longifolium***

21: Leaves not channelled adaxially

32 Calyx 2–2.5 mm high; leaves with both surfaces convex (W.A.)

10. *P. obovatum*

32: Calyx 0.5–1.5 mm high

33 Leaves linear to narrowly oblong, thick, with margins and midrib raised on abaxial surface (W.A.)

14. *P. laevigatum*

33: Leaves oblong to elliptic, not obviously thickened and without raised and thickened margins

34 Leaves flat, somewhat folded, or subterete, 7–70 mm long; calyx 0.5–1.2 mm high (Qld; N.S.W.; Vic.)

18. *P. squamulosum*

34: Leaves with both surfaces ±flat, 2–5 mm long

35 Calyx with lobes greatly exceeding the very short base (W.A.)

10. *P. drummondii*

35: Calyx cup-shaped, very shallowly lobed (Vic.)

27. *P. festivum*

1. *Phebalium clavatum* C.A.Gardner, *J. Roy. Soc. W. Australia* 27: 181 (1942)

T: Widgiemooltha, W.A., Nov. 1920, *C.A.Gardner s.n.*; holo: PERTH.

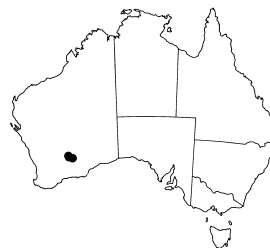
Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 547 (1998).

Erect pyramidal shrub to 1.3 m high. Branchlets terete, glandular-verrucose. Leaves clustered on short branchlets, turnip-shaped, c. 3 mm long, smooth, silvery-lepidote except for the truncate apex. Flowers solitary, terminal to short branchlets, sessile, subtended by 2 lepidote linear bracteoles c. 1 mm long. Calyx broadly turbinate, 1.5–3 mm high including the deltate-acuminate teeth c. ½ its length, closely silvery-lepidote. Petals obovate to broadly elliptic, 4–5.2 mm long, 2.5–3.7 mm wide, white, silvery abaxially. Cocci erect, 2.5–3 mm high; apex rounded.

Occurs in the Coolgardie district of W.A. Flowers Sept.–Dec.

W.A.: Londonderry, *K.N.Newbey 5353* (PERTH).

This is the most distinct of the W.A. species of *Phebalium*. The morphological upper surface of the leaf is probably represented by its truncate apex and a single large globular gland occupies much of its interior. The flowers are unusual in being solitary, sessile and in consistently possessing 2 linear bracteoles.



2. *Phebalium microphyllum* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25(2): 159 (1852)

Eriostemon tuberculosus var. *microphyllus* (Turcz.) Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 19: 40 (1907), *comb. illeg.* T: W.A., *J.Drummond s.n.*; holo: KW; (?)iso: MEL 4809, 4813.

E. tuberculosus var. *laevis* F.Muell., *Fragm.* 9: 108 (1875). T: W.A., *J.Drummond s.n.*; syn: MEL 4809, 4813.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 548 (1998).

Rounded shrub c. 0.5 m high. Branchlets smooth, closely lepidote. Leaves spreading, shortly petiolate, oblong, 3–4 mm long, 1.5 mm wide, slightly crenulate, rounded at apex, coriaceous; adaxial surface convex, ±smooth, glabrous, without an impressed midrib; abaxial surface smooth, closely lepidote. Umbels sessile, 3–6-flowered; pedicels slender, 3–6 mm long. Calyx small, c. 1 mm high including the deltate teeth c. 0.5 mm long, smooth, closely ferruginous-lepidote abaxially. Petals elliptic, c. 3.5 mm long, yellow, ferruginous abaxially. Cocci erect, c. 3 mm high, rounded at apex, apiculate on outer angle.

Occurs in SW W.A. from L. Grace to the Fitzgerald R. Flowers Sept.–Dec.

W.A.: 29 km E of L. Grace, *J.Armstrong 7061* (PERTH); Twertup Ck, *A.S.George 9912* (PERTH); c. 29 km E of West Mt Barren, *G.J.Keighery 154* (PERTH).



Phebalium microphyllum resembles *P. filifolium* in floral characters and in the lack of glandular tubercles on stem and leaves; in leaf shape it comes closest to *P. tuberosum* from which it differs in having a small calyx and a smooth stem. In the strict sense it has a restricted distribution.

The syntypes of var. *laevis* on MEL sheets 4809 and 4813 are a good match with the holotype of *P. microphyllum* and are probably part of the same collection; if this is the case they are also isotypes of that species.

3. *Phebalium canaliculatum* (F.Muell. & Tate) J.H.Willis, *Victorian Naturalist* 74: 169 (1958)

Eriostemon canaliculatus F.Muell. & Tate, *Trans. Proc. & Rep. Roy. Soc. S. Australia* 16: 337 (1896). T: Between Victoria Springs and Ularung, W.A., 7–9 Oct. 1875, *J. Young*; lecto: MEL, *fide* J.H.Willis, *loc. cit.*

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 547 (1998).

Erect shrub to 1.5 m high. Branchlets somewhat glandular-verrucose. Leaves ascending, slender-terete, straight or slightly falcate, c. 25 mm long, 1 mm wide, obtuse, smooth to slightly verrucose, channelled adaxially, silvery-lepidote all over. Umbels c. 6-flowered; pedicels 4–7 mm long. Calyx small, c. 1 mm high including the deltate lobes c. 0.5 mm long, closely lepidote. Petals elliptic, 4–5 mm long, 2–3 mm wide, dark pink to pale mauve, silvery-lepidote abaxially. Stamens: filaments pale mauve; anthers well exerted. Cocci c. 3 mm high, rounded above with a spreading subapical boss. Plate 53.

Occurs in southern W.A. from Wongan Hills E to Kalgoorlie and N to Sandstone. Flowers Sept.–Dec.

W.A.: 11 km SSE of Perrinvale HS, *R.J.Cranfield* 7175 (PERTH); near Comet Vale, *T.D.Macfarlane* 1558 (PERTH); 4 km SE of Londonderry, *P.G.Wilson* 3116 (PERTH).

The ramifications regarding the application of the name *P. canaliculatum* are involved (see Wilson 1970) and it may here be used incorrectly.



4. *Phebalium filifolium* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25(2): 159 (1852)

Eriostemon filifolius (Turcz.) F.Muell., *Fragm.* 9: 108 (1875). T: W.A., *J.Drummond* 5: 206; holo: KW; iso: K, MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 547 (1998).

Rounded shrub to 1.3 m high. Branchlets slender, smooth, closely lepidote. Leaves spreading to ascending, slender, subterete (bluntly triangular in T.S.), c. 15 mm long, 1 mm wide, smooth, silvery- to ferruginous-lepidote or adaxial surface glabrous, not channelled. Umbels 3–8-flowered; pedicels slender, c. 7 mm long. Calyx short, 1–1.5 mm high including the deltate lobes c. 0.6 mm long, closely ferruginous-lepidote abaxially. Petals broadly elliptic, 3.5–5.5 mm long, 2.5–3.5 mm wide, pale to bright yellow (rarely white), ferruginous-lepidote abaxially. Staminal filaments shortly exceeding petals. Cocci erect, 2–2.5 mm high; apex rounded with a small subapical boss. Fig. 66A–I.

Occurs in southern W.A. from near Dalwallinu, E to Menzies and S to Katanning and Mt Ragged. Flowers Sept.–Dec.

W.A.: 26 km SW of Bodallin, *R.J.Cranfield* 2481 (PERTH); c. 43 km E of Merredin, *E.M.Scrymgeour* 2124 (PERTH); E of L. King, *C.Stacey* 14 (PERTH).



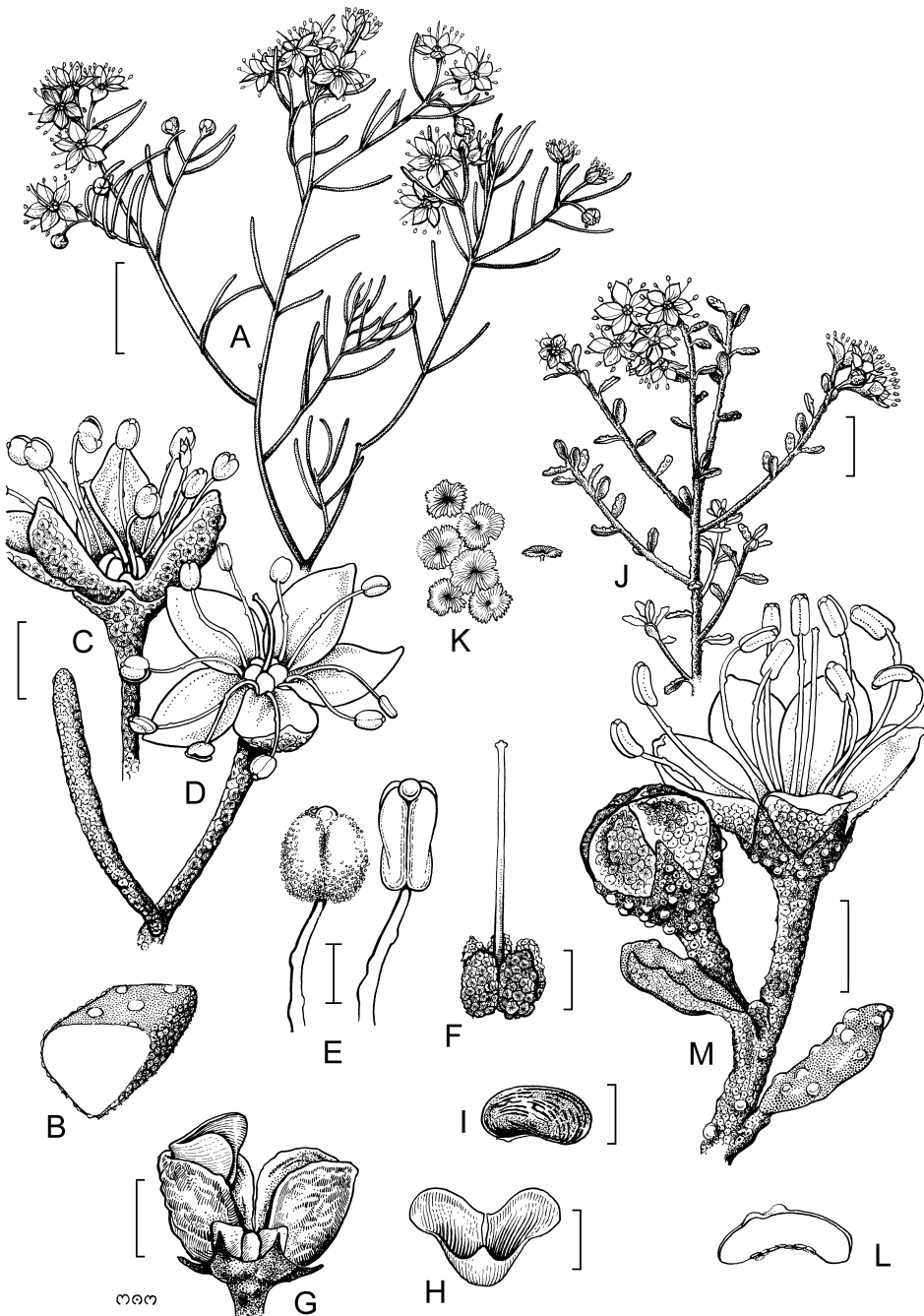


Figure 66. *Phebalium*. A–I, *P. filifolium*. A, flowering branch; B, leaf T.S.; C, D, flowers; E, anthers (left-hand anther dehiscent); F, pistil; G, cocci; H, endocarp; I, seed (A–I, fresh material from Mt Desmond, voucher not recorded). J–M, *P. tuberosum*: J, flowering branch; K, indumentum detail; L, leaf T.S.; M, flower and flower bud (J–M, fresh material from Mt Desmond, voucher not recorded). Scale bars: A = 20 mm; C, D = 3 mm; E, F, I = 0.5 mm; G, H = 1 mm; J = 5 mm; M = 1.5 mm. Drawn by M. Wilson.

5. *Phebalium tuberosum* (F.Muell.) Benth., *Fl. Austral.* 1: 343 (1863)

Eriostemon tuberosus F.Muell., *Pl. Victoria* 1: 130 (1862). T: "S.W. Austr.", *G. Maxwell*; lecto: MEL, fide P.G. Wilson, *Nuytsia* 1: 71 (1970).

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 550 (1998).

Erect shrub to 1.5 m high. Branchlets prominently glandular-verrucose, closely lepidote. Leaves spreading, closely revolute, 4–7 mm long, glandular-verrucose, glabrous adaxially, not medially channelled. Umbels 3- or 4-flowered; pedicels thick, 2–5 mm long, ferruginous. Calyx 2–3 mm high including the narrowly deltate lobes, verrucose, glabrous adaxially, ferruginous-lepidote abaxially. Petals broadly elliptic, 3–4.5 mm long, 2–3.3 mm wide, white, ferruginous-lepidote abaxially. Cocci erect, c. 3.5 mm high, rounded at summit. $n = 32$, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954) as *P. microphyllum*. Fig. 66J–M.

Found in SW W.A. from Kalbarri S to Katanning and E to Zanthus. Flowers Sept.–Dec.

W.A.: 50 km E of Yellowdine, *L.A. Craven* 7459 (PERTH); Bencubbin, *B.R. Maslin* 6690 (PERTH); Morawa, *B. Wells* 6/84 (PERTH).

Phebalium tuberosum grows in many localities in association with *P. filifolium* but it flowers earlier, which possibly explains why both species often retain their distinctive character. Hybrids do, however, occur and intergrades between the two species may be found where they grow together.

**6. *Phebalium brevifolium* Paul G. Wilson, *Nuytsia* 12: 281 (1998)**

P. tuberosum subsp. *brachyphyllum* Paul G. Wilson, *Nuytsia* 1: 72 (1970). T: Great Victoria Desert, camp 59, near Queen Victoria Spring, W.A., 22 Sept. 1891, *R. Helms*; holo: AD; iso: MEL, NSW.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 546 (1998).

Small shrub c. 0.7 m high. Branchlets tuberculate. Leaves sessile, obcuneate, c. 2 mm long, 1.5 mm wide at base, closely revolute, glabrous and almost smooth adaxially, not medially channelled. Umbels 1–3-flowered; pedicels 2–3 mm long. Calyx c. 2.5 mm high, deeply dentate, prominently tuberculate, stellate-lepidote adaxially, ferruginous-lepidote abaxially. Petals obovate, 6–7 mm long, 2.5 mm wide, white adaxially, ferruginous-lepidote abaxially. Fruit not seen.

Occurs in W.A. in the vicinity of Cundeelee and Queen Victoria Spring on the edge of the Great Victoria Desert, c. 200 km ENE of Kalgoorlie. Flowers Sept.–Nov.

W.A.: 25 km NNE of Queen Victoria Spring, *D. Pearson* 448 (PERTH); c. 21 km N of Cundeelee, *R.D. Royce* 5511 (PERTH).

**7. *Phebalium megaphyllum* (Ewart) Paul G. Wilson, *Nuytsia* 12: 285 (1998)**

Eriostemon tuberosus var. *megaphyllum* Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 19: 39 (1907); *Phebalium tuberosum* subsp. *megaphyllum* (Ewart) Paul G. Wilson, *Nuytsia* 1: 72 (1970). T: Cowcowing, W.A., Sept. 1904, *M. Koch* 1330; holo: MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 549 (1998).

Rounded shrub to 1 m high. Branchlets glandular-verrucose. Leaves shortly petiolate, oblong-cuneate, 7–15 mm long, 2–4 mm wide, cuneate at base, recurved and glandular-crenulate at margins, obcordate, recurved at apex; adaxial surface slightly rounded, smooth to glandular-scabridulous, glabrous, medially channelled; abaxial surface with prominent glandular-verrucose midrib, closely silvery-lepidote. Umbels (1–) 3–6-flowered; pedicels 4–6 mm long. Calyx hemispherical, 3.5–4.5 mm high including the prominent deltate lobes 2–2.5 mm long, glandular-



verrucose, silvery stellate-lepidote adaxially, silvery- to ferruginous-lepidote abaxially. Petals broadly elliptic, 5–6 mm long, 3 mm wide, white. Fruit as in *P. tuberosum*. *n* = 32, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954) as *P. drummondii*.

Occurs in SW W.A. from Mullewa to Ravensthorpe and E to Coolgardie. Flowers Sept.–Nov.

W.A.: Bullabulling, *W.E.Blackall* 4062 (PERTH); 10 km E of Ghooli, *L.A.Craven* 7457 (PERTH); 13 km SW of Mukinbudin, *B.R.Maslin* 6451 (PERTH).

8. *Phebalium lepidotum* (Turcz.) Paul G.Wilson, *Nuytsia* 1: 73 (1970)

Boronia lepidota Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 36(1): 596 (1863). T: Swan R., W.A., 1849, *J.Drummond* 208; holo: KW; iso: K, MEL.

Eriostemon maxwellii F.Muell., *Fragm.* 9: 108 (1875); *P. maxwellii* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19a: 260 (1931). T: Between the Bank and Eyres Relief, W.A., *G.Maxwell*; syn: MEL; Israelite Bay, W.A., *G.Maxwell*; syn: MEL; Cape Arid, W.A., *J.Forrest*; syn: MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 549 (1998).

Rounded shrub to 0.7 m high. Branchlets smooth or slightly tuberculate, closely lepidote. Leaves shortly petiolate, narrowly oblong, 10–15 mm long, entire or undulate, coriaceous; adaxial surface flat or convex, medially channelled, glabrous; abaxial surface silvery-lepidote. Umbels 3–6-flowered; pedicels slender, c. 5 mm long. Calyx c. 1.5 mm high including the deltate lobes, smooth, glabrous adaxially, ferruginous-lepidote abaxially. Petals broadly elliptic, 4–5 mm long, 3–3.5 mm wide, white to cream, ferruginous-lepidote abaxially. Fruit as in *P. tuberosum*.

Occurs in SW W.A. from Merredin E to Zanthus and S to the coast. The mid-nineteenth century distribution records by Maxwell from Israelite Bay and further east, noted above, have not been confirmed by more recent collecting. Flowers Aug.–Nov.

W.A.: c. 76 km E of Norseman, *J.S.Beard* 5208 (PERTH); Kumarl, *L.A.Horbury* 77 (PERTH); Fitzgerald River Natl Park, *K.Newbey* 6810 (PERTH).



9. *Phebalium obovatum* (Paul G.Wilson) Paul G.Wilson, *Nuytsia* 12: 285 (1998)

P. lepidotum var. *obovatum* Paul G.Wilson, *Nuytsia* 1: 74 (1970). T: Between Israelite Bay and Pt Culver, W.A., *G.Maxwell*; holo: MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 548 (1998).

Spreading shrub to 1 m high. Leaves thick, narrowly obovate to obovate or elliptic, c. 5 mm long, 1.5–2 mm wide, entire, rounded at apex; adaxial surface flat to convex, smooth, glossy; abaxial surface flat to slightly convex, densely lepidote. Umbels few-flowered; pedicels short, 1.5–2.5 mm long, densely ferruginous-lepidote. Calyx turbinate, c. 2–2.5 mm high including the deltate teeth c. 1 mm long, densely silvery- to ferruginous-lepidote. Petals elliptic, c. 4 mm long, white, silvery- to ferruginous-lepidote abaxially. Fruit not seen.

Occurs in southern W.A. in the Ravensthorpe district; growing in heath or mallee woodland. Flowers Sept.–Dec.

W.A.: 17 km NW of Clyde Hill, *M.A.Burgman* 1234 (PERTH); Frank Hann Natl Park, *D.Monk* 319 (PERTH); Peak Charles, *P.Poli* 83 (PERTH).



10. *Phebalium drummondii* Benth., *Fl. Austral.* 1: 343 (1863)

Eriostemon benthamii F.Muell., *Fragm.* 9: 108 (1875). T: Swan River Colony, W.A., *J.Drummond* 13; holo: K; iso: MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 548 (1998).

Small shrub to 1 m high. Branchlets smooth, closely lepidote. Leaves shortly petiolate, narrowly to broadly elliptic or obovate, 3–5 mm long, 1–2 mm wide, obtuse at base, entire,

obtuse to rounded at apex, coriaceous; adaxial surface flat or slightly concave, smooth, without midrib, glabrous, dull green (when dry); abaxial surface flat, smooth, closely silvery-lepidote. Umbels 3–6-flowered; pedicels 2–5 mm long. Calyx shortly hemispherical, c. 1 mm high including the short deltate lobes c. 0.5 mm long, smooth, silvery- to ferruginous-lepidote abaxially. Petals elliptic, c. 4 mm long, 2.5 mm wide, bright yellow, silvery- to ferruginous-lepidote abaxially. Fruit not seen.

Occurs in SW W.A. in the Merredin and Newdegate districts. Flowers Aug.–Nov.

W.A.: 26 km SW of Bodallin, *R.J.Cranfield* 2493 (PERTH); Manmanning, 6 Aug. 1978, *B. & M.Smith* (PERTH); Wialki, Nov. 1961, *F.Spark* (PERTH).



11. *Phebalium brachycalyx* Paul G.Wilson, *Nuytsia* 1: 75 (1970)

T: Wongan Hills, W.A., 9 Aug. 1959, *A.S.George* 71; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 549 (1998).

Shrub c. 1 m high. Branchlets glandular-verrucose. Leaves shortly petiolate, narrowly oblong, 10–15 mm long, 1.5 mm wide, glandular-crenulate on margins, rounded to emarginate; adaxial surface flat or rounded, medially channelled, glabrous; abaxial surface with prominent verrucose midrib, silvery- to ferruginous-lepidote. Umbels 3–6-flowered; pedicels slender, 4–8 mm long. Calyx small, patelliform, c. 1 mm high including the deltate lobes c. 0.5 mm long, smooth, glabrous adaxially, closely ferruginous-lepidote abaxially. Petals broadly elliptic, c. 4 mm long, 2 mm wide, white to pale yellow, silvery- to ferruginous-lepidote abaxially. Fruit not seen.

Occurs in SW W.A. from Dalwallinu to Kondinin. Flowers Aug.–Nov.

W.A.: c. 27 km E of Piawaning, *A.C.Beauglehole* 12290 (PERTH); 9 km NW of Wongan Hills township, *L.Nunn* 7 (PERTH).



12. *Phebalium appressum* Paul G.Wilson, *Nuytsia* 12: 280 (1998)

T: Near Coolgardie [precise locality withheld], W.A., 16 July 1991, *Shreeve & Spencer s.n.*; holo: PERTH.

Rounded shrub to 1 m high. Branchlets silvery-lepidote, sparsely glandular-verrucose. Leaves thick, crowded, sessile, erect and appressed to branch, cordate-ovate, c. 2 mm long, 1.5 mm wide, closely revolute, otherwise ±flat adaxially, smooth, green, glabrous or sparsely silvery-lepidote. Flowers solitary or paired; pedicels short and thick, c. 1 mm long, densely ferruginous-lepidote, bearing a few reduced leaves or bracteoles. Calyx c. 1.5 mm high, deeply deltate-lobed, ferruginous-lepidote. Petals elliptic, c. 5 mm long, white, lepidote abaxially. Fruit not seen.

Occurs in southern W.A., NNW of Coolgardie. Flowers July–Sept.

W.A.: near Coolgardie [precise locality withheld], *S.Reiffer* *SRE*324 (PERTH).



13. *Phebalium elegans* Paul G.Wilson, *Nuytsia* 12: 282 (1998)

T: 9 km WSW of Mt Pleasant, Fraser Ra., W.A., 20 Sept. 1980, *K.Newbey* 7536; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 549 (1998).

Spreading shrub to 0.9 m high. Branchlets glandular-tuberculate, silvery-lepidote. Leaves spreading, shortly petiolate, cuneate, c. 5 mm long, 2–3 mm wide, recurved and glandular-undulate at margins, retuse, glandular-tuberculate when dry, medially channelled, glabrous and dark green adaxially, silvery-lepidote abaxially. Umbels 2–5-flowered; pedicels slender, 5–10 mm long, silvery-lepidote. Calyx c. 1.5 mm high including the deltate lobes

1 mm long, silvery- to reddish brown-lepidote abaxially. Petals broadly elliptic, 4–5 mm long, white, silvery- to ferruginous-lepidote abaxially. Fruit not seen.

Occurs in southern W.A., from the Bremer Ra. E to the Fraser Ra.; growing in well-drained soil on rocky hills. Flowers July–Sept.

W.A.: 96 km E of Norseman, *D.E.Albrecht 4032* (PERTH); 9 km E of Norseman, *C.A.Gardner 14222* (PERTH); Mt Day, *K.Newbey 5273* (PERTH); c. 33 km W of Balladonia Motel, 9 Mar. 1968, *M.E.Phillips* (CANB).



14. *Phebalium laevigatum* Paul G.Wilson, *Nuytsia* 12: 284 (1998)

T: 48 km ESE of Merredin, W.A., 7 Sept. 1973, *N.N.Donner 4600*; holo: PERTH.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.*, 2nd edn, 2: 550 (1998).

Erect slender shrub to 1 m high. Branchlets glandular-tuberculate. Leaves ascending; petiole 2 mm long; lamina linear to narrowly oblong, (5–) 12–15 mm long, (1–) 1.5–2 mm wide, entire, obtuse; adaxial surface convex, sparsely silvery-lepidote, becoming glabrous, glossy when mature, smooth or faintly channelled; abaxial surface silvery-lepidote, with or without prominent midrib. Umbels c. 7-flowered; pedicels slender, c. 4 mm long. Calyx c. 1.5 mm high, divided half way into deltate lobes, ferruginous- or silvery-lepidote. Petals broadly elliptic, 4–5 mm long, yellow to white, ferruginous-lepidote abaxially. Cocci erect, c. 3.5 mm high, rounded at summit.

Occurs in southern W.A. in the Merredin–Bullfinch area E to Queen Victoria Spring on the margin of the Great Victoria Desert; usually growing in eucalypt scrub. Flowers July–Oct.

W.A.: c. 48 km E of Merredin, *P.R.Jeffries 631004* (PERTH); 8.5 km NW of Wialki, *F. & M.Mollemans 3369* (PERTH); 43 km NW of Queen Victoria Spring, *D.J.Pearson 2228* (PERTH); Chandler near Campion, *R.D.Royce 2060* (PERTH).

In the eastern areas of its distribution the leaves are smaller (5–7 mm long) and the midrib is not apparent.



15. *Phebalium bullatum* J.M.Black, *Trans. & Proc. Roy. Soc. S. Australia* 40: 460 (1916)

P. glandulosum var. *bullatum* (J.M.Black) Court, *Victorian Naturalist* 73: 174 (1957). T: Between Murray Bridge and Callington, S.A., 5 Oct. 1906, *herb. J.M.Black*; lecto: AD, *fide* P.G.Wilson, *Nuytsia* 1: 76 (1970).

[*P. sediflorum* auct. non F.Muell.: F.J.H.von Mueller, *Trans. Victorian Inst.* 1: 30 (1855), not as to lectotype, see P.G.Wilson, *Nuytsia* 1: 78 (1970)]

[*Eriostemon sediflorus* auct. non (F.Muell.) F.Muell.: F.J.H.von Mueller, *Fragm.* 9: 102 (1859), not as to lectotype, see P.G.Wilson, *loc. cit.*]

Illustration: J.P.Jessop & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 2: 772, fig. 413 (1986).

Shrub to 2 m high. Branchlets sparsely glandular-verrucose, silvery- to ferruginous-lepidote. Leaves shortly petiolate, thick, narrowly oblong-cuneate, often V-shaped in T.S., 6–12 mm long, 1.5–2 mm wide, glandular-undulate on margins, rounded or retuse; adaxial surface flat to conduplicate and acutely channelled, smooth, glabrous, glossy; abaxial surface convex, silvery-lepidote. Umbels c. 6-flowered; pedicels slender, c. 5 mm long. Calyx hemispherical, c. 1.5 mm high including the low, broadly deltate teeth. Petals spreading, broadly elliptic, c. 3 mm long, 2 mm wide, yellow, silvery- to ferruginous-lepidote abaxially. Cocci erect, c. 3.5 mm high, rounded at summit. *n* = 16, S.Smith-White, *Austral. J. Bot.* 2: 293 (1954) as “*P. sp* SA52/21”.

Occurs in southern S.A. from western Eyre Penin. E to western Vic. Flowers Aug.–Oct.

S.A.: Arno Bay, *C.R.Alcock C 12* (AD); Pinnaroo, *S.L.Everist 5779* (BRI). Vic.: 34 km S of Murrayville, *M.G.Corrick 6262* (MEL); 39 km N of Sunset Tank, *P.S.Short 1166* (MEL).



16. *Phebalium lowanense* J.H.Willis, *Victorian Naturalist* 73: 196 (1957)

T: Great Desert, about 11 miles [17.6 km] N of Serviceton, Vic., 17 Sept. 1948, *J.H.Willis*; holo: MEL; iso: AD.

Slender shrub to 0.8 m high. Branchlets densely silvery- to ferruginous-lepidote. Leaves spreading, subsessile, appearing terete due to strongly revolute margins, 4–12 mm long, 1 mm wide, obtuse; adaxial surface smooth or slightly scabridulous, glabrous, midrib not impressed; abaxial surface stellate-lepidote. Umbels 1–6-flowered; pedicels stout, 3–7 mm long. Calyx broadly turbinate, 3–4 mm high including the deltate lobes c. 1.5 mm long, densely stellate-lepidote. Petals obovate, c. 5 mm long, 2.5 mm wide, yellow, silvery- and ferruginous-lepidote abaxially. Style coiled and recurved in bud and remaining so during and after anthesis, densely ferruginous-stellate-lepidote in lower $\frac{2}{3}$. Cocci erect, c. 3.5 mm high, rounded at summit.

Occurs in SE S.A. and adjacent Vic. Flowers Aug.–Sept.

S.A.: 23 km NE of Keith, *N.N.Donner* 147 (AD). Vic.: 92 km S of Murrayville, *M.G.Corrick* 6272 (MEL); 8 km SSW of Red Bluff, *N.G.Walsh* 1466 (MEL).



The style in *P. lowanense* remains coiled with the stigma situated near the style base, a character not observed elsewhere in the genus. Listed as Vulnerable under the EPBC Act, 1999.

17. *Phebalium glandulosum* Hook. in T.L.Mitchell, *J. Exped. Trop. Australia* 199 (1848)

Eriostemon lepidotus var. *glandulosus* (Hook.) F.Muell., *Fragm.* 9: 107 (1875), *comb. illeg.* T: near Mt Owen, Qld, 16 June 1846, *T.L.Mitchell* 331; holo: K; iso: MEL.

Shrub to 2.5 m high. Branches glandular-verrucose, silvery- to ferruginous-lepidote. Leaves shortly petiolate, linear to narrowly or broadly oblong-cuneate, 5–30 mm long, 0.5–5 mm wide, somewhat recurved and sometimes glandular-undulate at margin, truncate to emarginate or obcordate at apex; adaxial surface smooth to rugulose, plane or with deeply impressed midrib; abaxial surface with or without a prominent midrib, sparsely glandular-verrucose, lepidote. Umbels sessile or shortly pedunculate; pedicels 1.5–7 mm long. Calyx turbinate to shallowly or deeply hemispherical, 0.8–2 mm high, 1.3–3 mm wide, glandular-verrucose, lepidote. Petals elliptic, 2–3.5 mm long, yellow, lepidote abaxially. Fruit not seen.

A widespread species, found from the Eyre Penin., S.A., to Qld; 6 subspecies are recognised.

- | | | |
|----|---|----------------------------------|
| 1 | Leaves with deeply impressed midrib above | |
| 2 | Leaves linear-cuneate, c. 1 mm wide at apex; calyx shortly hemispherical | 17d. subsp. angustifolium |
| 2: | Leaves narrowly cuneate or oblong-cuneate, 2–3 mm wide at apex; calyx turbinate to deeply hemispherical | |
| 3 | Leaves sinuate; not glossy adaxially; margins flat to slightly recurved | 17a. subsp. glandulosum |
| 3: | Leaves straight-sided, glossy adaxially; margins moderately to strongly recurved | 17b. subsp. riparium |
| 1: | Leaves with midrib not or weakly impressed adaxially | |
| 4 | Leaves 2–3 cm long, 3–5 mm wide, glossy adaxially | 17c. subsp. nitidum |
| 4: | Leaves less than 1.5 cm long, 1–2.5 mm wide, not glossy adaxially | |
| 5 | Calyx shortly hemispherical, 0.8 mm long, c. 1.5 mm wide | 17e. subsp. eglandulosum |
| 5: | Calyx deeply hemispherical, 0.9–1.6 mm long, 1.8–3 mm wide | 17f. subsp. macrocalyx |

17a. *Phebalium glandulosum* Hook. subsp. *glandulosum*

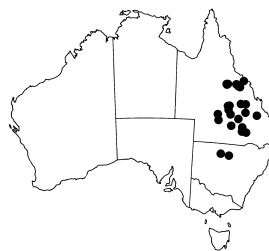
Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 302, fig. 1a (2002).

Leaves narrowly oblong, 10–30 mm long, 2–3 mm wide at apex; margins plane to slightly recurved, sinuate; adaxial surface matt, glandular-verrucose, with deeply impressed midrib; abaxial surface silvery-lepidote, sparsely verrucose, with prominent midrib. Pedicels 1.6–5.1 mm long. Calyx narrowly hemispherical to turbinate, 0.6–1.6 mm high, 1.3–2.4 mm wide,

ferruginous- to silvery-lepidote. Petals erect, c. 1.9 mm long, 1.2 mm wide, silvery- to ferruginous-lepidote. Anthers 0.5–0.9 mm long. Plate 52.

Found in Qld and in NE N.S.W. in the Gunderbrooka Ra. S of the Bourke/Cobar region. Flowers Aug.–Nov.

Qld: Muckadilla, c. 40 km W of Roma, *F.M.Bailey* (AD); SE of Surat, Thomby Ra., *S.T.Blake* 21292 (BRI). N.S.W.: Mulgowan Stn, 70 km S of Bourke, Nov. 1984, *J.Benson* (NSW).



17b. *Phebalium glandulosum* subsp. *riparium* R.L.Giles, *Austral. Syst. Bot.* 21: 284 (2008)

T: MacKillops Bridge, Snowy River Natl Park, Vic., 5 April 1996, *J.A.Jeanes* 230; holotype: MEL.

Leaves broadly oblong-cuneate, 9–20 mm long, 2–4 mm wide; margins moderately to strongly recurved, straight-edged; apex retuse to obcordate; adaxial surface smooth, glossy, prominently glandular-verrucose, with deeply impressed midrib; abaxial surface lepidote, sparsely verrucose, with prominent midrib. Pedicels 2.4–6.6 mm long. Calyx narrowly hemispherical, 0.9–1.4 mm high, 1.6–2.1 mm wide, glandular-verrucose, ferruginous-lepidote. Petals erect, c. 1.8 mm long, 1.2 mm wide, ferruginous-lepidote. Anthers 0.5–0.8 mm long.

Found in the Snowy River Natl Park in Vic. and N.S.W., particularly along the Snowy R. gorge. Grows on rocky slopes and riparian sites. Flowers Apr.–May.

N.S.W. or Vic.: Snowy R.: near 'Gentle Annie' rapid, *D.E.Albrecht* 4675 (MEL). Vic.: Tulach Ard Gorge, *N.G.Walsh* 2193 & *K.C.Norris* (BRI, HO, MEL); Long Point, *N.G.Walsh* 5575 & *R.L.Giles* (CANB, MEL, NSW).



17c. *Phebalium glandulosum* subsp. *nitidum* Paul G.Wilson, *Nuytsia* 12: 284 (1998)

T: Warrumbungle Mtns, N.S.W., 25 May 1948, *E.F.Constable*; holotype: NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 302, fig. 1d (2002).

Branches sparsely glandular-verrucose. Leaves shortly (2–3 mm) petiolate, narrowly oblong or narrowly oblong-elliptic, mostly 2–3 cm long, 3–5 mm wide; base cuneate; margins crenate and glandular-verrucose; apex truncate and slightly retuse; adaxial surface convex with shallow midrib impression, glabrous, glossy, smooth or sparsely glandular-verrucose; abaxial surface smooth apart from the prominent sparsely verrucose midrib. Pedicels slender, 5–7 mm long. Calyx hemispherical, c. 2 mm high including the c. 0.7 mm long broadly triangular lobes, glandular-verrucose.

Found in the Warrumbungle Ra. of N.S.W. where confined to rocky basalt slopes. Flowers Apr.–June.

N.S.W.: Head of Tooraweenah Ck, Warrumbungle Mtns, 18 Apr. 1952, *L.A.S.Johnson* & *E.F.Constable* (NSW).



17d. *Phebalium glandulosum* subsp. *angustifolium* Paul G.Wilson, *Nuytsia* 1: 79 (1970)

T: Murrumbo to Kerrabee, N.S.W., 9 Sept. 1951, *L.A.S.Johnson*; holotype: AD; isotype: NSW, SYD.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 302, fig. 1b (2002).

Branchlets minutely and sparsely glandular-verrucose. Leaves linear-cuneate, 5–8 mm long, 0.5–1 mm wide; margins glandular-undulate, slightly recurved; apex truncate and retuse; adaxial surface glandular-verrucose, with deeply impressed midrib. Pedicels slender, 4–5 mm long. Calyx shortly hemispherical, c. 1 mm long, 2 mm wide, glandular-undulate on margins, silvery-lepidote. Petals elliptic, 1–2 mm long.



Found in Wollemi Natl Park in the Murrumbo-Cox's Gap-Rylstone area of N.S.W. Grows along streams and in heathy woodland on soils derived from Sydney Basin sandstones. Flowers spring to early summer.

N.S.W.: Murrumbo R. E of Bylong, *T. & S. Whaite 3343* (NSW); Honeysuckle Ck, Cox's Gap, 6 Oct. 1969, *J.H. Willis* (MEL).

17e. *Phebalium glandulosum* subsp. *eglandulosum* (Blakely) Paul G. Wilson, *Nuytsia* 1: 79 (1970)

P. glandulosum var. *eglandulosum* Blakely, *Contr. New South Wales Natl Herb.* 1: 124 (1941). T: Torrington, N.S.W., 29 Sept. 1907, *R.H. Cabbage 1723*; holo: NSW.

Illustration: G.J. Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 302, fig. 1c (2002).

Branchlets minutely glandular-verrucose, closely ferruginous-lepidote. Leaves narrowly oblong-cuneate, c. 5 mm long, 1–2 mm wide; margins revolute; apex truncate and retuse; adaxial surface convex, smooth, sparsely glandular-verrucose, with midrib not impressed; abaxial surface convex, smooth. Pedicels 2–4 mm long. Calyx shortly hemispherical, c. 0.8 mm high, c. 1.5 mm wide, with broad deltate lobes, silvery- and ferruginous-lepidote. Petals spreading, broadly elliptic, c. 3 mm long, deep yellow.

Found in the Darling Downs near Thulimbah, Qld, and in the Torrington district of N.S.W. Grows in heath among granite outcrops. Flowers in spring.

Qld: E side of Passchendale State Forest, *W.J.F. McDonald 1983* (BRI). N.S.W.: Torrington, Nov. 1911, *J.L. Boorman s.n.* (NSW).

Listed as Vulnerable under the EPBC Act, 1999.



17f. *Phebalium glandulosum* subsp. *macrocalyx* R.L. Giles, *Austral. Syst. Bot.* 21: 286 (2008)

T: Goschen area, Fox Flora Res., Vic., 4 Sept. 1999, *N.G. Walsh 5096*, *J. Eichler & B. Mole*; holo: MEL.

P. sediflorum F. Muell., *Trans. Vict. Inst.* 1: 30 (1855); *Eriostemon sediflorus* (F. Muell.) F. Muell., *Fragm.* 9: 102 (1859). T: Lake Lalbert and Lake Tyrell Desert, 1854, *F. Mueller*; lecto: MEL, *vide* P.G. Wilson, *Nuytsia* 1: 78 (1970).

Leaves linear to linear-cuneate, 4–11 mm long, 1.3–2.5 mm wide; margins slightly to strongly recurved or revolute, often glandular-undulate; apex obtuse to obcordate; adaxial surface convex and glandular-verrucose, usually silvery-lepidote. Pedicels 1.9–6 mm long. Calyx deeply hemispherical, 0.9–1.6 mm long, 1.8–3 mm wide. Petals yellow, silvery-lepidote abaxially.

Found in inland areas of N.S.W., NW Vic., and the southern Eyre and Yorke Peninsulas of S.A. Occurs in sandy soils of heathland and mallee. Flowers in spring.

S.A.: c. 5 km W of Kulpara, *B. Copley 1510* (AD). N.S.W.: 35 km from L. Cargellico towards Mt Hope, *C. Dunlop 8/68* (BRI, CANB). Vic.: L. Albacutya, Sept. 1887, *C. French* (MEL).



18. *Phebalium squamulosum* Vent., *Jard. Malmaison* 2: t. 102 (1805)

Eriostemon lepidotus Spreng., *Syst. Veg.* 2: 322 (1825), *nom. illeg.* based on *P. squamulosum*. T: “originaire de la Nouvelle Galles [N.S.W.], et croissant sur les montagnes”; holo: G.

Shrub to 3 m high (to slender tree 7 m high). Branchlets lepidote, usually smooth. Leaves with petiole 0.5–4 mm long; lamina linear to oblong, elliptic, obovate or appearing subterete, 7–70 mm long, 1.5–8 mm wide, flat (or somewhat folded), entire or slightly crenulate or with recurved or revolute margins, chartaceous to coriaceous; adaxial surface smooth or glandular-verrucose, glabrous or sparsely stellate-hairy; abaxial surface densely stellate-tomentose or stellate-lepidote. Umbels sessile to pedunculate, 2–many-flowered. Pedicels

2–8 mm long. Calyx shortly to deeply hemispherical or subturbinate, 0.5–1.2 mm high, 1.5–2 mm wide, truncate to undulate (or rarely deltate-toothed), smooth or verrucose. Petals white, cream, or yellow adaxially. Cocci \pm square, shortly apiculate, 2–3 mm high.

A widespread species of eastern Australia from Qld to Vic.; 9 subspecies are recognised.

Phebalium squamulosum shows considerable variation. This species is not clearly separated from related taxa and could be enlarged so as to include *P. glandulosum* and *P. woombye*. If this were done it would contain plants of extremely diverse form and the step would necessitate the consideration of other species with the eventual amalgamation of most of the eastern states' representatives of the group. Another option would be to raise the subspecies to species level, however, due to the clinal nature of the populations a large number of plants would be intermediate in morphology between the typical variants of the species.

- | | | |
|----|---|----------------------------------|
| 1 | Leaves coriaceous, oblong-obovate to broadly obovate, to 11 mm long, loosely stellate-lepidote abaxially; margin recurved to revolute | 18i. subsp. ozothamnoides |
| 1: | Leaves coriaceous to chartaceous, linear to oblong or elliptic, 5–50 mm long | |
| 2 | Leaves linear and to 25 mm long or oblong to narrowly elliptic and to 15 mm long | |
| 3 | Leaves linear or narrowly oblong, c. 1 mm wide | |
| 4 | Leaves narrowly oblong to subterete, 6–10 mm long, prominently verrucose | 18e. subsp. parvifolium |
| 4: | Leaves linear, 10–25 mm long, entire, smooth | 18f. subsp. lineare |
| 3: | Leaves oblong or elliptic, 1.5 mm or more wide | |
| 5 | Leaves narrowly oblong or narrowly elliptic, 5–25 mm long, with adaxial surface glabrous when young; calyx \pm truncate | 18d. subsp. gracile |
| 5: | Leaves oblong or oblong-elliptic, slightly recurved, 7–10 (–12) mm long, obtuse to rounded, adaxial surface thinly lepidote when young; calyx undulate and minutely dentate | 18h. subsp. alpinum |
| 2: | Leaves elliptic or broadly elliptic to oblong, usually more than 15 mm long and 2 mm wide | |
| 6 | Stem, leaves, and calyx verrucose | 18g. subsp. verrucosum |
| 6: | Stem and leaves (and usually calyx) smooth | |
| 7 | Leaves chartaceous, stellate-lepidote adaxially at least when young | |
| 8 | Leaves narrowly oblong, obtuse to truncate or retuse, usually \pm ferruginous-lepidote | 18a. subsp. squamulosum |
| 8: | Leaves elliptic to obovate, silvery lepidote abaxially, rounded at apex; flowers silvery-lepidote | 18c. subsp. argenteum |
| 7: | Leaves chartaceous to coriaceous, always glabrous adaxially | |
| 9 | Leaves chartaceous or subcoriaceous, rounded to acute; calyx truncate | 18a. subsp. squamulosum |
| 9: | Leaves coriaceous, oblong-elliptic, obtuse to rounded, flat or conduplicate; calyx prominently undulate | 18b. subsp. coriaceum |

18a. *Phebalium squamulosum* Vent. subsp. *squamulosum*

P. aureum A.Cunn. in B.Field, *Geogr. Mem. New South Wales* 331 et t. (1825). T: Blue Mountains, N.S.W., 1822, *A. Cunningham* 26; syn: K; Blue Mountains, N.S.W., Oct. 1818, *A. Cunningham* 60; syn: MEL, BRI.

P. elaeagnifolium A.Juss., *Mem. Soc. Hist. Nat. Paris* 2: 132. t. 11, fig. 2 (1825); *Eriostemon elaeagnifolius* (A.Juss.) Baill., *Hist. Pl.* 4: 388 (1873). T: Port Jackson, N.S.W.; *n.v.*

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2a (2002).

Small shrub, Leaves oblong to elliptic, 15–50 mm long, acute to obtuse, truncate or retuse, chartaceous or subcoriaceous; adaxial surface smooth (rarely scabridulous), not glandular-

verrucose. Calyx \pm truncate, smooth, silvery- to ferruginous-lepidote. Petals cream to pale yellow, silvery- to ferruginous-lepidote abaxially. $n = 16$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954).

Occurs in SE Qld, E N.S.W., and E Vic. Flowers in spring.

Qld: Stanthorpe, 15 Sept. 1962, *G.Ward* (MEL). N.S.W.: Central Colo., 20 Aug. 1958, *E.F.Constable* (NSW); Port Jackson district, Aug. 1914, *Miss Taylor* (NSW). Vic.: Donna Buang–Healesville road., 28 Sept. 1981, *P.K.Gullan* (MEL).



This subspecies has two principal forms which are fairly widespread in N.S.W. and are well represented in herbaria. The first, which includes the type of *P. squamulosum*, has leaves elliptic, acute, entire, chartaceous or subcoriaceous, and glabrous above; it occurs near the N.S.W. coast from Botany Bay north to Patonga. The second form, which includes the types of *P. aureum* and *P. elaeagnifolium*, has leaves that are thin, oblong, with the apex bluntly retuse, the margin slightly undulate, and the upper surface often with small scattered glandular tubercles; it is found east of the Great Dividing Ra. from Jervis Bay north to near Castlereagh. In Victoria a form is found that is similar to the second of these but with the leaf slightly lepidote above. Near Stanthorpe, on the Qld–N.S.W. border, a form similar to the type form is found but with the leaves oblong and obtuse; this plant matches *P. whitei* in appearance but is much smaller in all its parts.

The style is normally glabrous, however, in specimens from near Yarra Junction, Vic., it is stellate-lepidote towards the base. The calyx, truncate in the typical form, is also not constant in shape for at Bairnsdale on the SE coast of Vic. it is broadly deltate-toothed, although in other respects this is similar to the Victorian forms of the typical subspecies.

Usually a shrub but in the mountains of SE Vic. it can form a tree to 6 m high.

18b. *Phebalium squamulosum* subsp. *coriaceum* Paul G.Wilson, *Nuytsia* 1: 82 (1970)

T: Between Camp Pincham and Camp Wombelong, Warrumbungle Mtns, N.S.W., 28 Aug. 1961, *M.E.Phillips*; holo: AD; iso: CBG.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2b (1991).

Leaves broadly oblong-elliptic, c. 25 mm long, 5 mm wide, flat or tending to folded (not recurved), obtuse to rounded, coriaceous, smooth, glabrous, drying pale green adaxially, closely silvery-lepidote abaxially. Flowers numerous in pedunculate umbels. Calyx undulate. Petals bright yellow adaxially, silvery- and rufous-lepidote abaxially.

Occurs in N.S.W. in the Warrumbungle Ra. and neighbouring ranges. Flowers in spring.

N.S.W.: Beloungery Split Rock, Warrumbungle Mtns, *L.A.S.Johnson & B.G.Briggs* 934 (NSW); Sappa Bulga Ra., 6 July 1973, *R.T.Perry* (NSW).

Differs from subsp. *squamulosum* in the shape and slight folding of the leaf, in the undulate calyx, and in the bright yellow petals.

A similar plant, but with a papery leaf, is found in the Gibraltar Ra., N.S.W.



18c. *Phebalium squamulosum* subsp. *argenteum* Paul G.Wilson, *Nuytsia* 1: 83 (1970)

T: Wreck Bay, A.C.T., 19 Sept. 1959, *J.Campbell* 80; holo: CANB.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2c (2002); N.G.Walsh & T.J.Entwistle (eds), *Fl. Victoria* 4: 189, fig. 34g (1999).

Leaves chartaceous, oblong-elliptic to broadly elliptic or oblong-obovate, 15–70 mm long, 3–10 mm wide, rounded at apex; adaxial surface with shallow midrib, stellate-lepidote when young; abaxial surface silvery-stellate-lepidote. Calyx shortly hemispherical, silvery-lepidote. Petals and ovary silvery-lepidote.

Occurs principally near the central and S coasts of N.S.W., including Jervis Bay, A.C.T., and extreme eastern Vic.; in heath on sand-stone. Flowers in spring.

N.S.W.: Bundanoon Ck, c. 11 km S of Moss Vale, 8 Oct. 1960, *E.F.Constable* (NSW). A.C.T.: Jervis Bay, June 1899, *J.H.Maiden* (NSW). Vic.: Gabo Is., *A.C.Beaglehole* 34233 (NSW).

This subspecies may be distinguished from subsp. *squamulosum* by the presence of stellate-lepidote hairs on the upper surface of the young leaf and by the shallow midrib indentation. The indumentum of the lower surface consists of stellate hairs or of trichomes intermediate between these and scales, silvery or slightly rufous. It has evident affinities with subsp. *ozothamnoides* since both subspecies have similar leaf trichomes and calyx shape. Near Port Hacking and Georges R. it grades into the thin-leaved variant of subsp. *squamulosum*.



18d. *Phebalium squamulosum* subsp. *gracile* Paul G.Wilson, *Nuytsia* 1: 83 (1970)

T: 19 miles [c. 27 km] E of Ulan, N.S.W., 9 Oct. 1959, *R.Story* 6800; holo: CANB; iso: NSW, PERTH.

Illustrations: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2e (2002); T.D.Stanley & E.M.Ross (eds), *Fl. SE Queensland* 1: 466 fig. 71H (1983).

Small shrub. Leaves small, narrowly oblong to narrowly elliptic, 5–25 mm long, rounded to acute; adaxial surface smooth, glabrous, with fine impressed midrib, coriaceous to chartaceous. Calyx shallow, truncate or undulate on margin. Petals 2–3 mm long, pale yellow.

Occurs in eastern N.S.W. from the upper Hunter Valley W to the Pilliga Scrub, and also in eastern Qld as far N as Emerald; growing in open woodland on sandstone. Flowers in spring.

N.S.W.: Gulgong, *G.W.Althofer* 59 (NSW); Murrumbo, Oct. 1893, *R.T.Baker* (NSW); 90 km ENE of Mudgee, 19 Nov. 1973, *J.B.Williams* (NSW).



18e. *Phebalium squamulosum* subsp. *parvifolium* Paul G.Wilson, *Nuytsia* 1: 83 (1970)

T: Kildary, N.S.W., 10 Oct. 1917, *W.R.A.Baker*; holo: MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2f (2002).

Branchlets glandular-verrucose. Leaves narrowly oblong to subterete, 6–10 mm long, 0.7–1 mm wide, entire or glandular-crenate, rounded at apex; adaxial surface rounded, glossy, glandular-verrucose, deeply impressed over midrib; abaxial surface smooth and ±plane to convex or rounded, coriaceous to chartaceous. Calyx truncate, 0.7 mm high, 1.5 mm wide, closely brown-lepidote.

Occurs in central N.S.W. from West Wyalong to Nymagee districts; growing on rocky ridges in sandy soils. Flowers in spring.

N.S.W.: 10 km W of West Wyalong, 2 Aug. 1973, *C.Betteridge* (NSW); 22 km S of Nymagee, *G.M.Cunningham* & *P.Milthorpe* 2732 (NSW); 'Shuttleton', *P.J.Walker* 39 (NSW).

This subspecies approaches some forms of *P. glandulosum* in having large glands on the leaves. However, in the latter species the leaves are recurved and the calyx lobed or undulate.



18f. *Phebalium squamulosum* subsp. *lineare* Paul G.Wilson, *Nuytsia* 1: 84 (1970)

T: Scone, N.S.W., 31 Aug. 1907, *R.H.Cabbage* 1671; holo: NSW; iso: CANB, SYD.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2g (2002).

Branchlets smooth, lepidote. Leaves linear, 10–25 mm long, 1 mm wide, entire, truncate to obtuse, smooth, with midrib strongly impressed adaxially, coriaceous to chartaceous. Flowers numerous on slender pedicels. Calyx very short, truncate or undulate, rufous-lepidote.

Occurs in eastern N.S.W., from the Shoalhaven R. and the Hunter Valley N to Murrurundi. Flowers in spring.

N.S.W.: Owens Gap, 13 Aug. 1969, *G.Burgess* (CANB); Denman, Nov. 1964, *J.Kennedy* (NSW).



18g. *Phebalium squamulosum* subsp. *verrucosum* Paul G.Wilson, *Nuytsia* 1: 84 (1970)

T: Tia Falls, N.S.W., Oct. 1900, *W.Forsyth*; holo: NSW.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 303, fig. 2d (2002).

Branchlets glandular-verrucose. Leaves oblong-elliptic, 15–30 mm long, flat or with slightly recurved margins, rounded to truncate or slightly retuse, chartaceous; adaxial surface stellate-hairy when young and with numerous small verrucose glands, with impressed midrib; abaxial surface smooth, densely stellate-hairy or lepidote. Calyx deeply hemispherical, prominently and acutely dentate, glandular-verrucose, silvery-lepidote. Petals silvery-lepidote.

Occurs in NE N.S.W. between Wollomombi Gorge and Gloucester Tops, N to Tia Falls; in woodland and dry rain forest on ridges. Flowers in spring.

N.S.W.: Gloucester Tops, 1 Jan. 1967, *R.Coveny* (PERTH); Wollomombi Falls, *A.G.Floyd 1087* (NSW).



18h. *Phebalium squamulosum* subsp. *alpinum* (Benth.) Paul G.Wilson, *Nuytsia* 1: 85 (1970)

P. podocarpoides F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 31 (1855); *Eriostemon alpinus* F.Muell., *Fragm.* 1: 103 (1859), *nom. illeg.*; *P. squamulosum* var. *alpinum* Benth., *Fl. Austral.* 1: 343 (1863); *P. alpinum* (Benth.) Maiden & Betche, *Census New South Wales Pl.* 116 (1916), *nom. illeg.*, *superfl.* T: Mt Buller, Vic., Mar. 1853, *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 85 (1970).

Illustration. N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 189, fig. 34h (1999).

Small compact shrub c. 1 m high, lower branches frequently prostrate. Leaves oblong to oblong-elliptic, 7–12 mm long, 1.5–2.5 mm wide, entire, slightly recurved, obtuse to rounded, coriaceous; upper surface smooth, glossy (thinly lepidote when young); lower surface closely silvery- to ferruginous-lepidote. Umbels sessile, c. 5-flowered; pedicels 2–3 mm long. Calyx shortly hemispherical, undulate and minutely dentate, ferruginous-lepidote. Petals white to yellow, ferruginous-lepidote abaxially.

Occurs in E Vic. and SE N.S.W.; in alpine heath. Flowers spring.

N.S.W.: Schlink Pass, Kosciusko Natl Park, *J.Thompson 2742* (NSW).
Vic.: Mt Nelse, *S.J.Forbes 781* (MEL); Reservoir Rd, Mt Buffalo, *M.A.Todd 195* (MEL).

This subspecies in its typical form is restricted to Vic. In the Snowy Mtns of N.S.W. the plant here referred to as subsp. *alpinum* is intermediate between the typical form and subsp. *ozothamnoides*.



18i. *Phebalium squamulosum* subsp. *ozothamnoides* (F.Muell.) Paul G.Wilson, *Nuytsia* 1: 86 (1970)

P. ozothamnoides F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 31 (1855); *Eriostemon ozothamnoides* (F.Muell.) F.Muell., *Fragm.* 1: 103 (1859). T: Upper Mitta Mitta, Vic., *F.Mueller*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 86 (1970); isolecto: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 304, fig. 2h (2002).

Compact shrub 1–2 m high. Leaves oblong-obovate to broadly obovate, cuneate or suborbicular, 11 mm long and 3.5 mm wide to 7 mm long and 6 mm wide, entire, recurved to revolute, rounded at apex, coriaceous; adaxial surface sparsely stellate-hairy to glabrous (always stellate-hairy when young), smooth or scabrid, with midrib not impressed; abaxial surface smooth, loosely stellate-lepidote. Umbels sessile, 2–5-flowered; pedicels 4–5 mm long. Calyx hemispherical c. 1 mm high, 2 mm wide, truncate to shortly (rarely deeply) lobed, silvery-lepidote or silvery- and ferruginous-lepidote abaxially. Petals c. 4 mm long, yellow adaxially, silvery- to ferruginous-lepidote abaxially. *n* = 32, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954) as *P. ozothamnoides*.

Occurs in NE Vic. and eastern N.S.W. at high altitudes. Flowers in spring.

N.S.W.: Coxs R., Oct. 1904, *J.H.Maiden* (NSW). A.C.T.: Mt Gingera, Brindabella Ra., *M.Evans* 2563 (NSW). Vic.: summit of Mt Tingiringi, 30 Nov. 1962; *J.H.Willis* (MEL); Buchan R. Gorge, *N.G.Walsh* 2056 (MEL).

This subspecies shows considerable variation: in Vic. the calyx is truncate; in the Snowy Mtns of N.S.W. it is \pm lobed; in the Blue Mtns (N.S.W.) it is again truncate; however, farther N near Backwater (NE of Guyra) the calyx is deeply lobed, turbinate in outline, and approaches the southern form of *P. woombye* (which, however, has leaves glabrous above). See also under subsp. *alpinum*.



19. *Phebalium distans* P.I.Forster., *Austrobaileya* 6: 438 (2003)

T: Mt Walla, Walla Ra., 5 km SW of Coalstoun Lakes, Qld, 13 Sept. 2002, *P.I.Forster* 28831; holo: BRI *n.v.*

Illustration: P.I.Forster, *op. cit.* 439, fig. 1.

Small tree to 8 m high (shrub-like when young). Branchlets sparsely glandular-tuberculate, densely lepidote. Leaves with petiole 1.7–3 mm long; lamina linear, 14–62 mm long, 0.5–0.8 mm wide, recurved, entire or sinuate to crenulated near apex, apiculate to shortly acuminate, chartaceous; adaxial surface with sunken midrib, glossy, dark green, sparsely glandular, glabrous; abaxial surface with strongly raised midrib, densely lepidote. Umbels many-flowered; pedicels 4–5 mm long with dense stellate hairs. Calyx shortly subturbinate, 0.8–1 mm long, 1.7–1.8 mm diam., glabrous adaxially, markedly glandular-verrucose abaxially and with sparse stellate hairs; lobes broadly triangular, c. 0.3 mm long. Petals elliptic, 3–3.2 mm long, densely lepidote abaxially. Cocci erect, 3.5–4 mm long, 2.5–3 mm wide.

Found in SE Qld at 3 localities: Mt Berryman, near Kingaroy, and Mt Walla; growing in semi-evergreen vine thickets in red volcanic soils. flowers Aug.–Sept.

Qld: Mt Berryman area, Nov. 1991, *L.H.Bird* (BRI); 3 km SE of Kingaroy, *P.I.Forster* 29129 (BRI); 3 km SW of Coalstoun Lakes, Walla Ra., *Randall* 613 (BRI).

This species is unusual in the genus in that in its mature state it is a tree. Listed as Critically Endangered under the EPBC Act, 1999.



20. Phebalium longifolium S.T.Blake, *Proc. Roy. Soc. Queensland* 70: 44 (1959)

P. squamulosum subsp. *longifolium* (S.T.Blake) Paul G.Wilson, *Nuytsia* 1: 85 (1970). T: W of Ingham, near Wallaman Falls, Qld, 14 Aug. 1951, *S.T.Blake 18809*; holo: BRI.

Illustration: P.I.Forster, *Austrobaileya* 6: 443, fig. 2 (2003).

Shrub to 3 m high; branchlets smooth, densely lepidote. Leaves with petiole 1.7–3 mm long, densely lepidote; lamina narrowly elliptic to narrowly oblanceolate, 15–80 mm long, 2.5–10 mm wide, flat, entire or sinuate or minutely dentate on margin, acute, chartaceous; adaxial surface with sunken midrib, glossy, dark-green, \pm glabrous, sparsely glandular-verrucose; abaxial surface with prominent midrib, densely ferruginous-lepidote. Umbels pedunculate, few-flowered; pedicels 5–12 mm long, densely lepidote. Calyx shortly sub-turbinate, 0.7–1.4 mm long, 2.2–3 mm diam., glabrous adaxially, densely lepidote abaxially, smooth; lobes broadly triangular, 0.3–0.5 mm long. Petals elliptic, c. 3 mm long, cream, densely lepidote abaxially. Cocci 3–3.5 mm long.

Occurs in NE Qld from the Herberton Ra. S to the Paluma Ra. Found on the edge of rain-forest. Flowers June–Sept.

Qld: W edge of Mt Spec, *D.F.Blaxell 1618* (NSW); Longlands Gap, *P.I.Forster 16776* (BRI); 6 km W of Paluma, *P.C.Jobson 508* (MEL).

**21. Phebalium daviesii** Hook.f., *Fl. Tasman.* 2: 358 (1859)

P. glandulosum var. *daviesii* (Hook.f.) Benth., *Fl. Austral.* 1: 342 (1863); *Eriostemon daviesii* (Hook.f.) F.Muell., *Proc. Roy. Soc. Tasmania* 1879: App. 6 (1880). T: Near St. Helens Bay, Tas., *R.H.Davies*; holo: K.

Slender shrub; branchlets smooth or minutely glandular-verrucose, closely lepidote. Leaves shortly petiolate, narrowly oblong-cuneate, 20 mm long, entire, revolute, retuse to obcordate and 1–3 mm wide at apex; adaxial surface smooth or sparsely glandular and verrucose, glabrous, with midrib deeply impressed; abaxial surface smooth, densely silvery-lepidote, with prominent midrib. Umbels sessile; pedicels c. 4 mm long. Calyx shortly hemispherical, 1–1.5 mm high, 2 mm wide, with low, broadly deltate teeth, slightly glandular-verrucose, closely lepidote. Petals broadly elliptic, c. 3 mm long, 2 mm wide, white adaxially, silvery- and ferruginous-lepidote abaxially. Fruit and seed not seen.

Occurs near George Bay, E coastal Tas. Flowers Sept.–Nov.

Tas.: George Bay, *A.Simson 684* (MEL).

Listed as Critically Endangered under the EPBC Act, 1999.

**22. Phebalium whitei** Paul G.Wilson, *Nuytsia* 1: 87 (1970)

P. squamulosum var. *grandiflorum* C.T.White, *Proc. Roy. Soc. Queensland* 50: 69 (1939). T: Wyberba, Qld., Sept. 1932, *N.Gunn*; holo: BRI.

Shrub to 1 m high; branchlets closely silvery- and ferruginous-lepidote. Leaves with petiole 3–6 mm long; lamina oblong-elliptic, (7–) 10–70 mm long, c. 15 mm wide, broadly cuneate at base, entire, somewhat recurved, rounded at apex, coriaceous; adaxial surface smooth, glabrous, with midrib prominently impressed; abaxial surface closely silvery-lepidote. Umbels sessile, 1–4 (–6)-flowered; pedicels thick, 2–4 mm long. Calyx hemispherical, 2.5 mm high, 3.5 mm wide, almost truncate, closely silvery- and ferruginous-lepidote. Petals elliptic or obovate, c. 9 mm long, 3 mm wide, bright yellow adaxially, silvery-lepidote abaxially in lower half, ferruginous-lepidote in upper half. Fruit not seen.

Occurs in the border mountains of SE Qld near Wallangarra. Flowers June–Sept.

Qld: Wyberba, *J.Galbraith 28* (MEL); Lyra, June 1921, *W.R.Petrie* (BRI).



This species resembles *P. squamulosum* subsp. *squamulosum*, and a form of the latter found at Stanthorpe has a similar but smaller leaf. Listed as Vulnerable under the EPBC Act, 1999.

23. *Phebalium woombye* (F.M.Bailey) Domin, *Repert. Spec. Nov. Regni Veg.* 12: 133 (1913)

Asterolasia woombye F.M.Bailey, *Queensland Agric. J.* 3: 281 (1898). T: Woombye, Qld, *W.French*; iso: K.

A. woombye var. *intermedia* F.M.Bailey, *Queensland Agric. J.* 16: 189 (1905). T: Mount Coolam [= Mt Coolum], Qld, *W.Fawcett-Story*; iso: K.

A. woombye var. *parvifolia* F.M.Bailey, *loc. cit.* T: Mount Coolam [= Mt Coolum], Qld, *W.Fawcett-Story*; iso: K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 304 (2002).

Shrub to 2 m high; branchlets stellate-lepidote. Leaves shortly petiolate, elliptic to broadly elliptic, from 15 mm long and 2–11 mm wide to 60 mm long and 9 mm wide, entire, obtuse to rounded, chartaceous; adaxial surface flat, smooth, glabrous, with midrib impressed; abaxial surface smooth with prominent midrib, silvery-lepidote. Umbels 4–10-flowered. Pedicels 4–15 mm long. Calyx turbinate, c. 3 mm long including the narrowly deltate teeth c. 1.5 mm long, silvery- to silvery- and ferruginous-lepidote on both sides. Petals obovate, to 6 mm long, 2.5 mm wide, white adaxially (to pink in inland form), ferruginous-lepidote abaxially. Fruit not seen.

Occurs in SE Qld and NE N.S.W.; principally in coastal dunes, but also at some inland localities. Flowers July–Aug.

Qld: Near Noosa Heads, *W.E.Fisher* 163 (NSW); Nambour district, July 1964, *G.Ward* (NSW). N.S.W.: Middle Ck W of Glenreagh, 28 Aug. 1971, *K.Grieves* (NSW).

Phebalium woombye shows considerable morphological variation over its geographical range. In the typical form the leaves are smooth and glabrous above and the petals are white. This form is found at or near the coast of SE Qld from near Middle Is. in the north to Morton Is. in the south. Somewhat inland, from Rockhampton in the north to Biggenden, Gundiah, Glenbar and Canungra in the south, is found a form in which the upper surface of the leaves is wrinkled (when dry) and stellate-hairy (when young), the lower surface is stellate-hairy rather than lepidote, and the petals are white to pink. These are characters associated with *P. nottii* and it is possible that this form is an easterly remnant of a topocline between the two species.

Near Miles (SE Qld) is found a form which in floral characters is intermediate between *P. woombye* and *P. nottii* but in foliage is similar to the N.S.W. form of *P. nottii*, i.e. the leaves are narrowly oblong with recurved to revolute margins. The specimens from Canungra (the southernmost locality record) have the calyx only sparsely lepidote adaxially, which suggests an approach to *P. squamulosum* subsp. *argenteum*.



24. *Phebalium nottii* (F.Muell.) Maiden & Betche, *Proc. Linn. Soc. New South Wales* 23: 773 (1899)

Eriostemon nottii F.Muell., *Fragm.* 6: 22 (1867); *Crowea nottii* (F.Muell.) Baill., *Hist. Pl.* 4: 463 (1873). T: "In montibus Newcastle-Range"; Dev. ranges [? Dividing Range] Flinders and Burdekin rivers, Qld, *J.Sutherland* 98; holo: MEL; iso: BRI, K.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 304 (2002).

Shrub to 3 m high; branchlets closely lepidote. Leaves thin; petiole 2–4 mm long; lamina oblong-elliptic to elliptic, from 20 mm long and 4 mm wide to 50 mm long and 9–13 mm wide, flat or slightly recurved; adaxial surface smooth, glabrous, with midrib impressed; abaxial surface smooth, closely silvery-stellate-lepidote. Umbels 1–6-flowered; pedicels 2–5 mm long. Calyx cup-shaped, 5–8 mm high, 5–6 mm wide (including the 5–8 deltate to narrowly triangular teeth of 2–3 mm), silvery- to ferruginous-stellate-lepidote adaxially and abaxially,

enlarging in fruit. Petals 5–8, erect, narrowly obovate to spatulate, 8–12 mm long, 3–4 mm wide, pink to deep mauve, ferruginous-lepidote abaxially. Fruit not seen.

Occurs in inland eastern Qld and NE N.S.W.; in dry sclerophyll forest on sandstone. Flowers in spring.

Qld: Isla Gorge, *S.L. Everist 8034* (NSW); c. 37 km ESE of Rolleston, *M. Lazarides & Story 113* (NSW). N.S.W.: Upper Copmanhurst, Oct. 1909, *J.L. Boorman* (NSW); Whiskey-still Gully, Punchbowl, 27 Sept. 1970, *K. Grieses* (NSW).

Phebalium nottii is characterised by its deeply cup-shaped calyx which has up to 8 lobes and by its equivalent number of petals, stamens and carpels. The petals are narrow, sometimes clawed, and pink to mauve in colour.

Phebalium nottii inhabits mountainous country and appears to have a disjunct distribution. Over its geographical range it shows considerable morphological variation in both leaf and flower form, with generally an increase in flower size from south to north. With this goes a change in petal shape from narrowly obovate to unguiculate, and a change in bud shape from ellipsoidal (with flattened apex) in the south to spherical in the north. The number of floral parts varies between different flowers on the same plant and it is difficult to make accurate counts on herbarium specimens. However, in the south (near Peak Hill) the flowers appear to be predominantly 5- or 6-merous while in the north (Expedition Ra.) they are normally 7- or 8-merous.

The typical form of *P. nottii* is found in mountain ranges 100–200 km from the sea, whereas *P. woombye* is near-coastal. In the intervening country in southern Qld are found plants intermediate between the two species that may represent remnants of a cline which is now only known from a few localities, e.g. from Gundiah, Biggenden and Miles (see also notes under *P. woombye*).



25. *Phebalium bifidum* P.H. Weston & M. Turton, *Telopea* 10: 788 (2004)

T: Capertee Valley, Central Tablelands, N.S.W., 29 Aug. 2003, *P.H. Weston 2609*, *D.M. Crayn*, *J. Allen* & *H. Washington*; holo: NSW *n.v.*; iso: PERTH.

Illustration: P.H. Weston & M. Turton, *op. cit.* 789, fig. 1.

Erect shrub to 1.5 m high; branchlets densely lepidote, smooth. Leaves shortly petiolate, Y-shaped, bilobed, to 14 mm long, entire, revolute; proximal portion of lamina narrowly oblong to narrowly cuneate, to 10 mm long and 1.8 mm wide; lobes oblong or tapering to a truncate or obtuse apex, to 3 mm long, and 1.2 mm wide; adaxial surface dark green, lightly verrucose, sparsely lepidote becoming \pm glabrous, with midrib distinctly impressed; abaxial surface densely lepidote, with prominent midrib. Umbels sessile or shortly pedunculate, predominantly terminal; pedicels 2.5–7.5 mm long, densely lepidote. Calyx cup-shaped, 0.9–1.6 mm long, 2.0–2.5 mm wide, smooth or slightly verrucose, densely lepidote, truncate to obtusely lobed. Petals spreading, \pm elliptic, c. 3 mm long, cream to bright lemon yellow adaxially, abaxially densely lepidote with glossy scales cream towards base and ferruginous distally. Fruit not seen.

Known only from Capertee Valley, N.S.W.; growing in sclerophyll woodland and heath. Flowers Aug.–Oct.

N.S.W.: Capertee, 24 Sept. 1998, *M. Turton* (NSW); Capertee Valley, 29 May 2001, *H. Washington* (NSW).



26. *Phebalium obcordatum* A.Cunn. ex Benth., *Fl. Austral.* 1: 342 (1863)

Eriostemon mortonii F.Muell., *Fragm.* 9: 108 (1875), based on above [*non E. obcordatus* Hook. (1834)]. T: SW of St. Georges Ra., N.S.W., June 1817, *A.Cunningham* 164; holo: K, iso: MEL.

Illustration: G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 304 (2002).

Shrub to 1.3 m high. Branchlets smooth. Leaves broadly obovate to obcordate, 2–3.5 mm long, 1.5–2.5 mm wide, entire; adaxial surface flat and slightly channelled in middle (no definite midrib) with 2–8 hemispherical glandular pustules; abaxial surface densely silvery-lepidote. Umbels small, sessile, frequently on short lateral branchlets; pedicels 2–3 mm long. Calyx shortly hemispherical, 0.5–1 mm high, 1–2 mm wide, undulate to truncate, smooth, silvery- to ferruginous-lepidote. Petals elliptic, 2.5 mm long, 1.5 mm wide, pale yellow, silvery-lepidote abaxially. Fruit not seen.

Occurs in central N.S.W.; on hilly areas in woodland. Flowers late winter–early spring.

N.S.W.: c. 24 km S of Mt Hope, 16 Sept. 1969, *G.W.K.Dumbleton* (NSW); ridge of Mt Brogden, *M.D.Fox* 8208498 & *H.Fallding* (NSW); W of Cookeys Plains, 6 Aug. 1987, *G.W.Horton* (NSW).

The leaves are conduplicate when first formed and this type of aestivation causes the mature leaves to be grooved above whereas in the otherwise similar species *P. festivum* they are smooth.

**27. *Phebalium festivum*** Paul G.Wilson, *Nuytsia* 12: 283 (1998)

T: Flagstaff Hill, 5.5 miles [c. 8.8 km] N of Eaglehawk, Vic., 30 Sept. 1952, *R.Melville* 1254; holo: MEL; iso: K *n.v.*

Phebalium sp. 1, M.F.Duretto in N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 188 (1999).

Illustration: N.G.Walsh & T.J.Entwisle (eds), *op. cit.* 192, fig. 35a.

Shrub c. 0.6 m high; branchlets slender, smooth. Leaves oblong to broadly elliptic or obcordate, 2–3 mm long, 1–1.5 mm wide, recurved and slightly crenulate at margins, rounded at apex, coriaceous; adaxial surface convex and almost smooth; abaxial surface silvery-lepidote. Umbels small, sessile, 3–10-flowered; pedicels c. 1.5 mm long. Calyx shortly hemispherical, 1–1.5 mm high, undulate to truncate, smooth, silvery- to ferruginous-lepidote. Petals elliptic, 2.5 mm long, 1.5 mm wide, white or very pale yellow, reddish brown-lepidote abaxially. Fruit not seen.

Found near Bendigo in western Vic.; growing in open eucalypt forest. Flowers spring–summer.

Vic.: Gobarup Flora Res., *A.C.Beaglehole* 68931 (MEL); Painswick, near Dunolly, 18 Mar. 1961, *M.E.Phillips* (AD); Tarnagulla State Forest, 28 Aug. 1979, *P.G.Smith* (MEL).

This species differs from *P. obcordatum* principally in the shape of the leaves and in their smooth slightly convex upper surface which lacks a medial groove.

**28. *Phebalium stenophyllum*** (Benth.) Maiden & Betche, *Census New South Wales Pl.* 116 (1916)

P. squamulosum var. *stenophyllum* Benth., *Fl. Austral.* 1: 343 (1863); *Eriostemon stenophyllus* (Benth.) F.Muell., *Second Syst. Census Austral. Pl.* 19 (1889). T: Mt Abrupt, Grampians, Vic., *J.Dallachy*; lecto: MEL, *fide* P.G.Wilson, *Nuytsia* 1: 91 (1970).

Illustrations: N.G.Walsh & T.J.Entwisle (eds), *Fl. Victoria* 4: 192 fig. 35b (1999); G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 304 (2002).

Shrub c. 1 m high. Branchlets closely fulvous- to ferruginous-lepidote. Leaves shortly petiolate, narrowly oblong in outline, 4–20 mm long, 0.8–2 mm wide, recurved to tightly revolute, obtuse; adaxial surface convex, smooth, with no visible midrib, glabrous or nearly so (lepidote when young); abaxial surface smooth, stellate-lepidote, often obscured. Umbels

sessile, 3–10-flowered; pedicels slender, 3–8 mm long. Calyx hemispherical, 1 mm high, 2 mm wide, truncate (or undulate in N.S.W.), smooth, silvery- to ferruginous-lepidote. Petals elliptic, 3.5–4.5 mm long, 2 mm wide, yellow adaxially, lepidote abaxially (ferruginous in upper half, silvery in lower). Fruit not seen.

Occurs in western Vic. and central N.S.W.; recorded from SE S.A. in J.P.Jessop & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 2: 792 (1986). Flowers spring.

N.S.W.: c. 3.2 km W of Timor Rock, *B.G.Briggs* 919 (NSW); Mt Woorut, *H.Streimann* 617 (NSW). Vic.: WNW of Mt Zero, *A.C.Beauglehole* 28230 (MEL); 29 km S of Nhill, *M.G.Corrick* 6780 (MEL).

The variant of *P. stenophyllum* found in central N.S.W. closely resembles the variant from western Vic., however, specimens from N.S.W. have the leaves slightly glandular-pustulate and the calyces undulate (not truncate), while the flowers are slightly larger than those from Vic. The N.S.W. variant is similar to some forms of *P. glandulosum* subsp. *eglandulosum*.



18. MICROCYBE

Paul G. Wilson

Microcybe Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 166 (1852); from the Greek *micros* (small) and *kybe* (head), referring to the small flower heads.

Type: *M. multiflora* Turcz.

Undershrubs; branches smooth or verrucose, densely stellate-lepidote when young. Leaves alternate, simple, small, entire, revolute, stellate-lepidote below. Flowers clustered in a compact terminal head or solitary (*M. ambiguum*), small, sessile, subtended by foliar bracts. Sepals usually 5, free or united below. Petals 5, free, slightly imbricate in bud, narrowly elliptic, 2–3 mm long, with prominent subterminal gland, glabrous or sparsely to densely stellate-lepidote abaxially. Stamens 10, free, exceeding petals; filaments slender, glabrous or stellate-pilose; anthers ±basifixed, cordate-orbicular, c. 0.7 mm long, with small terminal gland. Disc absent. Ovary stellate-lepidote; carpels 2–4, free, not apiculate. Cocci hemispherical. Seed oblong-reniform; axial endocarp thin, caducous; aril linear; sclerotesta longitudinally rugulose; hilum linear; raphe small, shrunken.

An endemic Australian genus of 4 species found in southern W.A., southern S.A., and western Vic.

Microcybe is morphologically very similar to *Phebalium* and the molecular data (see Mole *et al. op. cit.*) supports this relationship. *Microcybe ambigua* is anomalous in the genus and could be segregated as a monotypic genus or the whole of *Microcybe* could be united with *Phebalium*.

B.J.Mole *et al.*, Molecular phylogeny of *Phebalium* (Rutaceae: Boronieae) and related genera based on the nrDNA regions ITS 1+2, *Pl. Syst. Evol.* 249: 197–212 (2004).

- | | |
|--|-------------------------|
| 1 Flowers solitary | 4. <i>M. ambigua</i> |
| 1: Flowers clustered | |
| 2 Leaves subterete due to revolute margins, minutely and sparsely scabridulous and glandular-punctate | 2. <i>M. pauciflora</i> |
| 2: Leaves subterete to narrowly oblong, deltate, or ovate, glandular-punctate to glandular-verrucose, otherwise smooth | |
| 3 Leaves spreading or divaricate to erect; petals glabrous or sparsely stellate-ciliate | 1. <i>M. multiflora</i> |
| 3: Leaves spreading or reflexed; petals sparsely silvery-stellate-lepidote | 3. <i>M. albiflora</i> |

1. *Microcybe multiflora* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 166 (1852)

T: W.A., *J.Drummond* 5: 211; holo: KW (photo seen); iso: MEL, PERTH, TCD.

Subshrub 0.2–1 m high. Branchlets glandular-verrucose or smooth. Leaves sessile, spreading, subterete, obtuse and to 8 mm long, 1.5 mm wide, to erect, deltate or narrowly deltate or broadly ovate, closely revolute, channelled abaxially, often glandular-verrucose, otherwise smooth. Inflorescences 10–20-flowered. Sepals ranging from free, linear-spathulate and c. 1 mm long to somewhat united, deltate and c. 0.5 mm long, stellate-pilose to lepidote. Petals glabrous or sparsely stellate-ciliate, white to pale yellow. Staminal filaments glabrous. Fruiting cocci verrucose and slightly transversely rugulose.

Found from southern W.A. to western Vic. Two subspecies are recognised, which are to some extent sympatric and intergrade over part of their range in W.A. and S.A.

Leaves spreading, semiterete

1a. subsp. *multiflora*

Leaves erect and appressed or slightly spreading, deltate or broadly ovate

1b. subsp. *baccharoides*

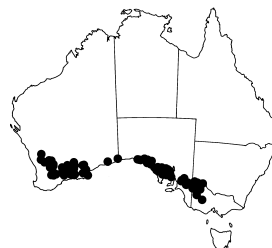
1a. *Microcybe multiflora* Turcz. subsp. *multiflora*

Phebalium capitatum S.Moore, *J. Linn. Soc. Bot.* 45: 165 (1920). T: Bruce Rock, W.A., *F.Stoward* 432; holo: BM *n.v.*

Branches ±glandular-verrucose. Leaves from divaricate, semiterete, strongly glandular-undulate, obtuse and 5–8 mm long, to ascending, narrowly deltate, thick, not undulate and 2.5 mm long. Plate 54; Fig. 67A–I.

Found in W.A. from Wongan Hills SE to Ravensthorpe and E through southern S.A. across the Nullarbor and northern Eyre Penin. to NW Vic.; generally on loam to clay soils. Flowers July–Nov.

W.A.: 25 km S of Salmon Gums, *E.M.Bennett* 2160 (PERTH); Wongan Hills, *K.F.Kenneally* 7702 (PERTH). S.A.: 16 km E of Kimba, 30 Sept. 1961, *J.H.Willis* (MEL). Vic.: 19 km SSW of Werrimull, *N.G.Walsh* 2625 (MEL).



In W.A., in the NW part of its range, the leaves are divaricate, semiterete and to 8 mm long and the sepals although initially short, broad, and united towards the base become irregularly separated on the expansion of the bud. In the southern part of its range in W.A. the leaves are slightly ascending, 3–4 mm long and semiterete to narrowly deltate, the sepals are free and narrowly spatulate. The variant found in central and eastern S.A. and western Vic. has ascending, narrowly deltate leaves c. 2.5 mm long.

In areas of W.A. and S.A. where subsp. *baccharoides* also occurs plants intermediate between that subspecies and the local variant of subsp. *multiflora* are found.

1b. *Microcybe multiflora* subsp. *baccharoides* (F.Muell.) Paul G.Wilson, *Nuytsia* 12: 87 (1998)

Eriostemon capitatus var. *baccharoides* F.Muell., *Fragm.* 9: 107 (1875); *Microcybe multiflora* var. *baccharoides* (F.Muell.) Ewart & Tovey, *Proc. Roy. Soc. Victoria* ser. 2, 32: 201 (1920). T: Near Port Eucla, W.A. or S.A., 1870, *J.Forrest*; lecto: MEL, *fide* P.G.Wilson, *loc. cit.*

Branchlets smooth. Leaves erect, appressed and obscuring the stem or very slightly spreading, broadly ovate or deltate, thick, not glandular-undulate, 2–2.5 mm long. Fig. 67A–I.

Found in SE W.A. from near Ravensthorpe E to Eucla and then to Eyre Penin., S.A. Flowers May–Nov.

W.A.: 6 km SSW of Mt Newmont, *W.R.Archer* 22099020 (PERTH); 25 km ESE of Cocklebiddy, *G.J.Keighery* 7896 (PERTH). S.A.: Bratten Monument, Lincoln Hwy, *J.D.Briggs* 1385 (MEL); 3.5 km E of W.A. border, *R.J.Chinnock* 3348 (PERTH).



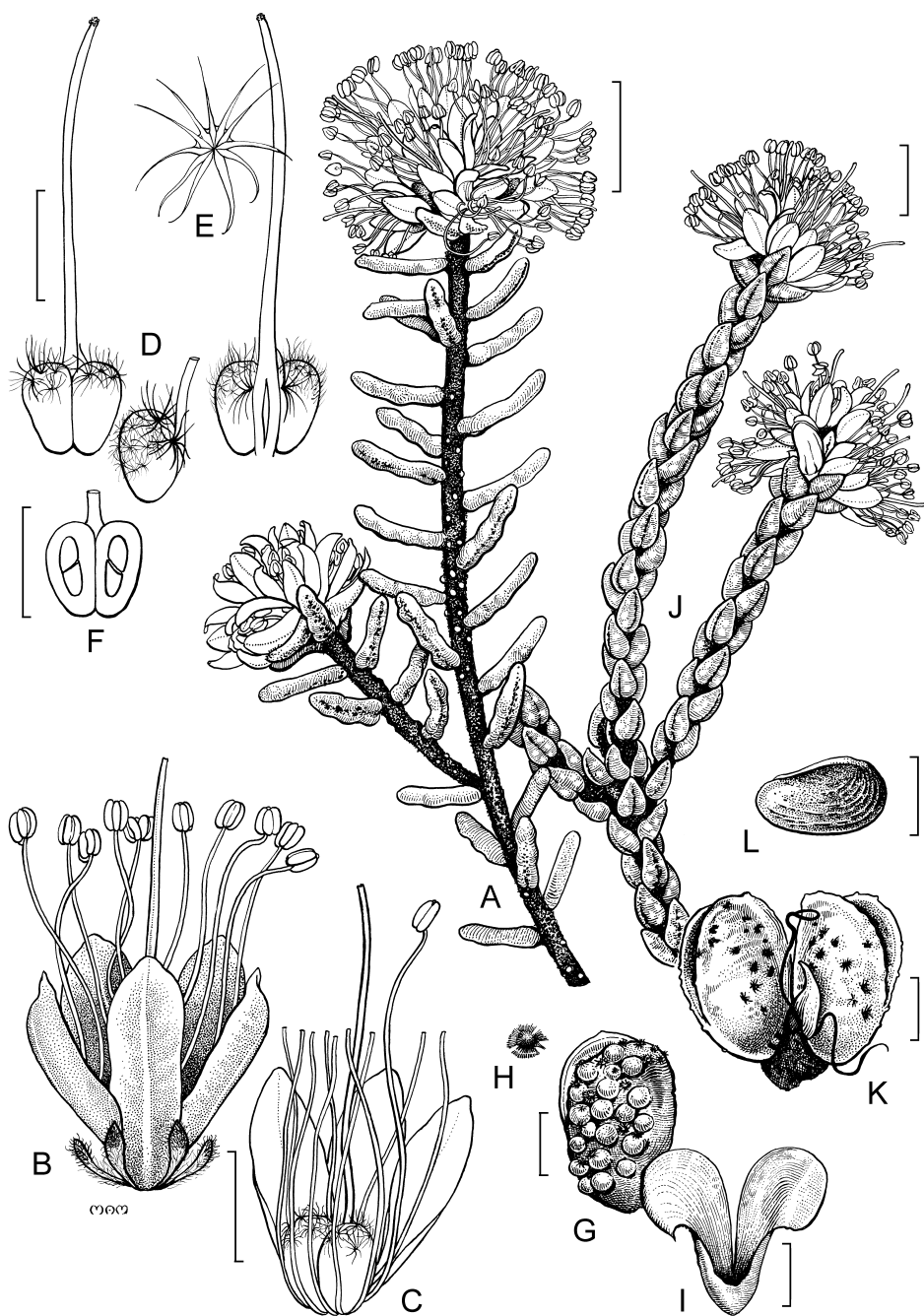


Figure 67. *Microcybe*. **A–I**, *M. multiflora* subsp. *multiflora*. **A**, habit; **B**, flower; **C**, flower (dissected); **D**, pistil, various views; **E**, hair detail; **F**, carpels L.S.; **G**, coccus; **H**, indumentum detail; **I**, endocarp (**A–I**, drawn from fresh material, voucher not recorded). **J–L**, *M. multiflora* subsp. *baccharoides*. **J**, habit; **K**, cocci; **L**, seed (**J–L**, drawn from fresh material, voucher not recorded). Scale bars: **A**, **J** = 5 mm; **B–D**, **F** = 2 mm; **G**, **I**, **K**, **L** = 1 mm. Drawn by M. Wilson.

The type of this subspecies has slightly spreading leaves and was presumably part of an intergrade between the variant with tightly appressed leaves and the local variant of subsp. *multiflora*.

The variant with small (c. 2 mm long), closely appressed, broadly ovate leaves is found from Lake King in W.A. eastwards to the Great Australian Bight and central Eyre Penin.; it is evidently confined to calcareous soils.

2. *Microcybe pauciflora* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 167 (1852)

T: W.A., *J.Drummond* 5: 209; holo: KW (photo seen); iso: MEL, TCD.

Subshrub 0.15–1 m high. Branchlets smooth, silvery-stellate to lepidote. Leaves subsessile, spreading, subterete due to the revolute margins, 4–16 mm long, 1–2.5 mm wide; adaxial surface glandular-punctate and sparsely scabridulous from persistent hair bases. Inflorescence 5–12-flowered. Sepals free, narrowly oblong, 1–2 mm long, stellate-lepidote. Petals glabrous or sparsely stellate, pale yellow. Staminal filaments stellate-lepidote near base. Fruiting cocci pitted, otherwise smooth.

Found from southern W.A. to NE Vic. Two subspecies are recognised.

Leaves 4–10 mm long; petals glabrous

2a. subsp. *pauciflora*

Leaves 14–16 mm long; petals sparsely stellate

2b. subsp. *grandis*

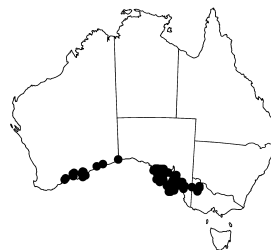
2a. *Microcybe pauciflora* Turcz. subsp. *pauciflora*

Asterolasia chorilaenoides F.Muell., *Defin. Austral. Pl.* 38 (1855); *Eriostemon capitatus* F.Muell., *Fragm.* 1: 106 (1859), *nom. illeg.*, *A. chorilaenoides* in syn. T: Near L. Hamilton, S.A., *C.Wilhelmi*; holo: MEL; iso: TCD.

Leaves 4–10 mm long, c. 1 mm wide, stellate-lepidote abaxially. Flower heads subtended by foliar bracts equal to or shorter than head. Sepals c. 1 mm long. Petals glabrous.

Found from West Mt Barren in W.A. E along the Great Australian Bight to southern S.A. and NE Vic.; generally found in calcareous soils. Flowers Aug.–Nov.

W.A.: 10 km N of Eyre, *G.J.Keighery* 7548 (PERTH); East Mt Barren, *W.Stevenson* 1173a (PERTH). S.A.: Lincoln Natl Park, *N.N.Donner* 11116 (MEL); 5 km W of Murray Bridge, *B.Nordenstam* 1065 (MEL). Vic.: Murrayville, 30 Dec. 1916, *H.B.Williamson* (MEL).



2b. *Microcybe pauciflora* subsp. *grandis* Paul G.Wilson, *Nuytsia* 12: 88 (1998)

T: Hatter Hill, W.A., 16 Sept. 1989, *G.Barrett* HAT 24; holo: PERTH.

Leaves 14–16 mm long, c. 2 mm wide, stellate-velvety abaxially. Flower heads subtended by leafy bracts exceeding the head. Sepals 1.5–2 mm long. Petals sparsely stellate abaxially.

Found on and near Hatter Hill, 40 km NE of L. King, and in the Bremer and Ravensthorpe Ranges, southern W.A.; growing on heavy soil. Flowers June–Dec.

W.A.: Bremer Ra., *B.Archer* 2206 (PERTH); Near Hatter Hill, *K.Newbey* 6546 (PERTH).



3. *Microcybe albiflora* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 25/2: 167 (1852)

T: W.A., *J.Drummond* 5: 210; holo: KW (photo seen); iso: MEL, PERTH.

Subshrub 0.1–0.6 m high. Branchlets silvery-lepidote when young. Leaves sessile, spreading or reflexed, flattened, ovate to narrowly oblong, 3–5 mm long, c. 1 mm wide, revolute (but not entirely obscuring abaxial surface), glandular-punctate to -verrucose but otherwise smooth. Inflorescence c. 10-flowered. Calyx c. 1.2 mm high, deeply lobed; lobes with a subterminal

gland, sparsely lepidote, ciliate. Petals pale cream, sparsely stellate-silvery-lepidote abaxially. Staminal filaments glabrous or slightly pilose near base. Cocci glandular-punctate, stellate-lepidote.

Found in southern W.A. from near Ongerup E to Mt Heywood; generally growing in loam or gravel. Flowers opportunistically throughout the year.

W.A.: 24 km ENE of Mt Heywood, *W.R.Archer 1711906* (PERTH); 30 km SW of Lake King, *D.J.Backshall 112* (PERTH); 16 km SE of Jerramungup, *K.Newbey 1348* (PERTH).



4. *Microcybe ambigua* (C.A.Gardner) Paul G.Wilson, *Fl. Australia* 26: 583 (2013)

Phebalium ambiguum C.A.Gardner, *J. Roy. Soc. W. Australia* 27: 180 (1942). T: Near Yellowdine, W.A., Oct. 1937, *W.E.Blackall*; lecto: PERTH, *fide* P.G.Wilson, *Nuytsia* 1: 65 (1970).

Microcybe pauciflora var. *uniflora* D.A.Herb., *J. & Proc. Roy. Soc. W. Australia* 8: 37 (1922). T: Westonia, W.A., Nov. 1920, *D.A.Herbert & E.H.Wilson 111*; holo: PERTH; iso: MEL.

Illustration: B.J.Grieve, *How to Know W. Austral. Wildfl.* 2nd edn, 2: 547 (1998).

Undershrub to 0.5 m high. Branchlets smooth. Leaves ascending, shortly petiolate, closely revolute and \pm terete, 4–6 mm long, 0.8 mm wide, obtuse, smooth to scabridulous, becoming glabrous adaxially. Flowers solitary. Calyx very shortly hemispherical, c. 0.5 mm high; lobes short, broadly deltate, smooth, ferruginous abaxially. Petals pale yellow, silvery to ferruginous abaxially. Cocci c. 3.5 mm high; apex rounded.

Occurs in SW W.A. from Wubin SE to Ravensthorpe. Flowers Nov.–Jan.

W.A.: Koorda, *C.A.Gardner 2739* (PERTH); Mt Short, 3 Nov. 1965, *A.S.George s.n.* (PERTH); Wubin, *G.J.Keighery 175* (PERTH).

Microcybe ambigua may be distinguished from *Phebalium*, with which it has been placed, by its solitary sessile flowers with 3 or 4 carpels and by its strongly revolute subterete leaves.



10. DIPLOLAENA

Paul G.Wilson

Diplolaena R.Br. in M.Flinders, *Voy. Terra Austr.* 2: 546 (1814); from the Greek *diplo*, double, and (*ch*)*laena*, a cloak, referring to the involucre bracts.

Type: *D. dampieri* Desf.

Shrubs, stellate-tomentose. Leaves alternate, petiolate, simple, entire. Inflorescence a terminal, dense, shortly pedunculate campanulate head, 4–15-flowered, surrounded by 3 or 4 rows of appressed imbricate bracts, the innermost ones membranous; flowers narrow with a subtending bract and 1 or 2 bracteoles. Sepals absent. Petals usually 5, free, linear, membranous, \pm equal in length to inner bracts. Stamens usually 10; filaments slender, subulate, equal to or well exceeding bracts, long stellate-pilose on adaxial side towards base; anthers versatile, narrowly oblong, minutely glandular-apiculate. Disc lobed. Carpels 5 (–8), free, not apiculate; style subulate, \pm equal to stamens; stigma shortly 5-lobed. Seed oblong-reniform, c. 6 mm long, smooth; hilum linear. $x = 13$ or 14 , H.M.Stace *et al.*, *Pl. Syst. Evol.* 187: 1–28 (1993).

A genus of 15 species endemic to SW W.A. Most of the species grade into one or more other species which confuses the identification of some collections.

All of the species appear to be adapted to bird pollination.

R. Classen-Bockhoff *et al.*, The inflorescences of the Australian genera *Diplolaena* R.Br. and *Chorilaena* Endl. (Rutaceae), *Austral. J. Bot.* 39: 31–42 (1991); G.J. Keighery, Breeding systems in the Western Australian flora. II. Pollination of *Diplolaena* and *Chorilaena* (Rutaceae), *W. Austral. Naturalist* 13: 156–158 (1976); Paul G. Wilson *et al.*, *Diplolaena* (Rutaceae), new taxa and nomenclatural notes, *Nuytsia* 12: 107–118 (1998).

- 1 Leaves linear to narrowly oblong, 2–6 cm long; margin recurved to revolute; inner involucre bracts 15–20 mm long **3. *D. angustifolia***
- 1: Leaves variously shaped but not linear, if margin recurved then inner involucre bracts less than 12 mm long
- 2 Leaves glabrous and smooth adaxially when mature, somewhat leathery, densely tomentose abaxially with a close pale indumentum
- 3 Outer involucre bracts broadly ovate; inner ones narrowly oblong, \pm equal to stamens **2. *D. grandiflora***
- 3: Outer involucre bracts triangular to narrowly triangular to ovate; inner ones much shorter than stamens
- 4 Leaves with a dense abaxial indumentum of minute stellate hairs c. 0.2 mm diam.; outer involucre bracts triangular, 7–10 mm long with a grey to dull red indumentum of small stellate hairs that have a solid centre and short radiating hairs, in all c. 0.2 mm diam. **4. *D. dampieri***
- 4: Leaves with a dense abaxial indumentum of multi-layered stellate hairs, those of the outer layer c. 0.6 mm diam.; outer involucre bracts ovate, c. 13 mm long with an outer indumentum of stellate hairs c. 0.6 mm diam. **10. *D. geraldtonensis***
- 2: Leaves pubescent adaxially, if sparsely so then not densely tomentose abaxially
- 5 Leaves sparsely stellate-hairy on both surfaces
- 6 Inner involucre bracts glabrous abaxially; leaves cordate-ovate **1. *D. andrewsii***
- 6: Inner involucre bracts pubescent abaxially; leaves rounded to cuneate at base
- 7 Leaves oblong-elliptic to elliptic, 25–65 mm long, very thin; involucre bracts grey-pubescent (Darling Ra.) **12. *D. drummondii***
- 7: Leaves obovate to broadly obovate, 10–17 mm long; involucre bracts rusty-pubescent (near-coastal) **15. *D. obovata***
- 5: Leaves moderately to densely stellate-hairy abaxially, sparsely to densely so adaxially
- 8 Leaves narrowly oblong-cuneate, 3–5 mm wide; margin flat or slightly recurved **11. *D. velutina***
- 8: Leaves oblong to broadly elliptic to broadly obovate; margin not recurved
- 9 Leaves broadly elliptic to broadly obovate, to 2 cm long, firm, grey- to fawn-tomentose on both surfaces **5. *D. mollis***
- 9: Leaves variable in shape, sparsely to moderately pubescent adaxially
- 10 Leaves sparsely to moderately pubescent abaxially
- 11 Leaf lamina mostly 2–6 cm long, thin, broadly oblong-elliptic (Darling Ra.) **12. *D. drummondii***
- 11: Leaf lamina to 2.5 cm long, herbaceous, elliptic to broadly elliptic (S coastal & inland)
- 12 Leaves loosely pubescent abaxially, with hairs \pm uniform, rusty coloured; outer involucre bracts rusty (near S coast) **13. *D. microcephala***
- 12: Leaves pubescent abaxially with loose outer layer and denser inner layer of colourless hairs; outer involucre bracts with fawn-coloured hairs (inland) **14. *D. graniticola***

- 10:** Leaves densely pubescent abaxially
- 13** Outer and inner involucre bracts with rusty red indumentum
- 14** Outer involucre bracts very narrowly triangular; leaves glabrous and bright green adaxially, somewhat leathery **8. *D. ferruginea***
- 14:** Outer involucre bracts ovate; leaves soft, sparsely pubescent and dull green adaxially **9. *D. eneabensis***
- 13:** Outer and inner involucre bracts green with grey to pale red indumentum; leaves papery to somewhat leathery
- 15** Leaves smooth and almost glabrous to sparsely to moderately pubescent adaxially, oblong-elliptic, flat, somewhat leathery **10. *D. geraldtonensis***
- 15:** Leaves pubescent adaxially, narrowly oblong to elliptic, broadly ovate, or broadly elliptic
- 16** Outer involucre bracts narrowly triangular to triangular; leaves narrowly oblong to oblong or elliptic or almost circular in *D. microcephala*, mostly 1–2 cm long, flat or folded (S coast or inland)
- 17** Leaf indumentum loose, with large hairs; outer involucre bracts rusty (near S coast) **13. *D. microcephala***
- 17:** Leaf indumentum loose or dense, with small hairs; outer bracts fawn or rarely rusty (inland) **14. *D. graniticola***
- 16:** Outer involucre bracts ovate to broadly ovate; leaves broadly ovate to broadly elliptic or circular, mostly 2–3 cm long, flat, soft, sparsely to moderately pubescent adaxially
- 18** Leaves broadly ovate to circular, with only stipitate stellate hairs adaxially; outer involucre bracts broadly ovate, obtuse, fawn-pubescent (coastal) **6. *D. leemaniana***
- 18:** Leaves elliptic, with sessile stellate hairs adaxially; outer involucre bracts ovate, acute to acuminate, grey-pubescent (inland) **7. *D. cinerea***

1. *Diplolaena andrewsii* Ostenf., *Biol. Meddel. Kongel. Danske Videnske. Selsk.* 3(2): 81 (1921)

T: Swan View, Darling Ra., W.A., 10 Oct. 1901, *C. Andrews 1st coll. no 109*; iso: K.

Divaricately branched shrub to 1 m high. Leaves with slender petiole 4–10 mm long; lamina flat, cordate-ovate, 1.5–4 cm long, rounded at apex, papery, sparsely stellate-hirsute on both sides. Flowerheads to 1.5 cm diam.; outer bracts broadly ovate, c. 8 mm long, obtuse, papery, sparsely stellate-hairy, green; inner bracts broadly ovate to narrowly oblong, slightly exceeding outer ones, reddish brown with white margins, glabrous abaxially. Petals \pm equal to inner bracts, white, ciliate otherwise glabrous. Stamens: filaments 10–14 mm long with pale red hairs in lower half; anthers c. 1.5 mm long. Plate 55.

Occurs in the Darling Ra. near Perth, W.A.; growing among granite rocks in woodland. Flowers July–Sept.; fruits Sept.–Nov.

W.A.: Swan View, *C.A. Gardner 1292a* (PERTH); John Forrest Natl Park, *A.S. George 6402* (PERTH).

A local and distinctive species that appears not to intergrade with others.



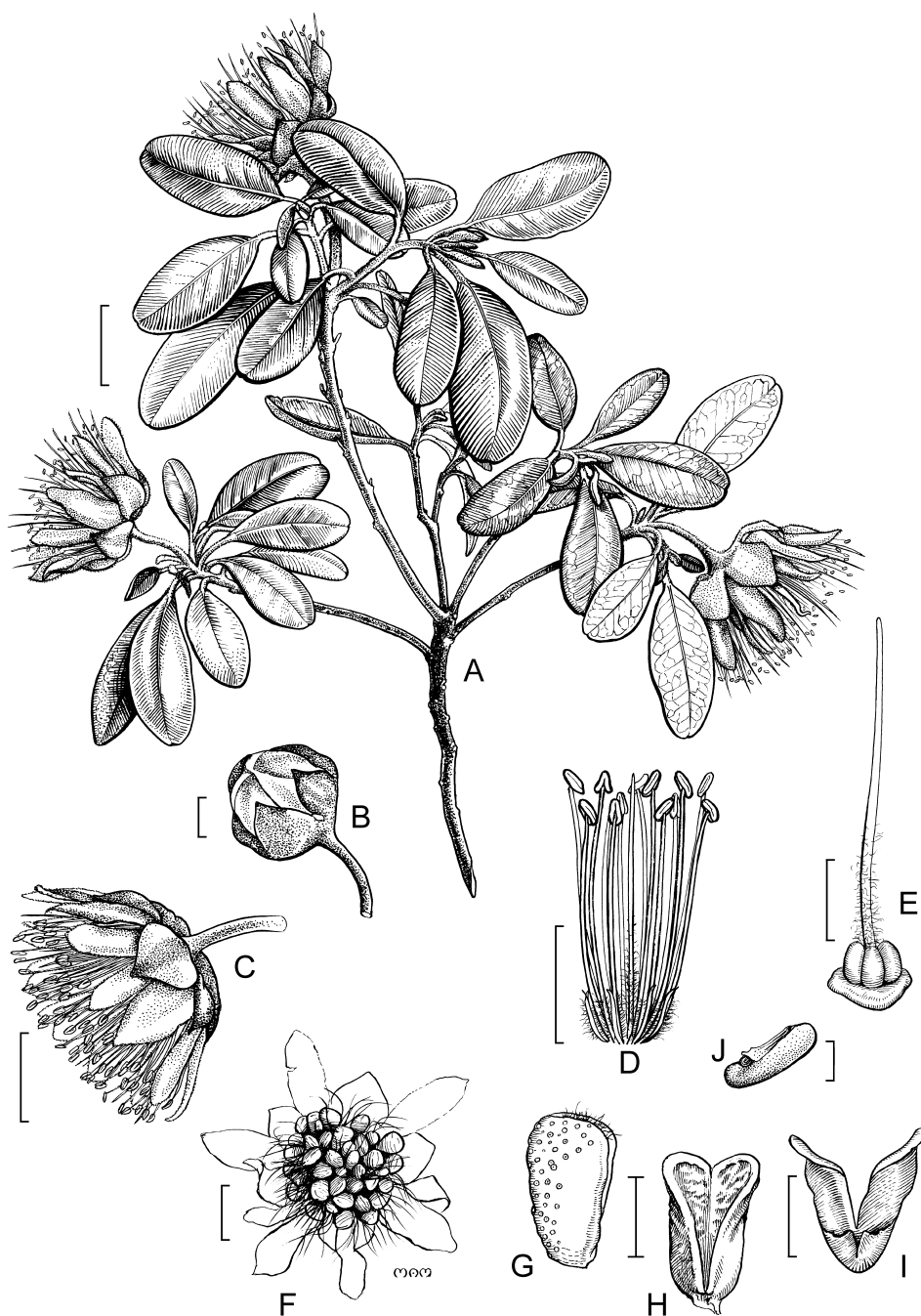


Figure 68. *Diplolaena grandiflora*. A, flowering branch; B, inflorescence in bud; C, inflorescence; D, flower; E, pistil; F, infructescence from above; G & H, coccus; I, elastic endocarp; J, seed (A–I, vouchers not recorded). Scale bars: A = 20 mm; B, J = 2 mm; C–F = 10 mm; G–I = 6 mm. Drawn by M. Wilson.

2. *Diplolaena grandiflora* Desf., *Mem. Mus. Hist. Nat.* 3: 451, t. 19 (1817)

T: Shark Bay [W.A.], *J.Leschenault*; iso: BM, G-DC, K (photos seen).

Shrub to 4 m high. Leaves with slender petiole 5–10 mm long; lamina flat, elliptic, 2–4.5 cm long, rounded at apex, leathery, glabrous adaxially when mature, cream-velvety abaxially with compact minute weak stellate hairs. Flowerheads 1.5–3 cm diam.; outer bracts broadly ovate, 7–15 mm long, obtuse, with a compact fawn to rusty indumentum of minute weak stellate hairs; inner bracts elliptic to narrowly oblong, 15–25 mm long, closely stellate-tomentose or the innermost almost glabrous, red. Petals c. 6 mm long, red, almost glabrous. Stamens: filaments 15–27 mm long, red, with pale red hairs towards base; anthers c. 2 mm long. $n = 13$, S.Smith-White, *Austral. J. Bot.* 2: 292 (1954). Fig. 68.

Occurs in W.A. between Geraldton and the North West Cape, near the coast and on off-shore islands; growing over limestone. Flowers May–Aug.; fruits Sept.–Oct.

W.A.: Yardie Ck, *K.M.Allan 448* (PERTH); Kalbarri, *D. & B.Bellairs 1793* (PERTH); Geraldton, *C.A.Gardner 13157* (PERTH).

The flowerheads vary considerably in size with the largest occurring on plants found near Geraldton. This species, as currently circumscribed, consists of 2 or 3 taxa that differ in the size of their inflorescences and in the amount of indumentum on the upper surface of their leaves.

Diplolaena grandiflora evidently hybridises with *D. geraldtonensis*.

**3. *Diplolaena angustifolia* Hook., *Bot. Mag.* t. 4059 (1843)**

T: Swan River Colony, W.A., *J.Drummond [1st coll.] no 14*; holo: K (photo seen).

D. salicifolia Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 173 (1845); *D. salicifolia* var. *revoluta* Bartl., *loc. cit.* T: along the Swan R. near Fremantle, Woodman Pt, and Rottnest Is., W.A., 15 Aug. 1839, *L.Preiss 2020 p.p.*; lecto: LD, *fide* P.G.Wilson *et al.*, *Nuytsia* 12: 111 (1998); isolecto: GOET, MEL (several sheets), TCD.

Illustration: N.G.Marchant *et al.*, *Fl. Perth Region* 1: 485, fig. 193 (1987).

Spreading shrub to 1 m high. Leaves with petiole 1–3 mm long; lamina linear to narrowly oblong, 2–6 cm long, 2–4 mm wide, narrowing at base, recurved to revolute, obtuse, glabrous adaxially, white-stellate-woolly abaxially. Flowerheads 2–3 cm diam.; outer bracts ovate, 10–15 mm long, acuminate, with a close, dense, pale brown to rusty indumentum of small weak stellate hairs; inner bracts ovate-lanceolate to narrowly oblong, 15–20 mm long, orange, stellate-tomentose. Petals c. 10 mm long, red, almost glabrous. Stamens: filaments c. 3 cm long, well-exserted, orange to red, with long red simple and stellate hairs in basal half; anthers c. 2 mm long, red. Fig. 69E–H.

Occurs towards the W coast of W.A. from Wanneroo N to near Eneabba; growing in sand over limestone. Flowers July–Sept.

W.A.: Green Head, *J.S.Bear 1893* (PERTH); Wanneroo, *H.Demarz 4488* (PERTH); Yanchep Natl Park, *G.J.Keighery 11568* (PERTH).

Collections made around 1840 indicate that this species once grew as far S as Fremantle where it appears to have intergraded with *D. dampieri*.

Diplolaena angustifolia is distinctive because of its large red inflorescences and its narrow leaves with recurved margins.

**4. *Diplolaena dampieri* Desf., *Mem. Mus. Hist. Nat.* 3: 452, t. 20 (1817)**

T: La terre d'Endracht [i.e. Shark Bay area, but probably from Geographe Bay, W.A.], 1801, *J.Leschenault*; iso: BM.

D. salicifolia var. *cuneata* Bartl. in J.G.C.Lehmann, *Pl. Preiss.* 1: 173 (1844). T: along the Swan R. near Fremantle, Woodman Pt, and Rottnest Is., W.A., 15 Aug. 1839, *L.Preiss 2020 p.p.*; lecto: MEL, *fide* P.G.Wilson *et al.*, *Nuytsia* 12: 112 (1998).

? *D. speciosa* Brong. ex Neumann, *Rev. Hort.* ser. 2, 4: 133, t. 14 (1845). T: cult.; n.v.

? *D. huegelii* hort. ex R.Mettler, *Neue Allg. Deutsche Gart.-Blumenzeitung* 2: 7 & tab. (1846). T: cult.; n.v.

Spreading shrub to 1.5 m high. Leaves shortly petiolate, flat, oblong-elliptic to elliptic, 1.5–3 cm long, cuneate at base, rounded or slightly retuse apically, somewhat leathery, glabrous adaxially when mature, cream-velvety abaxially with minute weak hairs. Flowerheads 10–15 mm diam.; outer bracts narrowly triangular to ovate, 7–10 mm long, with a close, dense grey to dull red indumentum of stellate hairs that have a thick solid centre and short radiating arms; inner bracts narrowly oblong, c. 12 mm long, stellate-tomentose. Petals c. 5 mm long, pale red, densely ciliate. Stamens: filaments 2–2.5 cm long, yellow and orange or red with long reddish hairs towards base; anthers c. 1.5 mm long. *n* = 14, G.J.Keighery, *J. Roy. Soc. W. Australia* 67: 26 (1984) as *D. microcephala*.

Occurs on the coast of SW W.A. from Cape Leeuwin N to Fremantle; growing in sand over limestone. Flowers July–Sept; fruits Sept.–Dec.

W.A.: Meelup, *B.R.Maslin* 2809 (PERTH); Fremantle, *A.Oldfield s.n.* (MEL); Yallingup, *I.Olsen* 627 (PERTH); Garden Is., *F.G.Smith* 2368 (PERTH).

See note under *D. angustifolia* regarding possible intergradation with *D. dampieri* which is otherwise distinct from other species. In the south the outer involucre bracts are narrowly triangular, they become broader to the north and near Fremantle are ovate.



5. *Diplolaena mollis* Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 116 (1998)

T: 1 km S of Kalbarri, W.A., 6 May 1968, *P.G.Wilson* 6559; holo: PERTH; iso: CANB, K.

Shrub to 2 m high. Leaves with petiole 3–6 mm long; lamina flat, broadly elliptic to broadly obovate, mostly 1–2 cm long, cuneate at base, rounded at apex, leathery, both sides with close and very dense fawn velvety indumentum of small weak stellate hairs. Flowerheads 15–20 mm diam.; outer bracts ovate, 6–10 mm long, densely velvety with small stellate hairs; inner bracts in 2 series shortly exceeding outer bracts, the outer series broadly ovate to narrowly oblong, acute, densely stellate-hairy, the inner series narrowly oblong, acute, thin and almost glabrous. Petals c. 7 mm long, pale red, woolly-stellate to glabrous. Stamens: filaments 15–20 mm long, pale to deep red, stellate-pilose towards base; anthers 1–1.4 mm long, red.

Occurs in SW W.A. on or near the W coast from c. 45 km N of Geraldton N to Shark Bay; growing in sand over limestone. Flowers June–Sept.; fruits Aug.–Nov.

W.A.: 5 km S of Kalbarri, *J.A.Armstrong* 7011 (PERTH); Dirk Hartog Is., *A.S.George* 11526 (PERTH); Tamala Stn, *B.R.Maslin* 3690 (PERTH).

This species may be recognised by the shape of its leaves and by the dense soft indumentum of small weak stellate hairs on both leaf surfaces. In the latter character it differs from *D. leemaniana* in which the upper surface of the leaves are only sparsely stellate and the hairs are shortly stipitate.



Some specimens from the southern part of its distribution have involucre bracts that, in their shape, are intermediate with those of *D. geraldtonensis*, while some specimens from near Kalbarri are intermediate with *D. grandiflora* in leaf and capitulum morphology.

6. *Diplolaena leemaniana* Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 115 (1998)

T: South Arrowsmith R., Cliff Head turnoff, W.A., 7 Sept. 1969, *A.C.Burns* 117; holo: PERTH.

Spreading shrub to 0.7 m high. Leaves with slender petiole 3–7 mm long; lamina flat, broadly ovate or broadly elliptic to circular, 20–35 mm long, 16–25 mm wide, rounded at apex and base, sparsely to moderately pubescent adaxially with only stipitate stellate hairs, moderately soft-pubescent to velvety abaxially. Flowerheads c. 2 cm diam.; outer bracts broadly ovate, c. 10 mm long, obtuse, with a fawn indumentum; inner bracts ovate to broadly

ovate, equal to or shortly exceeding outer ones, grey to rusty stellate-tomentose; innermost bracts red, sparsely pubescent. Petals slightly shorter than inner bracts, pale green, woolly-ciliate otherwise almost glabrous. Stamens: filaments 15–20 mm long, pale red, long stellate-pilose towards base; anthers c. 1.5 mm long, pink.

Occurs on or near the W coast of W.A. between Greenough and Jurien Bay; principally growing in sand over limestone. Flowers July–Sept., fruits Aug.–Nov.

W.A.: 5 km from Brand Hwy on road to Cliff Head, *D.E.Albrecht* 4187 (MEL, PERTH); 8 km SW of Greenough, *G.J.Keighery* 5172 (PERTH); between Jurien Bay and Green Head, *M.E.Phillips* 021820 (PERTH); Dongara, *N.H.Speck s.n.* (PERTH).

This species differs from *D. mollis* principally in leaf shape and texture, and in the sparse upper indumentum of the leaves in which the stellate hairs are shortly stipitate.



7. *Diplolaena cinerea* Paul G.Wilson in P.G.Wilson *et al.*, *Nuytsia* 12: 112 (1998)

T: Lesueur Natl Park, W.A., 12 Sept. 1993, *W.Evans* 711; holo: PERTH.

Bushy shrub to 1.2 m high. Leaves with slender petiole 4–8 mm long; lamina flat, elliptic, mostly 20–30 mm long, broadly cuneate at base, rounded at apex, soft, sparsely to moderately pubescent adaxially with small sessile and shortly stipitate stellate hairs, moderately soft-pubescent to velvety abaxially. Flowerheads c. 2 cm diam.; outer bracts ovate, c. 10 mm long, acute to acuminate, with a grey velvety indumentum; inner bracts narrowly ovate, shortly exceeding outer, grey-tomentose. Petals c. 9 mm long, pale orange, woolly-ciliate. Stamens: filaments c. 15 mm long, green to pale orange, stellate-pilose towards base; anthers c. 1.5 mm long, pink.

Occurs near the W coast of W.A. between Mt Peron and Dandaragan; growing in sandy or gravelly soils over laterite, usually in open woodlands. Flowers July–Sept.; fruits Sept.–Nov.

W.A.: c. 40 km SSW of Eneabba, *R.Coveny* 3085 (PERTH); E from Mt Peron, *C.A.Gardner* 9437 (PERTH); 8 km N of Mt Lesueur, *E.A.Griffin* 2221 (PERTH); Cataby Rd, W of Dandaragan, *E.A.Griffin* 5069A (PERTH).

This species may be recognised by the close grey indumentum on the leaf lower surface and in the shape of the involucre bracts. It grades locally into *D. ferruginea* and *D. velutina*, and northwards into *D. geraldtonensis*.



8. *Diplolaena ferruginea* Paul G.Wilson, *Nuytsia* 1: 198 (1971)

T: Mt Lesueur, W.A., 16 Oct. 1946, *C.A.Gardner* 8459; holo: PERTH.

Spreading shrub c. 1 m high. Leaves with petiole 3–5 mm long; lamina flat, elliptic to oblong-elliptic, 20–40 mm long, broadly cuneate at base, rounded at apex, leathery, glabrous or nearly so adaxially, densely cream to rusty velvety with small stellate hairs abaxially. Flowerheads c. 15 mm diam.; outer bracts very narrowly triangular, c. 8 mm long, rusty brown-pubescent with mostly reddish stellate hairs; inner and innermost bracts narrowly triangular, 10–12 mm long, acuminate, rusty-stellate-pubescent. Petals c. 9 mm long, pale red, moderately stellate-pubescent. Stamens: filaments c. 20 mm long, red in upper half, stellate-pilose towards base; anthers c. 1.4 mm long, red. *n* = 14, *G.J.Keighery*, *J. Roy. Soc. W. Australia* 67: 27 (1984).

Occurs in SW W.A. between Mingenew and Dandaragan; generally growing in sand over laterite in heathland. Flowers July–Sept.; fruits Sept.–Dec.

W.A.: 8 km S of Eneabba, *R.Hnatiuk* 771344 (PERTH); 4.3 km N of Cockleshell Gully, *R.W.Johnson* 3259 (BRI); Mt Peron, *S.Paust* 1181 (PERTH).



This species is distinctive in having very narrow inner and outer involucre bracts which are covered with a rusty indumentum.

9. *Diplolaena eneabbensis* Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 113 (1998)

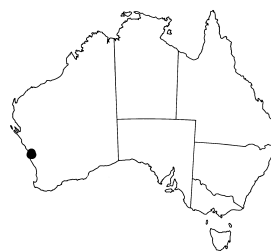
T: 1.8 km N of Beekeepers Rd, Eneabba, W.A., 22 Sept. 1988, *J.J. Alford* 1208; holo: PERTH; iso: CANB.

Shrub to 1 m high. Leaves with slender petiole 3–5 mm long; lamina flat, elliptic to broadly elliptic, mostly 20–25 mm long, broadly cuneate at base, rounded at apex, soft, very sparsely pubescent adaxially with small weak sessile and stipitate stellate hairs, moderately soft-pubescent to velvety abaxially. Flowerheads c. 2 cm diam.; outer bracts ovate, c. 13 mm long, 5–6 mm wide, acute, with a soft reddish brown indumentum; inner bracts narrowly ovate, shortly exceeding outer ones, reddish brown-tomentose. Petals c. 6 mm long, stellate-pubescent. Stamens: filaments c. 20 mm long, pink, stellate-pilose towards base; anthers c. 1.3 mm long, pink.

Occurs near the W coast of W.A. near Eneabba; growing in sand over laterite. Flowers July–Oct.

W.A.: 2.5 km S of Greenhead turnoff on Brand Hwy, *B. & B. Backhouse* NS74 (PERTH); E of Eneabba, *B. & B. Backhouse* NS63 (PERTH); 7 km ESE of Eneabba, *R.J. Cranfield* 8928 (PERTH).

This species is intermediate in morphology between *D. cinerea* and *D. ferruginea*; it differs from *D. cinerea* most noticeably in having rusty red involucre bracts, and from *D. ferruginea* in having ovate outer bracts and soft tomentose leaves.



10. *Diplolaena geraldtonensis* Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 113 (1998)

T: 1.5 km N along Buller River Rd, West Moresby Ra., W.A., 22 Aug. 1983, *R.J. Cranfield* 2766; holo: PERTH.

Shrub to 1.5 m high. Leaves with petiole 3–7 mm long; lamina flat, oblong to oblong-elliptic, 2.5–4 cm long, cuneate at base, rounded at apex, somewhat leathery, smooth adaxially and sparsely to moderately pubescent with weak stellate hairs, loosely velvety abaxially. Flowerheads c. 15 mm diam.; outer bracts ovate to narrowly triangular, 10–15 mm long, acute, densely tomentose with fawn (to rusty) unthickened hairs; inner bracts ovate to narrowly oblong, slightly exceeding outer bracts, acute to long-acuminate, pubescent. Petals c. 10 mm long, moderately pubescent. Stamens: filaments c. 20 mm long, pale red, stellate-pilose towards base; anthers c. 1.3 mm long, red.

Occurs near the W coast of W.A. between Hutt R. and Dongara; generally growing in gravel or sand. Flowers July–Oct.

W.A.: 28 km S of Northampton, *R.J. Cranfield* 4068 (PERTH); Burma Rd, *A.M. Ashby* 1511 (PERTH); Nina Springs Stn, *J.V. Blockley* 686 (PERTH).

The variability in the leaf indumentum and the shape and indumentum of the outer involucre bracts may be due to introgression with *D. ferruginea*.

Plants intermediate between *D. geraldtonensis* and *D. grandiflora* are found near Geraldton where the two species grow together. In the southern part of its range *D. geraldtonensis* appears to grade into *D. cinerea*.



11. *Diplolaena velutina* (Paul G. Wilson) Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 118 (1998)

D. microcephala var. *velutina* Paul G. Wilson, *Nuytsia* 1: 198 (1971). T: 2 miles [c. 3.2 km] N of Wyalkatchem, W.A., 30 June 1959, *T.E.H. Aplin* 509; holo: PERTH.

Shrub to 2 m high. Leaves with petiole c. 3 mm long; lamina flat or slightly conduplicate, narrowly oblong to narrowly oblong-cuneate, 1–4 cm long, 3–5 mm wide, flat or slightly recurved at margins, rounded and sometimes slightly retuse at apex, papery or somewhat

leathery, sparsely and minutely stellate-hairy adaxially, sparsely to densely rusty-tomentose to velutinous with very small stellate hairs abaxially. Flowerheads 10–15 mm diam.; outer bracts narrowly triangular to triangular, 7–10 mm long, sparsely to densely rusty (or fawn)-tomentose, the hairs with a thick solid centre and short radiating arms; innermost bracts narrowly elliptic, c. 10 mm long, somewhat stellate-hairy abaxially, densely woolly-ciliate on margin. Petals c. 10 mm long, cream-coloured, moderately pubescent. Stamens: filaments 12–20 mm long, yellow to orange or red, stellate-pilose towards base; anthers c. 1.5 mm long, red or pale yellow.

Occurs in inland SW W.A. from near Coorow SE to near Kondinin; generally growing on or around granite hills. Flowers June–Sept.; fruits Sept.–Nov.

W.A.: Nungarin Hill, *C.A.Gardner* 692 (PERTH); c. 37 km E of Quairading, *A.S.George* 8073 (PERTH); Mt Stevens, *N.G.Marchant* 70/338 (PERTH); c. 3 km SW of Manmanning, *B.H.Smith* 418 (MEL).

A variable species that may be recognised by its narrowly oblong-cuneate leaves that are velutinous below with very small stellate hairs.

Near Watheroo is found a variant with olive-grey involucral bracts, it is possibly an intergrade with *D. cinerea*; in the same area is found a variant that is probably an intergrade with *D. ferruginea*.

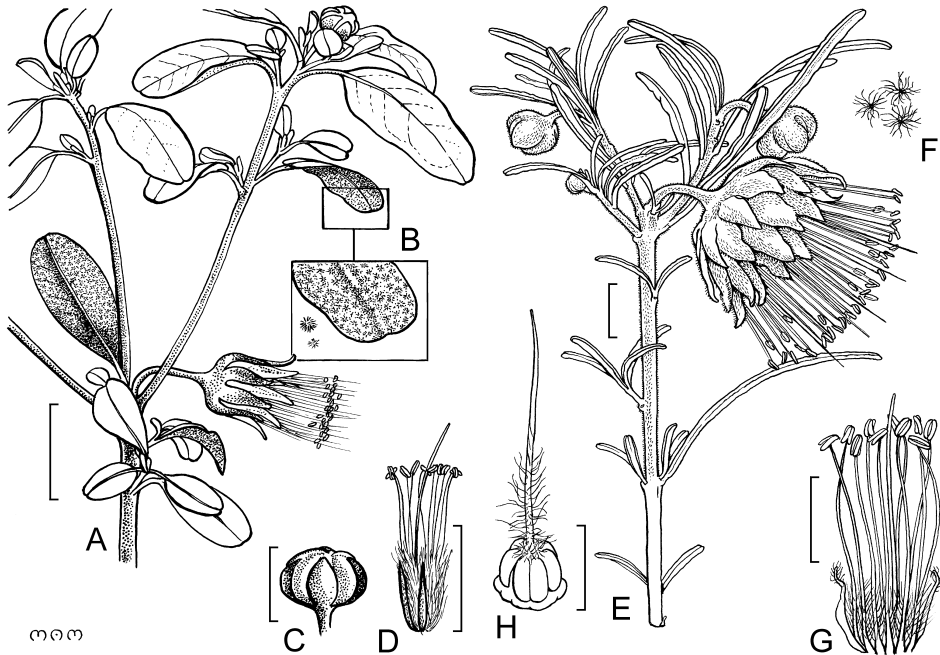


Figure 69. *Diplolaena*. A–D, *D. microcephala*. A, flowering branch; B, leaf indumentum detail; C, inflorescence bud; D, flower (A–D, drawn from fresh material, voucher not recorded). E–H, *D. angustifolia*. E, flowering branch; F, leaf hairs; G, flower; H, pistil (E–H, drawn from fresh material, voucher not recorded). Scale bars: A, D, E, G, H = 10 mm; C = 4 mm. Drawn by M.Wilson. Reproduced with permission from N.G.Marchant *et al.*, *Fl. Perth Region* 1: 485, fig. 193; 488, fig. 194 (1987).

12. *Diplolaena drummondii* (Benth.) Ostenf., *Biol. Meddel. Kongel. Danske Vidensk. Selsk.* 3/2: 80 (1921)

D. microcephala var. *drummondii* Benth., *Fl. Austral.* 1: 358 (1863). T: Swan R., W.A., *J. Drummond* 91; lecto: K, *fide* P.G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 113 (1998); isolecto: MEL.

Illustration: J.R. Wheeler *et al.*, *Fl. South West* 2: 876 (2002).

Spreading shrub c. 1 m high. Leaves with petiole 5–15 mm long; lamina flat, oblong-elliptic to elliptic, 20–50 mm long, broadly cuneate at base, rounded at apex, papery, sparsely pubescent adaxially, sparsely to moderately pubescent abaxially with small and large stellate hairs. Flowerheads c. 15 mm diam.; outer bracts ovate to narrowly triangular, c. 8 mm long, green to reddish brown, pubescent with small, and a few moderately large, stellate hairs; inner bracts narrowly oblong, c. 12 mm long, acuminate, stellate-pubescent. Petals c. 9 mm long, pale red, stellate-pubescent. Stamens: filaments c. 25 mm long, stellate-pilose towards base, red or yellow; anthers c. 1.2 mm long, pale red.

Occurs near Mundaring and near Collie in the Darling Ra., W.A.; growing in woodlands. Flowers Aug.–Oct.

W.A.: 17 km NW of Collie, *D. Halford* 808154 (PERTH); Wellington Mills, *G.J. Keighery* 6812 (PERTH); Helena Valley, *J. Seabrook* 140 (PERTH); Mornington Mills, 1932, *R.R. Williams* (PERTH).

This species may be distinguished from both *D. dampieri* and *D. velutina* by its thin leaves which have coarse stellate hairs on their lower side, and by its outer involucre bracts which have both coarse and minute hairs in the indumentum. To the east *D. drummondii* grades into *D. graniticola*.



13. *Diplolaena microcephala* Bartl. in J.G.C. Lehmann, *Pl. Preiss.* 1: 173 (1844)

T: Cape Riche, W.A., 20 Nov. 1840, *L. Preiss* 2019; lecto: MEL, *fide* P.G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 116 (1998).

Illustration: N.G. Marchant *et al.*, *Fl. Perth Region* 1: 488, fig. 194 (1987).

Rounded shrub to 1.5 m high. Leaves with petiole 2–4 mm long; lamina flat to conduplicate (when usually curved), narrowly oblong to elliptic or almost circular, 8–12 (–30) mm long, cuneate at base, rounded at apex, herbaceous, with sparse large unthickened rusty-stellate hairs adaxially, moderately hirsute with large unthickened rusty-stellate hairs abaxially. Flowerheads 7–12 mm diam.; outer bracts ovate to triangular, 6–10 mm long, red, pubescent with unthickened rusty hairs; inner bracts narrowly oblong to narrowly triangular, slightly exceeding outer, white with rusty-stellate broad central band. Petals c. 6 mm long, variable in colour, sparsely stellate-pubescent. Stamens: filaments 15–20 mm long, orange, stellate-pilose in lower half; anthers red, 1–1.5 mm long. Fig. 69A–D.

Occurs near the S coast of W.A. from near Walpole E to the Phillips R. (near Hopetoun), with an outlier c. 110 km E of Esperance; often growing in gravelly sand along the banks of rivers, also somewhat inland on granite outcrops. Flowers and fruits sporadically throughout the year.

W.A.: Cape Riche, *F. Diels* 446 (PERTH); Boyatup Hill, *Hj. Eichler* 20070 (PERTH); Fitzgerald R., *C.A. Gardner* 14776 (PERTH); Bremer R., *A.S. George* 6992 (PERTH); Gordons Inlet, *E. Wittwer* 486 (PERTH).

A variable species with each of the disjunct localities having a different variant that may warrant formal status.



14. *Diplolaena graniticola* Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 114 (1998)

T: Boyagin, W.A., 8 Aug. 1979, *H. Demarz* 7396; holo: PERTH.

Shrub to 1.5 m high. Leaves with petiole c. 5 mm long; lamina flat, elliptic to broadly elliptic, mostly 15–25 mm long, cuneate at base, rounded at apex, papery, sparsely covered

with very small unthickened stellate hairs adaxially, moderately covered with small unthickened stellate hairs abaxially. Flowerheads c. 15 mm diam.; outer bracts narrowly triangular, 10–14 mm long, pubescent with very small fawn-coloured stellate hairs; inner bracts narrowly triangular, slightly exceeding outer, tomentose. Petals c. 6 mm long, membranous, pale red, sparsely stellate-pubescent. Stamens: filaments c. 20 mm long, yellow to red, pilose in lower half; anthers 1–1.3 mm long, red.

Found in SW W.A. in the Darling Ra. E of Perth S to Wagin; predominantly growing on granite outcrops. Flowers July–Oct.

W.A.: 15 km SE of Dale, *D.E. Albrecht 4156* & *B.A. Fuhrer* (MEL, PERTH); Tutanning, 9 Aug. 1966, *S. James s.n.* (PERTH); 3.2 km W of Wagin, *K. Newbey 1281* (PERTH).

This species appears to grade to the east into *D. velutina* and to the west into *D. drummondii*.



15. *Diplolaena obovata* Paul G. Wilson in P.G. Wilson *et al.*, *Nuytsia* 12: 117 (1998)

T: Ocean Farm, Lancelin, W.A., 10 June 1981, *R.J. Cranfield 1688*; holo: PERTH.

Small erect shrub 20–80 cm high. Leaves with petiole 3–5 mm long; lamina broadly obovate, mostly 6–12 mm long, cuneate at base, rounded (and often emarginate) at apex, papery, sparsely covered with even-sized stellate hairs on both sides. Flowerheads small, c. 10 mm diam.; outer bracts ovate to broadly ovate, c. 12 mm long, rusty-pubescent with both small and large stellate hairs; inner bracts narrowly ovate to ovate, slightly exceeding outer ones. Petals c. 9 mm long, moderately stellate-pubescent. Stamens: filaments c. 15 mm long, green to yellow, stellate-pilose in lower half; anthers c. 1 mm long, red.

Occurs near the W coast of W.A. from Green Head S to Lancelin, growing in sand over limestone. Flowers May–Aug.

W.A.: Lancelin, 24 May 1966, *M. Barrow* (PERTH); 6 km inland from Jurien Bay, *J.S. Beard 7182* (PERTH); 11 km NE of Cervantes, *A.A. Burbidge 3905* (PERTH); 4 km NNE of Seabird, *E.A. Griffin 5697* (PERTH); Diamond of the Desert Spring, 14 Aug. 1993, *M. Hislop s.n.* (PERTH).



GROUP 3

A.J.G. Wilson

Shrubs. Anthers gland-tipped. Fruit dehiscent, horned mericarps. Cotyledons in seed considerably wider than hypocotyl.

A group with a single introduced genus in Australia, native to S. Africa; mostly small xeromorphic shrubs.

This group corresponds to the Tribe Diosmeae DC.

COLEONEMA

Coleonema Bartl. & H.L. Wendl., *Beitr. Bot.* 1: 55, t. A (1824); from the Greek *coleo*, sheath, and *nema*, thread, referring to the staminodes which are sheathed in the claws of the petals.

Type: *C. album* (Thunb.) Bartl. & H.L. Wendl.

Small erect shrubs; branchlets glabrous to puberulous with simple hairs. Leaves alternate, petiolate, simple, glandular-punctate in 2 rows abaxially; margins narrowly translucent. Flowers 5-merous, solitary, terminal or axillary, subtended by 2 bracteoles and 6–8 bracts (reduced

leaves). Calyx lobed. Petals free, spreading, white or pink; claw usually adnate with staminode. Stamens 5; anthers with a minute apical gland; staminodes 5, gland-tipped. Disc cupular or lobed. Ovary 5-carpellate, glabrous; carpel apices globose with an immersed gland; style short, glabrous; stigma capitate, depressed-globose. Fruit 5-carpellate, glabrous, with short horns (rarely horns absent), spreading or erect. Seeds black, shining.

A genus of 8 species endemic to the Cape Province of S. Africa; one species naturalised in southern Australia.

Several species are of horticultural interest, and available from nurseries in Australia. In W.A. the naturalised plants have been identified as *C. album*, while in S.A. and Vic. they are identified as *C. pulchellum*, however none of the Australian material is entirely consistent with the wild-collected species described in the revision of the genus by Williams (1981). All Australian material is identified as *C. pulchellum* in this treatment, being closer to the description of that species in Williams (1981), but the plants are up to 2 m high and flower colour varies from white to pink, whereas the S. African species is described as being up to 80 cm high, with flowers always pink.

I.Williams, Studies in the genera of the Diosmeae (Rutaceae): 9. A revision of the genus *Coleonema*, *J. S. African Bot.* 47: 63–102 (1981).

***Coleonema pulchellum* I.Williams, *J. S. African Bot.* 47: 89 (1981)**

T: Winterstrand, Port Elizabeth, S. Africa, 26 Aug. 1975, *I.Williams 2056*; holo: NBG; iso: BOL, K, L, MO, NSW, PRE, S, STE, all *n.v.*, *fide* I.Williams, *loc. cit.*

[*C. album* auct. non (Thunb.) Bartl. & H.L.Wendl.: J.R.Wheeler in N.G.Marchant *et al.*, *Fl. Perth Region* 1: 485 (1987)]

[*C. pulchrum* auct. non Hook.: J.Edmanson & L.Lawrence, *Australian Garden* 260 (2000)]

Illustrations: R.Spencer (ed.), *Hort. Fl. SE Australia* 3: 15 (2002); J.Parker & M.Malone (eds), *Flora: the Gardener's Bible* 401 (2003); F.J.Richardson *et al.*, *Weeds of the South-east* 371 (2006).

Shrub to 2 m high; branchlets puberulous. Leaves crowded, ±erect, very narrowly elliptic, (7–) 8–12 mm long, c. 1 mm wide, minutely toothed or ciliate at margin, acute to acuminate with pungent mucro, glabrous. Flowers towards end of branches; bracts and bracteoles c. 9, pungent, ciliate to fringed. Calyx lobes 2 mm long, acute, translucent and ciliate to fringed at margins. Petals c. 5 mm long, tapering evenly to base or with distinctly narrowed claw, white to pink; limb very broadly obovate, 1.5–2.3 mm wide, apiculate, often sparsely hairy on adaxial midline. Stamens: filaments 1.6–3 mm long; anthers 0.5–1 mm long. Staminodes adnate with petal claw except apical 0.3–0.5 mm, where enclosed by 2 ridges on claw. Disc lobed, as high as or slightly overtopping ovary. Style short, elongating after anthesis to 1.3 mm long. Fruit glabrous; carpels c. 5 mm long including horn. Seed c. 3 mm long. *Diosma*.

Native to coastal areas in Cape Province S. Africa; naturalised in W.A., S.A., Vic. and possibly Tas., usually near the coast. Flowers winter–spring.

W.A.: Two Rocks, *K.Richardson 201* (PERTH). S.A.: Porter Bay, S of Port Lincoln, *D.E.Symon 13602* (AD, CANB). Vic.: Anglesea, Eumerella Flora Reserve, 31 Oct. 2005, *R.J.Adair s.n.* (CANB); McLeod, grounds of former Greswell Rehabilitation Centre, *G.W.Carr 0208-153* (AD, CANB, MEL, NSW); Jan Juc, 5 Sept. 2001, *G.Stockton s.n.* (CANB, MEL).

This species has been known in horticulture as *C. pulchrum* since the 1800s. Williams (1981) described *C. pulchellum*, distinguishing it from *C. pulchrum* by its much smaller leaves and flowers and near-coastal habitat. Recent Australian gardening books (e.g. Parker & Malone, *op. cit.*) incorrectly synonymise *C. pulchrum* under *C. pulchellum*, but the two species are distinct.

The leaves are aromatic, and often yellowish. The 2 rows of gland dots on the abaxial leaf surface make this species distinctive even when not flowering.



RUTACEAE

GROUP 4

D.J.Mabberley

Trees and shrubs, usually evergreen. Fruit a berry or hesperidium; seeds without endosperm; cotyledons considerably wider than hypocotyl. $2n = 18$ (some polyploids recorded in cultivated *Citrus*), W.T.Swingle, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 846 (1943).

A group of 25 genera in the tropical and subtemperate Old World; 15 species (2 naturalised) in 6 genera in Australia.

This group corresponds to the well-defined subfamily Aurantioideae (see Kubitzki *et al.* (2011) for classification within the subfamily).

D.J.Mabberley, Australian Citreae with notes on other Aurantioideae (Rutaceae). *Telopea* 7: 333–344 (1998); K.Kubitzki *et al.*, Rutaceae subfam. Aurantioideae, in K.Kubitzki (ed.), *Fam. Gen. Vasc. Pl.* 10: 343–350 (2011).

KEY TO GENERA

- | | | |
|----|---|----------------------|
| 1 | Plants unarmed | |
| 2 | Petals valvate | 1. <i>Micromelum</i> |
| 2: | Petals imbricate | |
| 3 | Young shoots densely brownish pubescent | 3. <i>Glycosmis</i> |
| 3: | Young shoots not so | |
| 4 | Flowers up to 6 mm long | 2. <i>Clausena</i> |
| 4: | Flowers 13–18 mm long | 4. <i>Murraya</i> |
| 1: | Plants armed | |
| 5 | Climber | 5. <i>Luvunga</i> |
| 5: | Tree or shrub | 6. <i>Citrus</i> |

1. MICROMELUM

Micromelum Blume, *Bijdr.* 137 (1825), *nom. cons.*; from the Greek *micro-*, small and *melon*, apple (from the shape of the fruits).

Type: *M. pubescens* Blume

Aulacia Lour., *Fl. Cochinch.* 273 (1790), *nom. rej.* T: *A. falcata* Lour.

Unarmed trees and shrubs with simple hairs. Leaves in spirals, pinnate, without winged rachis; leaflets usually asymmetric. Inflorescence a terminal corymb. Flowers bisexual, 5-merous. Calyx cupular, often with triangular lobes, marcescent. Petals free, valvate, caducous. Stamens 10, free, alternately short and long in 1 whorl; filaments arising from disc; anthers basifixed. Disc annular. Ovary 2–6-locular, each locule with 1 oil gland and 2 pendulous ovules; stylehead discoid to subglobose. Berry subglobose. Seeds 1 or 2, ellipsoid; cotyledons thin, folded.

A genus of c. 10 species from Pakistan to S China and Polynesia. One species native in Australia.

W.T.Swingle, *Micromelum*, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 139–152 (1943); J.Armstrong, *Micromelum*, *Austral. Plants* 8: 228 (1975).

***Micromelum minutum* (G.Forst.) Wight & Arn., *Prodr.* 468 (1834)**

Limonia minuta G.Forst., *Fl. Insul. Austr. Prodr.* 33 (1786). T: Tonga, 'Friendly Islands', J.R. & G.Forster s.n.; lecto: BM, *fide* W.T.Swingle, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 149 (1943); isolecto: K. *M. pubescens* Blume, *Bijdr.* 138 (1825). T: Java 'in montosis praecipue calcareis', C.L.Blume s.n. [HLB 908203-1854]; lecto L, *fide* D.J.Mabberley, *Telopea* 7: 342 (1998).

Glycosmis subvelutina F.Muell., *Fragm.* 1: 25 (1858). T: Estuary of Burdekin R. [Qld], *Burdekin Expedition [E.Fitzalan]* 47; holo: MEL; iso: K.

Illustrations: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 669, fig. 206E (1992); W.Cooper & W.T.Cooper, *Fr. Rain Forest* 190, 191 (1994); R.Melzer & J.Plumb, *Pl. Capricornia* 312 (2011).

Tree to 10 (–20) m tall but often a scruffy shrub; bole to 15 cm diam. Leaves to 30 cm long, subglabrous to softly hairy adaxially; leaflets 7–15, ovate-lanceolate, 3–12 cm long, 1.5–6 cm wide, obtuse-asymmetric at base, entire to crenulate, attenuate-acuminate, coriaceous, often drying blackish, with axillary domatia at veins; petiolule to 5 mm long. Inflorescences 13–20 cm

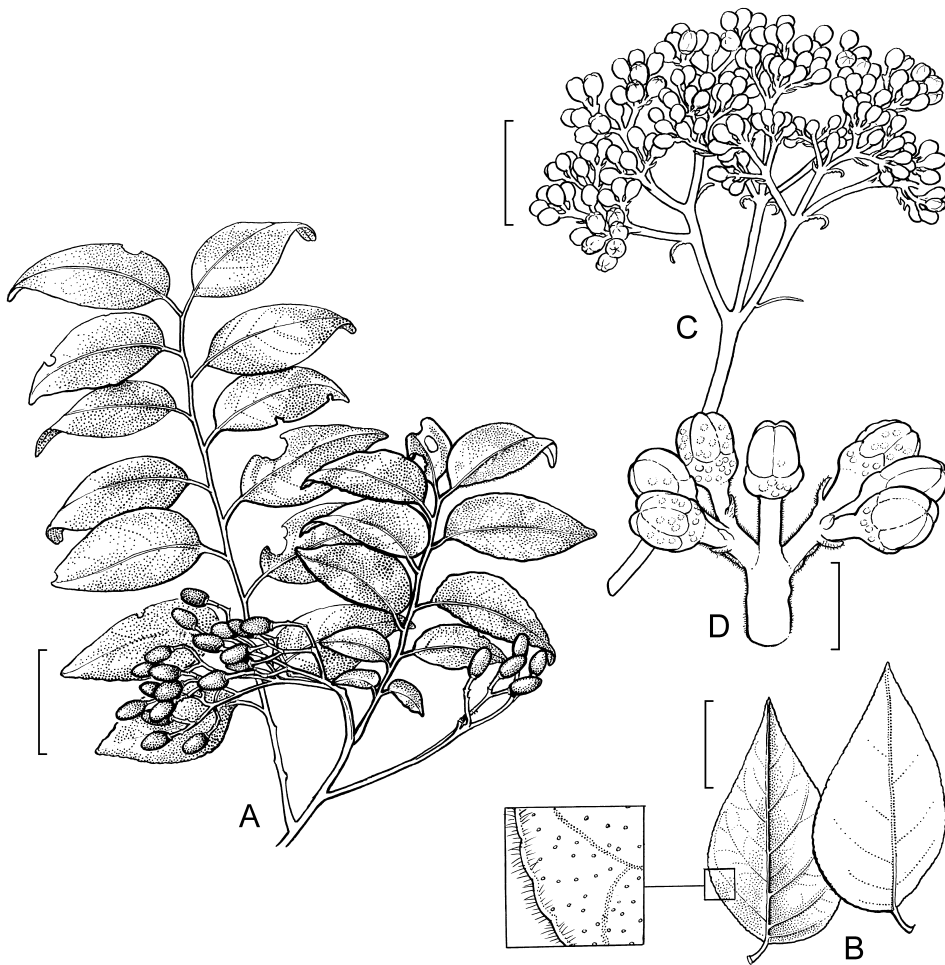


Figure 70. *Micromelum minutum*. **A**, fruiting branch; **B**, leaf, adaxial and abaxial surfaces, with detail of adaxial surface; **C**, inflorescence in bud; **D**, flower cluster in bud. Scale bars: **A** = 20 mm; **B**, **C** = 10 mm; **D** = 3 mm. Drawn by M.Wilson.

long, hairy, scented; bracts deltoid-linear; pedicels to 5 mm long. Sepals glabrous to shortly hairy. Petals 5–8 mm long, pale green or creamish. Filaments narrowed apically, white. Ovary c. 1.5 mm long, hairy at first; style subglabrous. Fruit ellipsoid, to 1 cm long, yellow to orange or red at maturity, glabrous. Cotyledons green. *Limeberry*, *Dilminyin* (E Arnhem Land), *Kimiar Margibur* (Murray Is., Qld). Plate 56; Fig. 70.

Occurs in N tropical Australia from the Kimberley region in W.A., N.T. and Qld, S to northern N.S.W., in usually coastal monsoon forest especially on dunes, coral or other limestones to 615 m alt., often common as on the Great Barrier Reef, but also in sandstone gorges and on karst outcrops far inland. Not collected in N.S.W. since 1911. Found from Indomalaysia to the western Pacific. Flowers and fruits all year round; trees often with both fruits and new flowers.

W.A.: Admiralty Gulf, Port Warrender, Walsh Pt, *K.F.Kenneally* 7821 (K, PERTH). N.T.: Sir Edward Pellew Group, W side of South West Is., *L.A.Craven* 3696 (CANB, L); S Goulburn Is., *A.Cunningham* 242 (BM, K, NSW). Qld: Lockerbie 10 miles [16 km] WSW of Somerset, *L.J.Brass* 18812 (BRI, CANB, K, L); Keppel Bay, 11 Aug. 1802, *R.Brown* s.n. [*Iter Austral.* 5319 p.p.] (BM). N.S.W.: Lismore, June 1891, *W.Bauerlen* s.n. (NSW).



Occasionally planted for ornament in Qld. Locally medicinal in Malesia, where the light timber is used for construction.

2. CLAUSENA

Clausena Burm.f., *Fl. Indica* 87 (1768), as *Claucena*; after P.Clausøn, 17th century Danish phycologist.

Type: *C. excavata* Burm.f.

Unarmed trees and shrubs. Leaves in spirals, imparipinnate; rachis rarely winged in mature plants; leaflets alternate, densely pellucid-dotted. Inflorescences terminal and/or axillary, thyrses or racemes. Flowers bisexual, rarely with some males, 4- and/or 5-merous. Sepals basally united, persistent. Petals free, imbricate, soon falling. Stamens 8 or 10 in 2 whorls, the outer (opposite sepals) often somewhat longer; filaments attached to disc; anthers dorsifixed, introrse. Disc annular. Gynophore hour-glass-shaped, glabrous. Ovary (2–) 4- or 5-locular, each locule with 2 pendulous, superposed to collateral ovules; style shorter than rest of pistil. Berry spherical to subconical, usually glandular. Seeds 1–3 (–5); cotyledons planoconvex.

Sixteen species of the Old World tropics from W Africa to NE Australia and Bougainville. Two native species in Qld (one endemic).

Molino (1994) recognises 4 sections in the genus: the Australian species belong to sect. *Clausena*. Sometimes cultivated is *C. lansium* (Lour.) Skeels (syn. *C. wampi* (Blanco) Oliv.) from China, which differs most markedly from native species in its yellow-orange fruits c. 1.5–3.0 cm diam.

W.T.Swingle, *Clausena*, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 158–192 (1943); J.Armstrong, *Clausena*, *Austral. Pl.* 8: 227 (1975); J.-F.Molino, Revision du genre *Clausena* Burm.f. (Rutaceae), *Bull. Mus. Natl. Hist. Nat., B, Adansonia* 16: 105–153 (1994).

Leaflets dull adaxially, often crenate; flowers 4 (or 5)-merous; fruit reddish purple to black

1. *C. brevistyla*

Leaflets glossy adaxially, entire; flowers 5-merous; fruit white

2. *C. smyrelliana*

1. *Clausena brevistyla* Oliv., *J. Proc. Linn. Soc. Bot.* 5, suppl. 2: 31 (1861)

T: Hope Islets [Qld], 18 July 1848, *J.McGillivray* s.n.; holo: K.

Illustration: W.Cooper & W.T.Cooper, *Fr. Rain Forest* 74, 75 (1994).

Tree to 15 m tall or shrub; bole to 8 cm diam.; branching somewhat fastigiate. Branches with conspicuous cicatrices. Leaves 15–45 cm long, glabrous to hairy, not glossy adaxially,

smelling of lime and guava when crushed; leaflets 7–15 (–18), ovate-elliptic to -lanceolate, 3–15 cm long, 2–8 cm wide, oblique at base, entire to crenulate, acute to subacuminate; petiolules 2–5 (–7) mm long. Thyrses (5–) 10–30 cm long, terminal and sometimes axillary. Pedicels 1–3 mm long. Flowers 4 (or 5)-merous. Sepals triangular, c. 0.5 mm long, glabrous to hairy with dorsal gland. Petals creamy white, often with apical gland. Anthers ovoid, 1–1.5 mm long, yellow, with a gland on connective. Disc 0.5–1.0 mm high, cylindrical with crown of glands, enveloping base of ovary. Ovary 0.8–1 mm high, each locule with a large gland; style 4-angled with lobed head. Fruit spherical, 0.8–1 cm diam., reddish purple or even bluish to black at maturity. Seeds 1–3, green. Plate 58.

Occurs in eastern Qld, from Cape York to Moreton District in *Araucaria* forest, and forest edge, to 720 m alt. Also found in Lesser Sunda Is. and Timor, Ceram, New Guinea and Bougainville. Flowers Oct.–Dec.; fruits Dec.–May.

Qld: Mt Elliot, *S.T.Blake 18705* (CANB, K); S of Hartley's Ck, *L.S.Smith 4632* (K, L, NSW); Cooyar Logging Area, *R.F.Thorne 20021a* (BRI, L).

Molino *loc. cit.* maintains two varieties but the distinction rests on inflorescence position and breaks down. This species is closely allied to *C. excavata* Burm.f. of Malesia, but that has a longer style and usually hairy ovary and pink fruits.



2. *Clausena smyrelliana* P.I.Forster., *Austrobaileya* 5: 716 (2000)

T: Qld, Wide Bay Dist., Dundowran, 8 Nov. 1999, *P.I.Forster 25182*; holotype: BRI; isotype: A, CNS, K, L, MEL.

Illustration: P.I.Forster, *op. cit.* 718, fig. 1.

Tree to 4 m tall or shrub. Branches with irregular longitudinal lines of yellowish lenticels. Leaves 15–30 cm long, subglabrous, glossy adaxially, very weakly smelling of citrus when crushed; leaflets 6–12, ovate-elliptic, 2–10 cm long, 1–7 cm wide, often oblique at base, entire, acute to subacuminate, rarely mucronate; petiolules 4–7 mm long. Thyrses to 9 cm long, terminal and sometimes axillary. Pedicels 3–4 mm long. Flowers 5-merous. Sepals triangular, 1–1.5 mm long, ciliate. Petals 7–7.5 mm long, creamy white, glabrous. Anthers ovoid, c. 1 mm long, yellow. Disc c. 1 mm high and wide. Ovary c. 1 mm high; style 4-angled with lobed head. Fruit depressed-globose, 8–9 mm long, 10–11 mm diam., white, with conspicuous oil-glands.

Possibly the most threatened vascular plant species in Qld (Forster, *loc. cit.*). Recorded from only 3 sites (now surviving only as a single tree at Dundowran) in dry littoral rain forest and vine thickets in SE Qld, but successfully taken into cultivation. Flowers Nov.–Jan.; fruits May.

Qld: Mon Repos Environmental Park, *J.Randall 409* (BRI); Dundowran, *I.Telford 11337* (BISH, BRI, CANB, NSW); Baffle Ck, *C.T.White 152118* (BRI).



3. GLYCOSMIS

Glycosmis Correa, *Ann. Mus. Paris* 6: 384 (1805), *nom. cons.*; from the Greek *glycos-*, sweet and *osmo-*, smelling.

Type: *G. arborea* (Roxb.) DC.

Unarmed trees and shrubs with reddish hairy innovations. Leaves usually in spirals, pinnate to unifoliate (rarely so in Australia); leaflets usually alternate, articulated at base. Inflorescences racemes or thyrses. Flowers bisexual, 4- or 5-merous. Sepals united basally, imbricate. Petals imbricate. Stamens 8 or 10, usually alternately unequal, attached around disc; filaments abruptly narrowed at apex; anthers generally with apical gland and sometimes 1 or more glands on connective. Disc annular, weakly lobed. Gynophore often present, stout.

Ovary 2–5-locular, each locule with 1 or 2 pendulous ovules; style short with swollen head. Berry spherical to ellipsoid, dry or fleshy. Seeds 1 or 2 (3), spherical to planoconvex; cotyledons green, fleshy.

A genus of perhaps 45 species of the Indopacific; 2 species in northern Australia.

Unfortunately, no satisfactory revision of this difficult genus has been published. Without a full appraisal of the plants in the *Flora Malesiana* region, this account must necessarily be provisional.

W.T.Swingle, *Glycosmis*, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 153–158 (1943); J.Armstrong, *Glycosmis*, *Austral. Plants* 8: 227 (1975); B.C.Stone, A conspectus of the genus *Glycosmis* Correa, *Proc. Acad. Nat. Sci. Philadelphia* 137: 1–27 (1985); B.C.Stone, Additional notes on the genus *Glycosmis* Correa (Rutaceae), *Gard. Bull. Singapore* 46: 113–119 (1994).

Leaves usually 3–5-foliolate; thyrses usually obviously branched; ovary 3-locular, with red curled hairs

1. *G. macrophylla*

Leaves (1–) 3 (–6)-foliolate; thyrses with congested flowers; ovary (2) 3 (4)-locular, glabrous

2. *G. trifoliata*

1. *Glycosmis macrophylla* (Blume) Miq., *Fl. Ned. Ind.* 1(2): 522 (1859)

Sclerostylis? *macrophylla* Blume, *Bijdr.* 135 (1825). T: Indonesia, Halmaheira, Aug. 1821, *C.G.C.Reinwardt s.n.*; lecto: L; isolecto: L, *fide* D.J.Mabberley, *Telopea* 7: 342 (1998).

G. sapindoides Lindl. ex Oliv., *J. Proc. Linn. Soc. Bot.* 5, suppl. 2: 38 (1861). T: Malaysia, Penang, 1822, *Anon. in Herb. E India Co.* 6376; holo?: K-W (fiche seen).

G. sapindoides var. *australiensis* B.C.Stone, *Proc. Acad. Nat. Sci. Philadelphia* 137: 18 (1985), *nom. illeg.*; *G. macrophylla* var. *australiensis* (B.C.Stone) B.C.Stone, *Gard. Bull. Singapore* 46: 119 (1994). T: W.A., Bonaparte Archipelago, Augustus Is., *P.G.Wilson* 10775; holo: PERTH.

Illustration: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 672, fig. 207A (1992), as *G. sapindoides*.

Tree or shrub to 10 m high. Twigs drying greyish. Leaves imparipinnate, (1) 3 or 5 (7)-foliolate, to 25 cm long; leaflets alternate, narrowly elliptic to oblong, 3–13 cm long, 1.5–3.5 (–6) cm wide, cuneate and weakly asymmetric at base, subacuminate to subobtusate or rarely rounded at apex, with c. 8–10 veins on each side. Thyrses axillary, to 10 cm long, often conspicuously branched with laterals to 4 cm long, minutely densely red-hairy; pedicels c. 1 mm long; bracts and bracteoles triangular, c. 1.5 mm long. Sepals triangular, c. 1 mm long, puberulous, ciliate. Petals oblong, c. 5 mm long, creamy white, sparsely hairy. Stamens 2.5–4 mm long; anthers elliptic, gland-tipped. Ovary 3-locular, with gynophore densely reddish-puberulent. Fruit not seen in Australian material.

Occurs in northern Australia from Broome, W.A. to ?Arnhemland, N.T.; also from Thailand, through Malesia to West New Guinea; occurs on rocky sandstone or behind sand dunes, in creek beds on basalt, to 210 m alt. Flowers Apr.–Nov.

W.A.: Dampier Penin., James Price Point, *P.R.Foulkes* 21 (PERTH); SE of Cape Londonderry, *A.S.George* 13334 (PERTH); Prince Frederick Harbour, ‘Shelly Beach Island’, *K.F.Kenneally* 10004 (PERTH). N.T.: Upper Mann R., *J.Russell-Smith & D.Lucas* 4033 (BRI, DNA); Kakadu Natl Park, Upper Koolpin Ck, *J.Russell-Smith & D.Lucas* 5507 (BRI, DNA).

No fruiting material has been seen though it is likely that some provisionally identified as *G. trifoliata* belongs here. Material collected since the naming of var. *australiensis*, allegedly differing from the type in smaller elliptic leaflets etc., shows that it is not distinct.



2. *Glycosmis trifoliata* (Blume) Spreng., *Syst. Veg.* 4, *Cur. Post.* 162 (1827)

Sclerostylis trifoliata Blume, *Bijdr.* 3: 133 (1825). T: Java, Cirebon, near Linga Jati, *C.L.Blume s.n.*; holo: L ('1614').

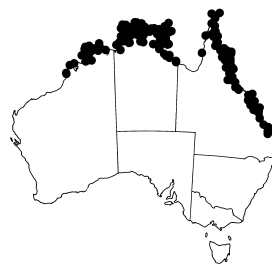
[*G. pentaphylla* auct. non DC.: G.Bentham, *Fl. Austral.* 1: 367 (1863)]

Illustrations: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 672, fig. 207B (1992); W.Cooper & W.T.Cooper, *Fr. Rain Forest* 150, 151 (1994).

Tree or shrub to 5 m high. Twigs drying pale. Leaves imparipinnate, (1) 3 (5, 6)-foliolate, to 19 cm long; leaflets alternate, ovate to elliptic, 5–13.5 cm long, 2.3–6.5 cm wide (apical one usually larger), subcuneate and weakly asymmetric at base, entire to subcrenulate, acute to acuminate, with c. 12 veins on each side. Inflorescence a congested axillary to apparently terminal thyrse of scented flowers; axis to 35 mm long, ferruginous; pedicels c. 1 mm long; bracts and bracteoles triangular, c. 0.5–1 mm long. Sepals triangular, c. 1 mm long, puberulous, ciliate. Petals elliptic-ovate, c. 5 mm long, white or creamy yellow, sparsely hairy. Stamens 2.5–4.5 mm long; anthers elliptic, glandular. Ovary (2) 3 (4)-locular, glabrous; gynophore glabrous. Berry spherical, c. 9–12 mm diam., with persistent style, pink, fleshy, 1- or 2-seeded. *Mulindj* (Bardi, W.A.). Plate 57.

Malesia (distribution unclear) to Australia, where found in N.W.A., N.T. and Qld as far S as Bundaberg; grows in rain forest to deciduous thicket, often common, from rocky coastlines and sand dunes, to 350 m alt. Flowers all year round; fruits most of year.

W.A.: Cape Leveque, northern tip of Dampierland, *K.F.Kenneally* 10650 (PERTH). N.T.: Douglas R., Limestone Arch, *J.Must* 1291 (BRI, DNA, K, L); Wessel Is., Jirrigiri Is., *J.Russell-Smith & D.Lucas* 4506 (BRI, DNA). Qld: Cape York, Iron Ra., *L.J.Brass* 19108 (BRI, L); Northumberland Is., 30 Sept. 1802, *R.Brown s.n.* [*Iter Austral.* 5340 p.p.] (BM, K, MEL, NSW).



4. MURRAYA

Murraya J.König in C.Linnaeus, *Mant. Pl.* 2: 554 (1771) as *Murraea*, *nom. cons.*; after J.A.Murray (1740–1791), a pupil of Linnaeus.

Type: *M. exotica* L.

Camunium Adans., *Fam. Pl.* 2: 166 (1763); *Chalcas* L., *Mant. Pl.* 1: 68 (1767), *nom. illeg., superfl.* T: *Chalcas paniculata* L.

Unarmed trees. Leaves in spirals, pinnate, with unwinged rachis; leaflets alternate. Inflorescences terminal or axillary thyrses. Flowers bisexual, 5-merous, fragrant. Calyx united in lower third, persistent in fruit. Petals free, imbricate, caducous. Stamens 10, free, alternately unequal in length; filaments ±linear, straight. Disc annular to shortly cylindrical. Gynophore not obvious. Ovary 2–5-locular, each locule with (1 or) 2 superimposed or almost collateral ovules; stylehead capitate. Berry subglobose or ovoid with mucilaginous pulp. Seeds 1 or 2, ovoid; cotyledons planoconvex.

A few species in Indomalesia and the western Pacific. One species in Australia.

On morphological grounds, now supported by molecular findings, it is best to restrict this genus to species with large petals, red fruits, yellowish stems and roots, sesquiterpenes and the alkaloid yuehchukene (sect. *Murraya*) and exclude sect. *Bergera* (small petals, purplish black fruits, brown stems and roots, monoterpenes and the alkaloid girinimbine) as the genus *Bergera* J.König. *Bergera* includes the ‘curry-leaf’ (*B. koenigii* L.), a native of tropical Asia but widely cultivated for its leaves used in flavouring food, being an essential ingredient in curry, and has much more the Gestalt of *Micromelum* or *Clausena*.

T.Tanaka, *Chalcas*, a Linnean genus which includes many new types of Asiatic plants, *J. Soc. Trop. Agric.* 1: 23–44 (1929); W.T.Swingle, *Murraya*, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 192–206 (1943); J.Armstrong, *Murraya*, *Austral. Plants* 8: 228 (1975); T.-C.Kong *et al.*, A chemotaxonomic division of *Murraya* based on the distribution of the alkaloids yuehchukene and girinimbine, *Biochem. Syst. Ecol.* 14: 491–497 (1986); Q.Li *et al.*, Monoterpene and sesquiterpene rich oils from the leaves of *Murraya* species: chemotaxonomic significance, *Biochem. Syst. Ecol.* 16: 491–494 (1988); J.J.Brophy *et al.*, Diversity in Australian populations of *Murraya paniculata* (Rutaceae): new evidence from volatile leaf oils, *Austral. Syst. Bot.* 7: 409–418 (1994); R.Samuel *et al.*, Phylogenetic

analyses of Aurantioideae (Rutaceae) based on non-coding plastid DNA sequences and phytochemical features, *Pl. Biol.* 3: 77–87 (2001).

Murraya paniculata* (L.) Jack, *Malay. Misc.* 1: 31 (1820), *s. lat.

Chalcas paniculata L., *Mant. Pl.* 68 (1767). T: “India”; lecto: illustration ‘Camunium vulgare’, G.E.Rumphius, *Herb. Amb.* 5: t. 17 (1747), *fide* K.N.Nair, in C.Jarvis *et al.*, *Reg. Veg.* 127: 32 (1993).

?*M. exotica* L., *Mant. Pl.* 2: 563 (1771), as *Murraea*. T: “India”; neo: Herb. Linn. 539.1; LINN, *fide* K.N.Nair, *op. cit.* 68.

M. exotica var. *ovatifoliolata* Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* III, 4: 188 (1896); *M. ovatifoliolata* (Engl.) Domin, *Biblioth. Bot.* 89: 296 (1927); *M. paniculata* var. *ovatifoliolata* (Engl.) Swingle in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 196 (1943). T: ‘mit rundlichen oder eifoermigen Blättchen, im tropische Nordaustralien’; holo: ?lost (B) or not preserved.

Illustrations: E.Soepadmo & K.M.Wong, *Tree Fl. Sabah Sarawak* 1: 404, t. 13 (1995); R.Melzer & J.Plumb, *Pl. Capricornia* 312 (2011), as *M. ovatifoliolata*.

Evergreen tree to c. 7 (–20) m high, but often a shrub. Bark smooth, pale to whitish. Young shoots glabrous to puberulous or distinctly hairy. Leaves imparipinnate, to 7-foliolate, rarely trifoliolate, to 17 cm long, glossy, usually glabrous; leaflets cuneate-obovate, ovate, elliptic or almost rhomboid, (0.6–) 2.5–10 cm long, (0.5–) 1.2–5 cm wide, sometimes reflexed marginally, acute to acuminate, coriaceous, ±glabrous; petiolule 2–6 mm long. Flowers fragrant, in terminal and/or lateral corymbose thyrses; pedicels (0.3–) 1–1.3 cm long. Calyx lobes (4) 5, narrowly deltoid, c. 1 mm long, sparsely pubescent. Petals (4) 5, narrowly obovate, (8–) 13–18 (–25) mm long, white or cream, recurved at anthesis. Ovary 2-locular; stylehead glandular. Berries ovoid, c. 12–14 mm long, often apically pointed, glabrous, orange-red; seeds densely hairy. *Orange jasmine (jessamine)*. Plate 59.

Native to N tropical Australia, mostly in E Qld, but with some records from W.A. and N.T. Occurs from Sri Lanka, throughout Indomalaysia to subtropical China and New Caledonia; widely cultivated in tropical countries and, under glass, in temperate ones. Often common, especially as an understorey shrub, in vine thickets particularly behind beaches and in vine forest, on basalt or calcareous soils, to 200 m alt. Flowers June–Mar.; fruits Jan.–Aug.



W.A.: N side of Prince Frederick Harbour, *P.G.Wilson 11406* (PERTH). N.T.: Winchelsea Is. off Groot Eylandt, 16 Jan. 1803, *R.Brown s.n.* [*Iter Austral.* 5341 p.p.] (BM, NSW); Guy Cave Area, Sixteen Mile Cave Res. S of Katherine, *L.J.Webb & J.G.Tracey 12838* (DNA). Qld: 4 miles [c. 6.4 km] E of Kilcummin Stn, *L.Adams 1260* (B, K, L, NSW); Wide Bay, Kepnock, *L.S.Smith 4161* (BRI).

The species comprises a number of apparently distinctive entities, one of which, probably domesticated in China, has been long and widely cultivated including in Australia, where it is locally naturalised (e.g. Qld, Chelona Shoal, Mackay, *G.N.Batianoff 9303478*, BRI); this is the orange jasmine, ‘*Murraya exotica*’, a form with rather small leathery leaflets: it is the shan fan or China box (J.Needham, *Science and Civilisation in China* VI, 1: 428, 495, 501 (1986)) used as a pesticide in Medieval China, especially to protect books from insects, though its status is still unclear and it may even represent a distinct wild species. Wild plants in Australia, with very few intermediate exceptions, from ‘dry’ semi-deciduous to deciduous vine thickets tend to be low sprawling shrubs less than 3 m tall with small leaflets, highly aromatic when crushed, and pedicels 3–7 mm long; they are found from Cape York to SE Qld and there are some records from W.A. and N.T. (‘Small Leaves’ of Brophy *et al.* (1994); see Mabberley (*Telopea* 7: 342–343 (1998)) for discussion). Plants from ‘less dry’ semi-deciduous notophyll forests form small trees 3–6 m tall with larger leaflets, less aromatic when crushed, and pedicels 10–13 mm long; these have been recorded across northern tropical Australia (‘Big Leaves’ of Brophy *et al.* (1994)). Their relationship to plants in neighbouring territories is not yet fully elucidated. Recent work (H.C.Nguyen, Circumscription of *Murraya* and *Merrillia* (Sapindales: Rutaceae: Aurantioideae) and susceptibility of species and forms to huanglongbing. PhD thesis, University of Western Sydney, 2012), to be extended in scope, so far indicates that in using characters of leaflet shape and pubescence,

besides molecular markers, i) the cultivated '*M. exotica*' probably native only in southern China and northern Vietnam, is indeed argued to be specifically distinct from *M. paniculata* s. str. (native to Malesia), ii) the native Australian populations (also in Timor) of *M. paniculata* s. lat., are argued to be worthy of specific rank as '*M. ovatifoliolata*', though that may not be the earliest available specific epithet. In general terms these taxa, at whatever rank, would therefore appear to be allopatric; however, according to Nguyen, there are populations of putative hybrids (? '*M. × omphalocarpa* Hayata') between '*M. exotica*' and '*M. ovatifoliolata*' recorded from Lan Yu (off southern Taiwan), and also from western New Guinea, in neither of which localities have either of the suggested parental taxa so far been recorded.

Murraya paniculata has been hybridised with species of *Citrus*, one of which also has pinnate leaves (Kubitzki, 2011) and at least one of which can be grafted on it (Swingle, 1943). It is held to be a mosquito-repellent and a water-soluble toxin extracted from the leaves has been shown to kill eggs and nymphs of the Asian citrus blackfly.

5. LUVUNGA

Luvunga Wight & Arn., *Prodr. Fl. Ind. Orient.* 90 (1834); from *luvungalata*, the Sanskrit name for *L. scandens*.

Type: *L. scandens* (Roxb.) Wight

Evergreen lianes with axillary solitary spines sometimes hooked. Twigs ±terete. Leaves (1) 3-foliolate; petiole pulvinate, not winged. Flowers in axillary racemes or solitary, bisexual, 3–5-merous. Calyx cupular; margin lobed. Petals imbricate. Stamens 6–10, free or ±basally connate. Disc annular, pulvinate or columnar. Ovary 3–5-locular, with gynophore, each locule with 1 or 2 ovules. Berry rounded or lobed, resinous; mesocarp mucilaginous. Seeds 1–3, ovoid or flattened with single straight embryo.

A genus of c. 12 species from Indomalesia to northern Australia; 1 species native in Australia.

W.T.Swingle, *Luvunga* & *Paramignya*, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 244–269 (1943); B.C.Stone, *Luvunga* Buch-Ham. ex Wight & Arn., *Proc. Acad. Nat. Sci. Philadelphia* 137: 221–223 (1985); L.Pedley, *Paramignya* Wight (Rutaceae: Citreae) in Australia, *Austrobaileya* 2: 416 (1987).

Luvunga monophylla (DC.) Mabb., *Telopea* 7: 334 (1998)

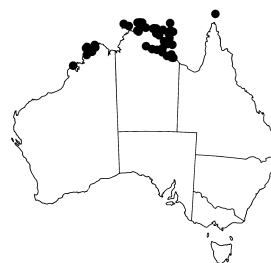
Triphasia monophylla DC., *Prod.* 1: 536 (1824); *Atalantia trimera* Oliv., *J. Proc. Linn. Soc. Bot.* 5, suppl. 2: 24 (1861), non *Atalantia monophylla* DC.; *Paramignya trimera* (Oliv.) Burkill, *Gard. Bull. Straits Settlements* 5: 213 (1931), non *P. monophylla* Wight. T: Timor, *Anon.* (ex herb. Paris 1821 [J.B.L.C.T. Leschenault de la Tour, 1803]); holotype: G-DC (fiche seen); ?iso: K ['Leschenault'], L ['ex herb. Paris'].

Atalantia (?) *recurva* Benth., *Fl. Austral.* 1: 370 (1863). T: Gulf of Carpentaria, Sir Edward Pellew Group, Dec. 1802, *R.Brown s.n.* [Iter Austral. 5342]; lectotype: K; isotype: BM, *fide* D.J.Mabberley, *Telopea* 7: 334 (1998).

Illustration: J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 674, fig. 208 (1992), as *Paramignya trimera*.

Glabrous lianoid shrub to 2 m high. Spines stipular, to 2 (–3) cm long, apically weakly hooked on long shoots, much smaller on flowering ones. Leaves simple, ovate or obovate to elliptic, 3.5–8.0 cm long, weakly crenulate distally, obtuse to emarginate, coriaceous. Racemes of sweetly scented flowers (frequently galled), to 2.5 cm long; axis puberulous; pedicels 1–3 mm long. Calyx 3-lobed, c. 1 cm long. Petals 3, lanceolate-oblong, 2.5–4 mm long, obtuse, white to cream. Stamens 6, c. 3 mm long; filaments flattened. Berry spherical, c. 1 cm diam., yellow-orange. Seeds usually 2, round, somewhat flattened. Plate 60.

Occurs in the Kimberley region of W.A., northern N.T. and Torres Strait islands, Qld; also in Java and southern Philippines. Found in monsoon forest and vine thickets on sandstone or



basalt, among boulder scree, on stabilised sand dunes; often very common and sometimes forming the understorey. Flowers Aug.–Nov.; fruits Nov., Jan.–Mar.

W.A.: Dampier Penin., W of Carnot Peak, *T.Willing* 145 (PERTH); Bonaparte Archipelago, SW Osborne Is., *P.G.Wilson* 11026 (PERTH). N.T.: Sir Edward Pellew Group, Vanderlin Is., Sharp Stones Point, *J.Russell-Smith & D.Lucas* 6771 (DNA); Arnhem Land Aboriginal Res., Yirrkala, *R.L.Specht* 992 (K, L, NSW, PERTH). Qld: Torres Strait, Iama [Yam Is.], *D.G.Fell* 8851 & *D.J.Stanton* (BRI).

6. CITRUS

Citrus L., *Sp. Pl.* 2: 782 (1753); after the Classical Latin name for the sweet-smelling North African timber, *Tetraclinis articulata* (Cupressaceae), applied by Linnaeus to the citron, *C. medica* (probably because it was originally used for its scent rather than eaten), and its allies.

Type: *C. medica* L.

Poncirus Raf., *Sylva Tellur.* 143 (1838). T: *P. trifoliata* (L.) Raf.

Eremocitrus Swingle, *J. Agric. Res.* 2: 86 (1914); *Citrus* subg. *Eremocitrus* (Swingle) Burkill, *Gard. Bull. Straits Settlements* 5: 218 (1931). T: *E. glauca* (Lindl.) Swingle

Microcitrus Swingle, *J. Washington Acad. Sci.* 5: 570 (1915); *Citrus* subg. *Microcitrus* (Swingle) Burkill, *Gdms Bull. Straits Settlements* 5: 219 (1931). T: *M. australasica* (F.Muell.) Swingle

Evergreen, rarely deciduous, armed trees or shrubs. Young twigs angled or not, with solitary (rarely paired) spines in axils. Leaves unifoliate, rarely 3-foliate, imparipinnate (not in Australia) or apparently simple, sometimes dimorphic (seedlings with much smaller leaves), with dense pellucid oil glands, fragrant when crushed; petiole often pulvinate, often ±winged. Inflorescences small axillary fascicles or flowers solitary. Flowers bisexual or male (ovary aborted), fragrant. Calyx cupular, (3) 4- or 5-lobed. Petals (3) 4 or 5 (–8), imbricate. Stamens usually c. 4 times as many as petals but up to 10 times, free or basally coherent. Disc annular or short. Ovary (3–) 5–14 (–18)-locular, without gynophore, each locule with 2–8 or more ovules. Berry (hesperidium) with segments of pulp vesicles and adaxially attached seeds; pericarp with oil-glands. Seeds obovoid or flattened obovoid, ±angular with 1 or more embryos.

About 25 species in tropical and subtropical S & SE Asia to W Pacific; 6 native (5 endemic) species in Australia (more than any other region), and 2 introduced.

Four tropical and subtropical Asiatic and W Malesian species comprise Swingle's subg. *Citrus* ('*Eucitrus*') and three allopatric ones of these are believed to have contributed to the principal citrus crops, most of which are agamic complexes arising from hybridity and apomixis (see Mabberley, 1997): *C. reticulata* Blanco (mandarin, tangerine, S China), *C. maxima* (Burm.) Merr. (pomelo, pummelo, SE Asia) and *C. medica* L. (citron, ? N India). The oranges (sweet and sour) and grapefruit, *C. × aurantium* L., are crosses and backcrosses between *C. reticulata* and *C. maxima*; the lemon, *C. × limon*, is a cross between *C. medica* and *C. × aurantium*, and the rough or 'bush' lemon, *C. × taitensis* Risso, a hybrid possibly between the citron or the lemon and *C. reticulata*. The bergamot sour oranges, (*C. × bergamia* Risso & Poit.), their peel the source of oil of bergamot used as a flavouring (as in Earl Grey tea for example), comprise a cultivar group of lemons. The lime, *C. × aurantiifolia* (Christm.) Swingle, is a cross between *C. maxima* and possibly *C. hystrix* DC. (subg. *Papeda* (Hassk.) Swingle; tropical Asia), which species is sold as lime-leaves (Kaffir-lime) in Australia and has the very broad petioles typical of subg. *Papeda*. The seedless lime, *C. × latifolia* (Yu.Tanaka) Tanaka is possibly a cross between the lime and the lemon. The kumquats are cultivars of *C. japonica* Thunb. (*Fortunella japonica* (Thunb.) Swingle, S China). The calamondin, *C. × microcarpa* Bunge (*C. × mitis* Blanco, × *Citrofortunella microcarpa* (Bunge) Wijnands, × *C. mitis* (Blanco) J.Ingram & H.Moore), is a kumquat-mandarin cross. The limequats, *C. × floridana* (J.W.Ingram & H.E.Moore) Mabb. (× *Citrofortunella floridana* J.Ingram & H.Moore, × *C. swinglei* J.W.Ingram & H.E.Moore) are kumquat-lime crosses (Mabberley 1998). The citrangequat, *C. × georgiana* Mabb., is a cross between *C. japonica*

and the citrange, *C. × insitum* Mabb. (\times *Citroncirus webberi* J.W.Ingram & H.E.Moore non *Citrus × webberi* Wester), which is widely used as a citrus rootstock, its parents being *C. × aurantium* and *C. trifoliata* L. (*Poncirus trifoliata* (L.) Raf.). *Citrus trifoliata*, itself sometimes also used as a rootstock, is native in N China.

In Australia, most kinds of commercial citrus are grown or have been tried. Some persist around abandoned homesteads and along roadsides; some are self-sown and some are rootstocks run wild. Pigeonholing all of these is by their very nature impossible. What are considered rough ('bush') lemons (rootstocks) have escaped on Norfolk Is. and Lord Howe Is. and some plants in N.S.W. have been referred there: only taxa represented by readily identified herbarium material of feral plants seen are included here.

W.T.Swingle, *Citrus, Eremocitrus, Microcitrus*, in H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 361–366, 376–445 (1943); D.J.Mabberley, A classification for edible *Citrus* (Rutaceae), *Telopea* 7(2): 167–172 (1997); D.J.Mabberley, Australian Citreae with notes on other Aurantioideae (Rutaceae), *Telopea* 7(4): 333–344 (1998); D.J.Mabberley, Limau Hantu and Limau Purut: the story of lime-leaves (*Citrus hystrix* DC., Rutaceae), *Gard. Bull. Singapore* 54: 185–197 (2002); D.J.Mabberley, *Citrus* (Rutaceae): a review of recent advances in etymology, systematics and medical applications, *Blumea* 49: 481–498 (2004); Z.Dianxiang & D.J.Mabberley, *Citrus*, in Z.Y.Wu *et al.* (eds), *Fl. China* 11: 90–96 (2008).

- | | | |
|----|--|---------------------------|
| 1 | Petioles winged, articulated with lamina; stamens basally coherent in bundles | |
| 2 | Fruit ovoid, yellow | 1. <i>C. × limon</i> |
| 2: | Fruit globose, orange to scarlet | 2. <i>C. reticulata</i> |
| 1: | Petioles unwinged; stamens free, very rarely weakly coherent at base | |
| 3 | Leaves 8–18 × 4–10 cm, with very numerous lateral veins; spines often paired | 3. <i>C. inodora</i> |
| 3: | Leaves 1.5–6 (–9) × (0.2–) 0.5–3 cm, without numerous lateral veins; spines solitary | |
| 4 | Fruits ovoid to ellipsoid to cylindrical | |
| 5 | Fruits ovoid to ellipsoid | 4. <i>C. garrawayi</i> |
| 5: | Fruits cylindric-fusiform | 5. <i>C. australasica</i> |
| 4: | Fruits globose to obovoid | |
| 6 | Leaves obovate to obcordate | 6. <i>C. australis</i> |
| 6: | Leaves oblanceolate to sublinear | |
| 7 | Locules 8 or 9 | 7. <i>C. gracilis</i> |
| 7: | Locules 3 | 8. <i>C. glauca</i> |

1. *Citrus × limon* (L.) Osbeck, *Reise Ostind. China* 250 (1765), as *limonia

C. medica var. *limon* L., *Sp. Pl.* 2: 782 (1753). T: not designated; lecto: '*Limon vulgaris*' in J.B.Ferrarius, *Hesperides* 191, 193 (1646), *fide* D.J.Mabberley, *Telopea* 7: 169 (1997).

Small spiny trees with reddish shoots and flowerbuds. Leaves 1-foliolate; petiole narrowly winged, articulated with lamina; lamina ovate to elliptic, 8–14 × 4–6 cm, crenulate to serrate or subserrate, usually mucronate. Flowers solitary, or several in fascicles, bisexual or male. Calyx cupular with 4 or 5 lobes. Petals linear-oblong, 1.5–2 cm long, white, pink abaxially. Stamens 20–40, basally coherent in bundles. Ovary subcylindric or barrel-shaped, 8–10 (11)-locular. Fruit ovoid with apical mamilla; pericarp yellow, thick, prominently gland-dotted. Seeds ovoid, pointed, smooth; embryo usually solitary but sometimes numerous. *Lemon*.



Cultigen (*Citrus medica* L. \times *C. aurantium* L.), grown through much of tropical to subtemperate Australia, naturalised in E Qld and E N.S.W. Flowers Oct.–Nov.; fruits Mar.–May.

Qld: Shoalwater Bay Military Reserve, near abandoned Manifold HS, *J.R.Clarkson & T.D.Stanley 885* (BRI); Sarabah Ra., just N of Mt Cainbale, 14 Apr. 1977, *W.J.F.McDonald & T.D.Stanley s.n.* (BRI).

It should be noted that some of these plants identified as *C. limon* may be referable to *C. taitensis* (see above).

***2. *Citrus reticulata* Blanco, *Fl. Filip.* 610 (1837)**

T: [Cultivated] Philippines, Luzon, *Sp. Blancoanae* 402; neo: UC *n.v.*; isoneo: BM, K, *fide* W.T.Swingle, in H.J.Webber & L.D.Batchelor, *op. cit.* 413.

Small spiny tree. Leaves 1-foliolate: petiole narrowly winged, articulated with lamina; lamina lanceolate, elliptic or broadly ovate, obscurely crenulated distally or rarely entire, emarginate. Flowers solitary or up to 3 in fascicles, bisexual. Calyx irregularly 3–5-lobed. Petals linear-oblong, usually less than 1.5 cm long, white. Stamens 20–25, basally coherent in bundles. Ovary (7–) 10–12-locular. Fruits subglobose to depressed globose; pericarp readily peeling from segments, bright orange to scarlet. Seeds ovoid (rarely seedless), pointed at one end; embryos numerous, rarely solitary, green.

Tangerine, Mandarin, Clementine.

Probably native in SE China and S Japan but long cultivated; hybrids with *C. maxima* (Burm.) Merr. and backcrosses with their parents are the oranges and grapefruits of commerce (*C. aurantium* L.). Grown throughout much of tropical to subtemperate Australia, naturalised in Qld. Flowers Oct.–Nov.; fruits Apr.–June.



Qld: Palmerston, Egan Logging Area, *B.Gray 5541* (CNS).

3. *Citrus inodora* F.M.Bailey, *Rep. New Plants Bellenden Ker* 1 (1889), as *inodorus*

Microcitrus inodora (F.M.Bailey) Swingle, *J. Washington Acad. Sci.* 5: 577 (1915). T: Qld, Russell R., Harvey's Ck, *F.M.Bailey s.n.*; holotype: BRI *n.v.*; ?iso: K, P, US.

C. maideniana Domin, *Biblioth. Bot.* 89: 297 (1927); *M. maideniana* (Domin) Swingle, *J. Washington Acad. Sci.* 28: 533 (1938). T: Qld, Russell R., Harvey's Ck, Dec. 1909–Jan. 1910, *K.Domin*; holotype: PR.

Illustrations: F.M.Bailey, *Queensland Fl.* 1: t. 10 (1899); H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 384, t. 64 (1943).

Tree to 4 m high with trunk to 5 cm diam.; spines 6–12 mm long, solitary or paired; twigs angled. Leaves: petiole 4–8 mm long, not winged, not articulated with lamina; lamina broadly ovate or lanceolate, 8–20 \times 4–10 cm wide, \pm acute at base, distally subcrenulate, acute to subacuminate; veins very numerous, parallel. Flowers solitary or rarely in small fascicles, subsessile, apparently bisexual and scentless. Calyx with 5 minute teeth. Petals 5, linear-oblong, c. 7 mm long, white. Stamens at least 30, of different lengths, free. Ovary 8-locular. Fruit ellipsoid, to 65 mm long and 30 mm diam., yellow, smooth; flesh sharply acid. Seeds pear-shaped in outline, planoconvex, 6–8 \times 4–5 mm. *Russell River Lime, North Queensland Lime.*

Restricted to NE Qld; found in rain forests, in *Backhousia bancroftii* forest, at 10–100 m alt., much reduced in range as forests are cleared for sugar cane and banana plantations. Flowers Aug. & Nov.; fruits Jan., Mar. & June.

Qld: Cow Bay area, Cape Tribulation, *I.Small 1* (CNS); Bellenden Ker 'foothill rainforests', Mar. 1922, *C.T.White 1256* (BRI, K, MEL, NSW).

This species has many features of those formerly referred to *Clymenia* Swingle, of New Guinea and the Bismarck Archipelago. According to C.T.White (*Heredity* 13: 119–121 (1921)), it regenerates in secondary growth and along the edges of clearings fruits very heavily.



4. *Citrus garrawayi* F.M.Bailey, *Queensland Agric. J.* 15: 491 (1904)

Microcitrus garrawayi (F.M.Bailey) Swingle, *J. Washington Acad. Sci.* 5: 574 (1915). T: Qld, Cape York Penin., Mt White near Coen, May 1904, *R.W.Garraway*; holotype: BRI n.v.; iso: P.

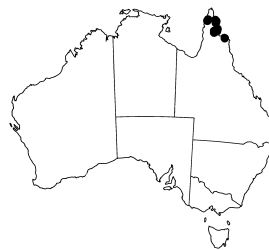
Illustration: W.Cooper & W.T.Cooper, *Fr. Rain Forest* 190, 191 (1994), as *Microcitrus garrawayae*.

Tree to 10 m high, 20 cm d.b.h., semi-deciduous in dry season; spines 2–5 mm long, solitary, sometimes few; leafy twigs hairy when young. Leaves: petiole 2–4 mm long, not winged, articulated with lamina; lamina broadly lanceolate to rhomboid, 30–45 × 15–20 mm in mature plants, cuneate at base, subcrenulate especially distally, obtuse to rounded or sometimes emarginate, coriaceous. Flowers usually solitary, bisexual. Petals linear-oblong, white. Stamens c. 25, free. Ovary 4- or 5-locular. Fruit ovoid to ellipsoid, to 10 cm long, 2 cm diam., 4- or 5-locular with many seeds; pericarp pale yellow or green with sunken oil-glands; flesh green or pink, pleasantly acidic. Seeds ovoid, 3-angled. *Mount White Lime*.

Restricted to Cape York Penin., Qld. Found in monsoon forest to 450 m alt.; often common. Flowers Nov.–Dec.; fruits Apr.–June.

Qld: Possum Scrub, *P.I.Forster 15279* (BRI); Lankelly Ck, *B.Hyland 8703* (BRI, CNS, L).

Records of *C. garrawayi* from Goodenough Is., New Guinea [also as *M. australasica* auct. non F.Muell.: B.C.Stone, *Proc. Acad. Nat. Sci. Philadelphia* 137: 226 (1985)] are considered to be referable to a distinct species restricted to that island, *C. wakonai* P.I.Forst. & M.R.Sm., *Austrobaileya* 8: 134 (2010).



5. *Citrus australasica* F.Muell., *Fragm.* 1: 26 (1858)

Microcitrus australasica (F.Muell.) Swingle, *J. Washington Acad. Sci.* 5: 572 (1915). T: Qld, Moreton Bay, *W.Hill s.n.*; holotype: MEL.

C. cataphracta W.Hill, *Queensland Timbers* 23 (1880). T: not preserved?

C. australasica var. *sanguinea* F.M.Bailey, *Dept. Agric. Queensland Bot. Bull.* 18: 8 (1892); *M. australasica* var. *sanguinea* (F.M.Bailey) Swingle, *op. cit.* 574. T: Qld, Herb. Brisbane (?F.M.Bailey); holotype: BRI n.v.

Illustrations: H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 381, fig. 63E (1943); G.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 274; pl. 17 (1991).

Shrub or small tree to 10 m high; spines 5–12 (–25) mm long, solitary. Leaves: petiole 1–3 mm long, not winged, articulated with lamina; lamina obovate to rhomboid, 22–25 (–50) × 14–15 (–25) mm (smaller and ovate in young plants), truncate at base, obscurely toothed in upper half, truncate or emarginate, glabrous. Flowers solitary or paired, male (mostly) and bisexual, (3–) 5-merous; Petals oblong, (6–) 7–8 (–9) mm long, white. Stamens 20–25, free. Ovary 5–7-locular, each locule with 8–16 ovules. Fruits cylindric-fusiform, often weakly falcate, to 50 (–100) mm long and (15–) 20 (–25) mm diam.; pericarp rough, greenish yellow; mesocarp yellow. Seeds many per locule, ovoid, 6–7 mm long; embryo solitary. *Finger-lime*. Fig. 71.

Restricted to Australia, from Brisbane, SE Qld, S to Clarence R., northern N.S.W. Flowers Dec., Mar.–Apr.; fruits Feb., June.

Qld: Lamington Natl Park, Old Cedar Rd, *C.Bell 579* (BRI). N.S.W.: Lismore, Wilson Park, *G.J.Harden 81270* & *J.B.Williams* (NSW).

The fruit has an acrid aftertaste due to oil-droplets in the pulp vesicles.

Forms with pink or red pulp vesicles have been found in the wild and have been called var. *sanguinea* F.M.Bailey. This has been crossed with the Rangpur Lime (perhaps a form of *C. × limon*) to give the commercially significant Blood Lime.

Timber formerly used. Good resistance to phytophthora and to the parasitic nematode *Radopholus similis*. *Citrus australasica* has been crossed with the calamondin (*C. × microcarpa* Bunge),



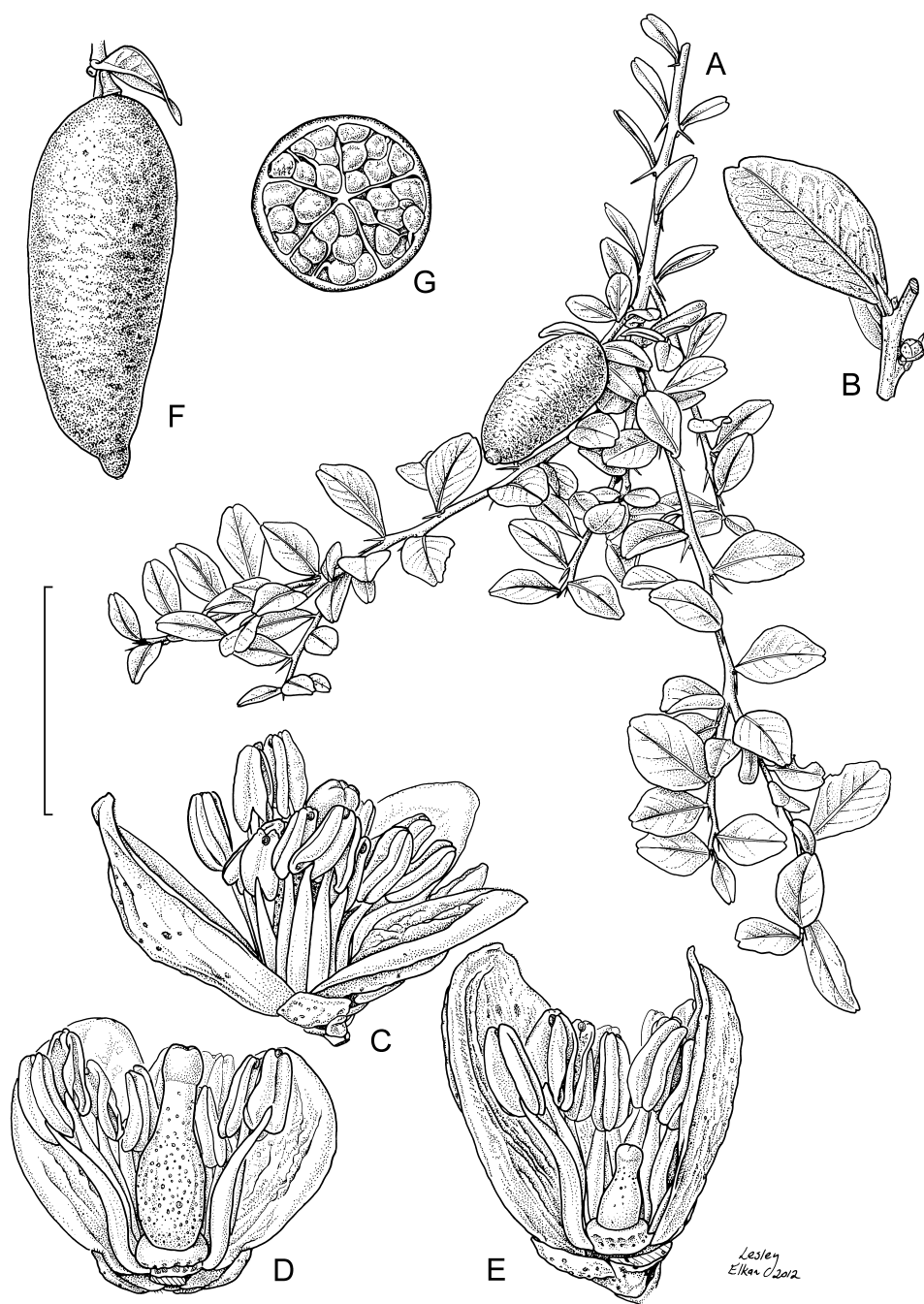


Figure 71. *Citrus australasica*. **A**, fruiting branch; **B**, leaf detail, showing spines; **C**, male flower; **D**, bisexual flower, several stamens removed; **E**, bisexual flower, several stamens removed; **F**, fruit; **G**, fruit T.S. (**A–G**, L.Elkan 17 Apr. 2012, NSW). Scale bar: **A** = 4 cm; **B**, **G** = 2 cm; **C–E** = 5 mm; **F** = 2.5 cm. Drawn by L.Elkan.

to give *C. × oliveri* Mabb., the so-called Faustrimedin (Swingle, *Citrus Industry* 1: 360 (1943)) known commercially as the Sunrise Lime in Australia, and also with *C. australis* (q.v.).

6. *Citrus australis* (Mudie) Planch., *Hort. Donat.* 18 (1858)

Limonia ? australis A.Cunn. ex Mudie, *Pict. Australia* 151 (1829); *L. australis* A.Cunn. ex Mudie, *Veg. Subs.* 420 (1829); *C. planchonii* F.Muell., *Fragm.* 9: 105 (1875), *nom. illeg., superfl.*; *Microcitrus australis* (Mudie) Swingle, *J. Washington Acad. Sci.* 5: 575 (1915). T: Moreton Bay [Qld], 1829, *A. Cunningham* '26'; lecto: BM; isolecoto: K, *fide* D.J.Mabberley, *Telopea* 7: 339 (1998).

Illustration: H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 381, fig. 63 A, B (1943).

Slender tree to 18 m high, spreading by suckering roots; spines 5–10 mm long, solitary; twigs quadrangular. Leaves: petiole 2–3 mm long, not winged, articulated with lamina; lamina obovate to obcordate, (2–) 3–4 (–6) × (1–) 2–3 cm, cuneate at base, entire or distally undulate, emarginate to obtuse. Flowers solitary, bisexual, 4- or 5-merous. Calyx lobes c. 1.5 mm long. Petals linear-oblong, c. 6 mm long, white. Stamens 16–20, free. Ovary 6-locular. Fruits globular, 25–35 (–50) mm diam., rough-skinned, becoming yellow on tree. Seeds c. 3 or 4 per locule, flattened. *Australian Lime*, *Dooja*.

Restricted to SE Qld; found in *Araucaria* vine forest especially at the forest edge. Flowers Sept.–Nov.; fruits Nov., Apr.

Qld: Pine Mtn, Oct. 1946, *S.L.Everist s.n.* (BRI, K); Amamoor, *L.S.Smith* 5383 (BRI, L).

Often difficult to distinguish from *C. australasica* when sterile, particularly juvenile forms with narrow leaves. The wood is light yellow and hard, used for cabinetwork and in the 19th century suggested for engraving.

Hybridised with *C. australasica*, apparently in the Royal Botanic Garden Sydney and the resultant cross therefore known as 'Sydney Hybrid [correctly 'Sydney']', *C. × virgata* Mabb. This is a small tree with seedless fruit falling when ripe; tried as a rootstock for commercial citrus (illustration: H.J.Webber & L.D.Batchelor, *Citrus Industry* 1: 381, t. 63 C, D (1943); it has been crossed with *C. reticulata* (Mabberley, *op. cit.* 340).



7. *Citrus gracilis* Mabb., *Telopea* 7: 340, fig. 1 (1998)

T: N.T., 5 miles W of Humpty Doo, *J.McKean* B19; holotype: NSW; isotype: CANB, DNA.

Illustration: D.J.Mabberley, *loc. cit.*

Straggly tree to 4 m high, often coppicing and suckering; spines to 12 mm long, solitary; twigs terete, fawn-pubescent when young. Leaves: petiole c. 3–15 mm long, often articulated with lamina; lamina oblanceolate to sublinear, 3–4.5 (–7) × 0.8–1.1 (–2) cm wide, acute to cuneate at base, sometimes distally crenulate, acute. Flowers usually solitary, rarely in fascicles of 3, 5-merous, bisexual or functionally male, ±subsessile. Calyx c. 2 mm long. Petals c. 8 mm long, pinkish white. Stamens 26–30, free. Ovary 8- or 9-locular. Fruit globose. *Humpty Doo Lime*.

Restricted to the 'Top End' of N.T.; in eucalypt woodland with grassy understorey on sandy or gravelly soils. Flowers Nov.; fruits Mar.–Apr.

N.T.: Arnhem Land, Maningrida–Oenpelli road, *M.J.Clark* 1332 (DNA); Kakadu, Kapalgga Stn, *T.G.Hartley et al.* 15142 (CANB, FHO); Marrakai, Mt Bundy Rd, *D.A.Hearne* 194 (BRI, CANB); Peppimenarti, 12 Mar. 1993, *K.Reynolds s.n.* (DNA).

Fruits said to be eaten by Aboriginal people.



8. *Citrus glauca* (Lindl.) Burkill, *Gdns Bull. Straits Settlem.* 5, Index: 3 (1932)

Triphasia glauca Lindl. in T.L.Mitchell, *J. Exped. Trop. Australia* 353 (1848); *Atalantia glauca* (Lindl.) Benth., *Fl. Austral.* 1: 370 (1863); *Eremocitrus glauca* (Lindl.) Swingle, *J. Agric. Res.* 2: 88 (1914). T: [Qld, Dublin County, near junction of Maranoa & Merivale R.], *T.L.Mitchell* 398; holo: CGE (photo seen); iso: BM, GH, K, L ('subtropical New Holland 1846'), NSW.

Atalantia glauca var. *inermis* F.M.Bailey, *Queensland Agric. J.* II, 3: 29 (1915). T: Qld, Near Dalby, Sept. 1913, *T.L.Bancroft s.n.*; syn: BRI *n.v.*; Qld, Chinchilla, Dec. 1914, *R.C.Beasley s.n.*; syn: BRI *n.v.*

Illustrations: G.M.Cunningham *et al.*, *Pl. W New South Wales* 446 (1992), as *E. glauca*; G.J.Harden (ed.), *Fl. New South Wales* 2nd edn, 2: 323 (2002).

Deciduous tree to 7 (–12) m high and bole to 15 cm diam. with pendulous branches, or tangled spiny shrub; far-spreading root-suckers heavily armed and sometimes flowering and fruiting; spines solitary, sometimes curved, to 6 cm long on young shoots but usually less. Leaves: petiole c. 2 mm long, unwinged; lamina oblong, linear- or elongate-obcuneate to sublinear, (1–) 3–4 (–5.5) cm long, (2–) 4–12 mm wide, cuneate at base, entire to crenulate, obtuse to emarginate, adpressed grey-hairy. Flowers solitary or in small axillary cymes, bisexual (possibly sometimes not), sweetly scented. Sepals 1–2 mm long, united basally by shallow cup. Petals 3–5, linear-oblong, 4–6 mm long, greenish white to yellow. Stamens (3–) 4 times as many as petals, free or rarely weakly coherent at base. Ovary 3-locular, each locule with 2 ovules. Fruit subglobular or obovoid, 12–15 mm diam., lemon-coloured when ripe. Seeds 2–4, 5–6 mm long, yellowish grey, furrowed; embryo solitary. *Wild Lime, Limebush, (Australian) Desert Lime, Native Lime, Desert Kumquat.* Plate 61.

Restricted to Qld, N.S.W. and S.A. Often common in mixed softwood forest especially in secondary growth, coolibah forest, brigalow-belah forest where very common as on the Darling Downs, to 340 m alt., on heavy brown clays, desert loams and red earths, sometimes in otherwise treeless habitats. Flowers Aug.–Oct.; fruits Oct., Dec.–Jan.

S.A.: Flinders Ra., c. 5 km N of Moocka Rly Stn (40 km NE of Wilmington), 19 Nov. 1969, *R.Callen s.n.* (AD, TI). Qld: Gilruth Plains, Cunnamulla, *G.H.Allen A504* (L); Broad Sound, 15 Sept. 1802, *R.Brown 'No. 58' [Iter Austral. 5343]* (BM, K, MEL, NSW); Winton, Happy Valley, 18 Feb. 1942, *G.Kelly s.n.* (BRI). N.S.W.: Gular, c. 45 km S of Coonamble, 30 Oct. 1911, *J.B.Cleland s.n.* (AD, NSW).



According to a note attached to *G.Mara s.n.* (Tiree, Torrens Ck, 18 Feb. 1941, BRI), the tree exists there in two forms, a fruiting relatively unarmed one and a very thorny sterile one: whether the latter are male trees remains to be ascertained, though at some sites at least trees are not known to bear fruit over many seasons.

Cultivated as a street tree in southern Qld. The fruit is edible and suitable for jam-making and cold drinks. Can be a pest in S Qld though readily controlled by burning followed by sheep-grazing. By 1988 in five shires of the Darling Downs it occupied 96 984 ha, of which 8426 were classed as dense to impenetrable and annual expenditure on limebush control was \$400,000 (S.M.Csurhes, *Plant Protection Quarterly* 8(2): 44–46 (1993)). Upper branches browsed by stock in times of drought. Has been crossed with *C. × limon* to give 'eremolemons', *C. × aurantium* Sweet Orange Group to give 'eremoranges' and *C. × insitorum* (citrange; *C. trifoliata* × *C. × aurantium* Sweet Orange Group) to give 'citrangereimos' (Swingle, *Citrus Industry* 1: 365–6 (1943)). Hybrids with lime set no seed and hybrids with *C. medica* L. (citron) die when young.

ZYGOPHYLLACEAE

R.M.Barker

Monoecious, rarely dioecious (*Nitraria*), herbs or shrubs, sometimes climbing or scandent on other vegetation. Leaves opposite or alternate, usually with 2 or more leaflets, rarely simple, stipulate, often somewhat succulent. Flowers regular, solitary and axillary, rarely leaf-opposed (in *Peganum harmala*), rarely cymose, bisexual, rarely unisexual (*Nitraria*). Sepals 4 or 5, often persistent, shorter or longer than petals. Petals (3–) 4 or 5, free, not persistent, yellow or white (in Australia). Stamens (1) 2 (3) times number of petals, often in 2 subequal whorls; filaments sometimes with basal appendages or wings; anthers dorsifixed or appearing basifixed in *Peganum*, 2-celled, opening longitudinally. Extrastaminal and/or intrastaminal nectariferous glands usually present. Ovary superior, (3–) 4 or 5-locular; ovules axile, pendulous, 1–6 per cell; style simple, short, ending in capitate stigma or same number of lobes as locules. Fruit indehiscent and 4-winged, an angular loculicidal capsule, a schizocarp splitting into 1–5 spiny or 1 or 2-winged, indehiscent cocci, or a fleshy drupe.

The family, treated here in its broad sense, consists of c. 25 genera and 250 species, mostly in tropical and warm-temperate areas. In Australia there are 5 genera and c. 60 species.

Divergent opinion exists as to both the placement of the family within an order and the placement of genera within Zygophyllaceae. The family has been variously treated as belonging to Geraniales, Malpighiales, Sapindales, Rutales, Linales and Polygalales as summarised by Sheahan & Chase (1996). Work based on morphological, anatomical and *rbcL* DNA analysis by Sheahan & Chase supported the view that both Peganaceae and Nitrariaceae be recognised at family level and as part of Sapindales, or more recently (APG III, 2009), that *Peganum* and *Nitraria* both belong in Nitrariaceae in Sapindales.

Zygophyllaceae *s. str.* is considered an isolated group deserving of its own order. Within Zygophyllaceae *s. str.*, Sheahan & Chase recognised 5 subfamilies. *Zygophyllum* belongs with subfam. Zygophylloideae while *Tribulus* and *Tribulopsis* belong with subfam. Tribuloideae. Later DNA and morphological work (Beier *et al.*, 2003) saw a suggestion for a changed circumscription within the subfamily, with Australian species of *Zygophyllum* transferred, with South African species, to a resurrected *Roepera*, and *Zygophyllum* confined to some 50 species in Asia (see notes under *Zygophyllum*). More recent studies (Bellstedt *et al.*, 2008) on the South African species suggest that this proposal may have been premature. It is possible that *Tribulus* and *Tribulopsis* may eventually be recombined since there seem to be no unique characters to separate them. Specimens of both genera have been assigned to *Kallstroemia* in the past but there is little doubt that the Australian material is distinct from the American *Kallstroemia* by its 5-lobed ovary and stigma rather than the 10-lobed state found in *Kallstroemia*. *Tribulopsis* shares with *Kallstroemia* the 1-ovulate state and a very similar fruit morphology.

Flowers of Zygophyllaceae are invariably saucer-shaped and presumably pollinated by a variety of insect visitors. Nectar is produced in most flowers by a variously modified disc and pollen by the usually 2 whorls of stamens. In those cases where one of the whorls of stamens is suppressed (e.g. *Tribulopsis*) there may be complete suppression or there may be stamens produced with much longer anthers than normal.

While most members of the family have been shown to possess the C₃ photosynthetic pathway (Sheahan, 2007) some have the C₄ photosynthetic pathway (*Tribulus terrestris*, *T. zeyheri*, *Kallstroemia grandiflora*, *Zygophyllum simplex* and *Z. coccinea*). While this is usually associated with Kranz anatomy, in *Z. simplex* this is not the case and Muhaidat *et al.* (2007) have also shown that the C₄ pathway in *Tribulus* differs from that in *Zygophyllum*.

This account and the precursor papers in *Tribulopsis* (Barker 1998), *Tribulus* (Barker, 1998) and *Zygophyllum* (Barker, 1996; 1998) owe much to the considerable material and notes accumulated by Dr Hansjoerg Eichler, who worked on the family until his untimely death in 1992. This gathering together of collections, protologues, references and photographs of type

ZYGOPHYLLACEAE

specimens saved considerable time. Those taxa in *Zygophyllum* which Hansjoerg had recognised as new but had not described at the time of his death were published in the earlier papers.

G.Bentham, Zygophyllaceae, in *Fl. Austral.* 1: 286–294 (1863); H.Eichler, Zygophyllaceae, in J.P.Jessop & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 2: 724–33 (1986); M.C.Sheahan & D.F.Cutler, Contribution of vegetative anatomy to the systematics of the Zygophyllaceae R.Br., *Bot. J. Linn. Soc.* 113: 227–262 (1993); M.C.Sheahan & M.W.Chase, A phylogenetic analysis of Zygophyllaceae R.Br. based on morphological, anatomical and *rbcL* DNA sequence data, *Bot. J. Linn. Soc.* 122: 279–300 (1996); B.-A.Beier *et al.*, Phylogenetic relationships and taxonomy of subfamily Zygophylloideae (Zygophyllaceae) based on molecular and morphological data, *Pl. Syst. Evol.* 240: 11–39 (2003); M.C.Sheahan, Zygophyllaceae, in K.Kubitzki (ed.), *Fam. Gen. Vasc. Pl.* 9: 488–500 (2007); P.F.Stevens, Angiosperm Phylogeny Website, Version 8, June 2007 [and more or less continuously updated since], available at www.mobot.org/MOBOT/research/APweb/; R.Muhaidat *et al.*, Diversity of Kranz anatomy and biochemistry in C₄ Eudicots, *Amer. J. Bot.* 94: 362–381 (2007); D.U.Bellstedt *et al.*, Phylogenetic relationships, character evolution and biogeography of southern African members of *Zygophyllum* (Zygophyllaceae) based on three plastid regions, *Molec. Phylogen. Evol.* 47: 932–949 (2008); Angiosperm Phylogeny Group [A.P.G.], An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG III, *Bot. J. Linn. Soc.* 161: 105–121 (2009).

KEY TO GENERA

- 1 Leaves with 2 or more pairs of leaflets
 - 2 Leaves alternate; uppermost pair of leaflets largest or of similar size to lowest **3. TRIBULOPIS**
 - 2: Leaves in unequal pairs or, by suppression of smaller pair, alternate; uppermost pair of leaflets smaller than lower leaflets **4. TRIBULUS**
- 1: Leaves simple or divided or with only 1 pair of leaflets
 - 3 Leaves alternate or clustered; flowers white; stamens 10–15
 - 4 Leaves simple, not divided; fruit a fleshy drupe; flowers mostly unisexual **1. NITRARIA**
 - 4: Leaves irregularly dichotomously divided into 3 or more linear segments; fruit a capsule; flowers bisexual **2. PEGANUM**
 - 3: Leaves opposite; flowers yellow, turning white on drying, or white; stamens 10 or less **5. ZYGOPHYLLUM**

1. NITRARIA

Nitraria L., *Syst. Nat.* 10th edn, 2: 1044 (1759); from Latin *nitrum* or the Greek *nitron*, referring to the white crystalline salt, potassium nitrate (also known as saltpetre), of the saline plains of Asia and Northern Africa from whence the first species was described.

Type: *N. schoberi* L.

Zygophyllum sect. *Carinaria* Miq. in J.G.C.Lehmann, *Pl. Preiss.* 1: 164 (1845). T: *Z. australasicum* Miq.

Woody shrubs, often spiny. Leaves simple, alternate, often clustered, often succulent. Flowers in scorpioid cymes, bisexual on any one bush, or in *N. billardiarei*, often unisexual on a bush. Pedicels usually erect in flower and fruit. Sepals 5, persistent, not downturned in fruit. Petals 5, not persistent, longer than sepals, hooded at apex, white. Stamens 10–15, without appendages. Nectariferous disc annular, inconspicuous. Ovary 3-celled; ovules solitary; style ±lacking; stigmas 3. Fruit erect, fleshy drupe with subtrigonus ornamented stone, 1-seeded.

About 8 species from N Africa through to central E Asia in dry saline areas, with a single species in Australia.

Evidence from various sources (see above) suggests that *Nitraria* L., together with *Peganum*, should be treated in the family Nitrariaceae Bercht. & J.Presl in the Sapindales, rather than within Zygophyllaceae.

J.C.Noble & R.D.B.Whalley, The biology and autecology of *Nitraria* L. in Australia. I. Distribution, morphology and potential utilization, *Austral. J. Ecol.* 3: 141–163 (1978A); J.C.Noble & R.D.B.Whalley, The biology and autecology of *Nitraria* L. in Australia. II. Seed germination, seedling establishment and response to salinity, *op. cit.* 3: 165–177 (1978B).

Nitraria billardiarei* DC., *Prodr.* 3: 456 (1828), as *Billardierii

N. schoberi var. *billardiarei* (DC.) Kom., *Trudy Imp. S.-Petersburgsk. Bot. Sada* 29: 155 (1908), as *Billardieri*. T: in Novae-Hollandiae, *Labillardiere s.n.*; probable holo: G-DC (microfiche seen).

?*N. schoberi* L., *Syst. Nat.* 10th edn, 2: 1044 (1759). T: “Gmel. sibir. 2, t. 98”; lecto: Herb. Linn. No. 624.1; LINN, *fide* A.Ghafoor, in E.Nasir & S.I.Ali (eds), *Fl. W. Pakistan* 66: 4 (1974).

Zygophyllum australasicum Miq. in J.G.C.Lehmann, *Pl. Preiss.* 1: 164 (1845). T: Crescit in clivulis arenosis insulae Cornac [Carnac Is., N of Garden Is.], W.A., 8 Nov. 1839, *L.Preiss* 2397; syn: P, U.

Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 437 (1981).

Rounded, sprawling, untidy and impenetrable woody shrubs, up to 2 m high and 5 m wide, spiny on some branch ends. Young branches closely appressed-pubescent with white hairs, glabrous with age; bark white initially, eventually pale grey. Leaves in whorls of 3–6, thick, narrowly obovate, 1–4 cm long, attenuate, entire, acute, initially densely appressed-pubescent, eventually glabrous, green or grey-green; stipules triangular. Flowers unisexual or bisexual on any one bush, sometimes mixed. Sepals united at base; lobes 0.5–1.5 mm long, acute or acuminate. Petals 2.5–3.5 mm long. Fertile stamens 11–15 in male or bisexual flowers; filaments 3–4 mm long, exceeding petals and stigma; staminodes 11–15 in female flowers, of similar height to stigma. Ovary densely white-appressed-pubescent; hairs continuous about stigma lobes. Fruit ovoid, 1–2 cm long, initially green, green-yellow, red or purple when ripe. *Nitre Bush*, *Dillon Bush*. Plates 63, 64; Fig. 72A–F.

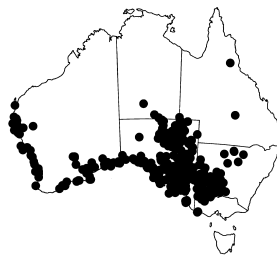
Occurs as a component of coastal vegetation from Carnarvon to Perth in W.A. and from E of Albany in W.A. to Portland in Vic; also in inland S.A., western Vic. and western N.S.W. along saline drainage areas and degraded agricultural lands, with isolated records from N.T. and Qld, which may represent introductions through agricultural activities. Flowers chiefly Sept.–Nov. but sporadically outside these months depending on rain and locality; fruits Mar.–May.

W.A.: Carnarvon foreshore, *A.A.Mitchell* 1886 (CANB, PERTH). N.T.: 10 km NNW Poeppels Corner, *B.Thomson* 2087 (DNA). S.A.: Pine Point, c. 16 km S of Ardrossan; Foreshore Reserve, *R.V.Smith* 86/04 (AD, MEL). Qld: Landsdowne, Tambo, Nov. 1957, *G.Lilley s.n.* (BRI). N.S.W.: 42.6 km from Enngonia, Ledknapper NR, *B.M.Wieczek* 791 & *A.E.Orme* (AD, CANB, MEL, NSW). Vic.: 2nd Reedy Lake, 5 miles [8 km] NNW of Kerang, *H.I.Aston* 558 (AD, MEL).

Possibly not distinct from the Russian species *N. schoberi*. While there is a documented chromosome number difference ($2n = 24$ for *N. schoberi* and $2n = 48$ for *N. billardiarei*), morphological differences, including spininess and leaf and floral characteristics, have not been investigated fully.

Morphological differences, including habit and size of the stones, were documented by Noble & Whalley (1978A) between the populations of *N. billardiarei* occurring along the Indian Ocean and those which occur along the Southern Ocean. Again, a molecular study across the range of the species could prove useful, particularly given the expanding distribution in inland areas.

The fruits of *N. billardiarei* are edible and particularly attractive to emus, and possibly to rock-parrots (S.A.White, *Emu* 16: 1–15 (1916)), but are also taken by kangaroos, sheep,



rabbits, lizards and decorator ants; germination was found to be enhanced after passage through an emu (J.C.Noble, *J. Ecol.* 63: 979–984 (1975)). *N. billardiarei* fruits have also been recorded as part of the diet of Australian Aborigines (B.Gott, *Telopea* 12: 215–226 (2008)) and have been eaten without any ill effects by the author. They have potential for development as a native food, although a little salty.

Leaves and inflorescences often have gall-like infestations and these may well prove of interest since gall-forming armoured scale insects (*Diaspidiotus* species) have been documented on *Nitraria* species elsewhere (E.M.Danzig, *J. Zoosyst. Rossica* 8: 287–289 (1999). Similarly, the sphecids wasps *Solierella nitraria* Pulawski and *Cerceris nitrariae* Morice (R.M.Bohart & A.S.Menke, *Sphecids wasps of the world: a generic revision* (1976)) described from Egypt and Morocco respectively, were named for their association with *Nitraria* species and it would be interesting to see whether these same associations occur in Australian populations.

Clearance of *Nitraria billardiarei* for control of feral species is often a controversial subject. It has been allowed in some parts of S.A. under State legislation but permission still needs to be sought from the Native Vegetation Council.

2. PEGANUM

Peganum L., *Sp. Pl.* 1: 444 (1753); *Gen. Pl.* 5th edn, 1: 204 (1754); from *peganon*, the Greek word for rue, a medicinal herb to which this has a resemblance, but no relationship.

Type: *P. harmala* L.

Perennial glabrous shrubs with woody base. Leaves alternate or spirally arranged, somewhat succulent, irregularly deeply divided into linear segments; petiole flattened; segments continuous with petiole, ?stipellate. Pedicel erect in flower and fruit. Sepals 4 or 5, persistent and erect in fruit. Petals 4 or 5, ?quickly deciduous, just shorter than sepals, white. Stamens 12–15; filaments widened at base. Nectariferous disc annular, very narrow. Ovary 3-lobed, 3-celled; ovules numerous per cell. Fruit erect, 3-lobed loculicidal capsule. Seeds many per cell, angled, possibly mucilaginous when wet (see note below).

About 6 species worldwide from Mediterranean countries through to N India, Mongolia and China; one species introduced in Australia.

Peganum L. has been considered to belong to its own family Peganaceae Tiegh. ex Takht. (see above), but it is now usually included with *Nitraria* in Nitrariaceae, which is considered to be part of the Sapindales (Stevens, 2001 onwards).

L.P.Ronse Decraene *et al.*, Morphological studies in Zygophyllaceae. II. The floral development and vascular anatomy of *Peganum harmala*, *Amer. J. Bot.* 83: 201–215 (1996); P.F.Stevens (2001 onwards), Angiosperm Phylogeny Website, Version 9, June 2008 [and more or less continuously updated since]; www.mobot.org/MOBOT/research/APweb/.

**Peganum harmala* L., *Sp. Pl.* 1: 444 (1753)

T: “Habitat in Arena, Madritii, Alexandriae, Cappadociae, Galatia”; lecto: Herb. Clifford: 206, *Peganum* 1; BM, *fide* M.N.Hadidi, in C.Jarvis *et al.* (ed.), *Regnum Veg.* 127: 74 (1993).

Dense, decumbent, woody shrub, 20–70 cm high, 30–40 cm wide. Branches terete or longitudinally ribbed. Leaves alternate or spirally arranged, irregularly divided, sometimes from base, into 3 or more linear segments, 2–5 cm long. Flowers white, leaf-opposed. Pedicel 10–25 mm long. Sepals 5, narrow, leaf-like, sometimes divided as in leaves, far exceeding fruit. Petals 5, 12.5–22 mm long. Stamens c. 15; filaments c. 10 mm long; anthers basifixed, 6–7 mm long. Ovary glabrous, globose; style 5–6 mm long, glabrous; stigma twisted, 3-keeled, 5 mm long, papillose on keels. Capsule 3-celled, globose, c. 10–12 mm diam.; seed black, reticulate. *Harmal*, *African Rue*, *Syrian Rue*. Plate 62; Fig. 72G–J.

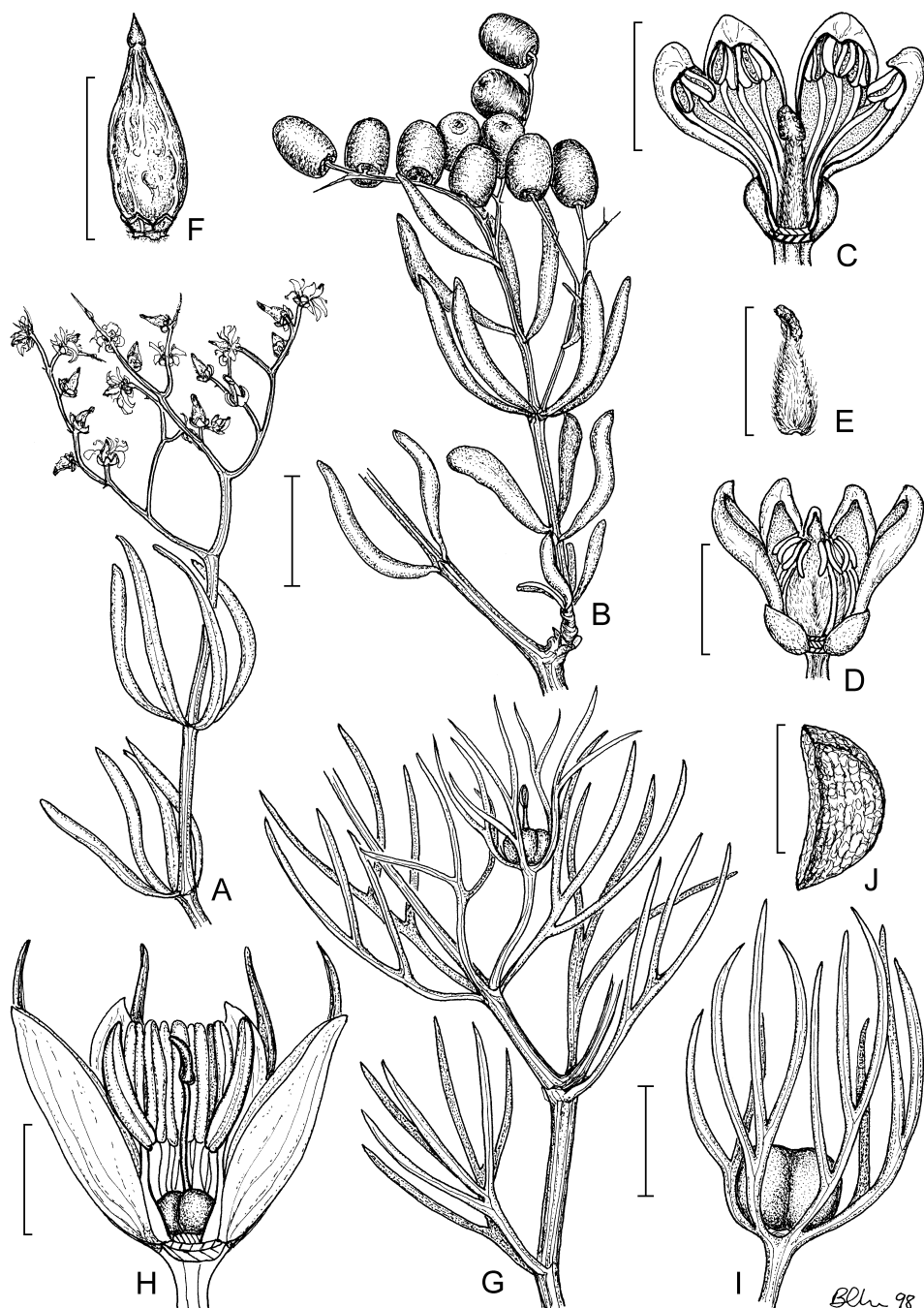
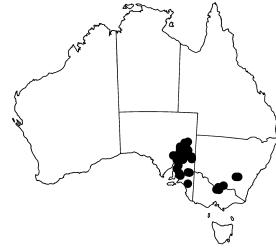


Figure 72. A–F, *Nitraria billardierei*. A, flowering branch; B, fruiting branch; C, male or bisexual flower, 1 petal and 2 stamens removed; D, female flower with sterile anthers, 1 petal removed; E, ovary and stigma; F, stone (A, D, E, N.Donner 11195, AD; B, F, M.O’Leary 2330, AD; C, D.J.Whibley 8417, AD). G–J, *Peganum harmala*. G, habit; H, flower, 1 petal and 2 stamens removed; I, fruit with calyx still attached; J, seed (G, I, M.Nobbs 1245, AD; H, M.Crisp 413, AD; J, B.Carrodus 31220661, AD). Scale bars: A, F, I = 10 mm; B, G = 20 mm; C, D, J = 3 mm; E = 2 mm; H = 5 mm. Drawn by B.Chandler.

Native to Mediterranean and SE Europe through the Middle East to India, China and N Africa. Introduced in N America and Australia. In Australia it has been recorded from S.A., N.S.W. and Vic. Flowers Oct.–Feb. (–Apr.); fruits Jan.–Apr.

S.A.: Flinders Ra., Willochra Gorge, *R.Bates 3660* (AD); Horseshoe Crescent, Port Gawler, *G.H.Bell 1759* (AD). N.S.W.: “Wirruna”, 13 miles [21 km] W of Young, *E.J.McBarron 14133* (AD, BRI, CANB, K, MEL, MO, NSW). Specimens not seen from other states.



There is conflicting information on this species. The seeds are reported to be mucilaginous on wetting but those which were observed showed no evidence of any mucilaginous substances. Instead the outer reticulately-marked surface expanded, apparently trapping a great deal of air between it and the embryo. Seeds also yield a dye called “Turkey Red” used for colouring tarbooshes [hats] (D.Mabberley, *Pl. Book* 437 (1987)) and for dyeing carpets in Turkey and Iran (W.Emboden, *Narcotic Plants* (1972)) but other references within dyeing books also attribute the dye known by this name to Madder (*Rubia tinctorum*). The colour of the dye extracted from the seeds depends on whether the extraction is done in water (yellow fluorescent) or alcohol (red).

Peganum harmala plants have an unpleasant smell and are possibly poisonous to livestock. The alkaloids contained within the roots and seeds possibly account for this, as they may also account for a number of reputed medicinal properties ranging from emetic to antispasmodic, narcotic, stimulant and antihelminthic (A.Ghafoor, *Zygophyllaceae*, in S.M.H.Jafri & A.El-Gadi (eds), *Fl. Libya* 38: 9 (1977)). Emboden (*op. cit.*) also refers to the aphrodisiac, narcotic and hallucinogenic properties of *Peganum harmala*.

Peganum harmala is a declared plant in W.A. and S.A.

3. TRIBULOPIS

Tribulopsis R.Br. in C.Sturt, *Narr. Exped. C. Australia* 2: App. 70 (1849); from *Tribulus* and the Greek *-opsis*, like, or having the appearance of, *Tribulus*; *-opsis* has the same meaning, hence the occasional alternative spelling of *Tribulopsis*.

Tribulus subg. *Tribulopsis* (R.Br.) F.Muell., *Pl. Victoria* 1: 99 (1862), as *Tribulopsis*. T: *T. angustifolia* R.Br. *Tribulopsis* F.Muell., *Fragm.* 1: 47 (1858), *orth. var.*

Prostrate, usually pubescent annual or short-lived perennial herbs, ?usually arising from perennating rootstock. Leaves alternate, 2–6-foliolate, the upper pair usually ±erect and larger than lower pair(s), not succulent; petiole terete; leaflets shortly petiolulate, not stipellate; stipules markedly unequal. Pedicel usually erect in flower, deflexed in fruit. Sepals 5, not persistent in fruit. Petals 5, quickly deciduous, usually longer than sepals, rarely of similar length, yellow, not fading to white. Stamens 10 or fewer, usually in 2 subequal whorls; filaments not winged. Extrastaminal nectariferous disc 5-lobed; intrastaminal disc of 5 free lobes or sinuate ring or lacking. Ovary 5-celled; ovules 1 per cell; style short; stigma 5-ridged, papillose. Fruit a pyramidal schizocarp topped by persistent style and stigma, pendent, dissociating into 1–5 indehiscent, smooth or tuberculate, spiny, or rarely winged, cocci.

About 10 species, endemic to N Australia.

Although *Tribulopsis* was recognised as a separate genus by Brown in 1849, Bentham (*Fl. Austral.* 1: 287 (1863)) treated the species as part of *Tribulus*, within which he recognised two subgroups - “*Tribulus* proper” and “*Tribulopsis*, R. Br.”. Taxa now assigned to *Tribulopsis* continued to be described in *Tribulus* through the first half of the 20th century. Engler (in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890)) treated *Tribulopsis* as a synonym of the otherwise American genus *Kallstroemia* Scop. See also notes under the family description above.

Coccus and fruit shape in this genus seems to be very plastic and it has been found that the presence or absence of spines or bumps medially and dorsally can vary considerably within a single species. It may also prove to be the case that the shape of the dorsal surface (i.e. strongly curved vs. ±straight) and the indumentum are similarly plastic, but field studies are needed to assess this.

The majority of species produce fruits which are pyramidal in shape and it has been shown by Keighery (1982) that they are geocarpic i.e. they are turned down in fruit and burrow into the soil beneath the parent plant. While it is certainly the case that the pedicel is strongly reflexed in all of the species of *Tribulopsis* (as it is in the majority of the Australian species of Zygophyllaceae), it is also noticeable that most fruits dissociate into cocci, an attribute which would be of limited value to fruits already positioned under the soil. It seems possible that the shape of the undissociated fruit would adapt it for falling or being trampled into wet soil during the wet season with subsequent dissociation into cocci during the dry season, but it seems equally possible that the reflexion of the pedicel is merely a means of allowing the maturing fruits to develop beneath the protective foliage already present. It is also possible that those species in which the pedicels are particularly long and showing some signs of thickening (e.g. *T. aff. pentandra* (Mitchell Plateau) and *T. angustifolia*) do exhibit some aspects of geocarpy. No mature fruits were seen of the Mitchell Plateau taxon, but it seems that it is similar to *T. angustifolia* in frequently producing only a single mature coccus.

Fruit morphology of *Tribulopsis* species is very similar to that shown for American *Kallstroemia* species by Porter (1969), except that fruits of that genus are 10-lobed and the stigmas 10-lobed rather than 5-lobed.

D.M.Porter, The genus *Kallstroemia* (Zygophyllaceae), *Contrib. Gray Herb. Harvard* 198: 41–153 (1969); G.J.Keighery, Geocarpy in *Tribulopsis* R.Br. (Zygophyllaceae), *Flora* 172: 329–333 (1982); M.E.Lawrence, *Tribulopsis* in J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 675–678 (1992); R.M.Barker, Notes on the genus *Tribulopsis* (Zygophyllaceae) in Australia, including a key to taxa and the descriptions of potential new taxa, *J. Adelaide Bot. Gard.* 18: 77–93 (1998).

- 1 Leaflet pairs 2 per leaf throughout the plant
 - 2 Cocci straight dorsally and with a pair of diverging basal spines (widespread in N Australia) **1. *T. pentandra***
 - 2: Cocci curved dorsally, lacking basal spines but medial and basal protuberances sometimes present
 - 3 Cocci 1 per fruit, smooth on dorsal surface; style slender (Mitchell Plateau, Kimberleys, W.A.) **2. *T. sp. Mitchell Plateau* (K.F.Kenneally 7935)**
 - 3: Cocci 1–3 per fruit, strongly reticulate on dorsal surface; style thickened (Dampier Penin., Kimberleys, W.A.) **3. *T. sp. Koolan Island* (K.F.Kenneally 8728)**
- 1: Leaflet pairs more than 2 per leaf
 - 4 Leaflets linear to narrowly ovate
 - 5 Lowest pair of leaflets inserted very close to stem; ovary and fruits glabrous (Kimberleys, W.A.; Victoria R., N.T.; Julia Ck area, Qld) **5. *T. sessilis***
 - 5: Lowest pair of leaflets inserted well above stem; ovary and fruits covered with white hairs, rarely subglabrous (N Australia, S to Tropic of Capricorn) **6. *T. angustifolia***
 - 4: Leaflets elliptic, ovate or obovate
 - 6 Leaflet pairs 4 or 5 per leaf; lowest leaflet pair inserted very close to stem (Kimberleys, W.A.; Victoria R., N.T.; Julia Ck area, Qld) **5. *T. sessilis***
 - 6: Leaflet pairs usually 3 per leaf; lowest leaflet pair inserted close to or well above stem
 - 7 Flowering pedicel to 7 mm long; flowers with orange or darker centre or yellow throughout; lowest leaflet pair inserted close to or well above stem (S Kimberleys, W.A., to Victoria R., Katherine & McArthur R. area of N.T.) **4. *T. bicolor***

- 7: Flowering pedicel more than 7 mm long; flowers yellow throughout; lowest leaflet pair inserted well above stem (Cape York Penin. Qld)

- 8 Fruits with medial and basal spines or protuberances

7. *T. solandri*

- 8: Fruits lacking any protuberances or each coccus with a basal semicircular wing

8. *T. homalococca*

1. *Tribulopsis pentandra* R.Br. in C.Sturt, *Narr. Exped. C. Australia* 2: App. 70 (1849)

Tribulus brownii F.Muell., *Pl. Victoria* 1: 99 (1862); *Tribulus pentandrus* (R.Br.) Benth., *Fl. Austral.* 1: 290 (1863), non *Tribulus pentandrus* Forssk. (1775); *Kallstroemia pentandra* (R.Br.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: Carpentaria, Island s [Morgan Is., N.T.], 21 Jan. 1803, *R.Brown* 21 [iter Austral. 5219]; syn: BM, BRI, K725236 (all seen as photos), MEL *s.n.*, MEL (ex E), NSW.

Annual herb, sometimes forming mats; stems to 30 cm long, usually with appressed hairs often below spreading white hairs. Leaves with 2 pairs of leaflets, the lower pair inserted well above stem; leaflets spreading, narrowly elliptic, oblique, acute to acuminate, subglabrous adaxially, with white appressed hairs abaxially; upper pair 4.5–21 mm long, 1–5 mm wide, lower pair smaller. Flowering pedicel 2–7 mm long, upright. Sepals c. 3 mm long, glabrous adaxially, with white-appressed hairs abaxially. Petals (3.5–) 4.5–8 (–11) mm long, yellow throughout. Extrastaminal glands 5; intrastaminal glands absent. Stamens usually 5, rarely more or less (see note below), extra ones usually staminodal, at maturity equal to stigma; filaments c. 3 mm long. Ovary 5-lobed, appressed white-pubescent, impressed and glabrous at base at point of insertion of stamens; style (including stigma) 1–4 mm long. Fruit shortly pubescent, of 1–5, tardily dissociating, fully developed cocci; pedicel 6.5–18 mm long, usually deflexed. Cocci dorsally straight, 2.5–4 mm high, with pair of divergent basal spines 0.8–1 mm long dorsally and sometimes pair at base next to pedicel. Plate 65; Fig. 73A–C.

Occurs in northern W.A., N.T. and Qld; in a variety of situations ranging from quartzites, sands and sandstones to cracking clay and limestone pavement. Flowers and fruits Jan.–May, rarely Nov.

W.A.: Dead Horse Spring, near Argyle Village, just off road from Duncan Hwy to Ord R. dam, *Hj.Eichler* 22224 (CANB, CHR, DNA, L, MO, NSW, P, PERTH); Red Rock Ck, Bungle Bungle Natl Park, *K.A.Menkhurst* 777 (DNA). N.T.: Keep River Natl Park, *C.R.Dunlop* 5723 (DNA, MEL, NSW). Qld: Lawn Hill, sandstone plateau above canoe portage area, *D.E.Symon* 15792 (AD); 2 km along Royal Arch Rd from Gulf [=Burke] Development Rd (W of Chillagoe), *K.L.Wilson* 8094 *et al.* (CANB, MBA, NSW).



Stamen number is usually 5, but these are sometimes associated with 2 or 3 smaller staminodes, or sometimes there are 4 fertile stamens with one other filament either with a tiny undeveloped anther or a long linear anther. One specimen had 10 fully fertile anthers (*Alvin* 77, behind tailings dam at Argyle Diamond Mines (PERTH)) but it agreed in every other characteristic with *T. pentandra*.

2. *Tribulopsis* sp. Mitchell Plateau (K.F.Kenneally 7935)

T. aff. pentandra (Mitchell Plateau) R.M.Barker, *J. Adelaide Bot. Gard.* 18: 82 (1998).

Annual herb, sometimes forming mats; stems to 30 cm long, usually hirsute with spreading white hairs. Leaves with 2 pairs of leaflets, the lower pair inserted well above stem; leaflets narrowly elliptic, oblique, acute to acuminate, subglabrous adaxially, with white appressed hairs abaxially; upper pair 8–12 (–21) mm long, 2–3 (–6) mm wide, lower pair smaller, spreading. Flowering pedicel c. 5 mm long, upright. Sepals c. 3 mm long, glabrous adaxially, with white-appressed hairs abaxially. Petals 3.5–6.5 mm long, yellow throughout. Extrastaminal glands 5; intrastaminal glands absent. Stamens 5, at maturity equal to stigma; filaments c. 2 mm long. Ovary 5-lobed, appressed-white-pubescent or glabrous; style (including stigma) 2 mm long, very slender. Fruit shortly pubescent, of 1 tardily dissociating, fully developed coccus; pedicel 3.5–25 mm long, deflexed, thickened. Coccus 1.8–2.5 mm high, dorsally curved, smooth, unarmed or possibly with pair of basal protuberances. Fig. 73E–F.

Known only from the Mitchell Plateau, NW W.A., with larger flowered specimens coming from shallow soils over sheets of exposed basalt and smaller-flowered specimens from *Eucalyptus latifolia* woodland. Keighery (*op. cit.*), who also noted this difference, observed that the latter specimens were self-pollinating. Flowers Jan.–Feb.

W.A.: 5 km NE Amax Camp, *G.J.Keighery* 2630 (PERTH); 1.5 km SE of mining campsite, *K.F.Kenneally* 7858 (PERTH); Mitchell Plateau: c. 26 km N of mining camp, *K.F.Kenneally* 7935 (CANB, PERTH).

Possibly not distinct from *T. pentandra*, but the lack of any apparently mature fruits means that this cannot be confirmed. There are tiny immature recurved fruits present on the end of thickened pedicels and this species may well be geocarpic, with mature fruits possibly lacking because they have already burrowed into the soil and broken off on collection of the plant. Originally separated in Barker (1998) to highlight differences and to promote further collections and observations, its status is still unclear. The curvature of the cocci in this taxon and the next may be developmental since it has already been observed (Barker 1998) in *T. angustifolia* that such curvature occurs when only one of the five carpels of the fruit develops fully.



3. *Tribulopsis* sp. Koolan Island (K.F.Kenneally 8728)

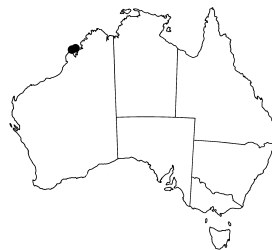
T. aff. pentandra (Koolan Island) R.M.Barker, *J. Adelaide Bot. Gard.* 18: 84 (1998).

Annual herb; stems to 50 cm long, usually with appressed hairs often below spreading white hairs. Leaves with 2 pairs of leaflets, the lower pair inserted well above stem; leaflets narrowly elliptic, oblique, narrowly acute, subglabrous adaxially, with white appressed hairs abaxially; upper pair to 16 mm long, 4.5 mm wide, lower pair smaller, spreading. Flowering pedicel 2.5–4 mm long, upright. Sepals c. 3 mm long, glabrous adaxially, with white-appressed hairs abaxially. Petals obovate, 3–4 mm long, yellow throughout, winged at base. Extrastaminal glands 5; intrastaminal glands absent. Stamens 6 or 7, all fertile, at maturity equal to stigma; filaments 1.5–1.8 mm long. Ovary 5-lobed, appressed-white-pubescent, impressed and glabrous at base at point of insertion of stamens; style (including stigma) 1.5–2 mm long. Fruit shortly pubescent, of 1–3 tardily dissociating, fully developed cocci; pedicel 3–6.5 mm long, deflexed. Cocci 3.5 mm high, dorsally rounded and reticulately ornamented, unarmed or with paired medial and basal outgrowths. Fig. 73D.

Known only from Koolan and Sunday Islands, and One Arm Point, near Derby, NW W.A. Occurs in sand in sandstone areas, possibly associated with pindan. Flowers Mar.–June.

W.A.: 6 km NW of One Arm Point, W of Whimbrel Point, Dampier Penin., *B.J.Carter* 617 (BRI, DNA, CANB, PERTH); Koolan Is, W end, on road to waterfall, SW of Jap Bay, *P.A.Fryxell et al.* 4612 (CANB); Sunday Is., Buccaneer Archipelago, *K.F.Kenneally* 8278 (PERTH).

The relationships of this taxon are obviously with *T. pentandra* but the fruit shape and markings are so different that it was highlighted in Barker (1998) to promote further collecting. Its status remains unresolved.



The 6 or 7 stamens seen in the few flowers present consist of 5 longer antisepalous stamens and 1 or 2 shorter antipetalous stamens.

4. *Tribulopsis bicolor* F.Muell., *Fragm.* 1: 47 (1858), as *Tribulopsis*

Tribulus bicolor (F.Muell.) F.Muell., *Pl. Victoria* 1: 99 (1862); *Kallstroemia bicolor* (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 8 (1890). T: Sandy Is., salt water beach, Victoria R. [N.T.], Oct. 1855, *F.Mueller s.n.*; lecto: MEL *s.n.*, fide R.M.Barker, *J. Adelaide Bot. Gard.* 18: 85 (1988); isolecto: K725234, K725235, MEL 110979, NSW 145424.

[*Tribulopsis solandri* auct. non R.Br.: M.E.Lawrence in J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 678 (1992)]

Somewhat fleshy annual herb, sometimes forming mats; stems to 100 cm long, usually with dense reflexed white hairs in young parts. Leaves with (2–) 3 (–4) pairs of leaflets, the lowest pair inserted well above stem or close to stem; leaflets elliptic or obovate to almost broadly so, oblique, spreading, 6–9.5 mm long, 4–6 mm wide, sometimes lowest pair smaller, obtuse or shortly acuminate, ciliate, otherwise glabrous. Flowering pedicel 2–7 mm long, upright. Sepals c. 5 mm long, glabrous adaxially, with white appressed hairs abaxially. Petals obovate, 4.5–8.5 mm long, yellow, often orange towards base. Extrastaminal glands 5; intrastaminal glands forming a sinuate ring. Stamens usually 10, up to 6 of these with linear anthers, at maturity equal to stigma; filaments c. 2.5 mm long. Ovary 5-lobed, glabrous, with white hairs between lobes or hairs all over; style (including stigma) 1.5–2 mm long. Fruit glabrous or shortly pubescent, of 1–4 tardily dissociating, fully developed cocci; pedicel 4.5–9 mm long, deflexed. Cocci c. 4 mm high, with pair of divergent basal and medial spines or bumps dorsally. Fig. 74 I–K.

Found from S Kimberleys, W.A., through to Victoria R., N.T., with single outlier populations in the Keep R., Katherine R. and McArthur R. areas of N.T. Occurs in stony skeletal soils ranging from basalts to shale, often in tussock grasslands or on roadsides. Flowers and fruits Mar.–June.



W.A.: Kelly Bore, c. 25 km E of Ord River HS, *Hj.Eichler 22387* (AD, CANB, CHR, LAE, L, NSW, PERTH); Gogo Stn, on the road to Quonbon, *A.A.Mitchell & T.Handyside 2099* (CANB, PERTH). N.T.: 26 km E Victoria River Crossing, *C.R.Dunlop 6904* (CANB, DNA, MEL, MO, PERTH); Keep R. area, 20 Dec. 1973, *R.Roos s.n.* (DNA); 27.6 km NE of Cape Crawford roadhouse on Borroloola road, *K.L.Wilson 5316* (CANB, NSW).

A distinctive species since it is the only one to have a darker coloured centre to the flower. It should be emphasised however that not all flowers have this darker centre and in the absence of this character it is often difficult to distinguish between *T. bicolor* and *T. solandri*: the two are possibly not deserving of species status.

5. *Tribulopsis sessilis* (Domin) H.Eichler, *Nuytsia* 5: 177 (1984)

Tribulus solandri var. *sessilis* Domin, *Biblioth. Bot.* 89: 281 (1926). T: Northwest-Queensland: Grassflächen der Rolling Downs zwischen Richmond und Cloncurry, Feb. 1910, *K.Domin 5504*; syn: PR *p.p.*; Nord-Australien: Victoria R. [N.T.], Dec. 1865 [1855], *F.Mueller s.n.*; syn: K725240, PR *p.p.*

[*Tribulus solandri* auct. non (R.Br.) F.Muell.: G.Bentham, *Fl. Austral.* 1: 290 (1863), *p.p.*, as to Mueller collections from N. Australia]

Somewhat succulent annual herb, sometimes forming a mat; stems 10–50 cm long, glabrous. Leaves with 4 or 5 pairs of leaflets, the lowest pair inserted very close to stem; leaflets narrowly ovate to ovate, oblique, 8.5–14 mm long, 2.7–5 mm wide, acute, very sparsely ciliate or glabrous. Flowering pedicel 12–15 mm long, upright. Sepals c. 3.5–4 mm long, glabrous. Petals obovate, 4.5–8 mm long, yellow throughout. Extrastaminal glands 5; intrastaminal glands 5. Stamens 10, in 2 whorls, all fertile, at maturity equal to stigma; filaments c. 2.5–4 mm long. Ovary 5-lobed, glabrous; style (including stigma) c. 1.5 mm long. Fruit glabrous, of 2–5 ?tardily dissociating, fully developed cocci; pedicel to 25 mm long, deflexed. Cocci c. 4 mm high, smooth, with pair of divergent basal, and sometimes medial, dorsal spines. Fig. 74A–C.

An apparently rare species known only from the Kimberleys, W.A., through to Victoria R. in the N.T.; there is a single modern collection from the Julia Ck region of Qld, and one of the types also comes from this area. Occurs in alluvial silts, or black or grey cracking clay, frequently with *Acacia farnesiana*. Flowers Dec.–Apr.

W.A.: Brooking Springs Stn, c. 10 km NE of Fitzroy Crossing, *T.E.H.Aplin et al. 242* (CANB); Carlton Hill Stn near site B7, *C.Glover 142* (CANB); Kimberley Research Stn, North Bank Diversion Dam, *K.T.Richards 56* (CANB). N.T.: 26 km NW of Top Springs roadhouse on Victoria River Downs road, *K.L.Wilson 4751* (NSW). Qld: Cremona Downs Stn, 70 km N of Julia Ck, 31 Jan. 1989, *A.R.Bird s.n.* (BRI).



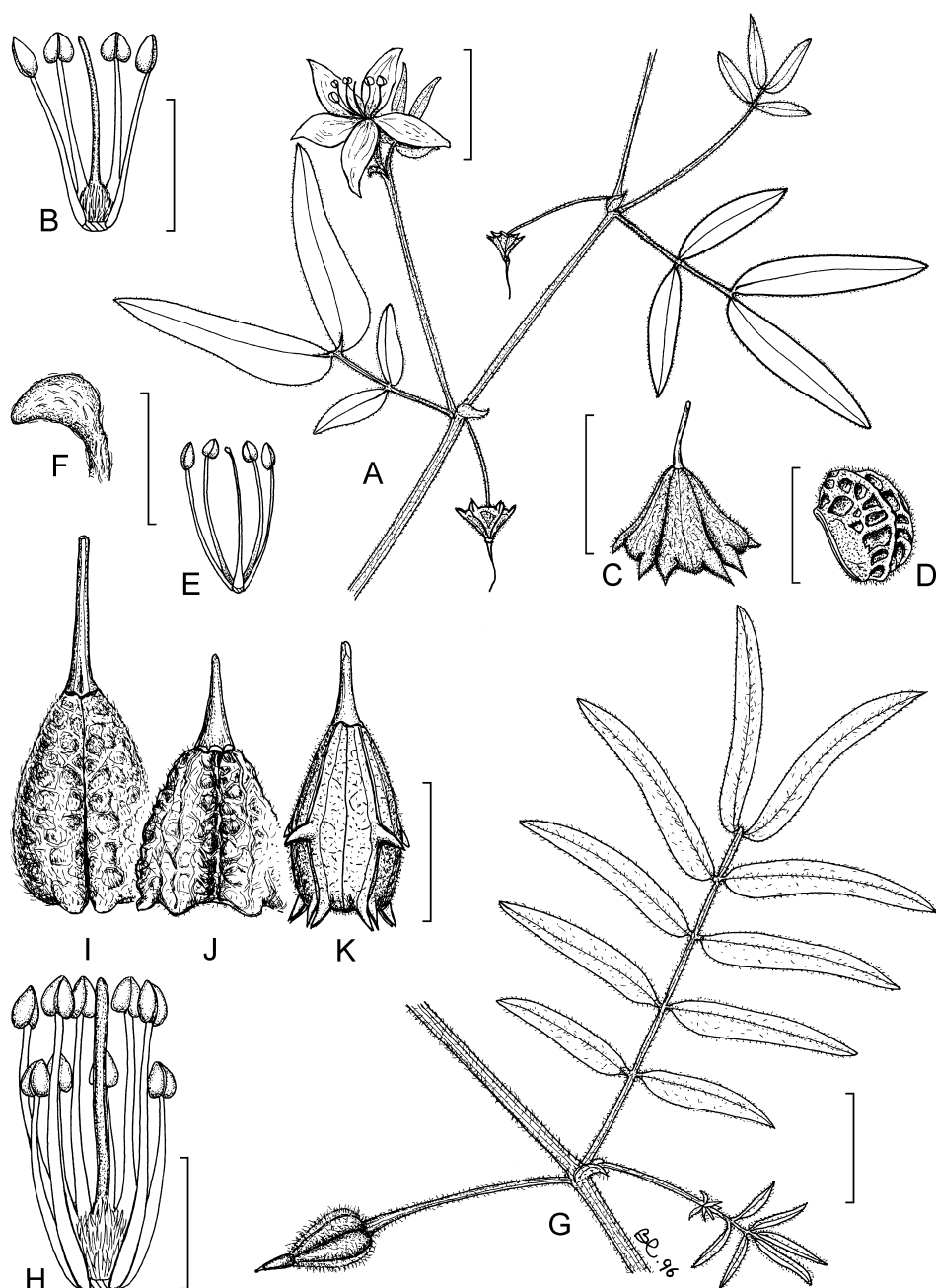


Figure 73. *Tribulopsis*. **A–C**, *T. pentandra*. **A**, habit; **B**, flower with petals and 1 stamen removed; **C**, fruit (**A**, **B**, J.Must 395, DNA; **C**, W.Leutert 86, PERTH). **D**, *T. sp.* Koolan Island (K.F.Kenneally 8728), coccus (P.Fryxell 4612, CANB). **E**, **F**, *T. sp.* Mitchell Plateau (K.F.Kenneally 7935). **E**, flower with petals and 1 stamen removed; **F**, upper pedicel with immature fruit, lacking style and stigma at apex (**E**, K.F.Kenneally 7935, PERTH; **F**, G.J.Keighery 2630, PERTH). **G–K**, *T. angustifolia*. **G**, habit; **H**, flower with petals and 1 stamen removed; **I–K**, fruit variation (**G**, B.Thomson 1853, DNA; **H**, W.Leutert 41, PERTH; **I**, I.D.Cowie 2452, DNA; **J**, C.R.Dunlop 9689, DNA; **K**, J.Devitt 145, PERTH). Scale bars: **A**, **G** = 10 mm; **B**, **E**, **F**, **H** = 3 mm; **C**, **I–K** = 5 mm; **D** = 3 mm. Drawn by B.Chandler.

6. *Tribulopsis angustifolia* R.Br. in C.Sturt, *Narr. Exped. C. Australia* 2: App. 70 (1849)

Kallstroemia angustifolia (R.Br.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890); *Tribulus angustifolius* (R.Br.) Benth., *Fl. Austral.* 1: 290 (1863). T: Island a, Carpentaria [Sweers Is., Qld], 18 Nov. 1802, *R.Brown s.n.*; syn: K725230, K725232, MEL, NSW.

Tribulus angustifolius var. *clementii* Domin, *Biblioth. Bot.* 89: 281 (1926). T: N.W. Australia, fl. Ashburton et Yule River, W.A., *s. dat.*, *E. Clement s.n.*; probable holo: PR (photo seen); iso: K725229 (photo seen).

Tribulopsis affinis (W.Fitzg.) H.Eichler, *Nuytsia* 5: 177 (1984); *Tribulus affinis* W.Fitzg., *J. & Proc. Roy. Soc. W. Australia* 3: 157 (1918). T: Junction of Lennard and Barker R., W.A., May 1905, *W.V.Fitzgerald 554*; syn: PERTH, NSW 145427; Lennard R., W.A., May 1905, *W.V.Fitzgerald 554*; syn: NSW 145428; King R., E Kimberley, W.A., Oct. 1906, *W.V.Fitzgerald 1681*; syn: PERTH, NSW 145429, NSW 145430 (NSW specimens without Fitzgerald number)

Tribulus curvicaulus W.Fitzg., *op. cit.* 158; *Kallstroemia curvicaulus* (W.Fitzg.) C.A.Gardner ex Beard, *Desc. Cat. W. Austral. Pl.* 53 (1965), *comb. inval.* basionym not cited; *Tribulopsis curvicaulus* (W.Fitzg.) Keighery, *Flora, Morphol. Geobot. Oekophysiol.* 172: 332 (1982). T: Goody Goody, near Derby, W.A., *W.V.Fitzgerald 211*; syn: NSW, PERTH.

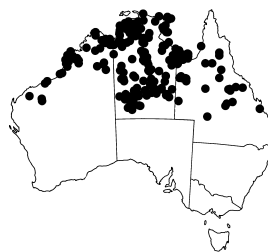
Tribulus leptophyllus F.M.Bailey, *Bot. Bull. Dept. Agric. Queensland* 3: 8 (1891). T: Walsh R., Qld, *T.Barclay Miller s.n.*; syn: BM, BRI, K725228, MEL.

Kallstroemia affinis (W.Fitzg.) Beard, *Desc. Cat. W. Austral. Pl.* 53 (1965), *comb. inval.* basionym not cited.

Slender annual herb, sometimes with perennial rootstock; stems 10–60 cm long, subglabrous, pubescent or hirsute. Leaves with (2–) 3–5 (–6) pairs of leaflets, the lowest pair inserted well above stem; leaflets linear to narrowly ovate, oblique, 10–45 mm long, 0.5–1.5 (–3.5) mm wide, acute, sparsely ciliate, glabrous adaxially, sparsely pubescent abaxially; lower pairs spreading. Flowering pedicel 13–38 mm long, upright. Sepals 2–8.5 mm long, glabrous adaxially and abaxially or sparsely appressed-pubescent abaxially. Petals obovate, 3.5–16 mm long, yellow throughout. Extrastaminal glands 5; intrastaminal glands lacking. Stamens 10, 5 usually shorter, all fertile, or 1 or 2 with linear anthers, at maturity equal to stigma; filaments c. 2–4 mm long. Ovary 5-lobed, with moderately dense to dense white erect or appressed hairs; style (including stigma) (1.5–) 2–7 mm long. Fruit hispid, appressed-pubescent or subglabrous, of 1–5 tardily dissociating, fully developed cocci; pedicel 20–50 mm long, deflexed. Cocci 5–11 mm high, smooth or reticulate, unarmed or with pair of divergent basal spines dorsally, sometimes also with pair of medial spines. Fig. 73G–K.

The most widespread *Tribulopsis* species, being found in W.A., N.T. and Qld, as far S as the Tropic of Capricorn. Occurs in sand or sand/clay in a variety of habitats including tussock grassland, *Eucalyptus* woodlands, levee banks and red sand interdune areas associated with spinifex. It is often recorded after fire. Flowers Nov.–May with sporadic records outside these months.

W.A.: Hidden Valley, just N of Kununurra, *Hj.Eichler 22483* (AD, CANB, CHR, CONC, L, LAE, MEL, MO, NSW, P, PERTH); Bull Ck, Bungle Bungle Natl Park, *I.D.Cowie 820* (DNA). N.T.: Barkly Hwy, *J.Egan 1890* (DNA); Fiddlers L., Tanami Desert, *P.Latz 11901* (MEL, NT). Qld: L. Moondarra, NNE of Mt Isa, *K.L.Wilson 5429* (CANB, NSW).



Tribulopsis angustifolia shows considerable variation in hair covering, flower size, ornamentation of the cocci, length of the style, size of the fruit and the number of spines on the fruit. Specimens with both medial and basal spines on the fruitlets are usually to be found in the more southerly part of the distribution. Specimens in which the fruits lack spines are usually larger-flowered and apparently short-lived perennials (because of the possession of a tap root); they are more likely to be associated with beach localities or deep sands of the N coast and in the areas N of Katherine.

Collections from the Mt Isa region, segregated as *T. aff. angustifolia* (Mt Isa) in Barker (1998) are distinctive by the appressed rather than erect hairs on the ovary, their wider leaflets (2–3.5 mm wide) and their shorter styles (1.5–1.8 mm long); however the species is so variable they have not been segregated here.

Ants apparently play some role in the distribution of this species since Latz & Albrecht (*Latz 11901*) recorded thousands of cocci covering a meat-ant's nest after fire.

7. *Tribulopsis solandri* R.Br. in C.Sturt, Narr. Exped. C. Australia 2: App. 70 (1849)

Tribulus solandri (R.Br.) F.Muell., *Pl. Victoria* 1: 99 (1862); *Kallstroemia solandri* (R.Br.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890); *Tribulus solandri* var. *typicus* Domin, *Biblioth. Bot.* 89: 281 (1926), *nom. inval.* type var. T: In ora orientali intratropica Novae Hollandiae prope Endeavour River [Qld], 1770, *J.Banks & D.Solander s.n.*; syn: BM, BRI, NSW (all seen as photos).

Tribulopsis sp. aff. *solandri* (Lizard Island) R.M.Barker, *J. Adelaide Bot. Gard.* 18: 91 (1998).

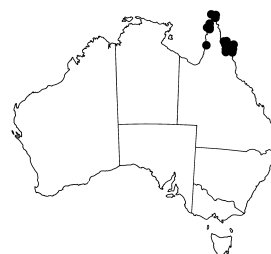
Tribulopsis sp. Weipa Mission (R.L.Specht W296), R.J.F.Henderson, *Queensland Pl.: Names Distrib.* 209 (1997).

Slender annual herb; stems 20–60 cm long, glabrous (Lizard Island specimens) or usually with dense appressed, curled white hairs in young parts. Leaves with (2–) 3 (–4) pairs of leaflets, the lowest pair inserted well above stem; leaflets ovate or obovate, oblique, ciliate, obtuse or shortly acuminate, glabrous adaxially and abaxially; upper pair to 18 mm long, to 8 mm wide, lower pair(s) smaller. Flowering pedicel (3.5–) 10–25 mm long, upright. Sepals 2.5–4 mm long, glabrous adaxially, sparsely white-appressed-hairy or glabrous abaxially. Petals obovate, 5.5–7.5 (–8.5) mm long, yellow throughout. Extrastaminal glands 5; intrastaminal glands 5 or a sinuate ring. Stamens 10, all fertile or up to 6 staminodal, at maturity equal to stigma; filaments 1.5–3 mm long. Ovary 5-lobed, with 5 bundles of lax white hairs or glabrous; style (including stigma) 1.0–2.0 mm long. Fruit glabrous or shortly pubescent, of 4 or 5 tardily dissociating, fully developed cocci; pedicel (7–) 13–25 mm long, deflexed. Cocci 3–3.5 mm high, somewhat rounded dorsally and with pair of divergent medial and retrorse basal spines or bumps. Fig. 74D–H.

Found only on Cape York Penin., Qld. Occurs in sands, associated with beaches and rivers, and also in basalt and granite. Flowers Mar.–May (–Aug).

Qld: Lizard is., Casuarina Beach, *G.N.Batianoff 12123* (BISH, BRI, CANB, DNA, K, NSW); Twelve Mile Lagoon area, Lakefield Natl Park, *A.R.Bean 5528 & P.Forster* (BRI, CANB); Quarantine Bay near Cooktown, *S.T.Blake 23485* (BRI); Weipa, Nanam Beach on Mission R., *A.Morton 558* (BRI); Bathurst Bay, *B.M.Waterhouse 7517* (AD).

The name applies to the slender herb found in the sands of the Cook region of Qld. More robust specimens from W.A., included within *T. solandri* in the past, are here treated as *T. bicolor*. Further studies may indicate that *T. bicolor* should be included under *T. solandri* but the two species have been maintained here.



Further collections of *T. solandri* have supported the view that the specimens from Lizard Is. which were segregated as *T. sp. aff. solandri* (Lizard Island) in Barker (1998) represent part of the variation of this species. A Waterhouse collection (*Waterhouse 7517*) from Bathurst Bay on Cape York Penin. has glabrous ovaries but fruits with an indumentum.

8. *Tribulopsis homalococca* (Domin) R.M.Barker, J. Adelaide Bot. Gard. 18: 91 (1998)

Tribulus homalococcus Domin, *Biblioth. Bot.* 89: 280, t. 37, fig. 2–6 (1926). T: in collibus calcareis apud opp. Chillagoe, Qld, Feb. 1910, *K.Domin 5503*; syn: PR (photo seen); in collibus calcareis Lions Head Bluff dictis apud opp. Chillagoe, Qld, Feb. 1910, *K.Domin 5502*; syn: PR (photo seen).

Slender annual herb; stems 20–30 cm long, with appressed, curled white hairs in young parts. Leaves with 3 pairs of leaflets, the lowest pair inserted well above stem; leaflets obovate, oblique, ciliate, shortly acuminate, glabrous adaxially, sparingly hirsute abaxially; upper pair 4–10 mm long, to 3.5 mm wide, lower pairs smaller. Flowering pedicel 18–23 mm long, upright. Sepals 3–3.5 mm long, glabrous adaxially, sparsely hirsute abaxially. Petals obovate, 5.5–7 mm long, yellow throughout. Extrastaminal glands 5; intrastaminal glands ?narrow sinuate ring. Stamens 10, all fertile or 5 staminodal, at maturity equal to stigma; filaments c. 2 mm long. Ovary seated on intrastaminal ring, glabrous; style (including stigma) c. 1 mm long. Fruit glabrous or rarely with a dense short erect pubescence, of 4 or 5 tardily dissociating, fully developed cocci; pedicel 18–23 mm long, deflexed. Cocci 3–3.5 mm high, rounded dorsally, smooth, lacking spines but sometimes with semicircular wing.

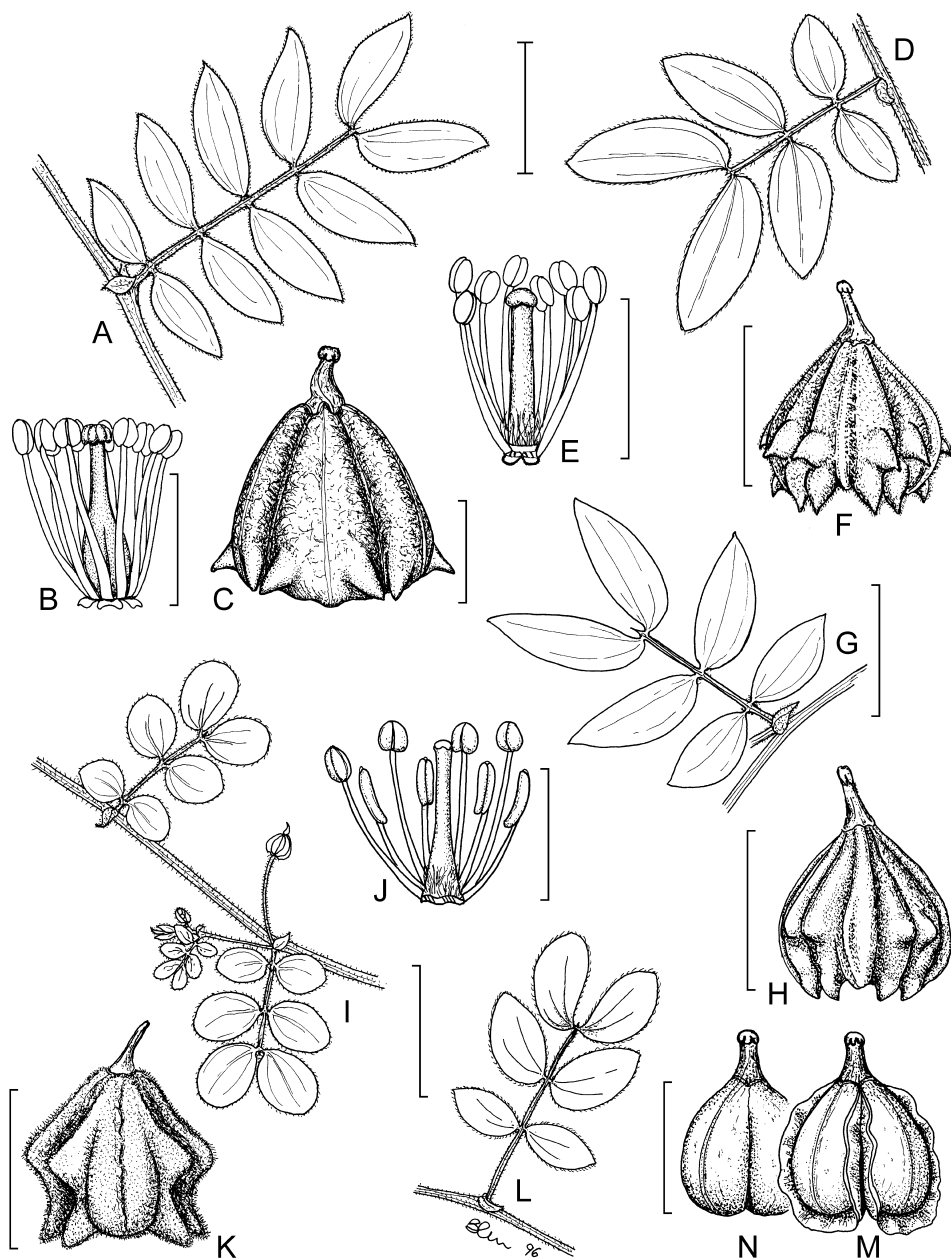


Figure 74. *Tribulopsis*. A–C, *T. sessilis*. A, leaf; B, flower with petals removed, showing extrastaminal glands; C, fruit (A, C.Glover B7-1, PERTH; B, C, H.F.Broadbent 592, PERTH). D–F, *T. solandri*. D, leaf; E, flower with petals and 2 stamens removed; F, fruit (D, E, A.Morton 558, BRI; F, S.T.Blake 23485, BRI). G, H, *T. solandri* Lizard Island variant. G, leaves; H, fruit (G, G.Batianoff 12123, BRI; H, N.Fisher & H.Leckie 105, CANB). I–K, *T. bicolor*. I, leaf; J, flower with petals and 2 stamens removed; K, fruit (I, J, I.Solomon 697, PERTH; K, M.Evans 3068, BRI). L, M, *T. homalococca* var. *alifer*. L, leaf; M, fruit (L, M, K.L.Wilson 8090, PERTH). N, *T. homalococca* var. *homalococca*, fruit (after illustration in Domin protologue). Scale bars: A, D, G, I, L = 10 mm; B, J, M, N = 1 mm; C = 3 mm; E, F, H, K = 3 mm. Drawn by B.Chandler.

Two varieties were described and illustrated by Domin, both from Chillagoe on Cape Yorke Peninsula. The material available is limited and a thorough survey of the Chillagoe area is needed to determine whether or not the development of the fruit wing and the presence of hairs is consistent and justifies the two varieties, but in the interim they are maintained.

Cocci lacking wings

8a. var. homalococca

Cocci with basal semicircular wings

8b. var. alifer

8a. *Tribulopsis homalococca* (Domin) R.M.Barker var. *homalococca*

Tribulus homalococcus var. *typicus* Domin, *Biblioth. Bot.* 89: 280, t. 37, fig. 2–5 (1926), *nom. inval.* type var.

Fruit rounded dorsally, lacking wings, spines or any outgrowths. Fig. 74N.

Known only from the type collections made at Chillagoe, N Qld.



8b. *Tribulopsis homalococca* var. *alifer* (Domin) R.M.Barker, *J. Adelaide Bot. Gard.* 18: 92 (1998)

Tribulus homalococcus var. *alifer* Domin, *Biblioth. Bot.* 89: 280, t. 37, fig. 6 (1926). T: Bei Chillagoe, Qld, Feb. 1910, *K.Domin 5501*; holo: PR (photo seen).

Tribulopsis sp. (Chillagoe C.E.Hubbard+ 6751), R.J.F.Henderson, *Queensland Pls: Names Distrib.* 209 (1997).

Fruit rounded dorsally, with basal semicircular wings. Fig. 74L, M.

Known only from the Chillagoe area of N Qld. Occurs on lower open slopes of limestone bluffs in open *Eucalyptus* forest within grasses. Flowers Jan.–Feb.

Qld: Chillagoe, *C.E.Hubbard & C.W.Winders 6751* (BRI); 2 km along Royal Arch road from Gulf [=Burke] Development Rd (W of Chillagoe), *K.L.Wilson 8090 et al.* (BRI, NSW).

The Hubbard & Winders collection cited above is questionably placed here; it does not possess mature fruit but there are indications on the young fruits that the wing characteristic of var. *alifer* is developing.



4. TRIBULUS

Tribulus Tourn. ex L., *Sp. Pl.* 1: 386 (1753); from *tribulus*, Latin or Greek for caltrop, the common name for species belonging to this genus; a caltrop was a 4-pointed weapon which when placed on the ground always had one point erect to lame advancing cavalry.

Type: *T. terrestris* L.

Kallstroemia sect. *Thamnozygium* Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam. T. III* 4 (52): 88 (1890). T: not designated.

Prostrate, usually pubescent, annual herbs, more rarely small erect shrubs. Leaves opposite, in unequal pairs or, more rarely, by suppression of the smaller of the pair, alternate, not succulent, 3- or more-foliolate; petiole terete; leaflets not continuous with petiole, not stipellate. Pedicel usually erect in flower. Sepals 5, not persistent in fruit. Petals 5, quickly caducous, longer than sepals, yellow, not fading to white. Stamens 10 or fewer, rarely 12 in some *T. suberosus* flowers, usually in 2 subequal whorls; filaments not winged. Extrastaminal nectariferous disc 5-lobed; intrastaminal disc of 5 free lobes or sinuate ring or lacking. Ovary 5-celled; ovules 1–5 per cell; stigma 5-ridged, papillose. Fruit a schizocarp, pendent in

shrubby species, erect in prostrate species, dissociating into 2–5 indehiscent, tuberculate, spiny or 2-winged cocci; pedicel ?erect.

A genus of perhaps 30 species, some of which, because of the attributes of their fruits, are weedy and ±global in their distribution. Best known examples of these are *T. terrestris*, thought to be originally of Mediterranean origin, and *T. cistoides*, thought to be native to tropical southern Africa. Others are much more restricted and endemic in drier areas of Africa and Australia, in particular. In Australia there are 17 species, of which at least 11 are endemic.

Native Australian species of *Tribulus* are usually easily distinguishable from each other and from the species with spiny cocci. However the taxonomy of the group of mostly extra-Australian species with spiny cocci (*T. terrestris* s. lat. and related species, *T. cistoides*, *T. occidentalis* and *T. hystrix*) is most unsatisfactory and there is difficulty in delimiting the taxa of this group, in distinguishing between *T. cistoides* and *T. eichlerianus* or *T. occidentalis* and between *T. occidentalis* and *T. hystrix*. This is probably because there are no real barriers to prevent interbreeding between these species where they overlap in distribution and morphological intermediates are eroding differences between them. For this reason informal names, originally proposed for “taxa” hypothesised to have arisen as a result of such events (Barker, 1998), have not been formalised but are retained until further clarification occurs; there is already a surfeit of names encompassing the morphological variants of this group elsewhere in the world.

It is likely that those native species with fruits well-adapted for transfer by vehicles and animals have expanded their pre-European distribution.

The status of *T. minutus* and *T. micrococcus*, treated in some literature as native to Australia, needs to be resolved so that conflicting advice is not given to farmers and native bush managers. Currently *T. minutus* has a Conservation Code in W.A. whereas it seems likely that it may represent an early introduction to Australia.

T. terrestris and *T. cistoides* are included on noxious weed lists in a number of states.

Occasional stamens have very long anthers, in the order of twice as long as those normally present (e.g. *T. platypterus*); these are thought to be infertile and are referred to as staminodal in the descriptions.

Species are grouped below in what are perceived by the author to be natural groupings. Hadidi's (1978) proposed sectional classification of *Tribulus*, primarily based on fruit morphology, was found to be difficult to apply to Australian species as discussed in Barker (1998).

D.M.Porter, Notes on the floral glands in *Tribulus* (Zygophyllaceae), *Ann. Missouri Bot. Gard.* 58: 1–5 (1971); N.Hadidi, An introduction to the classification of *Tribulus* L., *Taeckholmia* 9: 59–66 (1978); K.L.Wilson, A new species and a neotypification in Australian *Tribulus* (Zygophyllaceae), *Telopea* 5: 21–29 (1992); F.Al-Hemaid & J.Thomas, Review of the genus *Tribulus* L. in Saudi Arabia, *Arab Gulf J. Sci. Res.* 14: 415–443 (1996); R.M.Barker, A trial key and notes on *Tribulus* (Zygophyllaceae) in Australia, including one new species and validation of *Tribulus suberosus*, *Nuytsia* 12: 9–35 (1998); L.Boulos, *Tribulus*, in *Fl. Egypt* 2: 26–30 (2000).

1 Upright bushes [Group 1]

- 2** Stems usually lacking corky bark; leaflet pairs (4–) 5–7; sepals densely villous adaxially; fruits quickly dissociating, glabrous or sparsely pubescent between wings (Pilbara region, W.A.)

1. *T. platypterus*

- 2:** Stems with corky bark; leaflet pairs (1–) 2–4 (–5); sepals sparsely sericeous or patchily villous adaxially; fruits tardily dissociating, densely pubescent between wings (Pilbara region S to Wiluna, W.A.)

2. *T. suberosus*

1: Prostrate herbs

- 3** Fruits star-shaped when viewed from above, not winged (mulga woodlands from Carnarvon to Warburton in W.A.; southern N.T.; northern S.A.; SW Qld) [**Group 3**]

6. *T. astrocarpus*

- 3: Fruits 5-lobed or 5-winged, irregular or symmetrical, or if star-shaped, with wings
- 4 Fruits winged, at maturity splitting into five 2-winged cocci [**Group 2**]
- 5 Plants becoming glabrous; fruits sparsely appressed-pubescent, with a pair of medial spines between the wings (Cape Ra. to Geraldton, W.A., and inland to southern N.T. and northern S.A., usually in red sand) **5. *T. macrocarpus***
- 5: Plants villous; fruits densely pubescent between wings, lacking spines
- 6 Fruits 20–32 mm high, 20–45 mm wide; wings lacking any hardening or spines, very inflated in fresh state; style and stigma 3.5 mm long (Pilbara region through to Rudall R. and Great Sandy Desert in W.A. to southern N.T.) **3. *T. hirsutus***
- 6: Fruits 10–14 mm high, 18–25 mm wide; wings with hardened structures equivalent to spines just below middle in dried condition (unknown in fresh state); style and stigma 1.8–2.3 mm long (Mt Magnet, Newman, Leonora area, possibly extending through to Gibson Desert, W.A.) **4. *T. adelacanthus***
- 4: Fruits not winged
- 7 Plants subglabrous; intrastaminal glands lacking; fruits 5-lobed; cocci dorsally ±smooth, rounded and with a pair of medial spines (Carnarvon/Shark Bay area of W.A.) [**Group 4**] **7. *T. forrestii***
- 7: Plants villous; intrastaminal glands present; fruits irregular or 5-lobed; cocci dorsally spiny or tuberculate, rarely rounded, usually with more than medial pair of dorsal spines [**Group 5**]
- 8 Cocci not bilaterally symmetrical, with many distinct spines distributed randomly all over dorsal surface [**Subgroup A**]
- 9 Fruits with spines 10–17 mm long; petals 15–30 mm long; style 4–5 mm long (red sand dunes of central interior of Australia) **9. *T. hystrix***
- 9: Fruits with spines less than 8 mm long; petals 6–17 mm long; style less than 3 mm long
- 10 Flowers with petals 10–17 mm long; fruit 10–20 mm high, 20–30 mm wide, with spines 4–6 (–8) mm long (Broome to Carnarvon, coastal W.A.) **8. *T. occidentalis***
- 10: Flowers with petals 6–7 mm long; fruit 7–10 mm high, 12–15 mm wide, with spines 0.5–4 mm long (saline soils on edges of salt pans, central Australia) **10. *T. sp. saline flats* (Latz 4530)**
- 8: Cocci bilaterally symmetrical, often with a pair of medial and basal spines, sometimes tuberculate, but lacking distinct spines all over dorsal surface [**Subgroup B**]
- 11 Flowers with petals at least 15 mm long
- 12 Style 4 mm long or more; petals 15–35 mm long; leaves with 8–10 pairs of leaflets; leaflets 1–2.5 mm wide (Kununurra, W.A.; Victoria R. area N.T.) **11. *T. ranunculiflorus***
- 12: Style less than 4 mm long; petals 15–18 mm long; leaves with 5–8 pairs of leaflets; leaflets 3–5 mm wide
- 13 Fruit subglabrous, very sparsely strigose; medial pair of spines always present (coastal sands of tropical Australia) **12. *T. cistoides***
- 13: Fruit pubescent with relatively dense short hairs overtopped by sparser long strigose hairs; medial pair of spines present or absent (Rudall R., Giles and Hamersley regions in W.A. to Tanami in N.T.) **14. *T. sp. long-styled eichlerianus* (A.S.George 10666)**
- 11: Flowers with petals not more than 15 mm long (usually less)
- 14 Fruits 7–13 mm high, 10–20 mm wide, densely pubescent dorsally; intrastaminal glands forming a ring (drier areas of all states except Vic. & Tas.) **13. *T. eichlerianus***

14: Fruits 4–8 mm high, 5–13 mm wide, subglabrous to moderately pubescent dorsally; intrastaminal glands 5, distinct [*T. terrestris* complex]

15 Cocci with distinct, divergent, medial spines 3–8 mm long

15. *T. terrestris*

15: Cocci either lacking medial spines or these less than 3 mm long

16 Style 0.2–0.7 mm long, shorter than or equal to stigma; petals 2.5–7 mm long; fruits 5–7.5 mm high

16. *T. minutus*

16: Style 0.7–1.4 mm long, longer than or equal to stigma; petals 5–15 mm long; fruits 4–5 mm high

17. *T. micrococcus*

Group 1

Tribulus sect. *Alata* Hadidi, *Taeckholmia* 9: 61 (1978), *p.p.*

Erect subglabrous perennial bushes. Stems sometimes corky. Sepals lacking hyaline margins. Intrastaminal glands lacking. Fruits winged, not spiny, breaking into five 2-winged cocci.

A group of 2 species in W.A.

Fruits of these two *Tribulus* species are remarkably similar to those of the central and western Asian species, *Zygophyllum atriplicoides* Fisch. & C.A.Mey. Since the species are placed in different subfamilies (Sheahan & Chase 1996), this would appear to be an interesting example of parallel evolution.

1. *Tribulus platypterus* Benth., *Fl. Austral.* 1: 289 (1863)

Kallstroemia platyptera (Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: Hamersley Ra., W.A., *herb. Mueller* [*?Maitland Brown*] *s.n.*; syn: K725225 *p.p.*; Brought in from interior - Hamersley Ra., W.A., *Maitland Brown s.n.*; syn: MEL79456; E of H[amersley] range, W.A., *Maitl. Brown s.n.*; syn: MEL79455; [E of Hamersley Ra., W.A., *F.Gregory s.n.*; isosyn: MEL79454 = *T. suberosus*].

Upright, spreading, subglabrous shrub, 40–100 cm high, 50–200 cm wide; stems usually lacking corky bark except at base. Leaves in unequal pairs, with (4–) 5–7 pairs of leaflets; petiole 3–13 mm long; leaflets shortly petiolate, obliquely elliptic, 4–23 mm long, 2.2–8.3 mm wide, very shortly acuminate, glabrous. Flowering pedicel 3.5–6.5 mm long, upright. Sepals 6–8.5 mm long, glabrous or sparsely sericeous abaxially, densely villous adaxially. Petals elliptic to narrowly elliptic, 10–11 mm long, glabrous. Stamens 10, all fertile or some or all shorter and staminodal; longer filaments 5.5–6 mm long; shorter filaments c. 3 mm long. Ovary moderately densely white-sericeous; ovules 1 per cell; style and stigma 4.5–6 mm long; style glabrous. Fruit a globose 5-winged schizocarp, 12–18 mm long, 15–21 mm wide, easily dissociating into 5 cocci; fruiting pedicel 6–8.5 mm long. Cocci 2-winged, woody, glabrous or sparsely pubescent between wings dorsally, less so on wings, lacking any spines. Fig. 75K–M.

Found predominantly in the Pilbara region of W.A., but extending as far E as the Rudall R, and with outliers as far N as Christmas Ck in the Kimberleys and as far S as Geraldton. Occurs in rocky areas, including creek banks and beds, often in sand. Some records indicate its presence after fire. Flowers predominantly Aug.–Oct.

W.A.: Abydos Stn, S of Port Hedland, *N.T.Burbidge 5853* (CANB, PERTH); 56 km S of Woodstock t/off, *H.Demarz 10245* (PERTH); Karratha, near creek c. 1 km SE of corner Maitland Rd–Millstream Rd, *Hj.Eichler 23600* (AD, BRI, CANB, NSW, PERTH); 4 km S of Quarry Hill, c. 130 km W of Tom Price, *K.Newbey 10775* (PERTH); Rudall R., *P.G.Wilson 10429* (PERTH).



Tribulus platypterus has usually been considered to be the more northerly distributed of the pair of shrubby species, but there is considerable overlap throughout most of its range if the specimens in Australian herbaria (as projected on Australia's Virtual Herbarium map [<http://avh.ala.org.au>]) are correctly identified. It does not usually develop such noticeable corkiness as *T. suberosus* and differs from that species by the adaxially villous sepals, the more readily dissociating fruit, the fruits only with sparse appressed white hairs between the wings and the longer combined style and stigma length.

As has been pointed out by G.Keighery (pers. comm.) the closely related *T. suberosus* is predominantly dioecious, while *T. platypterus* produces mostly bisexual flowers. However a number of collections (*Burbidge 5853*, *Demarz 10245*, *Newbey 10775*, *Barker 1094*, *Eichler 23587* and *Carr 4609* & *Beaglehole 48387*) have flowers in which the stamens are all staminodal and so these are effectively female.

2. *Tribulus suberosus* H.Eichler ex R.M.Barker, *Nuytsia* 12: 15 (1998)

T: At the base of Mt Bruce, Hamersley Range Natl Park, W.A., 1 May 1977, *Hj.Eichler 22569*; holo: CANB; iso: PERTH, NSW.

T. suberosus H.Eichler ex R.M.Barker, *J. Adelaide Bot. Gard.* 17: 171 (1996), *nom. inval.* T: not cited.

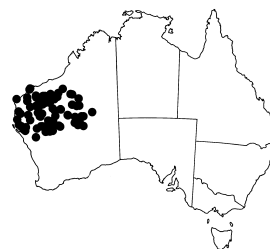
[*T. platypterus* auct. non Benth.: G.Bentham, *Fl. Austral.* 1: 289 (1863), *p.p.* (only as to Gregory collection, MEL79454)]

[*Kallstroemia platyptera* auct. non (Benth.) Engl.: J.S.Beard, *Desc. Cat. W. Austral. Pl.* 54 (1965), *p.p.*]

Upright, spreading, subglabrous shrub, 30–100 cm high, to 2 m wide; stems with corky bark. Leaves in unequal pairs, with (1–) 2–4 (–5) pairs of leaflets; petiole 2–5 mm long; leaflets shortly petiolulate, obliquely elliptic, sometimes narrowly so, 3–8 mm long, 2.2–5 mm wide, very shortly acuminate, glabrous. Flowering pedicel 4–7 mm long, upright. Sepals 6–7.5 mm long, glabrous or sparsely sericeous abaxially, sparsely sericeous or patchily villous adaxially. Petals 5 (6), elliptic to narrowly elliptic, 9–12 (–18) mm long, glabrous. Stamens 10 (–12), in 2 slightly unequal whorls, all fertile or some staminodal; filaments 5.5–6 mm long. Ovary very densely white-sericeous; ovules 2 per cell; style and stigma 2–4 mm long; style glabrous. Fruit a globose 5-winged schizocarp, 13–20 mm long, 18–25 mm wide, very tardily dissociating into 5 cocci; fruiting pedicel 7.5–11 mm long. Cocci 2-winged, woody, densely pubescent between wings dorsally, less so on wings, lacking spines. *Cork Hopbush*. Fig. 75N–P.

Found in the rocky hills and ranges from the Hamersley Ra. to the edge of the Gibson Desert, S to Wiluna and Hamelin and as far W as North West Cape, W.A., on a variety of soils. Flowers mainly Apr.–Aug., sporadically in other months.

W.A.: rocky ranges of North West Cape, *T. Carter B1342* (PERTH); c. 23 km E of Wittenoom, *Hj.Eichler 22553* (CANB, MEL, NSW, PERTH); 25 miles [40 km] WNW of Wiluna, *C.A.Gardner 2381* (PERTH); 19 miles [30.4 km] W of Mt Nossiter, Gunbarrel Hwy, *A.S.George 5480* (PERTH); Kennedy Ra., southern end by hill K39, c. 24 km NW of Gascoyne Junction, *P.G.Wilson 8440* (PERTH).



Despite its name, corkiness of the stems is not always reliable as a character. *Eichler 23606*, from opposite the Fortescue Roadhouse, is very corky on the main stem but the fruits undoubtedly belong to *T. platypterus*.

Tribulus suberosus is used as a fish poison.

As has been noted on herbarium specimens (*Corrick 9865* & *9866*) and by G.Keighery (pers. comm.), this species can be dioecious. Shrubs with larger flowers with conspicuous anthers are usually male while shrubs with fruits and flowers in which the stamens do not fully develop are functionally female. However there are a number of specimens (e.g. *Gardner 2381*, *George 5480*, *Fairall 2014* and *Barker 1115*) in which pollen-producing flowers are to be found on branches producing fruits, suggesting the production of some bisexual flowers and incomplete dioecy.

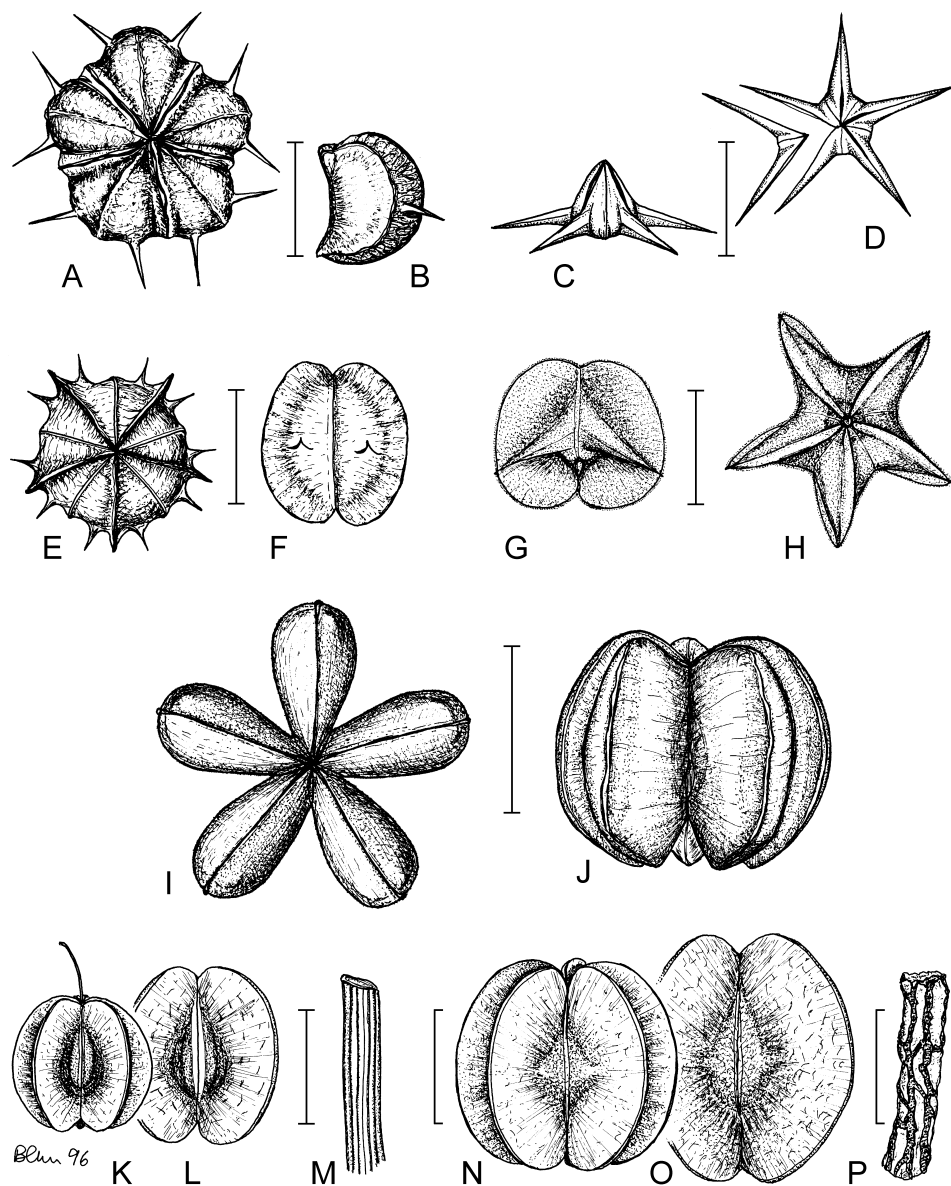


Figure 75. *Tribulus*. **A, B**, *T. forrestii*. **A**, fruit, from above; **B**, coccus, lateral view (**A, B**, R.M.Barker 1208, AD). **C, D**, *T. astrocarpus*. **C**, fruit, lateral view. **D**, fruit, from above, showing 1 coccus displaced (**C, D**, R.M.Barker 1067, AD). **E, F**, *T. macrocarpus*. **E**, fruit, from above; **F**, coccus, lateral view (**E, F**, R.M.Barker 1169, AD). **G, H**, *T. adelacanthus*. **G**, coccus, lateral view showing internal spines; **H**, fruit, from above (**G, H**, A.S.George 5588, PERTH). **I, J**, *T. hirsutus*. **I**, fruit, from above; **J**, fruit, lateral view (**I, J**, based on photo of fresh material, voucher R.M.Barker 1143, AD). **K–M**, *T. platypterus*. **K**, fruit, lateral view; **L**, fruit, non-winged portion glabrous; **M**, non-corky stem (**K–M**, R.M.Barker 1127, AD). **N–P**, *T. suberosus*. **N**, fruit, lateral view; **O**, fruit, non-winged portion pubescent; **P**, corky stem (**N–P**, R.M.Barker 1115, AD). Scale bars: **A–H, K, M, N, P** = 10 mm; **I, J** = 20 mm; **L, O** = 8 mm. Drawn by B.Chandler.

Group 2

Tribulus sect. *Alata* Hadidi, *Taeckholmia* 9: 61 (1978), *p.p.*

Prostrate herbs. Stems without corky bark. Sepals lacking hyaline margins. Intrastaminal glands lacking. Fruits winged, spiny or not, breaking into five 2-winged cocci.

A group of 3 species occurring from coastal W.A. to southern N.T. and S.A.

3. *Tribulus hirsutus* Benth., *Fl. Austral.* 1: 289 (1863)

Kallstroemia hirsuta (Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: Nickol Bay, W.A., *s. dat.* [1861], *P.Walcott s.n.*; lecto: MEL79405, *fide* R.M.Barker, *Nuytsia* 12: 16 (1998); isolecto: K725226.

[*Tribulus alatus* auct. non Delile: F.J.H.von Mueller, *Trans. Bot. Soc. Edinburgh* 7: 487 (1863)]

Prostrate, villous herb; stems 15–40 cm long. Leaves in unequal pairs or alternate, with (3–) 5–6 (–8) pairs of leaflets; petiole 6–16.5 mm long; leaflets elliptic, sometimes narrowly so, 7–21 mm long, 2.5–8 mm wide, rounded-oblique at base, rounded or acute, very shortly acuminate, glabrous adaxially, sparsely to densely villous abaxially, concolorous. Flowering pedicel 10–15.5 mm long, upright. Sepals c. 10 mm long, glabrous adaxially except for pubescent apex, villous abaxially. Petals ovate, 10–14 mm long, glabrous. Stamens 10, all fertile; filaments 6.5 mm long. Ovary densely white-pubescent; ovules 2 per cell; style (including stigma) 3.5 mm long in flower; stigma 1.5 mm long. Fruit 20–32 mm high, 20–45 mm wide, 5-lobed; lobes inflated, dissociating into 5 cocci; fruiting pedicel 16–17 mm long. Cocci 2-winged, densely pubescent between wings dorsally, sparsely pubescent on wings, lacking spines. Plate 68; Fig. 75 I, J.

Occurs from the Pilbara region of W.A. through Rudall R. and Great Sandy Desert to southern N.T. Usually in red sand or clay-sand in *Triodia*, often appearing after fire, sometimes also in disturbed localities. Flowers May–Oct., depending on rains.

W.A.: Marble Bar–Woodstock road, 22.4 km W of Hillside and Shaw R. crossing, *R.M.Barker 1102* (AD, MEL, PERTH); c. 4 km N of Tom Price, along the road to Hamersley, *Hj.Eichler 22574* (AD, CANB, CHR, CONC, G, K, L, LAE, MEL, NSW, P, PERTH); Djaluwon Ck, near S end of L. Gregory, *A.S.George 15373* (CANB, NT, PERTH). N.T.: on Tanami Track at Rabbit Flat, *P.A.Fryxell et al. 4515* (CANB, DNA); Ormiston Gorge, *P.K.Latz 9872* (DNA).



A variable species with respect to leaflet size and pubescence. When fruits are present their large size, yellow, brown or red colour and inflated wings before dissociation serve to easily distinguish this species from any of the other *Tribulus* species. Fresh, undissociated fruits in the field, with their 5 inflated lobes, bear little resemblance to the dried winged fruit of herbarium specimens.

4. *Tribulus adelacanthus* R.M.Barker, *Nuytsia* 12: 17 (1998)

T: c. 22 miles [35 km] S of Wongawol Stn HS, W.A., 28 July 1963, *A.S.George 5588*; holo: PERTH; iso: CANB.

Prostrate, villous herb; stems at least 20 cm long. Leaves alternate, or less usually in unequal pairs, with (3–) 4 or 5 (–6) pairs of leaflets; petiole 4–11 mm long; leaflets elliptic or ovate, sometimes narrowly so, 5.5–11 mm long, 3–4.5 mm wide, rounded-oblique at base, shortly acuminate, glabrous or sparsely white-villous adaxially, denser abaxially, discolorous/concolorous. Flowers unknown. Sepals mostly unknown, but villous abaxially. Ovary densely white-pubescent; ovule number per cell unknown; style and stigma 1.8–2.3 mm long in fruit; stigma 0.5–1.0 mm long. Fruit 10–14 mm high, 18–25 mm wide, star-shaped with apical conical projection, appearing 5-winged with wings from apex to each of the arms, densely pubescent, lacking spines, but wings including hardened structures just below middle in dried condition, probably dissociating into five 2-winged cocci; fruiting pedicel 9.5–14 mm long. Fig. 75G, H.

Known only by limited collections from an area bounded by Newman, Mt Magnet, Leonora and L. Carnegie in W.A. Specimens from the Gibson Desert may also belong here. Flowering time unknown.

W.A.: 10 km from Mt Magnet on Geraldton Rd, *Y. Chadwick* 1979 (PERTH); Eagle Bore Study area, Gibson Desert Nat. Res., burnt site 3 km N of camp, *A. Chapman & S. Fraser* 89 (PERTH); Leonora district, *S.B. Dimer per A.C. Linto s.n.* (PERTH); Bulloo Downs Stn, *A.A. Mitchell* 640 (PERTH).



Further material of this species is required to document its distribution, its variability and its floral characteristics and to understand how the fruiting structure develops. There has been no investigation of barriers to breeding between native *Tribulus* species and it is possible that this taxon represents a cross with *T. astrocarpus* as one of the parents and either *T. macrocarpus* or *T. hirsutus* as the other. More recent collections (2006 and 2007) held in PERTH, have not been seen by the author. All occur in the same area as those cited earlier and some of them may have flowers present. Some Gibson Desert collections (e.g. *Chapman & Fraser* 89) with affinities to this species have the spines \pm amalgamated with the wing, but the fruits are not as densely pubescent as those of collections from further south. They also appear to have the shorter styles and stigmas associated with *T. adelacanthus*.

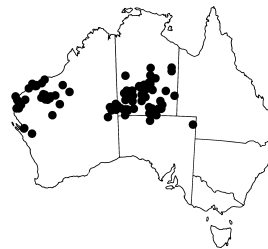
5. *Tribulus macrocarpus* F.Muell. ex Benth., *Fl. Austral.* 1: 289 (1863)

Kallstroemia macrocarpa (Benth.) Engl. in H.G.A. Engler & K. Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: Nickol Bay, *s. dat.*, Anon. [Unknown. Brought in from interior by Party, Gregory Expedition] *s.n.*; syn: K725223, MEL79423.

Tribulus sp. F.Muell., *Trans. Bot. Soc. Edinburgh* 7: 487 (1863).

Prostrate herb, becoming glabrous; stems 15–35 cm long. Leaves in unequal pairs or alternate, with 5–7 pairs of leaflets; petiole 3–10 mm long; leaflets narrowly elliptic or narrowly obovate, 5.5–11 mm long, 1.5–3.8 mm wide, obliquely rounded at base, shortly acuminate, sparsely appressed-pilose adaxially, glabrous abaxially. Flowering pedicel 8.5–14 mm long, upright. Sepals 5.7–9 mm long, glabrous adaxially except for pubescent apices, sparsely appressed-pilose abaxially. Petals elliptic or obovate, 6.5–10 (–11.5) mm long, glabrous. Stamens 10, all fertile; filaments 5.5–6 mm long. Ovary densely white-pubescent; ovules ?3 per cell; style (including stigma) 2.3–2.8 (–5.5) mm long in flower; stigma (0.7–) 0.9–1.0 mm long. Fruit globose, 5-winged, 15–22 mm high, 18–26 mm wide, sparsely pubescent, dorsally with a single 3.5–4 mm long spine medially or below either side of midrib between each of the wings, eventually dissociating into five 2-winged cocci; fruiting pedicel 11–35 mm long. Fig. 75E, F.

Found in dry areas of W.A. from Cape Ra. to Geraldton, and inland to southern N.T. and N of Oodnadatta in S.A. Found in red sand, usually in mulga with *Aristida*, *Plechtrachne* or *Triodia*, sometimes the sand over limestone. Flowers predominantly Apr.–Sept.



W.A.: 125 km S of Barradale, *Hj. Eichler* 23611B (CANB, PERTH); c. 0.5 km N of No. 18 Bore, Hamelin Stn, *Hj. Eichler* 23646 (CANB); Cape Ra., *Grealy* 10 (PERTH). N.T.: Western Bloods Ra., c. 18 km N of Docker Aboriginal Mission, *N.N. Donner* 4446 (AD, NT). S.A.: Mann Ra., *R. Bates* 58554 (AD).

In a note on a specimen, *Eichler* 23646, the flowers were described as sweetly scented. Personal observations have indicated that the flowers do not open until later in the morning and that the spines on the cocci, which are so obvious in the dried specimens, are not necessarily obvious in the field. Since there are only 2 spines present on each coccus to attach to vectors, *T. macrocarpus* is not as efficiently transported as other *Tribulus* species but it still adheres to boots quite readily when walked upon.

A single specimen from the Cape Ra. (*Grealy* 10) has much larger flowers and a longer style and stigma than is usually found in this species. Whether this is of any taxonomic significance is

unknown since there is only the one collection from the area, but plants from Cape Ra. can show divergence from the rest of the species or can represent different species e.g. *Calophanoides* (Acanthaceae), *Abutilon* (Malvaceae), *Stackhousia* (Stackhousiaceae).

Group 3

Prostrate herbs. Stems without corky bark. Sepals lacking hyaline margins. Intrastaminal glands lacking. Fruits star-shaped, lacking wings, breaking into five 3-spined cocci.

A single species occurring from coastal W.A. to central Australia (N.T., S.A. and Qld).

6. *Tribulus astrocarpus* F.Muell., *Fragm.* 12: 4 (1882)

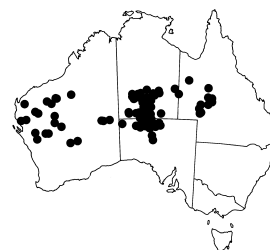
T: Menilyalya R, N of Shark Bay, W.A., 1882, *J.Forrest s.n.*; lecto: MEL79395; isolecto: K725227, *vide* R.M.Barker, *Nuytsia* 12: 20 (1998).

Kallstroemia astrocarpa (F.Muell.) Engl. ex Beard, *Desc. Cat. W. Austral. Pl.* 53 (1965), *comb. inval.* basionym not cited.

Prostrate, ±delicate herb, becoming glabrous; stems 10–50 cm long, reddish, without corky bark. Leaves alternate, with (3–) 4 (–6) pairs of leaflets; petiole 3–10 mm long; leaflets elliptic to obovate, 3–9 mm long, 1.8–6.8 mm wide, oblique at base, very shortly acuminate, sparsely white-pilose on both surfaces, ±concolorous. Flowering pedicel 6–10 (–20) mm long, upright, sparsely pubescent. Sepals 4.5–6.8 mm long, adaxially glabrous except for apical hairs, abaxially sparsely appressed-pilose. Petals 5.6–10 mm long. Stamens 10, all fertile or some staminodal; filaments 3.8–5 mm long. Ovary densely white-pubescent; ovules 2 per cell; style 1.3–3.5 mm long in flower; stigma 0.3–0.5 mm long. Fruit star-shaped with apical conical projection, tardily dissociating into 5 glabrous or sparsely pubescent, 3-spined cocci, the longer dorsal pair of spines 6–9.5 mm long; fruiting pedicel 10–35 mm long. Fig. 75C, D.

Occurs from Carnarvon to Warburton, W.A., southern N.T., SW Qld and northern S.A. Soils vary from red sand or pebbly brown clay, but *T. astrocarpus* is invariably found in mulga woodland. Flowers most months, but predominantly Mar.–May and Aug.–Sept.

W.A.: No 1 Well, Canning Stock Route, *L.A.Craven 5044* (CANB, PERTH); Warburton Community, between shop and river bed, *F.A.Zich 76* (CANB, NSW, PERTH, PRE). N.T.: Plenty Hwy, 22 km NE of Stuart Hwy, *K.L.Wilson 4641* (DNA, NSW). S.A.: Timber Camp Bore, Hamilton Stn, 100 km N of Oodnadatta, *F.Badman 309* (AD, BRI, C, CANB, MEL, NSW). Qld: 72 km S of Winton, March 1971, *P.Knowles s.n.* (BRI).



This species is clearly distinguished by its fruits, which are usually described as star-shaped and in shape resemble a squat Eiffel Tower with 5 legs. When the fruits dissociate into 5 cocci a third and shorter spine is left from the apical projection and it is this spine which is most likely to penetrate the trampling agent.

Group 4

Tribulus ?sect. *Inermis* Hadidi, *Taeckholmia* 9: 63 (1978), *p.p.*

Prostrate herbs. Stems without corky bark. Sepals without hyaline margin. Intrastaminal glands lacking. Fruits 5-lobed, spiny, breaking into 2–5 cocci.

A single species from coastal W.A.

7. *Tribulus forrestii* F.Muell., *S. Sci. Rec.* n. ser. 1 (1885); F.Muell., *Bot. Centralbl.* 24: 373 (1885)

T: Gascoyne R., W.A., 1880, *Jones s.n.*; lecto: MEL, *fide* R.M.Barker, *Nuytsia* 12: 18 (1998).

Prostrate, subglabrous herb; stems 30–50 cm long. Leaves in unequal pairs or alternate, with 6 or 7 pairs of leaflets above 3–11 mm long petiole; leaflets very shortly petiolulate, ovate, 3.5–10 mm long, 1.8–3 mm wide, oblique at base, shortly acuminate, glabrous or sparsely pubescent on margins adaxially and abaxially, concolorous. Flowering pedicel 11–17.5 mm long, upright. Sepals 6–6.5 mm long, sparsely appressed-pilose abaxially, glabrous except for pubescent margins adaxially. Petals obovate, c. 9.5 mm long. Stamens 10, all fertile; filaments 6 mm long. Ovary densely white-pubescent; style 1.8 mm long in flower; stigma 1.7 mm long. Fruit 5-lobed, to 10 mm high, 15–30 mm diam., dissociating into 2–5 cocci; fruiting pedicel 15–25 mm long. Cocci woody, bilaterally symmetric, rounded and ±smooth dorsally and with a pair of medial spines 4–6 mm long. Fig. 75A, B.

Confined to the Carnarvon area of W.A., particularly in the Shark Bay area. Flowers Apr.–Sept.

W.A.: Point Quobba Rd, 2.7 km from NW Coastal Hwy, *R.M.Barker 1208* & *P.S.Short* (AD); 76.2 km S of Minilya, *Hj.Eichler 23627* (AD, MEL, NSW, PERTH); Monkey Mia, Peron Penin., Shark Bay, *K.F.Kenneally 1333* (PERTH); 7 km M of Overlander Roadhouse on NW Coastal Hwy, *N.S.Lander 1311* (PERTH).

The fruits of this species have very similar markings to those of the shell of a peanut and, apart from the pair of medial spines, seem to agree well with those species described as belonging to Section *Inermis* Hadidi. Occasionally there is the suggestion of a wing at the junction of the carpels (e.g. *Eichler 23627*).



Group 5

Tribulus sect. *Terrestris* Hadidi, *Taeckholmia* 9: 60 (1978).

Prostrate herbs. Sepals with hyaline margins. Intrastaminal glands present, either free or in a ring. Fruits not winged, spiny, breaking into 2–5 cocci.

A group of 9 species further subdivided into 2 subgroups.

The taxonomy of this whole group is very much in need of revision but it is likely that an understanding of the biology as well as a world-wide study of the group will be necessary to achieve a satisfactory classification. It is probable that these species are all much more closely related than the classification below suggests. Recent studies in the Indian subcontinent (Varghese *et al.* 2006) have pointed to the similarity in morphological features between *T. rajasthanensis* Bhandari & V.S.Sharma (now treated as a variety of *T. terrestris*) and *T. echinops* Kers of W Africa and the Australian species, *T. hystrix* and *T. occidentalis*. For further notes on the variation of the species of this group and their interrelationships, see Barker 1998.

M.Varghese *et al.*, Taxonomic status of some of the *Tribulus* species in the Indian subcontinent, *Saudi J. Biol. Sci.* 13: 7–12 (2006).

Subgroup A

Cocci not bilaterally symmetrical, with long spines all over.

A subgroup of 3 species, one from coastal W.A., the others inland, all endemic to Australia.

8. *Tribulus occidentalis* R.Br. in C.Sturt, *Narr. Exped. C. Australia* 2: App. 69 (1849)

T: W.A., Carnarvon: on the outskirts of Onslow town, near the hospital, 1 July 1967, *D.E.Symon* 5420; neo: CANB; isoneo: AD, B *n.v.*, CANB, K *n.v.*, PERTH *n.v.*, *fide* K.L.Wilson, *Telopea* 5: 25 (1992).

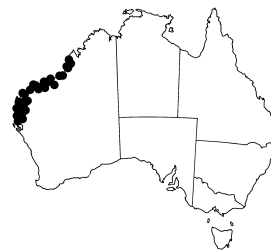
[*T. hystrix* auct. non R.Br.: G.Bentham, *Fl. Austral.* 1: 289 (1863), *p.p.*; F.J.H.von Mueller & R.Tate, *Trans. & Proc. Roy. Soc. S. Australia* 16: 338 (1896)]

Prostrate, silvery villous herb; stems 50–60 cm long. Leaves in unequal pairs, occasionally alternate, with 7–10 pairs of leaflets; petiole 2–10 mm long; leaflets subsessile, elliptic, 8.5–12 mm long, 3–5.5 mm wide, rounded-oblique at base, acuminate, sparsely villous adaxially, densely villous abaxially. Flowering pedicel 15–40 mm long, upright. Sepals 6–12 mm long, glabrous adaxially except for pubescent apex, densely villous abaxially except for glabrous hyaline margin. Petals broadly obovate, 10–17 mm long. Intrastaminal glands 5. Stamens 10, occasionally some staminodal, in 2 slightly unequal whorls; filaments 4–5 mm long. Ovary densely white-strigose; style 1–2.3 mm long; stigma similar length, rarely shorter than style. Fruit 10–20 mm high, 20–30 mm wide, of 2 or 3 (–5) tardily dissociating cocci; fruiting pedicel 15–50 mm long. Cocci asymmetrical, woody, pubescent and with many, sometimes toothed spines 4–6 (–8) mm long, all over dorsal surface. $2n = 48$, S.M.Morrison & J.K.Scott, *Austral. J. Bot.* 44: 193 (1996). Fig. 76G, H.

Confined to the W coast of W.A. from Broome to Carnarvon. Occurs in sand dunes and along roadsides. Flowers Apr.–Sept.

W.A.: Karratha Beach, on first sand dune back from beach, next to road, *R.M.Barker* 1145 (AD, PERTH); Dampier, at Dampier Clinic (Marine Biological Stn), *Hj.Eichler* 23602 (CANB, NSW, PERTH); c. 14 km SE of Carnarvon along the NW Coastal Hwy, *P.S.Short* 1574 (CANB, MEL); beside road near parking area at lagoon 1 km from Port Smith camping area, Port Smith, *F.Zich* 155 (CANB, DNA, NSW, PERTH, PRE, US).

Usually distinct from *T. hystrix* by the smaller fruits and flowers and by the style and stigma of similar length. There are some specimens (e.g. *Ballingall* 2569 from Minilya R on NW Coastal Hwy and *Mollemans* 2449 from Newman) which have longer styles, approaching, but not reaching, those of *T. hystrix* in length. Attempts to key out these specimens will fail, unless *T. occidentalis* is redefined to encompass specimens with styles up to 3 mm long.



Tribulus occidentalis occupies a similar coastal locality to *T. cistoides*, although also occurring further inland. Without fruits the species are difficult to distinguish. When fruits are present, *T. cistoides* has only 2 pairs of spines, one medial and one basal, compared with the all-over distribution of spines, some of which may be branched, in *T. occidentalis*.

9. *Tribulus hystrix* R.Br. in C.Sturt, *Narr. Exped. C. Australia* 2: App. 69 (1849)

Kallstroemia hystrix (R.Br.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: Sand hills in Lat. about 26°, *s. dat.*, *Captain Sturt* 109; holo: BM (photo seen).

T. lanatus R.Br. ex Walp., *Walp. Ann.* 2: 243 (1851–2). T: as for *T. hystrix* [Walpers merely copied the description from the protologue, substituting the third word, *lanatus*, for the species epithet, rather than the second word, *hystrix*].

[*T. occidentalis* auct. non R.Br.: F.M.Bailey, *Queensland Fl.* 1: 172 (1899); J.M.Black, *Fl. S. Australia* 2: 335 (1924), *p.p.*, as to S. Australian occurrence; H.Eichler, *Fl. Central Australia* 184 (1981), *p.p.*, as to S.A., Qld, N.S.W. & N.T. occurrences]

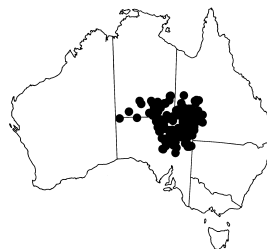
Prostrate, silvery villous herb; stems to 1 m long. Leaves in unequal pairs, occasionally alternate, with (4–) 7–9 pairs of leaflets; leaflets subsessile, elliptic, 10–17 mm long, 4–7 mm wide, rounded-oblique at base, acuminate, villous adaxially, more densely villous abaxially. Flowering pedicel 10–30 mm long, upright. Sepals 10–11 mm long, glabrous adaxially except for pubescent apex, densely villous abaxially except for glabrous hyaline margin. Petals broadly obovate, 15–30 mm long. Intrastaminal glands complete ring. Stamens 10, in 2 slightly unequal whorls; filaments 4.5–7 mm long. Ovary densely white-strigose; style 4–5 mm long; stigma much shorter than style. Fruit to 30 mm high and 50 mm wide

(including spines), of 2 or 3 tardily dissociating cocci; fruiting pedicel 20–60 mm long. Cocci asymmetrical, woody, pubescent and with many slender, sometimes toothed, spines (3–) 10–17 mm long, all over dorsal surface. Fig. 76A–C.

Found in central interior Australia, in N.T., S.A. and Qld; on slopes of red sand dunes, sometimes with spinifex. Flowers most months of the year, after rain.

N.T.: Camel L., Simpson Desert, *D.F. Gibson 61* (DNA). S.A.: 5 km N of Stuart Ck HS, *F.J. Badman 1587* (AD, HO, MEL); Priscilla Ck, 30 km NW of Finnis Ck on Oodnadatta road, *K.L. Wilson 4601* & *R.M. Barker* (AD, CANB, NSW). Qld: c. 27 km SW of Betoota, *K.P. Nicolson 291* & *P. Novelly* (BRI).

Tribulus hystrix occurs in central Australia and *T. occidentalis* on the W coast of W.A. between Broome and Carnarvon. The two species are distinguished by the much longer style than stigma and by the larger flowers and fruits of *T. hystrix*. Some specimens from the W coast of W.A. and the intervening area approach *T. hystrix* by having larger flowers than usual for *T. occidentalis* (petals up to 28 mm long) and the styles (to 3 mm long) are longer than the stigmas.



Having seen only inadequate specimens and not the type material examined by Brown, Bentham treated *T. occidentalis* as part of *T. hystrix*. His interpretation caused some confusion until the original specimens were examined and the differences in fruit morphology expressed by Brown were confirmed by S. Moore (*J. Linn. Soc. Bot.* 45: 159–162 (1920)).

10. *Tribulus* sp. saline flats (Latz 4530)

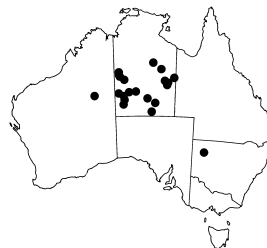
?*T. occidentalis* (smaller flowers and fruits) K.L. Wilson, *Telopea* 5(1): 28 (1992).

Prostrate, villous herb; stems to 30 cm long. Leaves in unequal pairs, more rarely alternate, with 6 or 7 pairs of leaflets; petiole 1–5 mm long; leaflets narrowly elliptic, 4–6.5 mm long, 1.5–2.5 mm wide, oblique at base, acute, villous adaxially, more densely villous abaxially, discoloured. Flowering pedicel 5–8 mm long, upright. Sepals c. 4 mm long, glabrous adaxially except for apical pubescence and densely villous abaxially except on hyaline margin. Petals obovate, c. 6–7 mm long. Intrastaminal glands 5. Stamens 10; filaments c. 2 mm long. Ovary densely white-pubescent; style 0.5–1 mm long in flower; stigma 0.9 mm long. Fruit 7–10 mm high, 12–15 mm wide, dissociating into 3–5 cocci; fruiting pedicel 10–16 mm long. Cocci asymmetrical, woody, moderately pubescent and with \pm equal 0.5–4 mm long spines all over dorsal surface. Fig. 76D–F.

Occurs in N.T. and W.A., with an outlier in N.S.W.; in saline soils on the edges of salt pans. Flowers Jan.–May, presumably in response to rains.

W.A.: Tobin L., Great Sandy Desert, *A.S. George 15640* (CANB, DNA, K, MEL, NSW, PERTH). N.T.: 2 miles [3.2 km] W Quartz Blow Rockhole, *N. Henry 402* (CANB, DNA); Newhaven Stn, *P.K. Latz 2172* or *2127* (AD, CANB, DNA, PERTH); 14 miles [22.5 km] S Rabbit Flat, *P.K. Latz 4530* (DNA, PERTH). N.S.W.: Salisbury Downs Stn, *P. Martensz 2758* (CANB).

This taxon possesses the flower size and style and stigma lengths of *T. eichlerianus*, but the fruits are more like miniature *T. hystrix* fruits. These species do overlap in their distribution and so this taxon may be the product of introgression between them; it has not been formally named because of the doubt about its status and the need for further work to establish its origins.



The *Martensz* collection from NSW agrees with this material in all respects except that its distribution is considerably removed from the rest of the collections and it is recorded as coming from a sandhill.

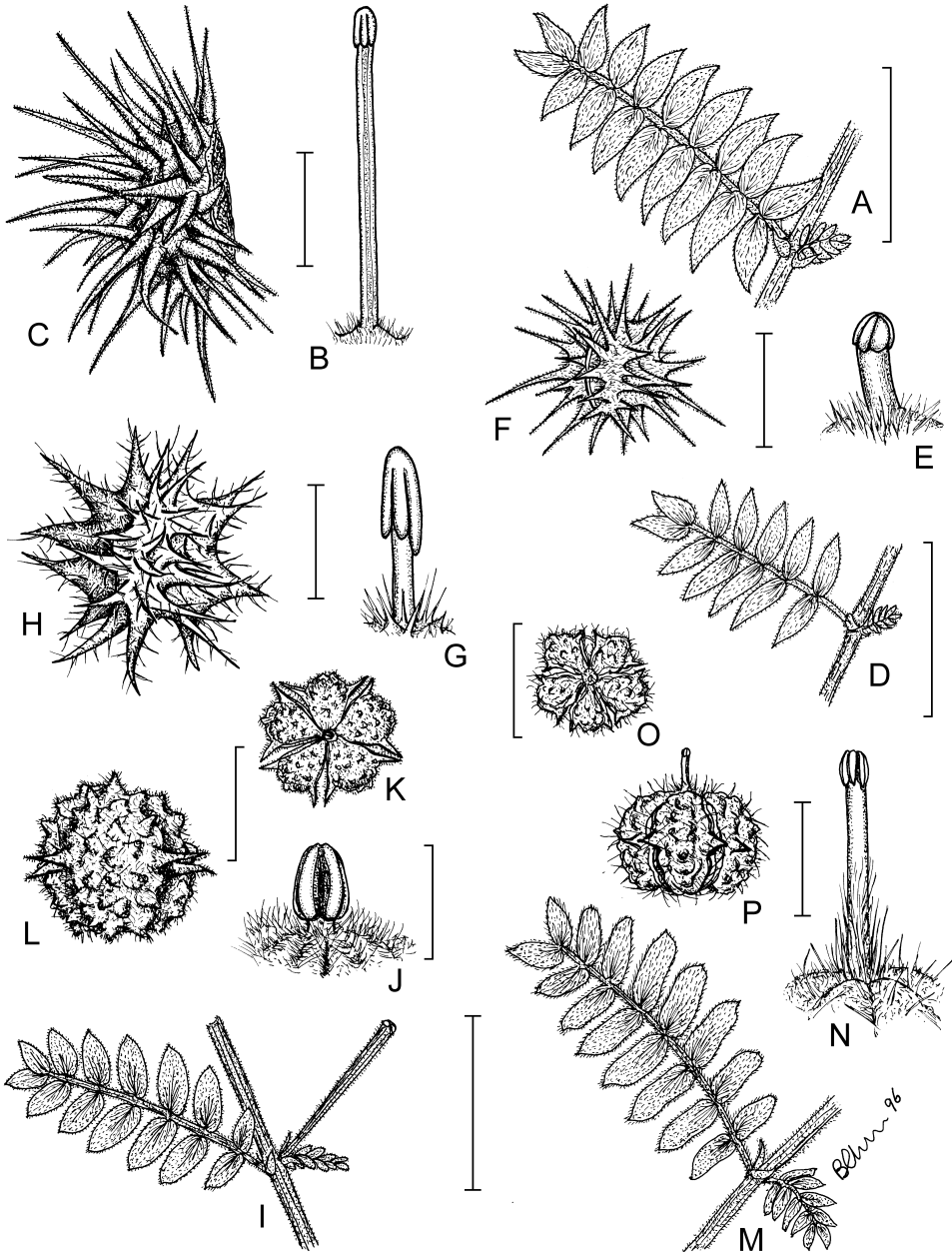


Figure 76. *Tribulus*. A–C, *T. hystrix*. A, pair of leaves; B, style and stigma; C, fruit, side view of coccus (A, R.Hill 434, AD; B, F.Badman 447, AD; C, P.Latz 4753, DNA). D–F, *T. sp. saline flats* (Latz 4530). D, pair of leaves; E, style and stigma; F, fruit, side view of coccus (D, P.Latz 2172, DNA; E, F, P.Latz 2420, DNA). G, H, *T. occidentalis*. G, style and stigma; H, fruit, side view of coccus (G, H, M.E.Ballingall 2561, CANB). I–L, *T. eichlerianus*. I, pair of leaves; J, style and stigma; K, fruit, from above; L, fruit, side view (I–L, D.Nelson 2425, DNA). M–P, *T. sp. long-styled eichlerianus* (A.S.George 10666). M, pair of leaves; N, style and stigma; O, fruit, from above; P, side view of fruit (M, P.Fryxell 4505, CANB; N–P, D.Symon 6904, AD). Scale bars: A, D, I, M = 20 mm; B, E, G, J, N = 2 mm; C, F, H, K, L, O, P = 10 mm. Drawn by B.Chandler.

Subgroup B

Cocci bilaterally symmetrical, spiny with medial pair of spines longest or cocci tuberculate, without spines.

A subgroup of up to 6 species throughout mainland Australia, all part of *Tribulus terrestris* s. lat., and possibly all introduced. Until there is a world study the status of *T. eichlerianus*, *T. micrococcus* and *T. minutus*, currently treated as Australian endemics, will remain uncertain.

11. *Tribulus ranunculiflorus* F.Muell., *Fragm.* 1: 48 (1858)

Kallstroemia ranunculiflora (F.Muell.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: Upper Victoria R. [N.T.], Jan. 1856, *F.Mueller s.n.*; syn: MEL; Wickham's Ck [N.T.], Apr. 1856, *F.Mueller s.n.*; syn: K725222.

Tribulus sp. A, M.E.Lawrence in J.R.Wheeler (ed.) *et al.*, *Fl. Kimberley Region* 681, fig. 210F (1992).

Prostrate villous herb; stems ?to 1 m long. Leaves in unequal pairs, with 8–10 pairs of leaflets; leaflets subsessile, narrowly elliptic, oblique, 6–14 mm long, 1–2.5 mm wide, acute, subglabrous adaxially, densely villous abaxially, ±concolorous. Flowering pedicel 15–40 mm long, upright. Sepals 9–15 mm long, glabrous adaxially, densely villous abaxially apart from glabrous hyaline margin. Petals (15–) 25–35 mm long. Intrastaminal glands distinct. Stamens 10; filaments 4–7.5 mm long. Ovary densely white-pubescent; style 4–7 (–10) mm long in flower; stigma 0.5–0.7 (–2) mm long. Fruit 6–7 mm high, to 10 mm wide, dissociating into 1–5 cocci; fruiting pedicel 20–45 mm long. Cocci woody, rounded, with short pubescence overtopped by sparser 2 mm long strigose hairs dorsally and with pair of medial spines to 3 mm long, with 2 shorter, downward pointing basal spines and shorter tubercles between. Fig. 77A–C.

Apart from the types from the Victoria R. area, N.T., known only from clay areas in the Kununurra region of W.A. A specimen from Mackay Ck (PERTH 03776085), the exact location of which is unknown, also belongs here. Flowers and fruits Jan.–June.

W.A.: Mackay Ck, *Anon. s.n.* (PERTH03776085); Kununurra area, *T.F.Black 10* (PERTH); opposite Kununurra airport, *E.C.Glover 56* (PERTH); ?9 km N of Kununurra at Mocks Dairy on E side of Ivanhoe Crossing road adjacent to milking parlour, *A.A.Mitchell 3085* (?NSW, PERTH).

This species may well represent a large-flowered form of *T. cistoides*. Other collections from Kununurra have styles and petals just slightly longer (c. 4 mm and c. 20 mm long respectively) than those normally found in *T. cistoides*. Fruits are more pubescent than those of *T. cistoides* but this may reflect the habitat since *T. cistoides* is usually coastal and these specimens have been collected further inland.



12. *Tribulus cistoides* L., *Sp. Pl.* 1: 387 (1753)

Kallstroemia cistoides (L.) Endl., *Ann. Wiener Mus. Naturgesch.* 1: 184 (1836); *Tribulus terrestris* var. *cistoides* (L.) Oliv., *Fl. Trop. Afr.* 1: 284 (1868). T: "Habitat in America calidiore."; lecto: illustration in P.Hermann, *Parad. Bat.* 236, t. 236 (1698), *fide* D.O.Wijnands, *Bot. Commelins* 203 (1983).

[*T. terrestris* auct. non L.: F.J.H.von Mueller, *Pl. Victoria* 1: 99 (1862)]

[*T. occidentalis* auct. non R.Br.: K.L.Wilson, *Telopea* 5: 27 (1992), *p.p.* (at least with respect to Cunningham collections from NW Coast)]

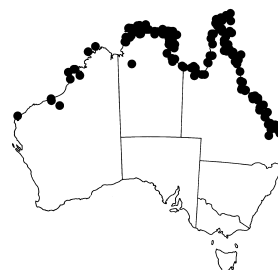
Illustration: N.M.Smith, *Weeds of the Wet/Dry Tropics of Australia* 55 (2002).

Prostrate, initially villous herb; stems to 100 cm long. Leaves in unequal pairs or alternate, with 5–7 pairs of leaflets; petiole 5–20 mm long; leaflets subsessile, elliptic, 9–12 mm long, 3–5 mm wide, obliquely rounded at base, shortly acuminate, villous adaxially, particularly on midrib, denser abaxially, discolorous. Flowering pedicel 10–30 mm long, upright. Sepals 8–10 mm long, glabrous adaxially except for pubescent apex, densely villous abaxially except on hyaline margin. Intrastaminal glands 5. Petals broadly obovate, 15–16 mm long.

Stamens 10, all fertile; filaments 4 mm long. Ovary densely white-strigose; style and stigma 2–3.8 mm long in flower; stigma 0.3–1.5 mm long, much shorter than style. Fruit to 8 mm high and 15 mm wide, of (2–) 3–5 tardily dissociating cocci; fruiting pedicel 23–42 mm long. Cocci woody, very sparsely strigose dorsally and with 2 longer medial spines, 2 shorter basal spines and shorter tubercles between. Plate 66; Fig. 77D–F.

A pantropical weed of coastal areas. In Australia occurs in tropical coastal areas on deep, sometimes coralline, sand. Flowers usually Apr.–July.

W.A.: One Arm Point township, N Dampierland, *B.J.Carter 537* (CANB, PERTH). N.T.: 3.5 km NE Victoria River Downs HS, *D.E.Albrecht 7434* (AD, DNA, NT); South West Is., Sir Edward Pellew Group, *G.Wightman 1581* (CANB, DNA). Qld: *s. loc.*, 1770, *Banks & Solander s.n.* (BM); Natl Park Stn, Pallarenda, Townsville, 15 Dec. 1980, *B.Jackes s.n.* (CANB).



For a discussion of the relationships of *T. cistoides* with *T. terrestris* and *T. occidentalis* see R.M.Barker, *Nuytsia* 12: 26–27 (1998).

While this species is usually coastal in its preference there are some inland collections (e.g. from Victoria River Downs in N.T. and from N of Marble Bar in W.A.) which indicate that it may well be capable of expanding its range if an appropriate dispersal agent is present.

Outside Australia, some of the finches with larger bills in the Galapagos are able to crush and shatter the cocci to extract the seed of *T. cistoides* (P.R.Grant, *Animal Behaviour* 29: 789–793 (1981) and P.R.Grant & B.R.Grant, *Science* 313: 224–226 (2006)) while baboons have also been reported as eating the fruits of this species in Ethiopia (L.Swedell *et al.*, *Folia Primatologica* 79: 476–490 (2008)). While fruits of this species have not been observed as being eaten in Australia, other species (see below) are eaten by cockatoos.

13. *Tribulus eichlerianus* K.L.Wilson, *Telopea* 5: 21 (1992)

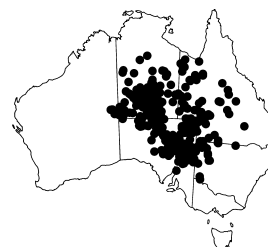
T: N.T., Central North, Sandover Hwy, 5 km SW of Utopia turn-off, 17 April 1983, *K.L.Wilson 4646 & R.Barker*; holotype: NSW; isotype: CANB, NT.

[*T. occidentalis* auct. non R.Br.: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 437 (1981)]

Prostrate, villous herb; stems to 100 cm long. Leaves in unequal pairs, more rarely alternate, with 6–10 pairs of leaflets; petiole 6–10 mm long; leaflets narrowly elliptic, 7–15 mm long, 3–6 mm wide, oblique at base, acute, villous adaxially, more densely villous abaxially, discolorous. Flowering pedicel 7–25 mm long, upright. Sepals 4–7 mm long, glabrous adaxially except for apical pubescence, densely villous abaxially except on hyaline margin. Petals obovate, 5–11 mm long. Intrastaminal glands connate into sinuate ring. Stamens 10; filaments 3–4 mm long. Ovary densely white-pubescent; ovules 3–5 per cell; style 0.5–1 mm long in flower; stigma 1.3–2.5 mm long. Fruit 7–13 mm high, 10–20 mm wide, dissociating into 3–5 cocci; fruiting pedicel 11–43 mm long. Cocci woody, densely pubescent dorsally and with very short spines or tubercles mixed with 0–3 pairs of longer spines to 6 mm long. Fig. 76 I–L.

Occurs naturally in the drier areas in eastern and central Australia, just into the desert area of W.A. The present distribution probably represents an expansion of range since the advent of Europeans. Found in sand dunes, in sandy or alluvial soils, more rarely in clays or limestone associated areas. Flowering is subject to rains.

W.A.: S side of Breaden Valley, *A.S.George 15520* (CANB, PERTH). N.T.: Yuendumu town, *T.S.Henshall 2867* (AD, CANB, NT, PERTH). S.A.: 1 km SW of Anna Creek HS, 17 km W of William Ck, *F.J.Badman 1190* (AD, CANB, MEL). Qld: 0.8 km from Musselbrook Mining Camp on road to stockyards and airstrip, *M.B.Thomas 485 & R.W.Johnson* (AD, BRI, CANB, DNA). N.S.W.: c. 30 km NW of Milparinka, Hawkers Gate road, *S.Jacobs 3501* (AD, NSW).



While this species can be quite distinctive because of its hairy fruits, somewhat similar fruits are also found in the taxon designated as *T. sp. long-styled eichlerianus* (A.S.George 10666). Whether this is a product of introgression or hybridisation between species requires further study, but the two can be distinguished by their flower sizes.

The fruits of *T. eichlerianus* are a favourite food for Red-tailed black cockatoos (pers. obs. and D.Albrecht, pers. comm.)

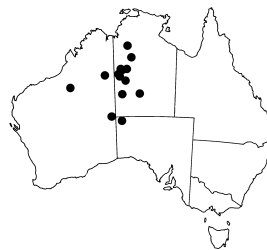
14. *Tribulus sp. long-styled eichlerianus* (A.S.George 10666)

?*T. hystrix* (short-spined, smaller fruits) K.L.Wilson, *Telopea* 5: 28 (1992).

Prostrate, villous herb; stems to 40 cm long. Leaves in unequal pairs, more rarely alternate, with 6–8 pairs of leaflets; petiole 4–10 mm long; leaflets narrowly elliptic, 6.5–13 mm long, 3–4.5 mm wide, oblique at base, acute, villous adaxially, more densely villous abaxially, discolorous. Flowering pedicel 9–28 mm long, upright. Sepals 7–10 mm long, glabrous adaxially except for apical pubescence, densely villous abaxially except on hyaline margin. Petals obovate, (10–) 15–18 mm long. Intrastaminal glands 5, indistinct. Stamens 10; filaments 3.7–4 mm long. Ovary densely white-pubescent; style 2–4 mm long in flower; stigma 0.6–1.7 mm long. Fruit 8–15 mm high, 11–20 mm wide, dissociating into (3–) 4 or 5 cocci; fruiting pedicel 14–35 mm long. Cocci woody, with moderately dense short hairs overtopped by sparser long strigose hairs dorsally and with short tubercles mixed with longer pair of medial spines 1.5–4 mm long. Fig. 76M–P.

Occurs in the Tanami Desert area of N.T. across to the Rudall R. area and S as far as Giles in W.A. and NW S.A. It has been recorded from red clay loam with *Melaleuca glomerata*, *Aristida* and *Stylobasium*, from stony loam and from hummock grassland in sandstone hills. Flowers Apr.–Aug.

W.A.: Rudall R., A.S.George 10666 (PERTH); Bloodwood Bore, near Balgo, C.H.Gittins 2452 (BRI). N.T.: Talbot L. area, c. 50 km N of Tanami Mine, P.K.Latz & D.E.Albrecht 19795 (AD, DNA, NT); Western Tanami, c. 90 km E of Talbot Well, P.S.Short & R.K.Harwood 5211 (AD, DNA). S.A.: between Tomkinson and Mann Ra., on W face of inselberg, c. 15 km by road NNE of turnoff on Pipalyatjara–Putaputa road, c. ½ km E of Waltjatjata road, N.N.Donner 6582 (AD, CANB).



The fruits of this taxon resemble those of *T. eichlerianus* but they are less densely pubescent and topped by a much longer style than that found in *T. eichlerianus*. Flower size is also much larger than that of *T. eichlerianus*, resembling more the flower sizes of *T. occidentalis* and *T. hystrix*, while the style length is usually much longer than that of the stigma, as is found in *T. hystrix*, except that the style is not as long as in that species. Fruits bear a strong resemblance to some of the larger-fruited central Australian specimens assigned to *T. micrococcus* (q.v.), but the flowers and style length are much smaller in that taxon. As with *T. sp. saline flats* above, this particular morphology may well be the result of crossing between species previously isolated from each other, so until further studies are undertaken, the name remains informal.

15. *Tribulus terrestris* L., *Sp. Pl.* 1: 387 (1753)

T: Europe, Herb. Clifford: 160, *Tribulus* 1; lecto: BM558734, *fide* B.L.Burtt, *Kew Bull.* 9: 398 (1954).

T. terrestris (short style) R.M.Barker, *Nuytsia* 12: 31 (1998).

T. terrestris (long style) R.M.Barker, *op. cit.* 32.

T. terrestris var. *macrocarpus* Rouy in G.C.C.Rouy & J.Foucaud, *Fl. France* 4: 132 (1897). T: Pl. d'Espagne no 112, 1849, E.Bourgeau; holo: ?P n.v.

T. acanthococcus F.Muell., *Trans. Philos. Soc. Victoria* 1: 9 (1854). T: Murray, 1853, F.Mueller s.n.; lecto: MEL, *fide* R.M.Barker, *Fl. Australia* 26: 584 (2013).

Illustrations: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 438 (1981); N.M.Smith, *Weeds of the Wet/Dry Tropics of Australia* 55 (2002).

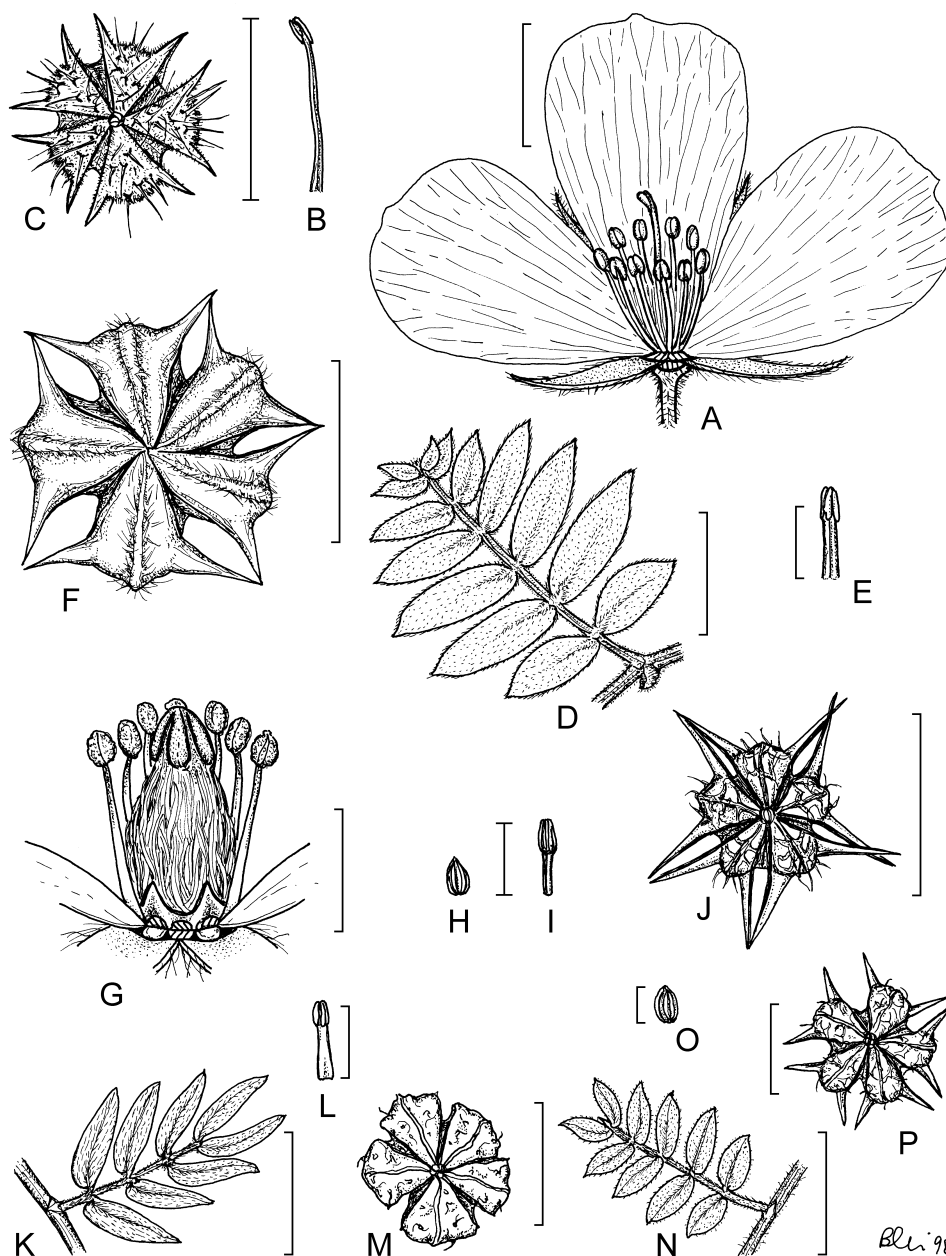
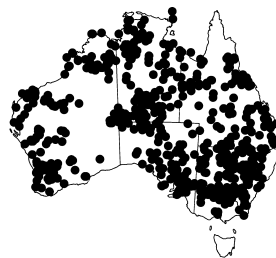


Figure 77. *Tribulus*. A–C, *T. ranunculiflorus*. A, flower, 2 petals and 1 sepal removed; B, style and stigma; C, fruit (A–C, E.C.Glover 56, PERTH). D–F, *T. cistoides*. D, leaf; E, stigma and style; F, fruit (D–F, R.L.Specht 293, AD). G–J, *T. terrestris*. G, ovary with stamens, stigma and disc or nectaries; H, sessile stigma of mostly S Australian populations; I, longer style and stigma of most N Australian populations; J, fruit (G, H, J, B.Lepschi 1589, CANB; I, J.H.Browne 583, CANB). K–M, *T. micrococcus*. K, leaf; L, style and stigma; M, fruit (K–M, C.White, NSW144920). N–P, *T. minutus*. N, leaf; O, sessile stigma; P, fruit (N–P, J.Dellow, 25 Mar. 1987, CANB). Scale bars: A–D, F, J, K, M, N = 10 mm; E, G–I, L = 2 mm; O = 1 mm; P = 5 mm. Drawn by B.Chandler.

Prostrate, subglabrous, more rarely villous, herb; stems 20–100 cm long. Leaves in unequal pairs, with 4–7 pairs of leaflets; leaflets narrowly elliptic, 5–12 mm long, 1–5 mm wide, oblique at base, acuminate, acute or rounded, subglabrous or sparsely villous adaxially, moderately to densely villous abaxially, \pm concolorous. Flowering pedicel 5–15 mm long, upright. Sepals 3–6.5 mm long, glabrous or pubescent adaxially, pubescent abaxially except sometimes for glabrous hyaline margin. Petals obovate, 4–12 mm long. Intrastaminal glands distinct. Stamens 10; filaments 3–4 mm long. Ovary densely white-strigose; style 0–0.3 mm long and stigma 0.9–1.3 mm long, or style 0.6–1.3 mm long and stigma 0.6–1.5 mm long. Fruit to 8 mm high, 8–12 mm wide, dissociating into 5 (rarely fewer) cocci; fruiting pedicel 10–20 mm long. Cocci woody, subglabrous or sparsely strigose, sometimes above a shorter erect and dense pubescence dorsally, and with pair of lateral, widely diverging, medial spines 3–8 mm long, shorter downward pointing basal pair and shorter spines or tubercles between. Fig. 77G–J.

Occurs predominantly in waste places and along roadsides across mainland Australia. Flowering can occur in most months of the year but is predominantly associated with the warmer months of Jan.–May, the plants dying with colder temperatures.

W.A.: Broome, *K.F.Kenneally 9864* (CANB, PERTH). N.T.: Port Keats “Wadey” township, *D.Murfet 3022* (AD, DNA). S.A.: Olympic Dam mine area, *A.Smith per T.J.Fatchen 391 1164* (AD). Qld: Karumba Point Caravan Park, *B.M.Waterhouse 6166* & *L.Hucks* (AD, BRI, CANB, MBA). N.S.W.: Bowning, near bridge at the corner of Leake and Bogolong Sts, *A.M.Lyne 2104* (AD, CANB, E, K, NSW, US). Vic.: Benalla, near entrance to Rly yards, *R.V.Smith 64/62* (AD, MEL).



Tribulus terrestris s. lat. consists of a number of taxa which overlap in distribution and imperceptibly intergrade in morphology. Three of these taxa have already been recognised at species level within Australia (*T. terrestris*, *T. micrococcus* and *T. minutus*) and it is not proposed to change the classification here, even though it can be difficult to apply and there has to be some doubt concerning the validity of the species recognised. *Tribulus terrestris* has been further subdivided in the past to recognise two forms of differing style length which have an approximate northern and southern Australia distribution, but these have not been formally recognised here. The group is very much in need of revision both within Australia and world-wide. It is a very good candidate for molecular study if we wish to understand relationships between the taxa in Australia and their overseas counterparts; the forms encountered presumably represent introductions of different forms of the species since *T. terrestris* is also very variable outside Australia, but there may well be new forms appearing with hybridisation with Australian species. Chromosome studies by Morrison & Scott (1996) have already revealed variable ploidy levels both in Australia and overseas and they also point to a number of introductions to Australia.

Germination of some seed any time after a rain event, dying back to an extensive root system in dry conditions and the ability to produce, in a very short time (6 weeks according to a number of sources), numerous fruit which are very effectively distributed by the activities of man, means that these plants are formidable weeds which are extremely difficult to combat. A number of insect visitors have been documented as effecting cross-pollination, while self-pollination occurs should there be no visitations, resulting in the potential for 100% seed set (Reddi *et al.* 1981). Estimates of the number of fruits per plant range from 200 to 5000, with each of these fruits usually having 5 cocci containing 2–5 seeds. The two main diverging spines, combined with shorter spines, all at differing angles, facilitate attachment and hence dispersal by animals or vehicles. Contamination of crops and wool is a problem for the agricultural industry.

In N.S.W., grazing of *T. terrestris* causes “staggers” in sheep (Bourke *et al.*, 1992), nitrate poisoning in sheep and cattle and is also associated with photosensitisation (Weed Management Unit (2009).

Despite being the subject of a number of searches for biological control agents elsewhere, it is difficult to look at introducing many of these agents to Australia because of the presence

of native *Tribulus* species. A review of the agents considered for Australia can be found in Scott (1990, 2012).

Many claims are made for the use of *T. terrestris* supplements in increasing testosterone levels and for, amongst other claims, body building purposes. Such supplements are certainly readily available but there are variable claims as to their efficacy. The whole plant has a long history of medicinal use in India and China.

V.R.Squires, Distribution and polymorphism of *Tribulus terrestris* sens. lat. in Australia. *Victorian Naturalist* 86: 328–334 (1969); C.S.Reddi *et al.*, Breeding structure and pollination ecology of *Tribulus terrestris*, *Proc. Indian Natl Sci. Acad.*, Part B 47: 185–193 (1981); J.K.Scott, *Tribulus terrestris* L. (Zygophyllaceae) in Southern Africa: an outline of biology and potential biological control agents for Australia, *Pl. Protection Quarterly* 5(3): 103–106 (1990); C.A.Bourke *et al.*, Locomotor effects in sheep of alkaloids identified in Australian *Tribulus terrestris*, *Austral. Veterin. J.* 69: 163–5 (1992); S.M.Morrison & J.K.Scott, Variation in populations of *Tribulus terrestris* (Zygophyllaceae). 2. Chromosome numbers. *Austral. J. Bot.* 44: 191–199 (1996); Weed Management Unit (2009), Primefact 723: *Tribulus*: Caltrop and yellow vine. (Industry & Investment: New South Wales Government) http://www.dpi.nsw.gov.au/_data/assets/pdf_file/0008/318563/Tribulus-caltrop-and-yellow-vine.pdf; J.K.Scott in M.Julien *et al.* (eds), *Biological Control of Weeds in Australia* pp. 576–580 (2012).

16. *Tribulus minutus* Leichh. ex Benth., *Fl. Austral.* 1: 291 (1863)

Kallstroemia minuta (Leichh. ex Benth.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 88 (1890). T: [Qld, Leichhardt District], before Canal [pastoral run] and afterwards, s. dat., *L. Leichhardt s.n.*; holo?: MEL s.n., p.p., excluding lower LHS specimen.

[*T. terrestris* auct. non L.: H.Eichler, *Fl. S. Australia* 4th edn, 2: 728 (1986), p.p.]

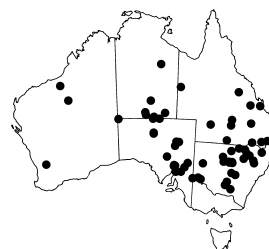
Prostrate, usually densely villous herb; stems 8–50 cm long. Leaves in unequal pairs, with 5–7 pairs of leaflets; leaflets narrowly elliptic, 3–6.5 mm long, 1–3 mm wide, oblique at base, rounded to acute, pubescent on both surfaces, \pm concolorous. Flowering pedicel 8 mm long, upright. Sepals c. 2 mm long, pubescent on both surfaces. Petals 2.5–7 mm long. Intrastaminal glands 5, distinct. Stamens 10; filaments c. 1.7 mm long. Ovary densely white-strigose; style 0.2–0.7 mm long; stigma 0.6–1.3 mm long. Fruit 5–7.5 mm high, 6–9 (–13) mm wide, dissociating into 5, rarely fewer, cocci; fruiting pedicel to 17 mm long. Cocci woody, rounded, sparingly pubescent and with short tubercles all over dorsally, sometimes with a pair of up to 3 mm long, diverging medial spines, and a pair of shorter basal spines. Fig. 77N–P.

Occurs N.T., S.A., Qld, N.S.W. and Vic. with isolated records from the wheatbelt and Pilbara regions of W.A. Despite its early collection and naming by Leichhardt it is probably not native since similar shorter-spined fruits are seen in populations in other parts of the world (e.g. *T. parvispinus* Presl from Africa through to Pakistan). Flowers and fruits predominantly Oct.–Apr.

W.A.: Trayning, Gent's Farm, *Hj.Eichler 24208* (CANB). N.T.: Petermann Ra. area, *P.K.Latz 2401* (DNA). S.A.: Nelshaby Res., *D.E.Murfet 2642* (AD, BRI, MEL). Qld: 17 km from Augathella on Augathella–Tambo road, *R.W.Johnson 2200* (BRI). N.S.W.: 'Curranyalpa', 1.5 km from Linwood gate, 61 km SW of Louth, *C.W.E.Moore 8605* (CANB). Vic.: Irymple, Armagh Court, Karradoc Ave end, *J.H.Browne 570* (CANB, MEL).

Central Australian specimens currently treated as *T. minutus* (e.g. *Latz 2401*) have fruits of similar shape to those of *T. minutus* but they are larger, being up to 13 mm wide. The fruits superficially resemble the fruits of *T. eichlerianus* but are much less densely pubescent dorsally and usually smaller than those of that species.

Dr. R.F.Parsons (pers. comm.) considered Victorian populations of *T. minutus* from Red Cliffs to be perennial because of their massive woody rootstocks compared to the clearly annual habit of *T. terrestris*. Certainly not all collections have a perennial rootstock but those that do not may be first year plants. Other commentaries on *T. terrestris* suggest that it



develops a perennial rootstock in tropical areas (P.Guertin, Factsheet for *Tribulus terrestris* L., USGS Weeds in the West project (2003) [<http://sdrsnet.snr.arizona.edu/data/sdrs/ww/docs/tribterr.pdf>])

Tribulus minutus is characterised by the stigma being subsessile or, if there is a style present, much shorter than the stigma, a characteristic it shares with the shorter-styled form of *T. terrestris*. The two are often difficult to separate.

Tribulus minutus could possibly be conspecific with the earlier named *T. acanthococcus* but the type material does have one of the fruits with 3 mm long spines and the style length is similar to or just exceeding that of the stigma, both characteristics which distinguish it from *T. minutus*. For this reason the name *T. acanthococcus* has been listed here as a synonym of *T. terrestris*.

17. *Tribulus micrococcus* Domin, *Biblioth. Bot.* 89: 279 (1926)

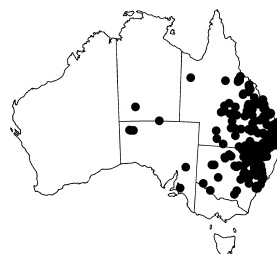
T: Rolling Downs apud opp. Nonda, Mar. 1910, *K.Domin* 5493; syn: PR (photo seen); Charters Towers, Mar. 1910, *K.Domin* 5492; syn: PR (photo seen); apud opp. Jericho, Mar. 1910, *K.Domin* 5494; syn: PR (photo seen).

[*Tribulus terrestris* auct. non L.: G.Bentham, *Fl. Austral.* 1: 288 (1863), *p.p.*]

Prostrate, villous herb; stems to 100 cm long. Leaves in unequal pairs, with 4–7 pairs of leaflets; leaflets narrowly elliptic, 4–12 mm long, 1.5–4.5 mm wide, oblique at base, rounded or acute, pubescent adaxially, densely villous abaxially, \pm concolorous. Flowering pedicel 13–25 mm long, upright. Sepals 3–6.5 mm long, glabrous adaxially, villous abaxially except for glabrous hyaline margin. Petals obovate, 5–15 mm long. Intrastaminal glands distinct. Stamens 10; filaments 2–3.5 mm long. Ovary densely white-pubescent; style 0.7–1.4 mm long; stigma 0.3–0.8 mm long. Fruit 4–5 mm high, 5–8 mm wide, dissociating into 5, rarely fewer, cocci; fruiting pedicel 11–28 mm long. Cocci woody, rounded, subglabrous or moderately pubescent with short tubercles all over dorsally, sometimes with a pair of medial spines to 2.5 mm long. $2n = 48$, S.M.Morrison & J.K.Scott, *Austral. J. Bot.* 44: 193 (1996). Fig. 77N–P.

Mainly found in central and eastern Qld and N.S.W., with outlying collections from N.T. and S.A. Probably not native since similar fruit morphology is seen and has been named in populations in other parts of the world (e.g. *T. kaiseri* Hosni of northern Africa). Flowers and fruits recorded Nov.–Aug.

S.A.: 9.4 km SE from Maryinna Hill, APY Lands, *P.J.Lang* 24652 & *H.Vonow* (AD). Qld: Minerva, *S.T.Blake* (BRI, CANB); 8 km along Leyburn road from Pittsworth–Milmarran road, *K.L.Wilson* 4198 (CANB, NSW). N.S.W.: Myall Ck, 18 km SW of Delungra on road to Bingara, *R.Coveny* 12582 *et al.* (CANB, NSW).



T. micrococcus is most easily characterised by the stigma being shorter than the distinct style and the distinctly 5-lobed fruit with dorsally rounded subglabrous and tuberculate cocci which either lack or have only a very short pair of divergent medial spines; the tubercles of the cocci usually have a single white hair at their apex. Flower size is variable across the range, as is leaflet size, although specimens from the black clay areas of eastern Qld, from where the type comes, are more uniform in their characteristics. More variable specimens from the western part of the distribution might well represent hybrids with other taxa, or misidentifications because of intermediate forms between this and *T. terrestris*.

5. ZYGOPHYLLUM

Zygophyllum L., *Sp. Pl.* 1: 385 (1753); *Gen. Pl.* 5th edn, 1: 182 (1754); from the Greek *zygon* (yoke) and *phyllon* (pair), a reference to the pair of leaflets which comprise each leaf and are responsible for the common name, Twinleaf.

Type: *Z. fabago* L.

Roepera A.Juss., *Mem. Mus. Hist. Nat.* 12: 454, t. 15, no. 3 (1825); *Zygophyllum* sect. *Roepera* (A.Juss.) Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 3(4): 82 (1890). T: *R. fabagifolia* A.Juss.

Sarcozygium Bunge, *Linnaea* 17: 7, t. 1 (1843); *Zygophyllum* sect. *Sarcozygium* (Bunge) Engl. in H.G.A.Engler & K.Prantl (eds), *loc. cit.* T: *S. xanthoxylum* Bunge.

Zygophyllum sect. *Ag[r]ophyllum* (Neck. ex Endl.) Engl. in H.G.A.Engler & K.Prantl (eds), *op. cit.* 81. T: not designated.

Zygophyllum sect. *Roeperiopsis* Engl. in H.G.A.Engler & K.Prantl (eds), *Nat. Pflanzenfam.* 2nd edn, 19a: 165 (1931). T: not designated.

Zygophyllum sect. *Roepera* F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 11: 29 (1855), *nom. inval.*

Zygophyllum sect. *Haplocarpus* F.Muell., *Fragm.* 3: 150 (1863); *nom. inval.* (no description given). T: *Z. howittii* F.Muell.

Annual or perennial glabrous herbs, often small, sometimes scandent on other vegetation, rarely becoming shrubs with a woody base. Leaves opposite, usually 2-foliate on common petiole, rarely sessile or simple, often succulent; petiole flattened or terete; leaflets articulated or continuous with petiole, stipellate. Flowers single, rarely paired at each node, bisexual. Pedicel usually erect in flower, deflexed in fruit. Sepals 4 or 5, often persistent and downturned in fruit. Petals 4 or 5, rarely 3, quickly caducous, longer than or shorter than sepals, usually yellow fading to white, rarely orange or white, without other markings. Stamens usually 8 or 10, rarely 4 or 6; filaments subulate or winged at base. Nectariferous disc 3–5-lobed; lobes sinuate or if free, then oblong or semicircular with papillose margin or apex. Ovary (3–) 4- or 5-angled, (3–) 4- or 5-celled; ovules 2–6 per cell. Fruit usually pendent, rarely erect, 4- or 5-angled loculicidal capsule or indehiscent and 3- or 4-winged, breaking into dorsally winged cocci or remaining fused together. Seeds 1–5 per cell, smooth or verrucose, mucilaginous when wet.

As presently constituted *Zygophyllum* would appear to consist of c. 150 species in the drier or saline regions of central and western Asia through to Africa, with 31 species endemic to mainland southern Australia.

Zygophyllum species in Australia fall into two major groupings based on fruiting morphology. One group consists of those species which produce capsules, while the other group has winged fruit. The name *Roepera* applies to the non-capsular group with winged fruit and this group was proposed for recognition at the generic level within the manuscripts of the late H.J. Eichler. However it was felt that a better understanding of the relationship of the Australian *Zygophyllum* species to those in the rest of the world was needed before a decision could be made about any formal rank which might be applied to these groups (Barker 1996). DNA and morphological work (Beier *et al.*, 2003) saw the suggestion for a changed circumscription within the subfamily, with Australian species of *Zygophyllum* transferred, with South African species, to a resurrected and greatly expanded *Roepera*, and *Zygophyllum* confined to some 50 species in Asia. This work was not adopted here since the number of Australian species sampled represented a relatively small selection of the genus (33 out of c. 150 species) and much of the tree produced was not robustly supported. More recent work on the South African species (Bellstedt *et al.*, 2008) supports retention of *Roepera* within *Zygophyllum*.

In the treatment below, *Zygophyllum* species are divided into informal groupings based on morphology. There has yet to be a molecular assessment of the Australian species to ascertain whether these morphological groups are supported. The work of Beier *et al.* (2003) with its limited Australian representatives did show the wing-fruited species clustering together as did species with their parts in fours and those with their parts in fives, suggesting that there is a basis to these groups. A key to the informal groups is supplied.

Beier *et al.* (2003) designated *R. billardiarei* as the type species of *Roepera*. This choice appears erroneous since the type species should be the wing-fruited species, *R. fabagifolia* (= *R. fruticulosa*). If formal groupings are adopted within *Roepera* in the future then the lectotypification is crucial in designating where the type falls.

Zygophyllum species are often included in lists of species poisonous to stock because of their high nitrate levels. Apart from a single paper by Chippendale *et al.* (1964) where *Z. ammophilum* was suspected of causing sudden deaths in cattle in the N.T. there appears to be little actual evidence to support this. It would also appear from some comments that the Australian

Zygophyllum species are usually not grazed (S.L.Everist, *Poisonous Pl. Australia* 764–766 (1981)) and so the opportunity for poisoning would not usually arise. However this argument is negated by Koch (*Trans. Roy. Soc. S. Australia* 22: 103 (1898)) who noted that even though *Zygophyllum* species were said to be “injurious” to stock, he had seen no evidence of this, but rather that stock fed freely on them; only *Z. iodocarpum* was suspected of being poisonous. He further noted that some species were used as food by the local aboriginal people. The only species that has been tested in feeding tests in Australia is *Z. apiculatum* (q.v.).

The structure referred to as the disc in descriptions is sometimes referred to as the nectary in treatments elsewhere; while often consisting of distinct oblong or semicircular lobes at the base of and within the 3 to 5 indentations of the ovary (fig. 82D, *Z. compressum*) the disc may also consist of a continuous sinuous ring (fig. 82K, *Z. glaucum*). When distinct the disc lobe is covered by a stamen, but the number of disc lobes is half that of the stamen number; in other parts of the world the lobe number is the same as the stamen number. Similarly the filaments of the stamens have been referred to as winged or not; winged in this case refers to any widening of the base of the filament (fig. 82C, *Z. compressum*). The apices of such wings may then be variously shaped as in the two forms of *Z. glaucum* (fig. 82 I, J) or variously toothed as in the distinctly fringed apices of *Z. crenatum* (fig. 81C).

Zygophyllum plants are usually a distinctive yellowish green colour making them readily detectable in the landscape, but sometimes some parts, as in the stems, leaves or fruits, or even all parts of the plant, can take on a reddish or purplish hue; this can be related to age, with young plants being a reddish colour, changing to green with maturity, but in other cases it can be just the stems or the fruits which have this coloration.

The introduction of the S African species, *Z. sessilifolium* L., into Australia was brief. Specimens were collected from Coode Is. in the Port of Melbourne in 1908, and exhibited by J.R.Tovey at the Victorian Field Naturalists Club on 8th May 1911 (note on Tovey’s collection MEL 95370). *Z. sessilifolium* persisted for only a few years or it was successfully eradicated. It can be distinguished from the Australian species of *Zygophyllum* by its shrubby perennial habit, white flowers with a coloured centre and with 5 petals and 5-lobed fruits, similar in shape to those of *Z. kochii* (Barker 1998).

G.Chippendale *et al.*, *Zygophyllum ammophilum* and presumed nitrate poisoning in cattle, *Austral. Veterin. J.* 40: 241 (1964); H.Eichler, Four new species of *Zygophyllum* (Zygophyllaceae) and one lectotypification, *Telopea* 4: 13–17 (1990); R.M.Barker, New taxa, new combinations, keys and comments on generic concepts of *Zygophyllum* and a new species of *Tribulus* (Zygophyllaceae) in the manuscripts of the late Hj.Eichler, *J. Adelaide Bot. Gard.* 17: 161–172 (1996); R.M.Barker, Notes on *Zygophyllum* (Zygophyllaceae) in Australia including the descriptions of five new species and one new subspecies, revised keys and typifications, *J. Adelaide Bot. Gard.* 18: 43–74 (1998); B.-A.Beier *et al.*, Phylogenetic relationships and taxonomy of subfamily Zygophylloideae (Zygophyllaceae) based on molecular and morphological data, *Pl. Syst. Evol.* 240: 11–39 (2003); D.U.Bellstedt *et al.*, Phylogenetic relationships, character evolution and biogeography of southern African members of *Zygophyllum* (Zygophyllaceae) based on three chloroplast regions, *Molec. Phylogen. Evol.* 47: 932–949 (2008).

KEY TO GROUPS AND SUBGROUPS

- 1 Fruits capsular, 4- or 5-angled, but lacking wings; fruit breaking into endocarp and exocarp; dissemination by seed; flowers 4- or 5-merous; filament of stamen usually winged at base [**Capsular Group**]
- 2 Flowers 4-merous
 - 3 Capsule with an erect appendage at each of the 4 angles of the summit **Prismatothecum sub-group**
 - 3: Capsule lacking any erect appendages at summit
 - 4 Capsule and ovary truncate or obliquely truncate at apex **Ammophilum sub-group**

- | | |
|--|-------------------------------|
| 4: Capsule and ovary rounded or emarginate at apex | Glaucum sub-group |
| 2: Flowers 5-merous | |
| 5 Capsule and ovary truncate at summit; capsule with an extension on upper corner of each of the 5 angles | Apiculatum sub-group |
| 5: Capsule rounded at apex, lacking any extensions | Iodocarpum sub-group |
| 1: Fruits non-capsular, each carpel with a broad vertical wing; fruit disseminated as a whole or splitting into single winged fruitlets; flowers 4-merous or with 3 petals and 4 sepals; filament of stamen lacking wings
[Non-capsular Group] | |
| 6 Flowers with 3 petals and 4 sepals; fruit 3-winged | Howittii sub-group |
| 6: Flowers 4-merous; fruit 4-winged | |
| 7 Fruits dissociating into single winged fruitlets for dispersal | Aurantiacum sub-group |
| 7: Fruits dispersed as whole, not dissociating | Fruticulosum sub-group |

KEY TO SPECIES

- | | |
|--|----------------------------------|
| 1 Upper leaf pairs fused at base, surrounding stem; flowers with 3 (or 4) petals and 4 sepals; fruit 3-winged (drier parts of N.T.; S.A.; Qld; N.S.W.) | 25. <i>Z. howittii</i> |
| 1: Upper leaf pairs not fused at base and not surrounding stems; flowers 4- or 5-merous; fruit 4-winged or a non-winged, 4- or 5-celled capsule | |
| 2 Flowers 4-merous; fruit with 4 vertical wings or a 4-angled capsule | |
| 3 Fruit with 4 vertical wings, dispersed in its entirety or breaking into 4 winged segments corresponding to the carpels; filaments not winged | |
| 4 Leaflets distinctly articulated with petiole (coastal areas of W.A.) | 26. <i>Z. fruticosum</i> |
| 4: Leaflets not articulated with petiole | |
| 5 Fruits dispersed as whole, not dissociating into winged fruitlets at maturity; plants scrambling or sprawling, often climbing in other vegetation | |
| 6 Fruits 11–15 mm long, with widely spaced reticulate venation on wings (Wiluna, W.A., through to Port Augusta, S.A.) | 27. <i>Z. reticulatum</i> |
| 6: Fruits 7–9 mm long, with very close sub-parallel venation on wings (mallee areas of S mainland states & N.T.) | 28. <i>Z. eremaeum</i> |
| 5: Fruits breaking into 4 single-winged fruitlets for dispersal; stand-alone shrubs, often sprawling but not climbing in other vegetation | |
| 7 Fruiting style 0.1–0.2 mm long; petals shorter than or equal to sepals; disc lobes oblong (salt lake margins, inland W.A.) | 29. <i>Z. tetrapterum</i> |
| 7: Fruiting style at least 0.5 mm long; petals longer than sepals; disc lobes semicircular | |
| 8 Petals less than 5 mm long; style less than 1.0 mm long (salt lake margins from Southern Cross to Balladonia, W.A., to Serpentine L., S.A.) | 30. <i>Z. halophilum</i> |
| 8: Petals more than 5 mm long; style more than 1.5 mm long (all mainland states and N.T.) | 31. <i>Z. aurantiacum</i> |
| 3: Fruit a capsule, opening loculicidally to disperse seeds, not winged; filaments winged or not | |
| 9 Capsule (and ovary) ±obtriangular or obtrullate in outline (i.e. with truncate or obliquely truncate apex) | |

- 10 Perennials; petals 7–10 mm long; style 3–5.5 mm long
- 11 Leaflets distinctly articulated at base **8. *Z. billardierei***
- 11: Leaflets not articulated at base **9. *Z. confluens***
- 10: Annuals or short-lived perennials; petals not more than 5 mm long (except *Z. angustifolium*, 4.2–8 mm long); style 3 mm long or less
- 12 Fruiting pedicel more than 5 mm long; petals 4.2–8 mm long; leaflets articulated at base **7. *Z. angustifolium***
- 12: Fruiting pedicel not more than 5 mm long; leaflets articulated at base or not
- 13 Leaflet apex emarginate; stamens 8; stigma not lobed **5. *Z. emarginatum***
- 13: Leaflet apex rounded or obtuse, or if emarginate then flowers with 4 stamens and stigma 4-lobed
- 14 Fruiting style not more than 0.5 mm long; stigma 4-lobed; petals not more than 2.5 mm long; disc lobes oblong
- 15 Stamens 4 **3. *Z. ammophilum***
- 15: Stamens 8 **4. *Z. simile***
- 14: Fruiting style 0.8–1.8 mm long; stigma not lobed; petals 3–5 mm long; disc lobes semicircular (Kangaroo Is. & Eyre Penin., S.A.) **6. *Z. flavum***
- 9: Capsule (and ovary) elliptic, obovate or circular in outline, not truncate apically, or capsule (and ovary) rectangular with erect appendages at each of the 4 angles of the summit
- 16 Capsule (and ovary) rectangular with erect appendages at each of the 4 angles of the summit
- 17 Fruits with a line of white circular glands along the longitudinal grooves of each of the 4 sides; grooves often reddish; apical appendages of fruit narrowly elliptic from a constricted base; fruiting pedicel less than 1 mm long (widespread, N.T.; S.A.; N.S.W.) **1. *Z. prismatothecum***
- 17: Fruits lacking white circular glands or these very sparse on apex of grooves of fruit; grooves same colour as rest of fruit; apical appendages of fruit falcate, continuous with fruit; fruiting pedicel 1–2.5 mm long (L. Eyre region, S.A.) **2. *Z. marliesiae***
- 16: Capsule (and ovary) elliptic, obovate or circular in outline, lacking appendages at apex
- 18 Mature capsule 10 mm long or more; petals 5–13 mm long
- 19 Leaflets with 3 blunt lobes apically, not glaucous; wing apex of filament distinctly fringed (mallee areas from Eyre Penin., S.A., to Balranald area of N.S.W. & NW Vic.) **14. *Z. crenatum***
- 19: Leaflets entire or emarginate, usually glaucous; wing apex of filament not fringed
- 20 Sprawling herbs or shrubs to 40 cm high; disc of 4 joined lobes; flowers yellow (dry southern Australia, all mainland states) **15. *Z. glaucum***
- 20: Upright shrubs, eventually becoming woody and forming mounds to 1 m high; disc of 4 separate lobes; flowers yellow or orange (limestone areas of northern S.A. and southern N.T.) **16. *Z. crassissimum***
- 18: Mature capsule less than 10 mm long; petals not more than 4 mm long
- 21 Capsule 2.5–3 mm long, transversely broadly elliptic or subcircular in outline; seed 1 per cell (channel country to L. Eyre – from Qld, through N.S.W. to S.A.) **11. *Z. humillimum***

- 21: Capsule 5–10 mm long, obovate or ovate in outline; seeds 2 per cell
- 22: Leaflets 1–3 mm wide, not appressed to each other; fruiting pedicels to 3 mm long; petals 1–1.8 mm long, shorter than to as long as sepals (widespread in drier areas of southern states and southern N.T.) **12. *Z. ovatum***
- 22: Leaflets 4–20 mm wide, appressed to each other; fruiting pedicels 5–12 mm long; petals 2.5–4 mm long, longer than sepals (gypseous areas associated with salt lakes in Norseman-Laverton-Wiluna area of W.A.; southern N.T.; northern S.A.; NW Vic.) **13. *Z. compressum***
- 2: Flowers 5-merous; ovary and capsule 5-angled
- 23 Capsule ±obtriangular in outline, truncate apically, with triangular extension (apiculum) on upper corner of each angle (from W.A. to Vic., including Bass Strait Islands, S parts of N.T. & Qld) **10. *Z. apiculatum***
- 23: Capsule oblong, elliptic, ovate, or obovate in outline, not obtriangular, rounded apically, lacking an extension on upper corner of each angle
- 24 Leaflets lobed at base on outer side
- 25 Capsule 5–6 mm long, with 1 or 2 seeds per cell; fruiting pedicels 10–12 mm long (Perth to Coral Bay, W.A.) **19. *Z. lobulatum***
- 25: Capsule 8.3–11.5 mm long, with 2–5 seeds per cell; fruiting pedicels 12–18 mm long (L. Eyre region, S.A.) **21. *Z. hybridum***
- 24: Leaflets not lobed at base
- 26 Leaflets (2–) 3 (–4)-lobed at apex
- 27 Petals 5.5–7 mm long; capsule 8–13 mm long; seeds 2–4 per cell (inland W.A. from the Hamersleys to northern S.A.) **17. *Z. kochii***
- 27: Petals 2–4 mm long; capsule 5–6 mm long; seeds 1 or 2 per cell (Perth to Coral Bay, W.A.) **19. *Z. lobulatum***
- 26: Leaflets entire or emarginate at apex
- 28 Fruiting pedicel more than 7 mm long
- 29 Flowers white (southern N.T.; Deering Hills S.A.; Rawlinson Ra., ?Norseman and Queen Victoria Spring area, W.A.) **18. *Z. tesquorum***
- 29: Flowers yellow, drying white (coastal, Karratha to Hamelin, W.A.) **20. *Z. retivalve***
- 28: Fruiting pedicel less than 7 mm long
- 30 Stamens with wing apex oblique and with an acute tooth either side of filament; capsule 6.5–8 mm long, 7.5–9.5 mm wide; leaflets entire (inland W.A. and central Australia) **22. *Z. eichleri***
- 30: Stamens with wing apex truncate, erose, lacking tooth either side of filament; capsule 4–6 mm long, 5–7 mm wide; leaflets rounded or emarginate
- 31 Style 0.2–0.3 (–0.6) mm long; stigma 5-lobed; leaflet apex emarginate; petals 2.7–3.7 mm long (inland, all mainland states) **23. *Z. iodocarpum***
- 31: Style 1–1.5 mm long; stigma not lobed; leaflet apex rounded or emarginate; petals 4–4.7 mm long (inland N.T.; S.A.; Qld) **24. *Z. rowelliae***

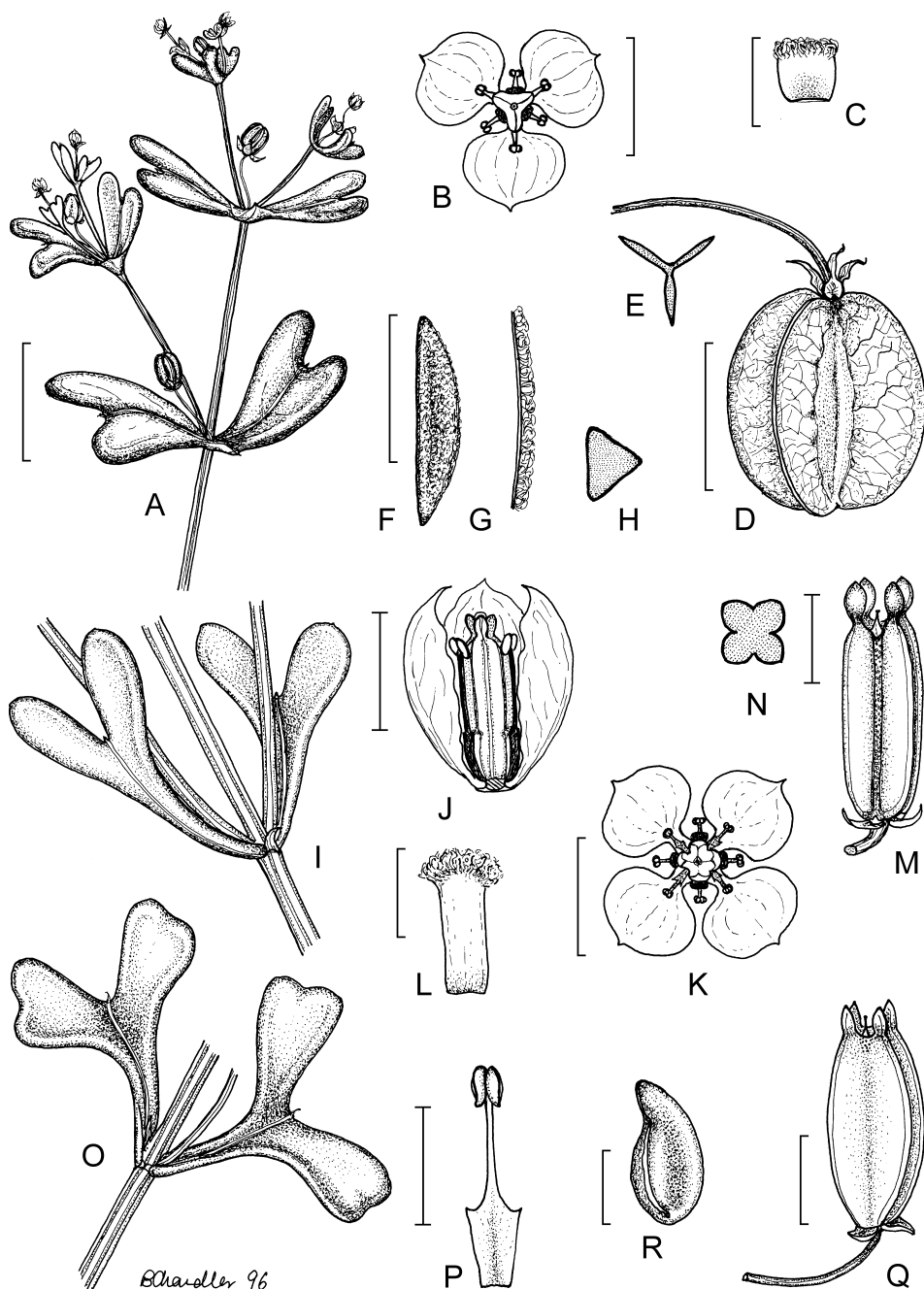


Figure 78. *Zygophyllum*. **A–H**, *Z. howittii*. **A**, habit; **B**, flower, diagrammatic top view; **C**, disc or nectary; **D**, fruit; **E**, T.S. of fruit; **F**, seed; **G**, edge of seed when wet; **H**, T.S. of seed (**A–C**, F.Badman 53, AD; **D–H**, C.O'Malley 113, AD). **I–N**, *Z. prismatothecum*. **I**, pair of leaves; **J**, flower, 1 petal removed; **K**, flower, diagrammatic top view; **L**, disc or nectary; **M**, fruit; **N**, T.S. of fruit (**I**, **M**, **N**, J.Z.Weber 2107, AD; **J–L**, D.J.Whibley 2267, AD). **O–R**, *Z. marliesiae*. **O**, pair of leaves; **P**, stamen; **Q**, fruit; **R**, seed (**O**, F.Badman 53, AD; **P–R**, K.Chorney 999, AD). Scale bars: **A**, **D**, **E**, **I**, **O** = 10 mm; **B**, **J**, **K** = 2 mm; **C**, **L**, **P**, **R** = 1 mm; **F**, **M**, **N**, **Q** = 5 mm. Drawn by B.Chandler.

Capsular Group

Fruit a capsule; dissemination of propagules as seed.

Prismatothecum sub-group

Floral and fruiting parts in 4s. Flowers solitary at each node. Fruit erect, rectangular with apical prolongations at each of the angles.

A subgroup of 2 species, in inland Australia, N.T., S.A. and N.S.W.

1. *Zygophyllum prismatothecum* F.Muell., *Linnaea* 25: 375 (1853)

Roepera prismatotheca (F.Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: Akaba, ad clivos siccos, S.A., Oct. 1851, *F.Mueller s.n.*; lecto: MEL, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 66 (1998); S. Australia, *s. dat.*, *F.Mueller s.n.*; probable islecto: K; N. Holl. austr. interior, *s. dat.*, *F.Mueller s.n.*; possible islecto: MEL. Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 443 (1981).

Spreading annual to 15 cm high, wider than high. Leaves with 2 pairs of leaflets; petiole flattened, 2–22 mm long, attenuate or rounded; leaflets succulent, elliptic, 2–22 mm long, 1–6.5 mm wide, continuous with petiole and not articulated at base, rounded at apex. Pedicel 0.5–0.7 mm long in flower. Sepals 4, 3–4 mm long. Petals 4, obovate, 2.5–4 mm long, equal to or slightly longer than sepals, yellow drying white. Stamens 8; filaments 1.5 mm long, winged in lower half, without appendages. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled; stigma capitate, not lobed. Capsule erect, rectangular-oblong, 10–15.5 mm long, 4-angled, 4-celled, with a line of white circular glands along the often reddish longitudinal grooves of each of the 4 sides and apically with 4 erect, narrowly elliptic, 2–3.5 mm long appendages from a constricted base; pedicel 0.5–1 mm long; fruiting style 0.7–1 (–1.5) mm long. Seeds (1–) 2 or 3 per cell, 2.7–2.8 mm long, smooth, shining, rapidly taking up water. *Square Twin-leaf*. Fig. 78 I–N.

Occurs in drier northern areas of S.A. through to southern N.T. and NW N.S.W. Found in a variety of situations but often associated with chenopod shrublands, gilgais or gibber plains, sometimes with limestone. Flowers all months except Dec.–Feb., peaking Aug.–Oct., presumably dependent on rains.

N.T.: Mt Riddock Stn, *P.K.Latz 3151* (AD, CANB, DNA, MEL, NT, PERTH); 4 km E of Mt Kingston Dam No. 2, *J.R.Maconochie 2439* (AD, CANB, DNA, K, MEL, MO, NT, PERTH). S.A.: Balcanoona, c. 1 km N of Nudlamutana Well along track to Oodnaminta Well, *Hj.Eichler 19620* (AD, AK, CANB, FI); c. 75 km W of Maree, *A.E.Orchard 636* (AD, BRI, CANB, L). N.S.W.: 5 km W of Milparinka on road to Hawker Gate, *B.G.Briggs 5407* (CANB, NSW).



The fruit is distinctive by the development of the rabbit-eared appendages on the apex. Each of the faces has a longitudinal groove down its midline, and this groove contains numerous white papillae.

2. *Zygophyllum marliesiae* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 63 (1998)

Roepera marliesiae (R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: S.A., 10 km NW of Warrina, 110 km NNW of William Ck, 30 July 1984, *F.J.Badman 1389*; holotype: AD; isotype: CANB, MEL.

Z. "Lake Eyre" (Chorney 999), R.M.Barker, *loc. cit.*

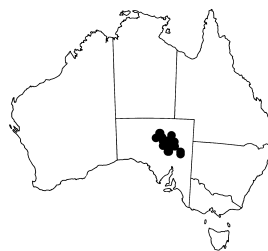
[*Z. prismatothecum* auct. non F.Muell.: H.Eichler in J.P.Jessup & H.R.Toelken (eds), *Fl. S. Australia* 4th edn, 2: 733 (1986), *p.p.*]

Spreading annual to 15 cm high, wider than high. Leaves with 2 pairs of leaflets; petiole flattened, 4.5–9.5 mm long, attenuate or rounded; leaflets succulent, elliptic, 3.5–8 mm long,

2.5–8.5 mm wide, continuous with petiole and not articulated at base, rounded at apex. Pedicel 0.8–2.5 mm long in flower. Sepals 4, 2.2–3.5 mm long. Petals 4, obovate, 1.9–3 mm long, slightly shorter than sepals, yellow drying white. Stamens 8; filaments 1.5 mm long, winged in lower half, without appendages. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled; style 0.4–0.5 mm long; stigma capitate, not lobed. Capsule erect, rounded-oblong, 7–11 mm long, 4-angled, 4-celled, lacking white circular glands along the same-coloured longitudinal grooves of each of the 4 sides, or these sparse and confined to apex of groove and the 4 angles continuous apically into 4 erect, narrowly elliptic and somewhat falcate, 0.5–1 mm long appendages without a noticeably constricted base; pedicel 1–2.5 mm long; fruiting style 0.6–1.0 mm long. Seeds (1–) 2 or 3 per cell, 2.5–3 mm long, smooth, shining, rapidly taking up water. Fig. 78 O–R.

Confined to the L. Eyre region of S.A. Recorded from salt pans, samphire flood plains, limestone formations associated with mound springs, gypseous flats and sand hills. Flowers June–Oct., with sporadic occurrences outside this time, presumably dependent on rains.

S.A.: flats along the Oodnadatta Track, S of Oodnadatta, *R.J.Bates 19261* (AD); 21 miles [33.6 km] N of William Ck, *A.C.Beauglehole 28113* (AD); shores of L. Eyre, c. 10 miles [16 km] from Coopers Ck entrance, 1950, *H.Brooks s.n.* (AD); 1 mile [1.6 km] S of Muloorina, *B.Copley 3576* (AD); Flinders Ra., mouth of Italowie Gorge, *Hj.Eichler 19673* (AD *p.p.*).



Distinct from *Z. prismatothecum*, with which it overlaps in distribution, by the longer pedicels in flower and fruit, the lack of reddish-coloured, longitudinal grooves with white papillae for their length on each of the faces of the fruit, the much shorter apical fruit appendages which are not constricted at their base, and the elliptic rather than rectangular fruits. The apex of the persistent style tends to be at about the same height as that of the apex of the appendage, whereas in *Z. prismatothecum* the apex of the appendage far exceeds the apex of the style.

Ammophilum sub-group

Floral and fruiting parts in 4s. Flowers solitary at each node. Fruit pendent, ±obtriangular or obtrullate in outline; apex truncate or obliquely truncate.

A subgroup of 7 species, found in all mainland states and Bass Strait islands.

3. Zygophyllum ammobophilum F.Muell., *Fragm.* 11: 28 (1878)

Z. billardierei DC. var. *ammophilum* (F.Muell.) J.M.Black, *Fl. S. Australia* 2: 333 (1924), *p.p.*, at least to specimens with 4 stamens; *Roepera ammobophila* (F.Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: Lachlan River, Sept. 1878, *F.Mueller s.n.*; lecto: MEL, *fide* Hj.Eichler, *Telopea* 4: 16 (1990); isolecto: MEL (3), NSW.

Z. ammobophilum F.Muell., *Linnaea* 25: 376 (1853), *nom. nud.*

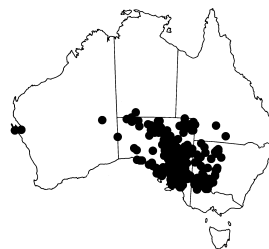
Roepera ammobophila F.Muell., *Linnaea* 25: 376 (1853), *nom. inval.* pro syn.

?*Z. billardierei* var. *ammophilum* F.Muell., *Rep. Pl. Babbage's Exped.* 7 (1859), as *Billardierii*, *nom. nud.*

Compact or sprawling, semiprostrate annual herb, to 20 cm high, wider than high. Leaves with 1 pair of leaflets; petiole flattened, 5–20 mm long; leaflets succulent, narrowly oblong or narrowly obovate, (3–) 8.5–24 mm long, 2–5.5 mm wide, articulated or not at base, rounded-obtuse with a tiny apiculum, or rarely, emarginate at apex. Pedicel 2.5 mm long in flower. Sepals 4, 1–2 mm long. Petals 4, obovate, usually narrowly so, 1.2–2.5 mm long, similar in length to or just longer than sepals, yellow drying white, or ?white. Stamens 4; filaments 1.2–1.5 mm long, narrowly winged in lower half, without appendages. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled, sometimes papillose on angles; stigma minutely 4-lobed. Capsule 5–7.5 mm long, 4–7 mm wide, 4-angled, 4-celled, obliquely

truncate at apex; pedicel 3.5–4.5 mm long; fruiting style 0.3 mm long. Seeds 2 (–4) per cell, 2–3 mm long, covered with longitudinal rows of tuberculae. Fig. 79H.

Because of the similarity between *Z. simile* and this species it is difficult to be sure of the precise distribution of *Z. ammophilum*. Many specimens in Australian herbaria are wrongly determined (distorting distributions on Australia's Virtual Herbarium maps [<http://avh.ala.org.au>]). However the species has a southern Australian distribution, being known from the drier areas of all mainland states. In limestone or hardened clay soils, in *Astrebla* or in chenopod shrubland. Flowers predominantly July–Nov., but collections from earlier in the year, particularly from inland areas, may also have flowers, probably in response to rain.



W.A.: Hamelin Pool, *R.M.Barker* 1214 (AD). S.A.: 10 km S of Port Victoria, *D.E.Murfet* 2033 (AD). Qld: 20 km NW of Mackunda Downs, *R.W.Purdie* 1202 (BRI). Vic.: Copi Plains, *D.C.Cheal* s.n. (MEL 686324).

Eichler (*loc. cit.*) stated that both *Z. ammophilum* and *Z. simile* differed from the rest of the species in this subgroup by possessing white rather than yellow flowers. Information given on some collections supports this statement but there are others where the flowers are recorded as yellow. Since flowers usually turn from yellow to white with age in Australian species further field observations are needed if this characteristic is to be used with confidence. Other distinguishing characters listed included the shape of the petals and number of seeds per cell of the capsule, but these too seem to be somewhat questionable. At the moment the differing stamen number is the only sure means of distinction and consequently those specimens lacking flowers are not determinable to species and even those which do have flowers are difficult to determine without a microscope.

Eichler (*loc. cit.*) also indicated that *Z. ammophilum* was confined to SE Australia but there are definitely specimens with 4 stamens from W.A.

Chippendale *et al.* (*Austral. Veterin. J.* 40: 241 (1964)) recorded *Z. ammophilum* as killing a number of cattle near Mt Lloyd Bore, just W of Alice Springs, in 1963. It needs to be established which of the *Z. ammophilum* segregates was involved here but it seems likely that all of the group would have the same effect. The deaths were attributed to nitrate poisoning.

4. *Zygophyllum simile* H.Eichler, *Telopea* 4: 15 (1990)

Roepora similis (H.Eichler) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: S.A., Musgrave Ranges, creek near entrance to the Aboriginal Reserve between Mulga Park and Musgrave Park, 8 Sept. 1963, *Hj.Eichler* 17390; holo: AD; iso: B, CANB, K725176.

[*Z. ammophilum* auct. non F.Muell.: F.J.H.von Mueller, *Fragm.* 11: 28 (1878), *p.p.*]

Compact decumbent, rarely sprawling, annual herb to 30 cm high, wider than high. Leaves with 1 pair of leaflets; petiole flattened, 5–12 mm long; leaflets succulent, narrowly elliptic to narrowly obovate, 5–20 mm long, 1.5–4.0 mm wide, continuous with petiole and not articulated at base, rounded-obtuse at apex. Pedicel 0.5–2 mm long in flower. Sepals 4, 1.8–2 mm long. Petals 4, obovate, 0.7–1.7 mm long, shorter than or equal to sepals, yellow drying white, or ?white. Stamens 8; filaments 1.5 mm long, narrowly winged in lower half, without appendages. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled, glabrous except for papillae on angles; stigma 4-lobed. Capsule 4.3–7.5 mm long, 4-angled, 4-celled, obliquely truncate at apex; pedicel 2–5 mm long; fruiting style 0.3–0.5 mm long. Seeds 1 or 2 (–3) per cell, 2.2–3.1 mm long, verrucose. Fig. 79A–G.

Found in the drier areas of all mainland states. As with *Z. ammophilum* there may well be wrongly determined specimens in Australian herbaria but the two species appear to have a similar distribution. Occurs in both sands and clays, in dunes and watercourses and at the edges of floodplains, usually in open areas without a lot of competition. Flowers predominantly June–Nov., but sporadic occurrences outside this time, particularly from inland areas, are a response to rain.

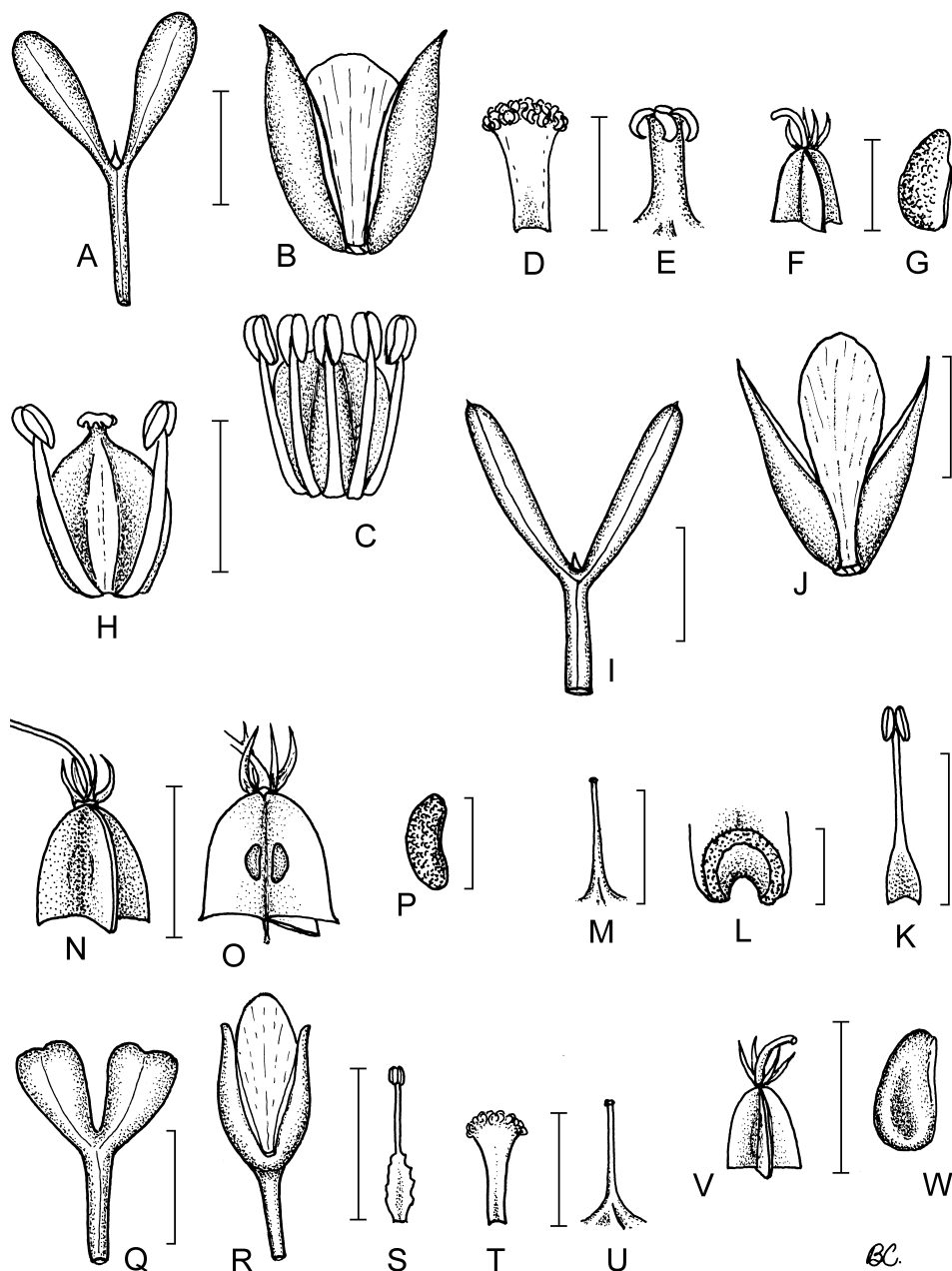
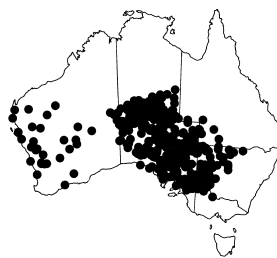


Figure 79. *Zygophyllum*. A–G, *Z. simile*. A, leaf; B, petal and sepals; C, stamens and ovary; D, disc or nectary; E, style and stigma; F, fruit; G, seed (A, F, G, Hj.Eichler 17982, AD; B–E, L.D.Williams 9904, AD). H, *Z. ammophilum*, stamens and ovary (voucher not recorded). I–P, *Z. flavum*. I, leaf; J, petal and sepals; K, stamen; L, disc or nectary; M, style and stigma; N, fruit; O, fruit with ovules; P, seed (I–P, Hj.Eichler 18470, AD). Q–W, *Z. emarginatum*. Q, leaf; R, petal and sepals; S, stamen; T, disc or nectary; U, style and stigma; V, fruit; W, seed (Q–W, F.J.Badman 3106, AD). Scale bars: A, I, N, O, Q, V = 10 mm; B, C, H, M, T, U = 1 mm; D, E, L = 0.5 mm; F = 6 mm; G, P = 3 mm; J, K, R, S = 2 mm; W = 5 mm. Drawn by B.Chandler.

W.A.: E edge of Fortescue Marsh, Roy Hill Stn, *S.van Leeuwen 4858* (AD, PERTH). N.T.: Rainbow Valley C.R., SW corner of large claypan, *D.E.Albrecht 6761* (AD, NT). S.A.: Between Minnipa and Yardea, c. 8 km NE of Chilpuddy, *Hj.Eichler 21385* (AD, B, CANB, RSA). Qld: Garrawin Stn, c. 32 km SSE of Eulo, *L.S.Smith 6024* (BRI). N.S.W.: 10 km S of Enngonia along Mitchell Hwy, *Hj.Eichler 22850* (AD, CANB). Vic.: 83 km SW of Mildura, 8 km N of Campbells Tank along track to Rocket L., *M.D.Crisp 3349* (AD, CBG, MEL).



Distinct from *Z. ammophilum* by having 8 stamens rather than 4. See discussion under that species.

5. *Zygophyllum emarginatum* H.Eichler, *Telopea* 4: 15 (1990)

Roepera emarginata (H.Eichler) Beier & Thulin, *Plant Syst. Evol.* 240: 31 (2003). T: S.A., NW Plains, Sloanes Bore Outstation, which is on Millers Creek Stn and c. 40 km N of Mount Eba on Stuart Highway, 9 Oct 1971, *J.Z.Weber 2954*; holo: CANB; iso: AD, CANB, COLO, HO.

[*Z. ammophilum* auct. non F.Muell.: F.J.H.von Mueller, *Fragm.* 11: 28 (1878), p.p.]

Decumbent, spreading annual herb, 8–15 cm high, 25–30 cm wide. Leaves with 1 pair of leaflets; petiole flattened, 6–18 mm long; leaflets succulent, obovate, 6–15 mm long, 3–8 mm wide, continuous with petiole and not articulated at base, emarginate at apex. Pedicel 1–3 mm long in flower. Sepals 4, 2.2–2.8 mm long. Petals 4, obovate, 2.2–3 mm long, slightly longer than or \pm equal to sepals, yellow drying white. Stamens 8; filaments c. 1.3 mm long, basally winged; wing apices apiculate. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled, glabrous, rarely with hairs on angles; stigma capitate, not lobed. Capsule, 4-angled, 4-celled, 5–6.5 mm long, obliquely truncate at apex; pedicel 2–3 mm long; fruiting style 0.3–0.4 (–0.6) mm long. Seeds 1 or 2 per cell, 3–3.6 mm long, greenish, smooth, shiny. Fig. 79Q–W.

Found in eastern central Australia, from southern N.T., NE S.A., SW Qld and NW N.S.W. Occurs on claypans or in gibber plains with clay and *Maireana* spp., usually on stony soils. Flowers predominantly June–Sept. with records outside these months probably due to unseasonal rains.



N.T.: Orange Creek Stn, *J.R.Maconochie 2442* (AD, B, CANB, DNA, PERTH). S.A.: Paisley Pond on Paisley Ck, c. 5 km due S of Beresford, c. 1 km W of the road from Marree–Oodnadatta, *J.Z.Weber 9609* (AD, BRI, CANB, Z). Qld: c. 38 km W of Quilpie on road to Eromanga, just past jetn with Windorah road, *R.J.Henderson H2097* (AD, BRI).

Distinctive in the *Z. ammophilum* group of species by the emarginate apex of leaflets, shiny greenish seeds and winged filaments.

6. *Zygophyllum flavum* H.Eichler ex R.M.Barker, *J. Adelaide Bot. Gard.* 17: 166 (1996)

Roepera flava (H.Eichler ex R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: S.A., Kangaroo Is., SW part of the island, near Hanson Bay, c. 4 km S of South-Coast Rd near the track on the W side of Sou'West R. to Hanson Bay, 9 Nov. 1958, *Hj.Eichler 15320*; holo: AD; iso: CANB.

[*Z. ammophilum* auct. non F.Muell.: F.J.H.von Mueller, *Fragm.* 11: 28 (1878), p.p.]

Decumbent or straggly annual or short-lived perennial herb, to 40 cm high, wider than high. Leaves with 1 pair of leaflets; petiole flattened, 5–10 mm long; leaflets often in unequal pairs, succulent, narrowly elliptic or narrowly obovate, 5–15 (–20) mm long, 1.5–4 mm wide, constricted slightly at junction with petiole but not articulated, obtuse at apex. Pedicel 2–4 mm long in flower. Sepals 4, 2–3.5 mm long. Petals 4, narrowly obovate, 3–5 mm long, usually just longer than sepals, light yellow drying white. Stamens 8; filaments c. 2 mm long, winged at base, without appendages. Disc 4-lobed; lobes free, semicircular, succulent, papillose on margin, less than $\frac{1}{2}$ ovary height. Ovary 4-angled, 4-celled, glabrous; stigma capitate, not lobed. Capsule 4-angled, 4-celled, \pm truncate or obliquely truncate at apex, 5.8–7 mm

long, 5.7–7 mm wide; pedicel 2–5 mm long; fruiting style 0.8–1.6 mm long. Seeds 1 or 2 per cell, 3–4 mm long, reddish brown, verrucose. Fig. 79 I–P.

Found only on Kangaroo Is. and Eyre Penin. in S.A. Occurs in sandy loam or sand dunes, sometimes with mallee shrubland, possibly only after fire or disturbance. Flowers Aug.–Sept. on Eyre Penin., Oct.–Jan. on Kangaroo Is.

S.A.: road to Point Ellen from Vivonne Bay, next to track 0.8 km before car park, *R.M.Barker 1316* (AD); roadside 5 km E of Tooligie, *G.C.Bishop per S.Pillman 003912* (AD); Jussieu Penin, adjacent to Pillie L., Lincoln Natl Park, *H.P.Vonow 818* (AD); Hincks Natl Park, N/S access track through the Hundred of Nicholls, clearing c. 2 km N of the S boundary, *J.R.Wheeler 993* (AD); Cape Borda, W end, 26 Oct. 1908, *S.A.White s.n.* (AD *p.p.*).



Flowers in some Kangaroo Is. collections may be cleistogamous, but this needs further investigation.

7. *Zygophyllum angustifolium* H.Eichler, *Telopea* 4: 13 (1990)

Roepera angustifolia (H.Eichler) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: S.A., Gawler Ranges, Yandini Gorge: in valley near waterfall c. 35 km NNE of Minnipa, 14 Oct 1969, *Hj.Eichler 20655*; holo: CANB; iso: AD, B, CANB, G, K, L, MEL, NSW, PERTH, US.

[*Z. billardierei* auct. non DC.: G.Bentham, *Fl. Austral.* 1: 293 (1863), *p.p.*]

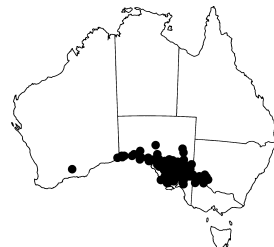
[*Z. billardierei* var. *bilobum* auct. non Benth.: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 439 (1981)]

Illustration: G.M.Cunningham *et al.*, *loc. cit.*, as *Z. billardierei* var. *bilobum*.

Slender annual herb, prostrate or often sprawling through other shrubs, to 40 cm high and 1 m wide. Leaves with 1 pair of leaflets; petiole subterete, 4–10 mm long; leaflets succulent, linear, 8–21 mm long, 0.7–2.2 (–3) mm wide, articulated at base, acute to acuminate at apex. Pedicel erect, 3–15 mm long in flower. Sepals 4, 2.5–5.2 mm long. Petals 4, obovate, 4.2–8 mm long, longer than sepals, bright yellow drying white. Stamens 8; filaments 3–4.5 mm long, not winged, without appendages. Disc 4-lobed; lobes free, semicircular, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous; stigma capitate, not lobed. Capsule 4-angled, 4-celled, 4–7.5 (–8) mm long, obliquely truncate at apex; pedicel 10–18 mm long, reflexed; fruiting style 1.0–3 mm long. Seeds 1 or 2 per cell, c. 3 mm long, tuberculate. Fig. 80J–O.

Found across southern Australia from Norseman, W.A., through to Balranald, N.S.W. Very variable in its habitat but usually found in open areas under mallee, mulga, western myall, *Melaleuca* spp., *Casuarina cristata* or within blue-bush or salt bush flats. Found in limestone or in sand. Flowers June–Oct.

W.A.: 3 km ENE of Moir Rock, c. 41 km WNW of Salmon Gums, *K.Newbey 5375* (PERTH). S.A.: Gawler Ra., c. 37 km NNE of Minnipa, *Hj.Eichler 23167* (MEL). N.S.W.: ‘Prungle’, Balranald, *G.M.Cunningham & P.L.Milthorpe 2445* (NSW). Vic.: Raak Plains, W edge of the Ochre Pits area, 37 km SW of Red Cliffs, *J.H.Browne 734* (MEL).



This species is distinctive by its petals longer than the sepals, its narrow leaves, long pedicels in fruit, semicircular disc, distinct style with capitate stigma and non-winged filaments. Flower size varies considerably. Distinct from *Z. confluens* when longevity is unclear by articulated leaflets and shorter style, but it can be difficult to distinguish from some of the smaller forms of *Z. billardierei*.

8. *Zygophyllum billardierei* DC., *Prodr.* 1: 705 (1824), as *Billardierii*

Roepera billardierei (DC.) G.Don, *Gen. Hist.* 1: 770 (1831). T: in Novae-Hollandiae terrae Van-Leuwin, *s. dat.*, *Labillardiere s.n.*; syn: G-DC.

[*Z. billardierei* var. *stenophyllum* F.Muell. ex Diels & E.Pritz., *Bot. Jahrb. Syst.* 35: 314 (6 Dec. 1904), *p.p.*, as *Billardieri*. T: S.A., Musgrave’s Ra., Lat 32°14’ Long 126° 24’ [?Wurrungoodyea Hills N of the Eyre Telegraph Stn on the Great Australian Bight], 1870, *J.Forrest s.n.*; syn: MEL56866 [Other possible syntypes in MEL belong here but at least one is *Z. angustifolium* H.Eichler].

[*Z. ammophilum* auct. non F.Muell.: F.J.H.von Mueller, *Fragm.* 11: 28 (1878), p.p. (only as to possible syntype specimen from Port Lincoln (MEL 110961, herb. Sonder)]

Spreading perennial shrub, sometimes climbing over other plants, sometimes forming mounds to 1 m, sometimes decumbent in exposed areas. Leaves with 1 pair of leaflets; petiole subterete, 1.5–9.5 mm long; leaflets succulent, narrowly oblong to oblong or narrowly obovate to obovate, 4–18 mm long, 0.5–5.5 mm wide, articulated at base, rounded-obtuse with tiny acumen. Pedicel 2.5–7.5 mm long in flower. Sepals 4, 5–5.7 mm long. Petals 4, obovate, 7–9.5 mm long, longer than sepals, yellow drying white. Stamens 8; filaments 4–4.7 mm long, not winged, without appendages. Disc 4-lobed; lobes usually free, sometimes apparently joined, semicircular, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous or papillose apically and within angles; stigma minute, not lobed. Capsule

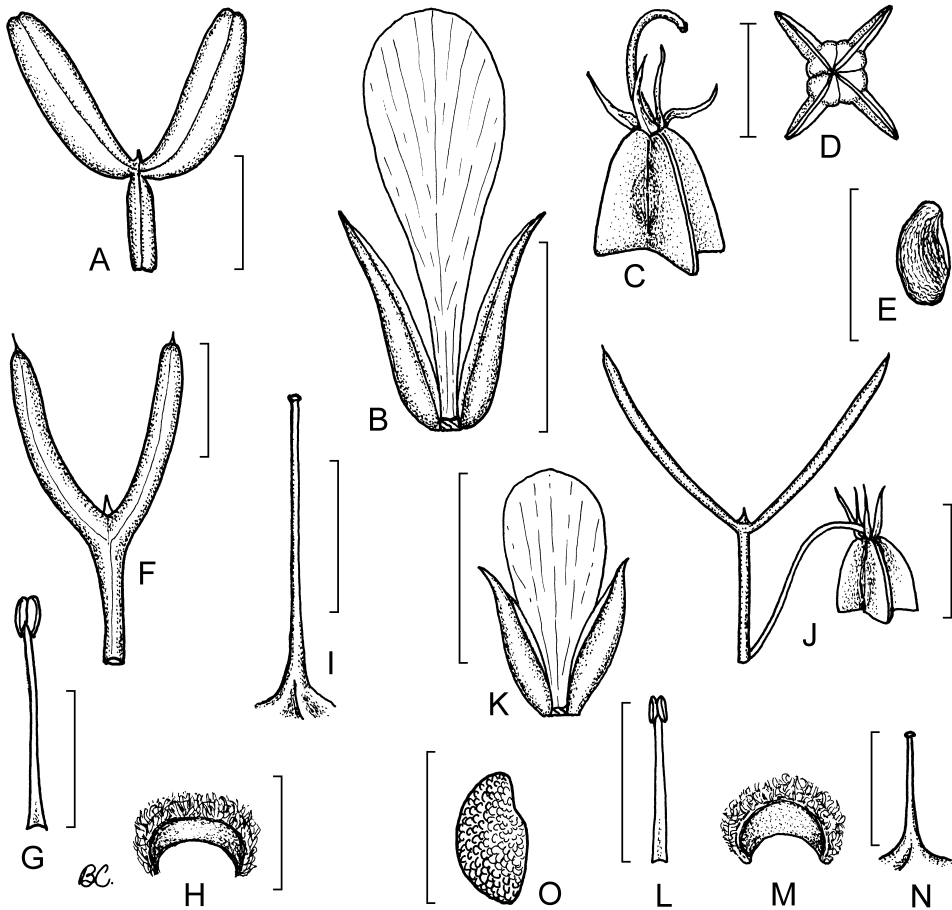


Figure 80. *Zygophyllum*. A–E, *Z. billardiarei*. A, leaf; B, petal and sepals; C, fruit; D, fruit from above; E, seed (A–D, E.M.James 76, AD; E, W.Barker 2607, AD). F–I, *Z. confluens*. F, leaf; G, stamen; H, disc or nectary; I, style and stigma (F–I, C.R.Alcock 614, AD). J–O, *Z. angustifolium*. J, leaf and fruit; K, petal and sepals; L, stamen; M, disc or nectary; N, style and stigma; O, seed (J–O, J.Weber 6225, AD). Scale bars: A, C, D, F, J = 10 mm; B, E, K, O = 5 mm; G, L = 3 mm; H, M, N = 1 mm; I = 2 mm. Drawn by B.Chandler.

4-angled, 4-celled, 5.5–12 mm long, 4–12 mm wide, truncate or obliquely truncate at apex; pedicel 4–13 mm long; fruiting style 3–5.5 mm long. Seeds 1 or 2 per cell, 3 mm long, finely verrucose. Fig. 80A–E.

On the southern coast of Australia from Cape Riche in W.A. through to the Bass Strait Is. Usually in sand dunes, often associated with limestone. Flowers Aug.–Dec.

W.A.: Cape Riche, 1 mile [1.6 km] N of bar at Eyre R. mouth, *J.W. Wrigley 4962* (AD, CANB). S.A.: c. 3.5 km from Corny Point PO on Warooka Rd, *W.R. Barker 1840* (AD, CANB, MEL, NSW). Vic.: Buckleys Cliffs, c. 30 miles [48 km] upstream, lower Glenelg R., *A.C. Beaglehole 7035* (AD, MEL). Tas.: Goose Is., Furneaux Group, *J.S. Whinray 1292* (MEL).



Variation in this species in size of leaves and flowers probably relates to habitat. Compact small-leaved plants are found at Port Lincoln on Eyre Penin., at Point Davenport and Point Souttar on Yorke Penin.; these populations tend to occur inland from the dune systems, often on heavier soil and sometimes under trees. They can be indistinguishable from *Z. angustifolium* except in their perennial habit. Larger-flowered populations, with larger fruits and sometimes with longer styles occur at Marion Bay on Yorke Penin. and Port Elliot on Fleurieu Penin. in S.A.

9. *Zygophyllum confluens* H.Eichler, *Telopea* 4: 14 (1990)

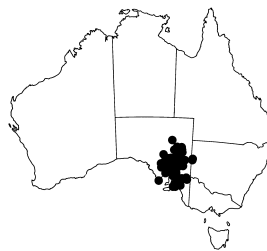
Roepera confluens (H.Eichler) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: S.A., c. 18 km WSW of Purnong, at turnoff to Walker Flat on road to Mannum, 11 Aug 1963, *Hj. Eichler 17211*; holo: CANB; iso: AD, B, CANB, K, MEL, NSW.

Zygophyllum billardierei var. *bilobum* Benth., *Fl. Austral.* 1: 294 (1863), as *Billardieri*. T: Holdfast Bay, S.A., Apr. 1847, *F. Mueller s.n.*; syn: MEL56863; Murray R., *s. dat.*, *F. Mueller s.n.*; syn: MEL56860.

Woody, rounded, compact or spreading perennial shrubs, occasionally sprawling in other bushes, 25–100 cm high, 1–2 cm wide. Leaves with 1 pair of leaflets; petiole terete, 3.5–10 mm long; leaflets succulent, narrowly oblong to oblong, 6.5–20 mm long, 0.8–2.8 mm wide, continuous with petiole and not articulated at base, rounded-obtuse with tiny apiculum. Pedicel 4–8.5 mm long in flower. Sepals 4, 5.5 mm long. Petals 4, obovate, 7.5–10 mm long, longer than sepals, bright yellow drying white. Stamens 8; filaments 4.4–6.3 mm long, not winged, without appendages. Disc 4-lobed; lobes free or usually joined, semicircular, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous apart from occasional papillae at apex; stigma minute, not lobed. Capsule 4-angled, 4-celled, 7–12 mm long, truncate at apex, sometimes obliquely so; pedicel 6–15 mm long; fruiting style 3.3–4 mm long. Seeds 1 or 2 per cell, 3.5–4.5 mm long, finely verrucose. Fig. 80F–I.

Occurs from Eyre Penin. in S.A. through to Broken Hill area of N.S.W. Rocky hills or outcrops in inland areas, rarely on plains, in cliffs or on cliff tops in coastal areas of Fleurieu Penin., S.A. Flowers July–Sept.

S.A.: Olivers Rocks, Onkaparinga R., *A.W. Bell 406* (AD, CANB); Redcliff Petrochemical Area, 25 km SE of Port Augusta, Mt Grainger, *R.J. Chinnock 1480* & *S. Chinnock* (AD, MO, RSA, UC); 0.5 km W of windmill and dam adjacent to Yarrah Vale Rd, c. 5 km N from Quorn, *L. Haegi 3453* & *B. Moore* (AD, BRI, CANB, PRE); river front at Overland Corner, *D.E. Symon 3875* (AD, K). N.S.W.: Umberumberka [Broken Hill], *A. Morris s.n.* (AD 98580955).



Zygophyllum confluens and *Z. billardierei* are the only perennials of the *Z. ammophilum* sub-group and their flowers are larger than those found in the rest of the sub-group. They can be distinguished from each other by the articulation of the leaflets in *Z. billardierei* (lacking in *Z. confluens*). *Z. confluens* is in addition more usually found in inland localities while *Z. labillardierei* is usually associated with coastal areas, although the two co-occur in coastal localities on Fleurieu Penin.; in this case *Z. billardierei* occurs in sand dunes while *Z. confluens* is found on the cliff tops. Leaves of *Z. confluens* occasionally approach those of *Z. angustifolia* in size, but the characters of the annual habit and the very narrow articulated

leaves of *Z. angustifolia*, together with the inland distribution, somewhat smaller flowers and shorter style (1.5 mm long), are usually sufficient to easily distinguish between the two taxa.

As with *Z. billardiarei* this species produces populations in which the plants are distinctly woody and aged and the leaves are very small and succulent. These again seem to be a response to exposure to harsher conditions as they predominantly come from hilltops. In view of the wider distribution of this species, why these populations should be confined to the Iron Triangle–Middleback Ra. area and gorges of the Flinders Ra. is not clear.

Apiculatum sub-group

Floral and fruiting parts in 5s. Flowers solitary at each node. Fruit pendent, \pm obtriangular in outline; apex \pm truncate, with an apical prolongation at each of the 5 upper outer angles.

A single species; occurs in all mainland states and southern N.T.

10. *Zygophyllum apiculatum* F.Muell., *Linnaea* 25: 373 (1853)

Roepora apiculata (F.Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: In pascuis semisalsis secus flumen Broughton & Clare sinum Spenceri versus, S.A., Nov. 1851, *F.Mueller s.n.*; syn: MEL94906; from Crystal Brook and Broughton, S.A., *s. dat.*, *Anon. [F.Mueller] s.n.* syn: MEL 110956.

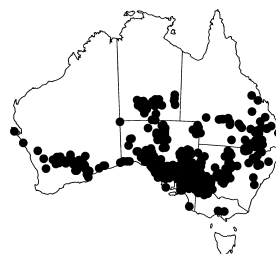
?*Z. terminale* Turcz., *Bull. Soc. Imp. Naturalistes Moscou* 31(1): 437 (1858). T: Nova Hollandia [Stirlings to W Mt Barren, W.A.], *s. dat.*, [*J.J.Drummond coll. V, n. 90*]; syn: BM, K, KW (photos seen).

Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 439 (1981).

Spreading, eventually much-branched, subshrub, to 150 cm high. Leaves with 1 pair of leaflets; petiole apparently terete with narrow leaflike wing, 5–20 mm long; leaflets somewhat succulent, usually obliquely obovate, rarely elliptic, 13–36 mm long, 7.5–26 mm wide, articulated at base, obtuse with tiny apiculum at apex. Pedicel 4–7.5 mm long in flower. Sepals 5, 5–6 mm long. Petals 5, obovate, 7–10 mm long, longer than sepals, yellow drying white. Stamens 10; filaments 3.5–3.7 mm long, winged below; wing with irregularly toothed apex. Disc 5-lobed; lobes joined, sinuate. Ovary 5-angled, 5-celled, glabrous, rarely with line of papillae between angles; stigma minute, not lobed. Capsule pendent, 5-angled, 5-celled, \pm obtriangular, 7–8 mm long, 8–10 mm wide, rounded at base, truncate at apex with 1–1.5 mm long apiculum on outer edge of each of the 5 angles; pedicel 5–7.5 mm long; fruiting style 1.5–2.1 mm long. Seeds 1 per cell, 4.3–4.6 mm long, smooth, shining; raphe or aril white. *Gall Weed*. Fig. 83K.

Occurs across Australia from W.A. to N.S.W., extending into S parts of N.T. and Qld. Flowers predominantly Aug.–Sept., but occasionally earlier.

W.A.: c. 2 km S of Balladonia Hotel, *Hj.Eichler 20418* (AD). N.T.: Palm Valley, *P.K.Latz 1892* (AD, DNA). S.A.: between Leigh Ck and Parachilna, in creekbed c. 5 km N of Beltana, *Hj.Eichler 17953* (AD). Qld: 65 miles [104 km] E of St George on Moonie Hwy, *M.E.Phillips s.n.* (AD). N.S.W.: Sturt Hwy between Mildura and Balranald, *Hj.Eichler 20906* (AD). Vic.: Sunset Country, 4 km SW of Sunset Tank, *M.G.Corrick 6615 & P.Short* (AD, MEL).



Previous records of *Z. apiculatum* for Tas. by J.D.Hooker (*Fl. Tasman.* 1: 60 (1855)) were based on a misidentification.

A Leichhardt collection of this species (MEL 94875) from the Drummond Ra., between Blackall and Emerald in Qld notes that this is a “native cabbage eaten by the Blacks”, while notes on other specimens variously report it poisoning sheep (*Johnson s.n.*, BRI 068825) or only being eaten by sheep as a last resort in drought conditions (*J.G.Cumming F*, BRI 065348). Everist (*Poisonous Pl. Australia* 765–766 (1981)) reported on sheep feeding trials in NSW and Qld; in both of these no ill effects were recorded. He further reported that when *Z. apiculatum* dried off sheep ate it freely and survived on it, while refusing to eat the green plants.

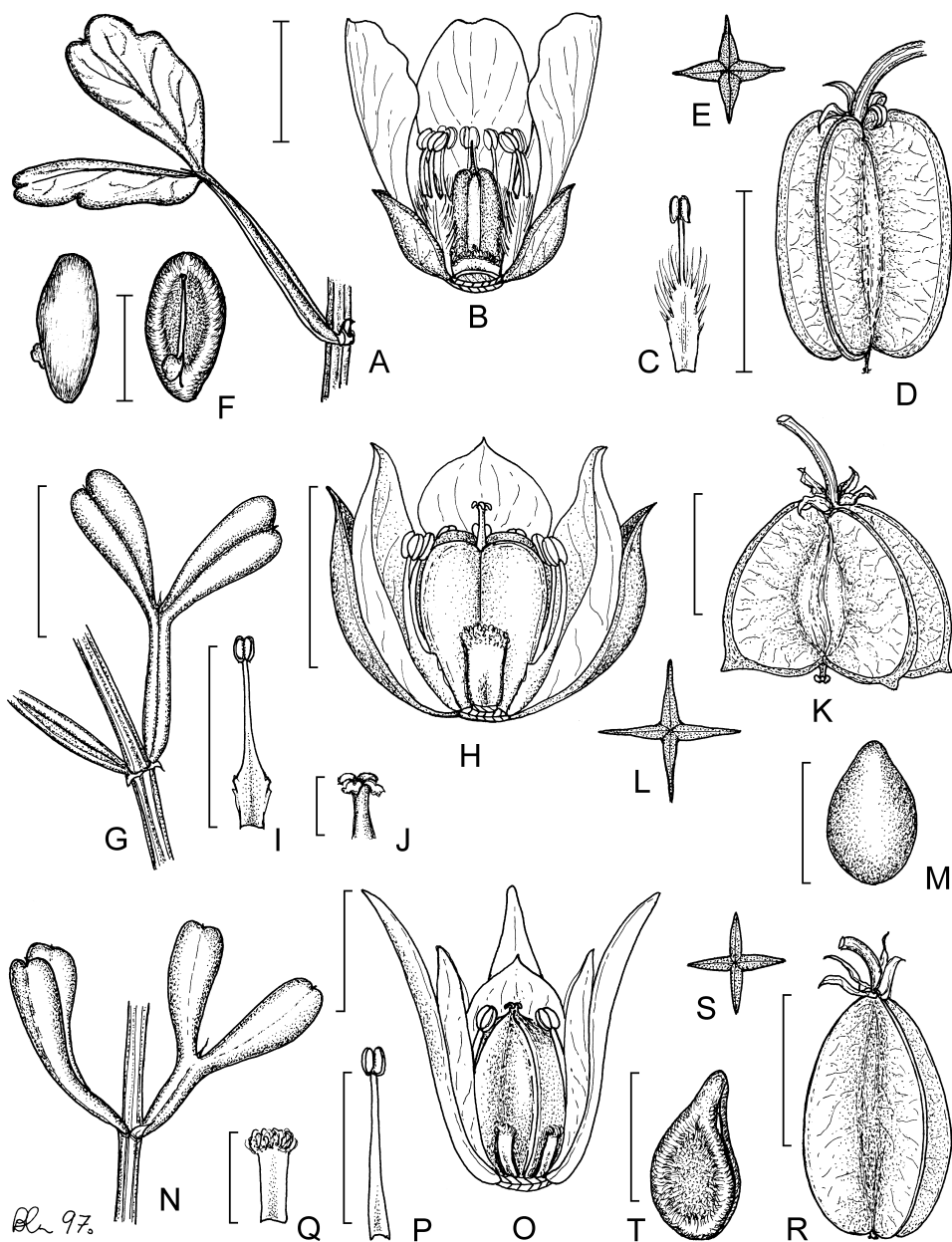


Figure 81. *Zygophyllum*. A–F, *Z. crenatum*. A, leaf; B, flower, 1 sepal, petal and stamen removed; C, stamen; D, fruit; E, T.S. of fruit; F, seed, ventral and dorsal views (A, P.E.Conrick 534, AD; B, C, E.A.Shaw 158, AD; D–F, N.Donner 8348, AD). G–M, *Z. humillimum*. G, leaf; H, flower, 1 sepal, petal and stamen removed; I, stamen; J, 4-lobed stigma; K, fruit; L, T.S. of fruit; M, seed (G–L, N.Loithian 1277, AD; M, N.Loithian 2083, AD). N–R, *Z. ovatum*. N, pair of leaves; O, flower, 1 sepal, petal and stamen removed; P, stamen; Q, disc or nectary; R, fruit; S, T.S. of fruit; T, seed (N–Q, J.Z.Weber 2872, AD; R–T, J.Z.Weber 6352, AD). Scale bars: A, C, D, G = 10 mm; B, N, R = 5 mm; F, H, I, T = 3 mm; J, Q = 0.5 mm; K, M = 2 mm; O, P = 1 mm. Drawn by B.Chandler.

Glaucum sub-group

Floral and fruiting parts in 4s. Flowers solitary at each node. Fruit pendent, elliptic or obovate, with rounded apices.

A subgroup of 6 species, found in drier areas of all mainland states.

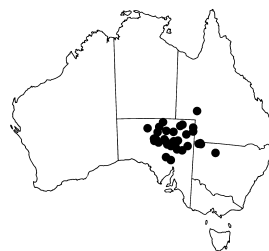
11. Zygophyllum humillimum M.Koch ex Tate, *Trans. Roy. Soc. S. Australia* 24: 207 (1900)

Roepera humillima (M.Koch ex Tate) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: S.A., Mt Lyndhurst, 12 June 1899, *M.Koch* 457; lecto: AD97918160, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 70 (1998); isolecto: AD97918159.

Spreading annual herb, to 25 cm high and 35 cm wide. Leaves with 1 pair of leaflets; petiole flattened, 2–18 mm long; leaflets succulent, not appressed to each other, obovate, 1.8–11 mm long, 0.8–5.5 mm wide, continuous with petiole and not articulated at base, emarginate at apex. Pedicel 2–2.5 mm long in flower, erect. Sepals 4, 1.8–2 mm long. Petals 4, obovate, 2.2–2.4 mm long, longer than sepals, yellow drying white. Stamens 8; filaments 1 mm long, winged below; wing entire. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled, glabrous; style 0.2–0.3 mm long; stigma 4-lobed. Capsule pendent, 4-angled, 4-celled, transversely broadly elliptic or subcircular, 2.5–3.5 mm long, emarginate at apex but with small membranous appendage on each of outer corners; pedicel 2.5–3.5 mm long; fruiting style 0.3–0.4 mm long. Seeds 1 per cell, 2–2.2 mm long, smooth, red-brown, shining. Fig. 81G–M.

Recorded in central Australia, S.A., SW Qld and NW N.S.W.; from chenopod shrubland, road verges and creek beds usually from sand but also from clay, including brown cracking clay dominated by *Astrebula pectinata* in Qld. Its distribution is probably related to the waters that drain the “channel country” and to flooding events. Flowers July–Sept.

S.A.: clay banks S of William Ck and on many creeks flowing into L. Eyre South, *R.Bates* 19332 (AD); sandhills around L. Wittakila, near junction of Boolkaree and Yandama Cks, S of L. Callabonna, *J.M.Bechervaise s.n.* (MEL). Qld: Bilby study sites, 15 km [?] of Ingledoon No. 2 Bore, Davenport Downs, *P.McRae* 46 (BRI). N.S.W.: walking track c. 2.25 km from Mt Wood summit, Sturt Natl Park., *B.Wiecek* 319 *et al.* (AD, CANB, NSW).



Only represented in herbaria by relatively few specimens, but it possibly only occurs in particularly good years with its occurrence related to flooding of the region. The small size of the plants and the copious production of fruits suggests a very short life cycle and self-compatibility.

Similar in appearance to *Z. emarginatum*, but the fruits of *Z. humillimum* are distinctly rounded-emarginate at the apex whereas they are truncate in *Z. emarginatum*.

12. Zygophyllum ovatum Ewart & Jean White, *J. Proc. Roy. Soc. New South Wales* 42: 197 (1908)

Roepera ovata (Ewart & Jean White) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: Watheroo rabbit fence, W.A., Sept. 1905, *M.Koch* 1674; lecto: MEL, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 69 (1998); isolecto: NSW, PERTH (specimen dated Sept. 1905).

Z. iodocarpum var. *bilobum* Benth., *Fl. Austral.* 1: 293 (1863). T: Swan River to the S[tirlings], W.A., s. dat. [received 1848], *J.Drummond* 91; syn: K725168, K725169, MEL 16550.

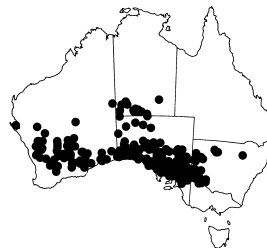
Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 442 (1981).

Decumbent, spreading, annual herb, 10–20 cm high, wider than high, glabrous apart from papillae on young parts. Leaves with 1 pair of leaflets; petiole flattened, 4–12 mm long, similar width to leaflets; leaflets succulent, not appressed to each other, narrowly oblong, 3–14 mm long, 1–3 mm wide, continuous with petiole and not articulated at base, emarginate at apex. Pedicel 0.5 mm long in flower. Sepals 4, 1.8–2 mm long. Petals 4, obovate with acuminate apex, 1–1.8 mm long, shorter than sepals, yellow drying white. Stamens 8;

filaments c. 1 mm long, slightly widened at base but not winged. Disc lobes 4, free, oblong, c. 0.5 mm high. Ovary 4-angled, 4-celled, papillose between angles; stigma capitate, 4-lobed. Capsule pendent, elliptic to subcircular, 4-angled, 4-celled, 5.5–6.5 mm long, rounded at apex; pedicel 2–3 mm long; fruiting style 0.1–0.2 mm long. Seeds 2 per cell, 2.7 mm long, dark brown, smooth, shining, with white ventral raphe, subsessile. *Dwarf Twin-leaf*. Fig. 81N–R.

Widespread and variable species from drier areas of the southern states and southern N.T. Found in sand, usually red-brown and forming a hard pan, in treeless flats and in bluebush flats. Flowers Sept.–Nov.

W.A.: c. 15 km N of Norseman on Coolgardie Rd, *A.C.Beaglehole* 13350 (AD); c. 110 km E of Mullewa, *E.A.Shaw* 641 (AD). N.T.: 22 miles [35 km] E of Curtain Springs, *P.K.Latz* 1785 (AD). S.A.: 154 km S of Vokes Corner, c. 100 km W of Cook, on the road to Vokes Corner, *N.N.Donner* 9494 (AD). N.S.W.: Sturt Hwy, c. 23 km W of Balranald, *Hj.Eichler* 20907 (AD). Vic.: between Ouyen and Balranald, c. 1 km W of Manangatang, *Hj.Eichler* 20886 (AD).



A somewhat variable species but usually easily distinguished by its small size, succulence and fruit shape. Ribs of the fruit are often reddish.

Some younger specimens still have the cotyledons at the base; these are obovate and undivided.

13. *Zygophyllum compressum* J.M.Black, *Fl. S. Australia* 2: 333 (1924)

Roepera compressa (J.M.Black) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: Port Augusta West, S.A., 28 Sept. 1920, *Anon. [Herb. J.M.Black] s.n.*; lecto: AD97918162 *p.p.*, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 66 (1998); isolecto: AD97918163 *p.p.*, K725163, MEL95437.

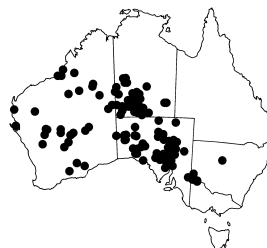
Erect or decumbent, annual herb, 5–30 cm high, usually wider than high. Leaves with 1 pair of leaflets; petiole flattened, but appearing subterete in older leaves, 5–17 mm long; leaflets succulent, appressed to each other, obliquely elliptic or obovate, 7–30 mm long, 4–20 mm wide, apparently articulated at base but in young leaves continuous with petiole and not articulated, rounded at apex. Pedicel 3–3.5 (–7) mm long in flower. Sepals 4, 1.7–2 mm long, with continuous hyaline margin. Petals 4, obovate, 2.5–4 mm long, longer than sepals, yellow drying white. Stamens 8; filaments 1.5–2.5 mm long, winged in basal half; wing apex irregularly toothed. Disc 4-lobed; lobes free, oblong. Ovary 4-angled, 4-celled, glabrous; stigma minutely capitate, not lobed. Capsule pendent, 4-angled, 4-celled, broadly obovate, 6.3–9 mm long, 4.3–7 mm wide, rounded at apex into short apiculum; pedicel 5–5.5 (–12) mm long; fruiting style 0.3–0.6 mm long. Seeds 2 per cell, 3.1–3.2 mm long, pale brown, dull. Fig. 82A–G.

Drier areas of W.A., S.A., southern N.T., N.S.W. and NW Vic. Often found in gypseous areas associated with salt lakes. Flowers Aug.–Sept.

W.A.: c. 84 km by road from Norseman towards Balladonia along the Eyre Hwy, *Hj.Eichler* 21289 (AD). N.T.: S of L. Neale, *P.K.Latz* 2422 (AD). S.A.: Dalhousie Springs, *D.E.Symon* 9321 (AD). Vic.: Raak Plains, c. 14 km WNW of Nowingi; side of track 0.5 km in from N edge & Meridian Rd, *J.H.Browne* 191 (MEL).

Distinctive within Australian *Zygophyllum* species by the leaflets being appressed to each other.

I.Sluis (Cunninghamia 11: 419–424 (2010)) has discussed the habitat requirements and distribution of the species in N.S.W. and Vic. and has suggested that it should be listed as a threatened species in both states. In W.A. *Z. compressum* is found in association with the distinctive *Lawrencia helmsii* (F.Muell. & Tate) Lander, also associated with gypseous areas near salt lakes.



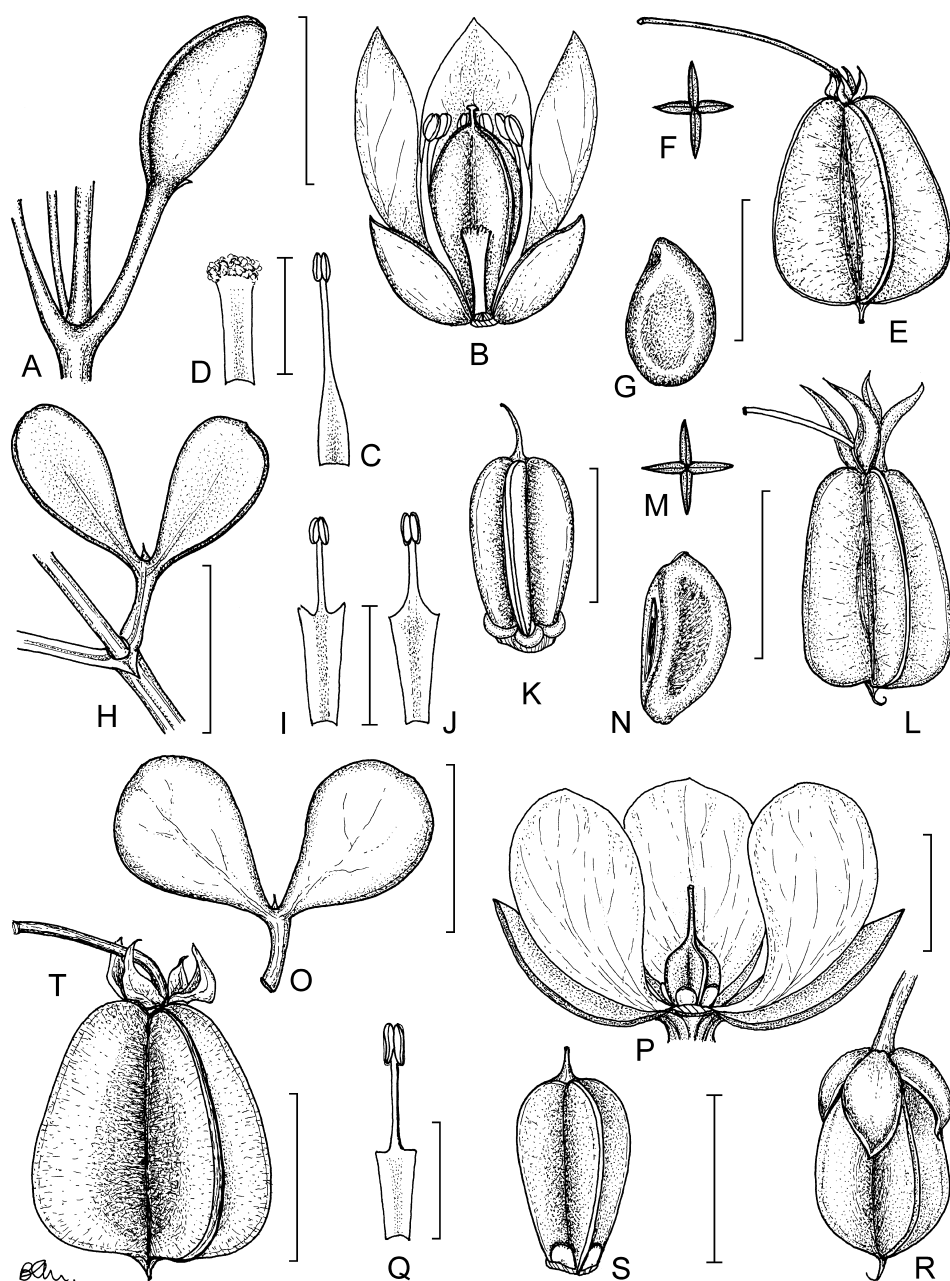


Figure 82. *Zygophyllum*. A–G, *Z. compressum*. A, leaf; B, flower, 1 petal and 2 stamens removed; C, stamen; D, disc or nectary; E, fruit; F, T.S. of fruit; G, seed (A–G, R.Chinnock 1697, AD). H–N, *Z. glaucum*. H, leaf; I, J, stamens, showing variation in wing shape; K, young fruit with basal disc lobes or nectaries; L, mature fruit; M, T.S. of fruit; N, seed (H, I, M.Fagg 439, AD; J, P.G.Wilson 1555, AD; K–N, R.Bates 20692, AD). O–T, *Z. crassissimum*. O, leaf; P, flower, 1 petal removed; Q, stamen; R, young fruit, calyx not downturned; S, young fruit, calyx removed to show individual disc lobes or nectaries; T, mature fruit (N–S, F.Badman 1345, AD; T, B.Lay 628, AD). Scale bars: A, L, R–T = 10 mm; B, K = 2 mm; C, D = 1 mm; E, P, Q = 5 mm; G = 2.5 mm; H, O = 20 mm; I, J, N = 3 mm. Drawn by B.Chandler.

14. *Zygophyllum crenatum* F.Muell., *Linnaea* 25: 374 (1853)

Z. glaucescens var. *lobulatum* Benth., *Fl. Austral.* 1: 293 (1863); *Roepera crenata* (F.Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: S.A., Cudnaka [Kanyaka], in depressis [subsalsis], Oct. 1851, *F.Mueller s.n.*; syn: MEL95448; S.A., Cudnaka, Rocky creek, Crystal Brook, Akaba, Oct. 1851, *F.Mueller s.n.*; syn: MEL 110968.

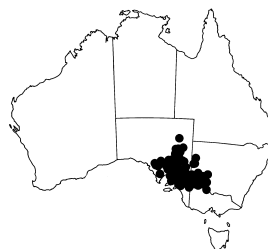
Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 440 (1981).

Spreading, decumbent annual herb, to 25 cm high and 35 cm wide. Leaves with 1 pair of leaflets; petiole flattened, 5.5–21 mm long; leaflets succulent, not appressed to each other, narrowly obovate to obovate, often asymmetrically so, 9–15 mm long, 3.5–11 mm wide, articulated at base, 3-lobed at apex. Pedicel 3–7 mm long in flower, deflexed. Sepals 4, 5.5 mm long. Petals 4, obovate, 8–10.5 mm long, longer than sepals, yellow drying white. Stamens 8; filaments 5 mm long, winged in lower part; wing apex and upper part fringed. Disc sinuate, 8-lobed, succulent, not markedly pubescent on margin. Ovary 4-celled, glabrous, 4-angled, with angles narrowly winged; stigma minutely 4-lobed. Capsule pendent, 4-angled, 4-celled, elliptic, 10–20 mm long, rounded at base and apex; pedicel 6–10 mm long; fruiting style 1–1.5 mm long. Seeds 2–4 per cell, c. 3 mm long, pale brown, smooth, sometimes shining. *Lobed Twin-leaf.* Fig. 81A–F.

Mallee areas, extending from Eyre Penin. in S.A. to Balranald area of N.S.W. and NW Vic. Usually in open areas in disturbed mallee, often besides tracks or in creek beds. Flowers Aug.–Nov.

S.A.: Yalpara Cons. Park, NE corner near entrance, adjoining Yalpara Stn, *G.H.Bell* 1019 (AAU, AD, CANB, NY, PRE, RSA); c. 20 km SSE of Burra, *Hj.Eichler* 18775 (AD, CANB). N.S.W.: Sturt Hwy, 3.5 km W of Euston, *Hj.Eichler* 13928 (AD, B, CANB, COLO). Vic.: Sunny Cliffs, S of Mildura, *A.C.Beauglehole* 16029 (AD).

At first glance easily confused with *Z. kochii* and *Z. hybridum* since the leaflet shape is very similar. In the latter two species floral and fruit parts are in 5s rather than 4s. Leaflets in *Z. kochii* are usually 3-lobed apically as in *Z. crenatum*, but *Z. hybridum* lacks these lobes.

**15. *Zygophyllum glaucum* F.Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 29 (1855)**

Z. glaucescens F.Muell., *Pl. Victoria* 1: 228 (Feb. 1862), *nom. superfl.* [*nom. nov.* for *Z. glaucum* F.Muell. (1855) since it was thought this name was preoccupied by *Z. glaucum* E.Meyer (1843), *nom. nud.*]; *Roepera glauca* (F.Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: Flinders Ra. & Spencers Gul[ph], S.A., Nov. 1851, *F.Mueller s.n.*; lecto: MEL95036, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 68 (1998).

Z. glaucum F.Muell., *Linnaea* 25: 376 (1853), *nom. nud.*

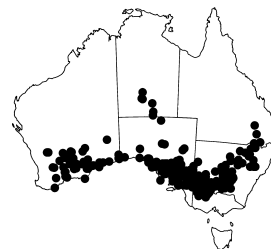
Roepera zygophylloides F.Muell., *Linnaea* 25: 376 (1853), *nom. inval. pro. syn.*

Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 441 (1981).

Spreading, sprawling, perennial or annual, green or dark green herb, 12–40 cm high, 30–80 cm wide. Leaves with 1 pair of leaflets; petiole narrow-flattened, 4–8 mm long; leaflets succulent, not appressed to each other, obovate, 18–52 mm long, 10–31 mm wide, continuous with petiole and not articulated at base, rarely appearing articulated, rounded at apex. Pedicel 3–7 mm long in flower. Sepals 4, 3.5–6.5 mm long. Petals 4, obovate, (5–) 6.5–13 mm long, longer than sepals, bright yellow drying white. Stamens 8; filaments 3–6 mm long, winged in lower half; wing apex with single tooth or truncate or reclinate; margins entire or obscurely toothed. Disc sinuately 4-lobed, entire, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous; stigma capitate, not lobed. Capsule pendent, 4-angled, 4-celled, elliptic or obovate in outline, 10–17 mm long, 6.5–12 mm wide, rounded at apex; pedicel 3–7 mm long; fruiting style 2–3 mm long. Seeds 2–5 per cell, 3.7–4.4 mm long, dark brown with whitish aril along most of one edge. *Pale Twin-leaf.* Fig. 82H–N.

Across dry southern Australia, occurring in all mainland states, and southern N.T. In mallee scrub or coastal cliffs, in calcareous sands or loams. Flowers June–Nov.

W.A.: c. 34 km E of Madura along Eyre Hwy, *Hj.Eichler 19811* (AD). N.T.: near Ormiston Gorge, Heavitree Ra., *C.H.Gittins 2043* (AD, NSW). S.A.: 6 miles [9.6 km] from Maitland on Ardrossan–Maitland Road, *B.Copley 1930* (AD). Qld: 19 km W of St George, *G.W.Trappnell & K.A.Williams 286* (BRI). N.S.W.: Sturt Hwy, 3.5 km W of Euston, *Hj.Eichler 20916* (AAU, AD, AK, B, BA, BAB, CANB, CAS, COLA, DELHI). Vic.: 2 km W of Manangatang rly crossing, towards Ouyen, *Hj.Eichler 24035* (AD).



The shape of the wing of the filament varies in this species.

Plants from the eastern part of the distribution have wings which are clearly toothed apically on either side of the filament (Fig. 82 I) while those from the west have the wing apex (Fig. 82J) either truncate or more usually reclinate with entire or slightly toothed margins. Both wing types occur on Eyre Penin. in S.A., and apparently retain their identity. These differences may prove worthy of some infraspecific ranking with further study.

16. *Zygophyllum crassissimum* Ising, *Trans. & Proc. Roy. Soc. S. Australia* 81: 167, figs 10–14 (1958)

Roepera crassissima (Ising) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: Evelyn Downs, c. 90 miles [154 km] by road SW of Oodnadatta, S.A., 7 Oct. 1954, *E.H.Ising 3746*; holo: AD; iso: AD.

Erect, perennial light blue-green shrub, 30–100 cm high, wider than high. Leaves with 1 pair of usually unequal leaflets; petiole narrowly flattened, 3–10 mm long; leaflets very thick and fleshy, not appressed to each other, asymmetrically obovate or broadly obovate, to 30 mm long, 20 mm wide, continuous with petiole and not articulated at base, obtuse or emarginate at apex. Pedicel 4–8 mm long in flower. Sepals 4, 5.5–6.2 mm long, hyaline along margin. Petals 4, obovate, 6–10 mm long, longer than sepals, yellow or orange drying white. Stamens 8; filaments 4–4.5 mm long, winged; wings 1.2–1.5 mm wide, antisepalous stamens with wing apex truncate and entire or crenulate, antipetalous stamens with wing apex oblique and entire, or both with wings truncate and entire. Disc 4-lobed; lobes free, inversely U-shaped, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous; stigma capitate, not lobed. Capsule pendent, 4-angled, 4-celled, broadly obovate, 10–18 mm long, rounded at apex; pedicel 7–13 mm long; fruiting style 0.5–1.5 mm long. Seeds 1–4 per cell, 3.5–5 mm long, dark brown with cream-white aril along part of one edge. Fig. 82 O–T.

Northern S.A. and southern N.T. in limestone areas, often associated with mound springs or from slopes or ridge tops of sandstone hills. Flowers June–July.

N.T.: c. 4 km NNW of Mt Hitchins summit, *D.E.Albrecht 6264* (NT); New Crown Stn, Beddome Ra., *P.K.Latz 12514* (DNA, NT); c. 1 km E of Mt Brunonia, Deep Well Stn, *B.W.Strong 663* (DNA, NT). S.A.: Copper Hills, *R.J.Bates 19080* (AD); 10 km WNW of Hogarth Hill near vermin fence, *R.J.Chinnock 2566* (AD).

Closely related to *Z. glaucum* but apparently distinct from that species by the stamens with filaments lacking teeth on the wing, the nectary disc of 4 separate inversely U-shaped lobes, the erect woody habit and possibly by the sepals continuing erect in young fruit and by the style length.



Bright orange flowered specimens (e.g. *Chinnock 2566*, *Bates 19080*), referred to by Eichler in manuscript as *Z. 'chinnockii'* belong here. They do not appear to differ in any other character than flower colour.

Iodocarpum sub-group

Fruiting and floral parts in 5s. Flowers solitary or paired at each node. Fruit pendent or erect, elliptic or oblong with rounded corners; apices rounded.

A sub-group of 8 species, found in drier areas of all mainland states and N.T.

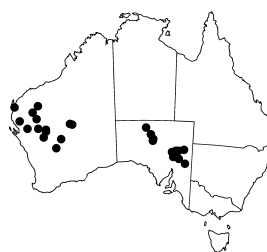
17. *Zygophyllum kochii* Tate, *Trans. & Proc. Roy. Soc. S. Australia* 23: 291 (1899)

Roepera kochii (Tate) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: S.A., Mt Lyndhurst, near Mt Fitton, also near the Trinity well, August 1899, *J. Langley* (herb. *M. Koch* 469); lecto: AD97918101, *vide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 47 (1998); isolecto: AD97904148; possible isolecto: K725161, K725162, BM (photo seen).

Decumbent, spreading, annual herb, 7–20 cm high, to 30 cm wide. Leaves with 1 pair of leaflets; petiole narrowly and equally winged either side, 3.5–17 mm long; leaflets succulent, obovate, often asymmetrically so, 8–17 mm long, 3–10.5 mm wide, usually continuous with petiole and not articulated at base, irregularly (2–) 3 (4–) lobed at apex. Flowers solitary at each node. Pedicel 8–20 mm long in flower, erect. Sepals 5, 3–4 mm long. Petals 5, obovate to spatulate, 5.5–7 mm long, yellow drying white. Stamens 10; filaments 3 mm long, winged below; wing apex oblique, subentire or slightly toothed. Disc 5-lobed; lobes joined, sinuate, succulent, papillose on margin. Ovary 5-angled, 5-celled, glabrous; stigma lobed. Capsule initially pendent, ?becoming erect, 5-angled, 5-celled, transversely broadly oblong with rounded corners, 8–13 mm long, rounded at apex; pedicel 8–19 mm long; fruiting style 0.7–0.8 mm long. Seeds 2 or 3 (–4) per cell, very shiny, smooth. Fig. 83C, D.

Inland W.A. from the Pilbara region to the Flinders Ra., S.A. Found in gravelly clay soils in low lying areas in mulga. Flowers July–Sept.

W.A.: Beefwood Well, Yoothapina Stn, *R.J. Cranfield* 5541 (CANB); NE part of Kennedy Ra., Gascoyne Area, *C. Teichert* 4 (MEL); c. 80 km W of Carnegie on road to Wiluna, *P.G. Wilson* 11987 (CANB, PERTH). S.A.: slopes of hill on N side of Nent Oura Research Unit, Mt Freeling Stn, *G.H. Bell* 1349 (AD); near Andamooka opal field airstrip, *R. Swinbourne* 155 (AD).



Zygophyllum kochii is distinctive in this sub-group by its leaflets being 3-lobed apically. The only other species with apically 3-lobed leaflets is *Z. crenatum* which is 4-merous rather than 5-merous.

18. *Zygophyllum tesquorum* J.M.Black, *Fl. S. Australia* 2: 334 (1924)

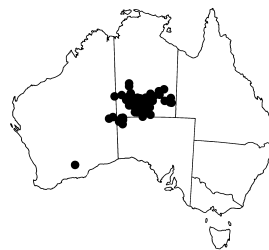
Roepera tesquorum (J.M.Black) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: Deering Ck, S.A., s. dat. [17 June 1894], Anon. [*Tate on Horn Expedition*] s.n.; lecto: AD97918157 LHS specimen, *vide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 44 (1998); isolecto: AD96246172.

Illustration: R.M.Barker, *loc. cit.* 51, fig. 1G.

Decumbent or prostrate, spreading, annual herb, to 20 cm high, to 25 cm wide. Leaves with 1 pair of leaflets; petiole subterete or narrowly winged, 4–10 mm long; leaflets succulent, narrowly obovate, 6.5–15.5 mm long, 2–4.5 mm wide, continuous with petiole and not articulated at base, rounded-acute with fragile acumen. Flowers solitary at each node. Pedicel 3.5–16.5 mm long in flower, erect. Sepals 5, 2.5–3.5 mm long. Petals 5, narrowly obovate to obovate, 4–6 mm long, longer than sepals, white. Stamens 10; filaments 2–2.5 mm long, winged basally; wing apex oblique and erose. Disc 5-lobed; lobes joined, rarely apparently free in some flowers, sinuate, succulent, papillose on margin. Ovary 5-angled, 5-celled, glabrous; stigma minute, lobed. Capsule pendent initially, ?eventually erect, 5-angled, 5-celled, elliptic, rarely broadly so, 6–10 mm long, rounded at apex; pedicel 9–21 mm long; fruiting style 0.5–1.1 mm long. Seeds 1 or 2 per cell, smooth, black or dark brown, not shiny. Fig. 83L, M.

Confined to southern N.T. and just into S.A. (Deering Hills) and W.A. (Rawlinson Ra.), possibly also in the Norseman and Queen Victoria Spring areas of W.A. Found in disturbed areas, often in calcareous soils with *Acacia kempeana*, *Triodia longiceps* and *Atalaya hemiglauca*. Flowers July–Sept.

W.A.: 37 km WNW Queen Victoria Spring, *D.J.Pearson 1728* (PERTH).
 N.T.: 47 km from Glen Helen turnoff, 12 km before Ellery Ck crossing,
Hj.Eichler 22638 (CANB, MEL); 40 km SE Alice Springs, *P.K.Latz 5147*
 (CANB, MEL, NT); 1.7 miles [2.7 km] E Corroboree Rock, Ross Hwy,
D.J.Nelson 2211 (AD, B, CANB, DNA, K, MO, NT, PAUH). S.A.: Mt Davies
 Rd, c. 145 km W of Musgrave Park Stn and c. 50 km W of Piltady Camp,
J.Z.Weber 220 (CANB).



Depauperate specimens from the Norseman area and from Queen Victoria Spring area (e.g. *Pearson 1728*) in W.A. may be a disjunct occurrence of *Z. tesquorum*.

Zygophyllum tesquorum is the only species in this group to have white petals rather than yellow petals drying white (David Albrecht, pers. comm.), a characteristic which it appears to share only with *Z. ammophilum* (q.v.) and *Z. simile* of the Australian species. It is very similar in habit to *Z. iodocarpum* and *Z. kochii*, but can be distinguished from *Z. iodocarpum* by its larger flowers, non-globular capsules and long pedicels in flower and fruit and from *Z. kochii* by its entire and narrower leaflets. *Zygophyllum tesquorum* plants are also more delicate, the capsule generally smaller and the petiole subterete in comparison to *Z. kochii* plants.

19. *Zygophyllum lobulatum* (Benth.) H.Eichler in R.M.Barker, *J. Adelaide Bot. Gard.* 17: 168 (1996)

Z. iodocarpum var. *lobulatum* Benth., *Fl. Austral.* 1: 293 (1863); *Roepera lobulata* (Benth.) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: W.A., Champion Bay [Thonunoko], s. dat., *Oldfield s.n.*; lecto: MEL, fide R.M.Barker, *J. Adelaide Bot. Gard.* 18: 46 (1998); islecto: K p.p.

Decumbent, spreading, annual herb, to 15 cm high, to 30 cm wide. Leaves with 1 pair of leaflets; petiole subterete or narrowly and equally winged either side, 10–11 mm long; leaflets succulent, narrowly elliptic, usually with a lobe on outer side near base, 7–12.5 mm long, c. 2–2.5 mm wide, continuous with petiole and not articulated at base, unlobed or irregularly 2- or 3-lobed at apex. Flowers solitary at each node. Pedicel 5–11 mm long in flower, erect. Sepals 5, 3–4 mm long. Petals 5, obovate to spatulate, 2–4 mm long, just longer than sepals, yellow drying white. Stamens 10; filaments 2 mm long, winged below; wing apex tapering, irregularly toothed. Disc 5-lobed; lobes free, semicircular. Ovary 5-angled, 5-celled, glabrous; stigma lobed. Capsule pendent, 5-angled, 5-celled, broadly elliptic to circular, 5–6 mm long, rounded at apex; pedicel 10–12 mm long; fruiting style 0.5 mm long. Seeds 1 or 2 per cell, very shiny, smooth. Fig. 83H–J.

On the W coast of W.A. from Swan R. to Coral Bay. Flowers July–Sept.

W.A.: S of Coral Bay, *Hj.Eichler 23622* (AD, CANB, NSW, PERTH); Mendel via Mullewa, Sept. 1953, *G.L.Throssell s.n.* (PERTH); 14 km S of Kalbarri, *D. & B.Bellairs 2181* (PERTH).

Zygophyllum lobulatum is probably not sustainable at species level. The lobe at the base of the leaflet on the outer side is distinctive when present, but apart from this character there are few distinguishing features to separate *Z. lobulatum*, *Z. retivalve* and *Z. kochii*. Further study and field observations are needed to clarify the status of these currently recognised species.



20. *Zygophyllum retivalve* Domin, *Biblioth. Bot.* 89: 281 (1926)

Roepera retivalvis (Domin) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: Between the Ashburton and De Gray rivers, W.A., s. dat., *E.Clement s.n.*; lecto: PR, fide R.M.Barker, *J. Adelaide Bot. Gard.* 18: 49 (1998); islecto: K725175.

Z. sp. 1 (Karratha, Coral Bay, *H.Eichler 23621*), *J.D.Briggs & J.H.Leigh, Rare Threatened Austral. Pl.* 188 (1995).

Z. sp. Karratha (*J.S.Beard 3508*), *R.M.Barker, loc. cit.*

Decumbent, spreading, glaucous, annual herb, to 12 cm high and 45 cm wide. Leaves with 1 pair of leaflets; petiole subterete or very narrowly winged, 3.5–14 mm long; leaflets

succulent, obovate, 6–18 mm long, (2–) 4–7 mm wide, continuous with petiole and not articulated at base, obtuse-rounded at apex. Flowers solitary at each node. Pedicel 8–14 mm long in flower, erect. Sepals 5, c. 3 mm long. Petals 5, spatulate, 5–6.8 mm long, longer than sepals, yellow drying white. Stamens 10; filaments 2.2–2.4 mm long, winged below; wing tapering and entire or with 1 small apical tooth. Disc 5-lobed; lobes free, semicircular. Ovary 5-angled, 5-celled, glabrous; stigma lobed. Capsule pendent (to erect), 5-angled, 5-celled, broadly elliptic to circular, 7–11 mm long, rounded at apex; pedicel 10.5–17 mm long; fruiting style 0.5–0.9 mm long. Seeds 1 or 2 per cell, very shiny, smooth. Fig. 83F, G.

Occurs from Karratha S to Hamelin, W.A., mostly near the coast. Recorded from limestone rises and from flat stony clay. Flowers July–Sept.

W.A.: S of Coral Bay, *Hj.Eichler* 23621 (AD, CANB, HO, L, MO, PERTH, NSW); Peg's Ck, Karratha, *P.Glennon* 62 (PERTH); 2 km W of Learmonth, *D.W.Goodall* 1162 (PERTH); E side of Kennedy Ra., *N.S.Lander* 1367 *et al.* (MEL).

This taxon seems to be different from *Z. lobulatum* in the thickness and glaucousness of the leaves and the larger and thicker-walled fruit, but as with that species, it is questionable whether it is deserving of species rank.



21. *Zygophyllum hybridum* Tate, *Trans. & Proc. Roy. Soc. S. Australia* 23: 291 (1899)

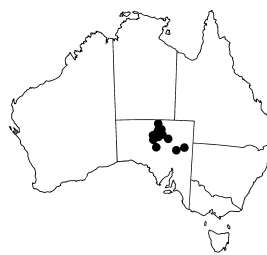
Roepera hybrida (Tate) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: Mount Lyndhurst Run, Far North, S.A., August 1899, *M. Koch* 332; lecto: AD *s.n.*, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 48 (1998); isolecto: BM, K725159, MEL95283, AD97904147; possible isolecto: K725160.

Spreading, decumbent, annual herb, 12–15 cm high, to 25 cm wide. Leaves with 1 pair of leaflets; petiole 10–21 mm long, narrowly winged either side, with wing dilated towards apex; leaflets spreading widely, succulent, elliptic, usually narrowly so, sometimes asymmetric, 10.5–15 mm long, 2.8–4.5 mm wide, lobed at base, continuous with petiole, rounded-obtuse at apex. Flowers solitary at each node. Pedicel 7–16.5 mm long in flower, erect. Sepals 5, 2.2–2.5 mm long. Petals 5, spatulate, c. 3.5 mm long, longer than sepals, yellow drying white. Stamens 10; filaments c. 2 mm long, winged at base; wing toothed. Disc sinuately lobed; lobes joined. Ovary 5-angled, 5-celled, glabrous; style 0.5 mm long; stigma distinctly 5-lobed. Capsule erect, 5-angled, 5-celled, elliptic, 8.3–11.5 mm long, rounded at apex; pedicel 12–18 mm long; fruiting style 0.5 mm long. Seeds 2–5 per cell, 3–3.5 mm long, pale brown, not shining. Fig. 83A, B.

Occurs in the Oodnadatta – Maree region of S.A. Found in clay soil of gibber plains, probably only in very wet years. Flowers May–Aug.

S.A.: Mt Barry Pastoral Lease, on SE side of Oodnadatta–Mt Barry road between Camel Ck and Aloorina Ck crossings, *R.J.-P.Davies* 676 (AD); Allandale Stn, 36 km SW of Oodnadatta, *T.S.Henshall* 3221 (CANB, NT).

A very distinctive species by the shape of the leaves, which have the same shape as those of *Z. kochii* but with the basal lobe of *Z. lobulatum* added - hence the name *Z. hybridum*. Fruits are reputedly erect in this species just as they are reputed to be in *Z. kochii* and *Z. lobulatum*, but this character is in need of confirmation. Both *Z. kochii* and *Z. hybridum* have 4 or 5 ovules per cell while *Z. lobulatum* has only 1 or 2 ovules per cell; seed of *Z. kochii* is black and shiny.



22. *Zygophyllum eichleri* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 50 (1998)

Roepera eichleri (R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: W.A., 91.4 km N of Kumarina Mine, 19 Aug. 1985, *Hj.Eichler* 23578; holo: AD; iso: CANB, MEL, NSW, PERTH.

[*Z. iodocarpum* *auct. non* F.Muell.: H.Eichler, in J.P.Jessop & H.R.Toelken, *Fl. S. Australia* 4th edn, 2: 733 (1986), *p.p.*]

Illustration: R.M.Barker, *op. cit.* 51, fig. 1A–F.

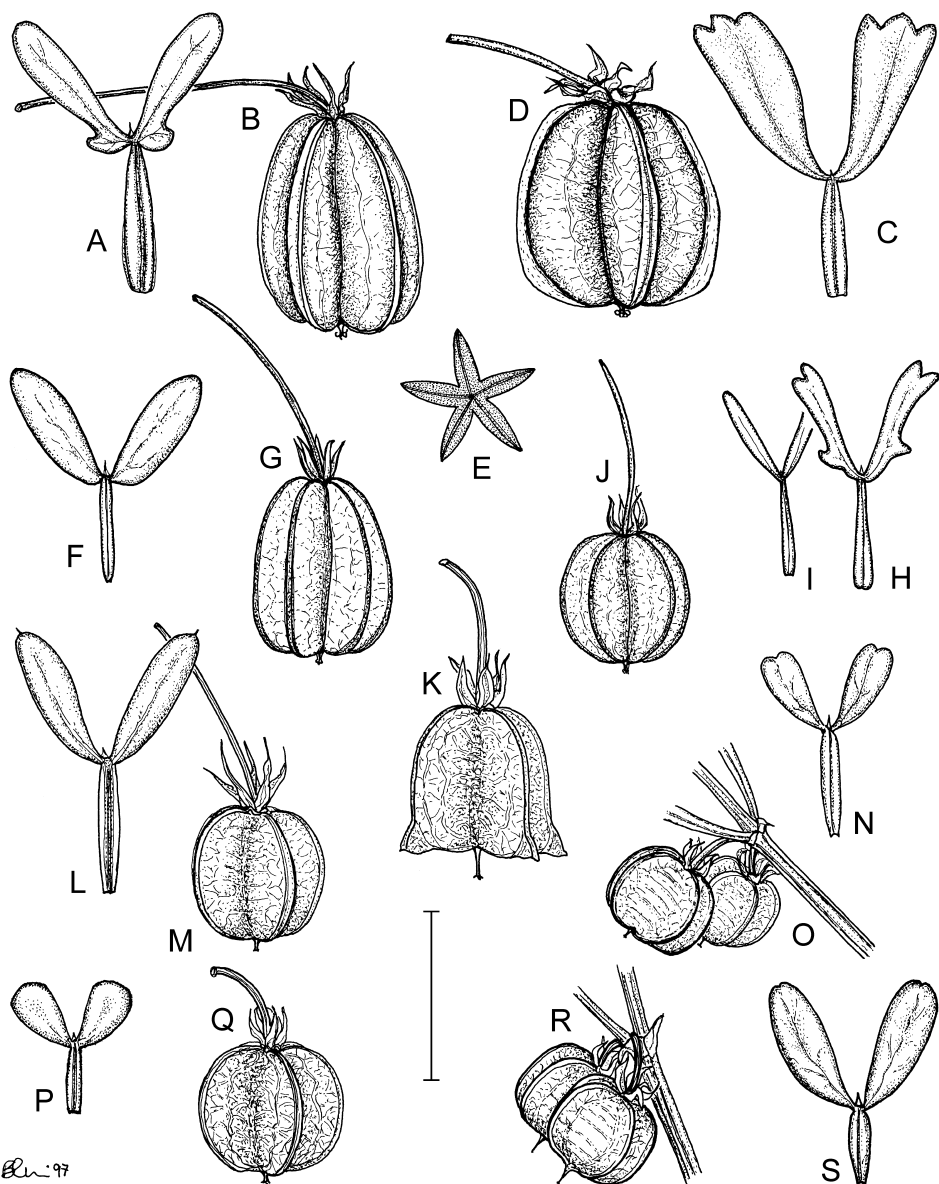
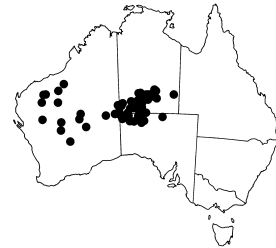


Figure 83. *Zygophyllum*. **A, B**, *Z. hybridum*. **A**, leaf; **B**, fruit (**A**, F.Badman 6987, AD; **B**, M.E.Ballingall 2254, AD). **C, D**, *Z. kochii*. **C**, leaf; **D**, fruit (**C**, T.L.Setter 264, PERTH; **D**, P.G.Wilson 11988, PERTH); **E**, generalised T.S. of 5-lobed fruit. **F, G**, *Z. retivalve*. **F**, leaf; **G**, fruit (**F**, C.J.Nicholson, 2 July 1986, PERTH; **G**, P.Glennon 62, PERTH). **H–J**, *Z. lobulatum*. **H**, older lobed leaf; **I**, younger unlobed leaf; **J**, fruit (**H, I**, D.Bellairs 2181, CANB; **J**, E.Jackson 3108, AD). **K**, *Z. apiculatum*, fruit (R.M.Barker 1279, AD). **L, M**, *Z. tesquorum*. **L**, leaf; **M**, fruit (**L, M**, F.C.Vasek 680914–5, CANB). **N, O**, *Z. iodocarpum*. **N**, leaf; **O**, fruit (**N, O**, R.M.Barker 1120, AD). **P, Q**, *Z. eichleri*. **P**, leaf; **Q**, fruit (**P, Q**, G.Bell 1034, AD). **R, S**, *Z. rowelliae*. **R**, leaf; **S**, fruit (**R, S**, W.R.Barker 5950, AD). Scale bar: **A, C, F, H, I, L, N, P, R** = 15 mm; **B, D, G, J, K, M, O, Q, S** = 10 mm. Drawn by B.Chandler.

Decumbent or prostrate, spreading, annual herb, to 20 cm high, wider than high. Leaves with 1 pair of leaflets; petiole narrowly winged, 5–15 mm long; leaflets succulent, obovate, sometimes broadly so, 5.5–15 mm long, 2.8–8.5 mm wide, continuous with petiole and not articulated at base, rounded-obtuse, sometimes with fragile acumen. Flowers solitary at each node. Pedicel 2–3.5 mm long in flower, erect. Sepals 5, 2–3.5 mm long. Petals 5, obovate to spatulate, 3.7–5.3 mm long, longer than sepals, yellow drying white. Stamens 10; filaments 1.7–2.2 mm long, winged basally; wing apex widened and with an acute tooth either side of filament. Disc 5-lobed, entire, sinuate, succulent, papillose on margin. Ovary 5-angled, 5-celled, glabrous; stigma minute, lobed. Capsule pendent, 5-angled, 5-celled, transversely broadly elliptic, 6.5–8 mm long, rounded at apex; pedicel 2–6.5 mm long; fruiting style 0.5–0.6 mm long. Seeds 1 per cell, smooth, pale to dark brown, not markedly shiny. Fig. 83P, Q.

Found in central Australia from southern N.T. through to Oakover R. and Carnegie region of W.A., and Musgrave and Mann Ra. of S.A. Occurs in rocky areas, often in red sand amongst scattered mulga, or in calcareous areas with *Eucalyptus transcontinentalis*. Flowers June–Sept.

W.A. 9 miles [14.4 km] E of The Gap (Rutters Grave), E of Laverton, *A.S. George 4609* (PERTH). N.T.: 44 km W of Alice Springs (turnoff to Glen Helen), *Hj. Eichler 22636* (CANB, DNA); 15.5 miles [25 km] NW of Lucy Creek Stn, *M. Lazarides 5898* (CANB, DNA). S.A.: c. 6 km ENE of Mt Moulden on track to Kuntjana, *W.R. Barker 3169* (AD); c. 1 km SW of Krewinkel Hill, c. 75 km NW of Mt Lindsay, beside road to Pipalyatjara, *N.N. Donner 6478* (AD).



Zygophyllum eichleri can be distinguished from *Z. tesquorum* by its shorter pedicels in both flower and fruit. It also tends to have wider leaves and the filament wing is toothed at the apex. *Zygophyllum eichleri* has yellow flowers aging white whereas *Z. tesquorum* has white flowers only. The two taxa do co-exist.

The shape of the fruit and length of the pedicel of *Z. eichleri* is similar to that of *Z. iodocarpum*, possibly accounting for the confusion with this species previously. The species can be readily distinguished by the paired fruit at each node in *Z. iodocarpum* while they are single in *Z. eichleri*.

23. *Zygophyllum iodocarpum* F. Muell., *Linnaea* 25: 372 (1853)

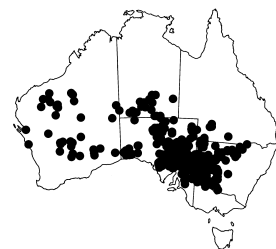
Roepora iodocarpa (F. Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: Cudnaka & Akava, S.A., Oct. [18]51, *F. Mueller s.n.*; lecto: MEL 95286, *fide* R.M. Barker, *J. Adelaide Bot. Gard.* 18: 52 (1998); isolecto: MEL 110970, MEL 110965.

[*Z. hybridum* auct. non Tate: R. Tate, *Trans. & Proc. Roy. Soc. S. Australia* 23: 291 (1899), *p.p.* (only with respect to the Elder Expedition collection from Cootanoorina)]

Illustrations: G.M. Cunningham *et al.*, *Pl. W. New South Wales* 442 (1981); R.M. Barker, *op. cit.* 54, fig. 2G–H.

Semi-prostrate or decumbent, spreading, annual herb, to 16 cm high, wider than high. Leaves with 1 pair of leaflets; petiole flattened, narrowly obovate by presence of wing, 4–20 mm long; leaflets succulent, obovate, sometimes narrowly and asymmetrically so, 5–20 mm long, 2–12 mm wide, appearing articulated with petiole by the constriction of the widened petiole at its apex, emarginate at apex. Flowers paired at each node. Pedicel 2.5–3.5 mm long in flower, ?initially erect, becoming deflexed. Sepals 5, 2.5–3 mm long. Petals 5, obovate, 2.7–3.7 mm long, longer than sepals, yellow drying white. Stamens 10; filaments 1.5–1.6 mm long, winged at base; wing oblong, erose apically. Disc 5-lobed; lobes joined, semicircular. Ovary 5-angled, 5-celled, glabrous; stigma minute, 5-lobed. Capsule pendent, 5-angled, 5-celled, transversely broadly elliptic, 4.5–6 mm long, rounded at apex; pedicel 3–5 mm long; fruiting style 0.2–0.3 (–0.6) mm long. Seeds 1 per cell, smooth, black or dark brown, shiny. *Violet Twin-leaf*. Fig. 83N, O.

Found in the drier areas of all mainland states and N.T. Occurs in open areas, often on clay plains, alluvial flood plains or gibber plains, but also frequently found in bare areas within chenopod shrublands. Flowers Apr.–Aug.



W.A.: c. 47 km NNW of Cocklebidly, *A.S.George 11873* (PERTH). N.T.: Andado Stn, *T.S.Henshall 581* (AUH, CANB, DNA, MO, NT). S.A.: Gregory Ck, 75 km W of Marree, *F.J.Badman 1427* (AD, CBG, MEL). Qld: 18 km NE of Yaralla, *R.W.Purdie 537D* (BRI). N.S.W.: Barrier Ra., c. 1/2 km by road S of Caloola Ck crossing by main Broken Hill–Tibooburra road, *W.R.Barker 2631* (AD). Vic.: Boundary Point, extreme NW corner of Vic., *J.H.Willis s.n.* (MEL 95289).

Diagnostic characters for *Z. iodocarpum* relate to the fruits. These are paired in the axils, shortly pendent, wider than high, often purple-tinged and 5-angled with a very short 5-lobed style.

24. *Zygophyllum rowelliae* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 53 (1998)

Roepora rowelliae (R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: S.A., Arckaringa Hills; c. 9 km by road E of turnoff into Arckaringa HS, then c. 0.9 km N along track and fence line from gate, 26 Aug. 1989, *W.R.Barker 6016*; holo: AD.

[*Z. iodocarpum* auct. non F.Muell.: H.Eichler, in J.P.Jessop & H.R.Toelken, *Fl. S. Australia* 4th edn, 2: 733 (1986), *p.p.*]

Initially erect, becoming decumbent and spreading, annual herb, to 25 cm high, wider than high. Leaves with 1 pair of leaflets; petiole subterete or with narrow wing, 3.5–12 mm long; leaflets succulent, obliquely obovate, 6–25 mm long, 2.5–14 mm wide, articulated at base or continuous with petiole, rounded or emarginate at apex. Flowers paired at each node. Pedicel 1–3 mm long in flower, erect. Sepals 5, c. 3 mm long. Petals 5, obovate, 4–4.7 mm long, longer than sepals, yellow drying white. Stamens 10; filaments 2–2.4 mm long, winged at base; wing oblong, erose apically. Disc 5-lobed, sinuate; lobes joined. Ovary not angled or 5-angled, 5-celled, glabrous; style 1–1.5 mm long; stigma subcapitate, not lobed. Capsule pendent, 5-angled, 5-celled, transversely broadly elliptic, 4–5 mm long, rounded at apex; pedicel 3–5 mm long; fruiting style 1–1.5 mm long. Seeds 1 (2) per cell, 2.5–3.5 mm long, minutely verrucose, black, shiny. Fig. 83R, S.

Found in an area bounded by Noccundra in SW Qld, Coober Pedy in S.A. and Ooraminna, S of Alice Springs in the N.T. Occurs in breakaways and dissected regions, often in gravelly soils. Flowers Apr.–Oct.

N.T.: Beddome Ra., New Crown Stn, *P.K.Latz 6874* (CANB, NT); Ooraminna Ra., *P.K.Latz 13420* (DNA, MEL). S.A.: Evelyn Ck, 3 km E of Copper Hills HS, *F.J.Badman 1055* (AD, CBG, MEL). Qld: 38.4 km SSE of Noccundra, *D.E.Boyland 3128* (BRI).



Very closely related to *Z. iodocarpum*, of which it may well represent an outcrossing variant. Distinct from that species by the somewhat larger flowers and longer style with undivided stigma, visible in both flowers and fruits. None of the specimens seen had the red-purple blush so commonly associated with the fruits and branches of *Z. iodocarpum*. Other characters by which it differs are the tendency to have a subterete petiole and the paired flowers often at different stages of development.

Non-capsular Group

Fruits with 3 or 4 vertical wings, dispersed entire or breaking into single winged fruitlets.

The following group of species, characterised by their winged fruits, may eventually be recognised as distinct as foreshadowed by H.J.Eichler in his manuscripts and discussed in Barker (1996). Should this happen the name *Roepora* would apply to them and not to the non-winged group of species as proposed by Beier *et al.* (2003).

Howittii sub-group

Floral and fruiting parts in 3s, except for 4 sepals and, rarely, 4 petals, and fruit reduced to 1 cell by abortion of 2 of the cells. Flowers solitary at each node. Fruit dispersed entire, not dissociating into fruitlets.

A single species, occurring in drier parts of S.A., N.T., Qld and N.S.W.

25. Zygophyllum howittii F.Muell., *Fragm.* 3: 150 (1863)

Roepera howittii (F.Muell.) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: Sandy country near Wills Ck [Diamantina R. near Salmonville, 14 miles upstream from Birdsville, Qld], [July, 1862], *Dr. J. Murray [Howitt's expedition]*; lecto: MEL, *fide* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 66 (1998); isolecto: K725173, K725171 *p.p.*

Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 441 (1981).

Prostrate or ascending, spreading, annual herb or shrub, to 50 cm high and 30 cm wide. Leaves with 1 pair of leaflets; petiole flattened and leaf-like, 4–17 mm long, connate-perfoliate (opposite pairs joined at base and encircling stem); leaflets not succulent, oblong (tongue-shaped), 2–12 mm long, 2–4 mm wide, continuous with petiole and not articulated at base, rounded at apex. Pedicel 3–6 mm long in flower. Sepals 4 (somewhat unequal by one being larger), 2 mm long. Petals 3 (4), obovate, 2–2.5 mm long, slightly longer than sepals, yellow drying white. Stamens 6; filaments 1.5 mm long, not winged, slightly dilated at very base. Disc lobes 3; lobes free, wider than high. Ovary 3-angled, 3-celled, glabrous; stigma capitate, obscurely 4-lobed. Fruit 3-winged, 1-celled by abortion, 10–19 mm long, 16–18 mm wide, deeply emarginate at apex; pedicel 4.5–6 mm long; fruiting style 0.2 mm long. Seeds 1 (2) per fruit, fusiform, triangular in T.S., 6–7 mm long, covered with mucous hairs which expand on wetting. *Clasping Twin-leaf*. Fig. 88A–H.

Occurs in drier parts of S.A., N.T., Qld and N.S.W. Usually found in sandy areas. Flowers Aug.–Oct. predominantly, rarely as early as May or as late as Nov.

N.T.: Simpson Desert, *P.K.Latz 4382* (AD, CANB, DNA, NT, MO). S.A.: 30 km W of William Ck on Coober Pedy road, *F.J.Badman 1334* (AD, CANB, HO, MEL); near salt lake, c. 48 km NE of Frome Downs HS, *D.J.Whibley 3487* (AD, STD, TI, W). Qld: Mt Howitt, 110 miles [176 km] W of Eromanga, *S.T.Blake 11991* (AD, BRI). N.S.W.: W side of Yantara L., *R.J.Chinnock 3444* (AD, HO).



The only *Zygophyllum* species to have some of its parts in 3s and opposite pairs of leaves joined at the base. As with many *Zygophyllum* species, fruits often have a reddish purple tinge.

Fruticulosum sub-group

Flowers and fruits 4-merous. Flowers solitary at each node. Fruit dispersed without dissociating into single winged fruitlets.

A sub-group of 3 species from coastal to central southern Australia.

26. Zygophyllum fruticulosum DC., *Prodr.* 1: 705 (1824)

Roepera fruticulosa (DC.) G.Don, *Gen. Hist.* 1: 770 (1831); *Roella fruticulosa* (DC.) Hereman in J.Paxton, *Paxton's Bot. Dict.* 2nd edn, 486 (1868). T: Nouvelle hollando, cote orient, 1821, *Mus. de Paris s.n.*; holo: G-DC (microfiche seen).

Roepera fabagifolia A.Juss., *Mem. Mus. Hist. Nat.* 12: 525, pl. 15, no. 3 (1825); *nom. illeg. Z. fruticosum* in syn.; *Z. fabagifolium* (A.Juss.) Baill., *Hist. Pl.* 4: 417 (1873), *nom. illeg.*

Spreading, ?perennial shrub, to 1.2 m high and 3 m wide, sometimes sprawling on other plants. Leaves with 1 pair of leaflets; petiole apparently terete to somewhat flattened, 5–15 mm long; leaflets succulent, narrowly ovate to ovate, 10–30 mm long, 1–6.5 mm wide,

articulated at base, acute to narrowly acute. Pedicel 4–7 mm long in flower, erect. Sepals 4, c. 3.5 mm long. Petals 4, spatulate, 5.2–7 mm long, longer than sepals, yellow drying white. Stamens 8; filaments 2.9–3.7 mm long, not winged, slightly dilated at very base. Disc 4-lobed; lobes free or joined, semicircular. Ovary 4-winged, 4-celled, glabrous; stigma minute, obscurely 4-lobed. Fruit pendent, 4-winged, 4-celled, not breaking into single winged fruitlets, transversely broadly elliptic, 11–25 mm long, rounded with deeply emarginate apex; wings with widely spaced reticulate venation; pedicel 4–13.5 mm long; fruiting style 1.3–1.8 mm long. Seeds (0) 1 (2) per cell, 5–5.5 mm long, 1.5–2 mm wide, brown, finely pitted by presence of layer of hygroscopic hairs all over. Fig. 84 I, J.

Coast and islands of W.A. from Perth to Onslow. Occurs in sand dunes and cliffs, often over limestone. Occasional inland records are from saline plains on lake margins. Flowers July–Sept., with fruits persisting until the end of the year.

W.A.: Dongara Beach, *Hj.Eichler* 21983 (AD, CANB, NSW, HO, L); 20 km N of Gascoyne Jctn, *J.W.Green* 5399 (CANB, PERTH); Zuytdorp Cliffs, Tamala Stn, *L.A.S.Johnson* 9381 & *B.G.Briggs* (CANB, NSW, PERTH); 36 km S of Dongarra, *R.W.Johnson* 3343 (BRI, K, PERTH); Exmouth, *J.Z.Weber* 4994 (AD, PERTH).

Z. fruticosum is distinguished from the rest of the *Z. aurantiacum* sub-group by its distinctly articulated leaves, predominantly coastal locality and large fruits with reticulate rather than parallel venation on the wings.



27. *Zygophyllum reticulatum* H.Eichler ex R.M.Barker, *J. Adelaide Bot. Gard.* 18: 57 (1998)

Roepera reticulata (H.Eichler ex R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: Boulder–Kambalda Rd, 16.8 km from Boulder P.O., W.A., 14 Sept. 1995, *R.M.Barker* 1260; holotype: AD.

[*Z. fruticosum* var. *eremaeum* auct. non Diels.: J.M.Black, *Fl. S. Australia* 2nd edn, 2: 489 (1948), p.p.]

[*Z. eremaeum* auct. non (Diels) Ostenf.: H.Eichler in J.P.Jessop & H.R.Toelken, *Fl. S. Australia* 4th edn, 2: 732 (1986), p.p.]

[*Z. aurantiacum* auct. non (Lindl.) F.Muell.: H.Eichler, *op. cit.* 730, p.p.]

Illustration: R.M.Barker, *J. Adelaide Bot. Gard.* 17: 163, fig. 4A–D (1998).

Annual shrubs, 25–40 cm high and 30–40 cm wide, or climbing in other vegetation and up to 2 m high. Leaves with 1 pair of leaflets; petiole flattened, 3–8 (–12) mm long, similar width to leaflets; leaflets succulent, narrowly oblong, 4.5–12 (–25) mm long, 0.9–1.5 (–2) mm wide, continuous with petiole, acute. Pedicel 2.5–3.5 (–7) mm long in flower, erect. Sepals 4, 3–4.5 mm long, often purple. Petals 4, obovate, usually distinctly clawed, 3.3–5 (–6.2) mm long, longer than sepals, yellow drying white. Stamens 8; filaments 2.2–2.5 (–3.7) mm long, gradually dilated to base, not winged, without appendages. Disc 4-lobed; lobes free, semicircular, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous; stigma usually distinctly 4-lobed, rarely entire. Fruit pendent, 4-winged, 4-celled, not breaking into single winged fruitlets, ± circular to transversely elliptic, 11–15 mm long, 7.5–22 mm broad, rounded or truncate with shallowly emarginate apex; wings with widely spaced reticulate venation; pedicel 3.5–7 (–9.5) mm long in fruit; fruiting style 0.6–1 (–1.8) mm long. Seeds 0 or 1 per cell (1 (2) per fruit), mostly immature, c. 5 mm long, pale brown with hygroscopic hairs all over. Fig. 84K.

Mainly recorded from an area E of Wiluna and from the Kalgoorlie area in W.A., with a few collections from the Nullarbor Plain and a number of collections from the Port Augusta area in S.A. Minimal ecological information is noted but the species is recorded from mallee and spinifex in red sand over limestone. Flowers Aug.–Oct.

W.A.: 30 km ESE of Sinclair Soak, c. 75 km NE of Norseman, *K.Newbey* 6919 (PERTH); 19 km N of Menzies, *P.G.Wilson* 7207 (AD, PERTH); near Warren Bore, c. 200 km N of Laverton, *P.G.Wilson* 7407 (AD, PERTH). S.A.: Redcliff Petrochemical area, 25 km SE of Port Augusta, *R.J. & S.Chinnock* 1411 (AD, G, H, PH, PRE, TI, US).



A variable species with respect to a number of characters. These are discussed and illustrated more fully in Barker *op. cit.* 58–59.

Despite the number of fruits present on most specimens, mature seeds are rarely found.

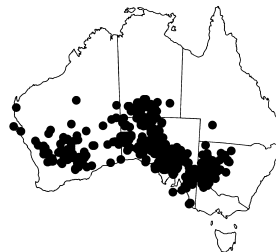
28. *Zygophyllum eremaeum* (Diels) Ostenf., *Biol. Meddel. Kongel. Danske Vidensk. Selsk.* 3: 76, Textfig. 11 b (1921)

Z. fruticulosum var. *eremaeum* Diels in F.L.E. Diels & E. Pritzel, *Bot. Jahrb. Syst.* 35: 315 (1904); *Z. aurantiacum* var. *eremaeum* (Diels) H. Eichler, *Taxon* 12: 297 (1963); *Roepera eremaea* (Diels) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: Austin district, near Murrinmurrin, W.A., s. dat., *W.J. George s.n.*; syn: B n.v.; Coolgardie district, near Kalgoorlie, W.A., Nov., *L. Diels 1684*; syn: B n.v.

Decumbent or scrambling, sometimes on other shrubs, perennial herb, to 50 cm high, wider than high. Leaves with 1 pair of leaflets; petiole subterete, flattened in older leaves, 0.5–10 mm long; leaflets succulent, linear, 1.5–30 mm long, 0.5–1.5 mm wide, continuous with petiole, acute. Pedicel 2.5–5 mm long in flower, erect. Sepals 4, 3–4 mm long. Petals 4, obovate to spatulate, 3–4.2 (–5.5) mm long, slightly longer than sepals, yellow drying white. Stamens 8; filaments 2–2.5 (–3.5) mm long, not winged, without appendages. Disc 4-lobed; lobes free, semicircular, succulent, papillose on margin. Ovary 4-winged, 4-celled, glabrous; style 0.8–1.3 mm long; stigma minutely capitate, not lobed. Fruit pendent, 4-winged, 4-celled, subcircular to transversely broadly elliptic, 7–8.8 mm long, rounded and shallowly emarginate at apex, not dissociating (1 seed per fruit); wings with very close reticulate venation appearing parallel; pedicel 6–7.5 mm long; fruiting style (0.6–) 0.8–1.3 mm long. Seeds (3.5–) 5–5.7 mm long, brown. Fig. 84L, M.

Found in southern Australia in all mainland states and N.T. Usually found in sand, often in calcareous areas, in mulga woodland and mallee. Flowers July–Oct.

W.A.: NE edge of Kalgoorlie, along Austral Rd before rly crossing, *Hj. Eichler 23536* (CANB, PERTH). N.T.: The Sedimentary, N Mt Olga, *P.K. Latz 5755* (CANB, DNA, M, NSW). S.A.: R. Murray, c. 1 km N of Murtho Park, *W.R. Barker 3965* & *R.M. Barker* (AD, HBG, HO). Qld: on “Tarko”, c. 35 miles [56 km] SW of Eulo, *M. Law 67B* (BRI). N.S.W.: Wilcannia, *L. Richley 1190* (AD). Vic.: Sunset Country, 9.7 km E of Last Hope Tank at Bladder Salt Bush Plain, *G.R. Lucas 321* (AD, CANB, HO, MEL).



For notes on variation in this species, see Barker, *J. Adelaide Bot. Gard.* 18: 63 (1998).

Aurantiacum sub-group

Floral and fruiting parts in 4s. Flowers solitary at each node. Fruit breaking into single winged fruitlets for dispersal.

3 species, in drier areas of all mainland states.

29. *Zygophyllum tetrapterum* H. Eichler ex R.M. Barker, *J. Adelaide Bot. Gard.* 17: 163 (1996)

Roepera tetraptera (H. Eichler ex R.M. Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 32 (2003). T: c. 27 km WSW of Menzies along the road to Diemals, at edge of salt swamp, Austin District, W.A., 11 Sept. 1982, *Hj. Eichler 22993*; holo: CANB.

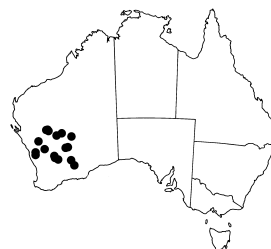
Illustrations: R.M. Barker, *J. Adelaide Bot. Gard.* 17: 165, fig. 1H–J (1998); R.M. Barker, *op. cit.* 18: 56, fig. 3E–G (1998).

Decumbent, compact, light green, perennial shrub, 7–22 cm high, 20–30 cm wide. Leaves with 1 pair of leaflets; petiole flattened, 2.5–13 mm long, similar width to leaflets; leaflets succulent, oblong, 2–11 mm long, 0.8–1.8 mm wide, continuous with petiole, obtuse-rounded at apex. Pedicel 3–4 mm long in flower, erect. Sepals 4, c. 3 mm long. Petals 4, obovate

(lacking claw), 2.2–3.3 mm long, shorter than or just exceeding sepals, yellow drying white. Stamens 8; filaments 1.5–1.7 mm long, gradually dilated to base, without appendages. Disc 4-lobed; lobes free, oblong. Ovary 4-winged, 4-celled, glabrous, rarely papillose; style 0.1–0.2 mm long; stigma minute, 4-lobed. Fruit pendent, 4-winged, cordate, broadly elliptic with deeply emarginate apex, 9–10 mm long, breaking into 4 single-winged fruitlets, rounded at apex; wings with reticulate venation; pedicel 4.5–6 mm long; fruiting style 0.1–0.2 mm long. Seeds 1 or 2 per cell, elliptic, 4.7 mm long, pale brown, finely pitted. Fig. 84F–H.

Found N of the Great Eastern Hwy in W.A. between Southern Cross and Coolgardie, at least as far N as Agnew and Meekatharra. Occurs in samphire flats at edge of salt lakes on gypsum. Flowers Aug.–Oct.

W.A.: Great Northern Hwy, L. Anneen, SW of Nannine, between Cue and Meekatharra, *R.M.Barker 1062A* (AD); 29 km NE of Menzies along the road to Leonora, *Hj.Eichler 22989* (MEL); L. Miranda, S end, 35 km N of Agnew, *Hj.Eichler 23561* (AD, CANB, PERTH); c. 7 km N of vermin proof fence in Hamersley L. region (c. 76 km from Bullfinch along road to Mt Jackson), *P.S.Short 1988* (AD, CANB, MEL, PERTH).



Zygophyllum tetrapterum is distinguishable from the rest of the *Z. aurantiacum* sub-group by its distribution, the petals of similar length to the sepals, the 4 oblong disc lobes and by the tiny style and 4-lobed stigma.

Zygophyllum tetrapterum is easily confused with *Z. halophilum* which has a more southerly distribution in the L. Bryde, Bullfinch and Peak Charles area of W.A. *Zygophyllum halophilum* differs from *Z. tetrapterum* by having a semicircular rather than oblong disc, petals longer than the sepals and longer styles, 0.5–0.7 mm long.

30. *Zygophyllum halophilum* R.M.Barker, *J. Adelaide Bot. Gard.* 18: 55 (1998)

Roepera halophila (R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 31 (2003). T: W.A., Coolgardie Esperance Hwy, 13.5 km NW of Norseman by road, 14 Sept. 1995, *R.M.Barker 1269*; holo: AD; iso: CANB, PERTH.

[*Z. tetrapterum* auct. non H.Eichler ex R.M.Barker: R.M.Barker, *J. Adelaide Bot. Gard.* 17: 164 (1996), p.p.]

Illustration: R.M.Barker, *J. Adelaide Bot. Gard.* 18: 56, fig. 3A–D (1998).

Decumbent, compact, perennial shrub, 12–20 cm high, 20–30 cm wide, often with reddish foliage. Leaves with 1 pair of leaflets; petiole flattened, 4.5–15 mm long, similar width to leaflets; leaflets succulent, oblong, 4–17 mm long, 1–2.5 mm wide, continuous with petiole, obtuse-rounded at apex. Pedicel 3–4 mm long in flower, erect. Sepals 4, 2.3–2.8 mm long. Petals 4, obovate, 3–3.7 mm long, longer than sepals, yellow drying white. Stamens 8; filaments gradually dilated to base, without appendages. Disc 4-lobed; lobes free, semicircular, succulent, papillose on margin. Ovary 4-winged, 4-celled, glabrous, often moderately papillose; style 0.5–0.7 mm long; stigma minute, 4-lobed. Fruit pendent, 4-winged, cordate, broadly elliptic with deeply emarginate apex, 7–10 mm long, breaking into 4 single-winged fruitlets, rounded at apex; wings with reticulate venation; pedicel 4.5–6 mm long; fruiting style 0.5–0.7 mm long. Seed 1 per cell, elliptic, 3.4–3.6 mm long, pale brown, finely pitted. Fig. 84A–E.

Occurs along the Great Eastern Hwy and Coolgardie–Esperance hwy in W.A. between Southern Cross and Scaddan and along the Eyre Hwy as far as Balladonia. Outlier collections come from Serpentine L. in S.A. and from Peak Charles in W.A. and it is likely that the species occurs in the intervening areas. Found in or on edges of salt lakes. Flowers Aug.–Oct.

W.A.: 14 km due S of Peak Charles, 9.54 km S of Peak Charles Rd on Fields Rd, *M.A.Burgman 3680* (PERTH); Bullfinch, *R.J.Cranfield s.n.* (PERTH); Lake Bryde Res., *K.Newbey 5170* (PERTH); 21 km NE of Scaddan, *P.van der Moezel 132* (PERTH). S.A.: Connie Sue Hwy, adjacent to Serpentine L., *D.E.Symon 012575* (AD, B, CANB).



Although obviously closely related, *Z. halophilum* is distinguishable from *Z. tetrapterum* by its longer style length, petals longer than the sepals and the semicircular rather than oblong disc. In addition this species seems to have the capacity to become woody and perennial.

31. *Zygophyllum aurantiacum* (Lindl.) F.Muell., *Linnaea* 25: 376 (1853)

Roepera aurantiaca Lindl., *Bot. Reg.* 24: Misc. p. 57, No. 105 (1838); *Z. fruticosum* var. *bilobum* Benth., *Fl. Austral.* 1: 294 (1863); *Z. fruticosum* var. *aurantiacum* (Lindl.) F.Muell. & Tate, *Trans. Roy. Soc. S. Australia* 16: 337 (1896). T: s. loc. [Interior of New Holland], 11 May [1836], *Major Mitchell's Expedition 182[3]6*; lecto: CGE *p.p.* fide R.M.Barker, *J. Adelaide Bot. Gard.* 18: 60 (1998); s. loc., 11 May [1836], *Mitchell's journey 142*; ?isolecto: MEL, possibly *p.p.*

[*Z. fruticosum* auct. non DC.: J.M.Black, *Fl. S. Australia* 2: 334 (1924)]

Illustration: G.M.Cunningham *et al.*, *Pl. W. New South Wales* 439 (1981).

Low, spreading, straggly but intricately branched, woody but brittle undershrub, usually 30–50 cm high, to 1 m wide, occasionally sprawling in other shrubs. Leaves sessile and simple or petiolate and with 2 leaflets, but petiole varying in length and width; leaflets succulent, continuous with petiole, obtuse, truncate, emarginate or, rarely, 3-lobed at apex. Pedicel 3–14.5 mm long in flower, erect. Sepals 4, 4–7.5 mm long. Petals 4, obovate, clawed, 5.5–11 mm long, longer than sepals, yellow drying white. Stamens 8; filaments 3.5–5.2 mm long, unequal, not winged, without appendages. Disc 4-lobed; lobes free, semicircular, succulent, papillose on margin. Ovary 4-angled, 4-celled, glabrous; style 2.2–5.5 mm long; stigma minutely capitate, not lobed. Fruit pendent, 4-winged, 4-celled, subcircular to transversely broadly elliptic, 8–20 mm long, rounded but deeply emarginate at apex, breaking into 4 single winged fruitlets; wing with very closely spaced reticulate venation, appearing almost parallel when dry; pedicel 9.5–15 mm long; fruiting style 2.6–5 mm long. Seed 0 or 1 per cell, linear to narrowly elliptic, 3.2–5.6 mm long, pale brown. *Shrubby Twin-leaf*.

Occurs in all mainland states and N.T. in drier areas. Found in sand, usually associated with mallee scrubs. Flowers predominantly July–Oct. for all of the subspecies, with records outside these months being due to summer rains. There are 4 subspecies.

Zygophyllum aurantiacum is a variable species with respect to leaf and petiole ratios. The typical subspecies is always petiolate with 2 leaflets to give a Y-shape, but the other subspecies are a variation of this Y-shape. In subsp. *verticillatum* the lobing is to the base of the leaf so that the leaf is apparently sessile and there appear to be 4 simple leaves at a node; subsp. *simplicifolium* is unlobed or virtually so at the apex and so appears to either be a simple, sessile leaf with an emarginate apex or an extremely long-petioled leaf with 2 very short leaflets, while subsp. *cuneatum* maintains the Y-shape but is much more flattened and broader than the typical subspecies (see fig. 84). These leaf differences are associated with soil type, with the 3 atypical subspecies associated with gypseous or calcareous areas; they are the only obvious distinction between the subspecies and intermediate leaf types are common.

Distinct from *Z. eremaeum* by the dissociation of its fruits, a character which is not always easily determined in young fruit. The size of the flowers and the length of the style, more than 2.5 mm in the *Z. aurantiacum* sub-group compared with 1 mm in *Z. eremaeum*, are characters which are more easily used for distinguishing between the species.

- | | | |
|--|---|--|
| 1 | Leaves with distinct petioles and leaflets (Y-shaped) (widespread in drier areas, central Australia) | 31a. subsp. <i>aurantiacum</i> |
| 1: Leaves apparently simple and lacking either petiole or leaflets | | |
| 2 | Leaves flattened, cuneate or orbiculate (Victoria Desert, W.A.; L. Eyre, Gairdner-Torrens and Flinders Ra., S.A.; W Qld) | 31c. subsp. <i>cuneatum</i> |
| 2: Leaves subterete | | |
| 3 | Leaves simple, entire or bilobed only at very apex, 2 per node (gypseous areas: Simpson Desert, Nullarbor to Gawler Ranges, NW Eyre Penin., S.A.; N.T.) | 31b. subsp. <i>simplicifolium</i> |
| 3: | Leaves bilobed from base, apparently 4 per node (L. Eyre, Gairdner-Torrens and Flinders Ra., S.A.) | 31d. subsp. <i>verticillatum</i> |

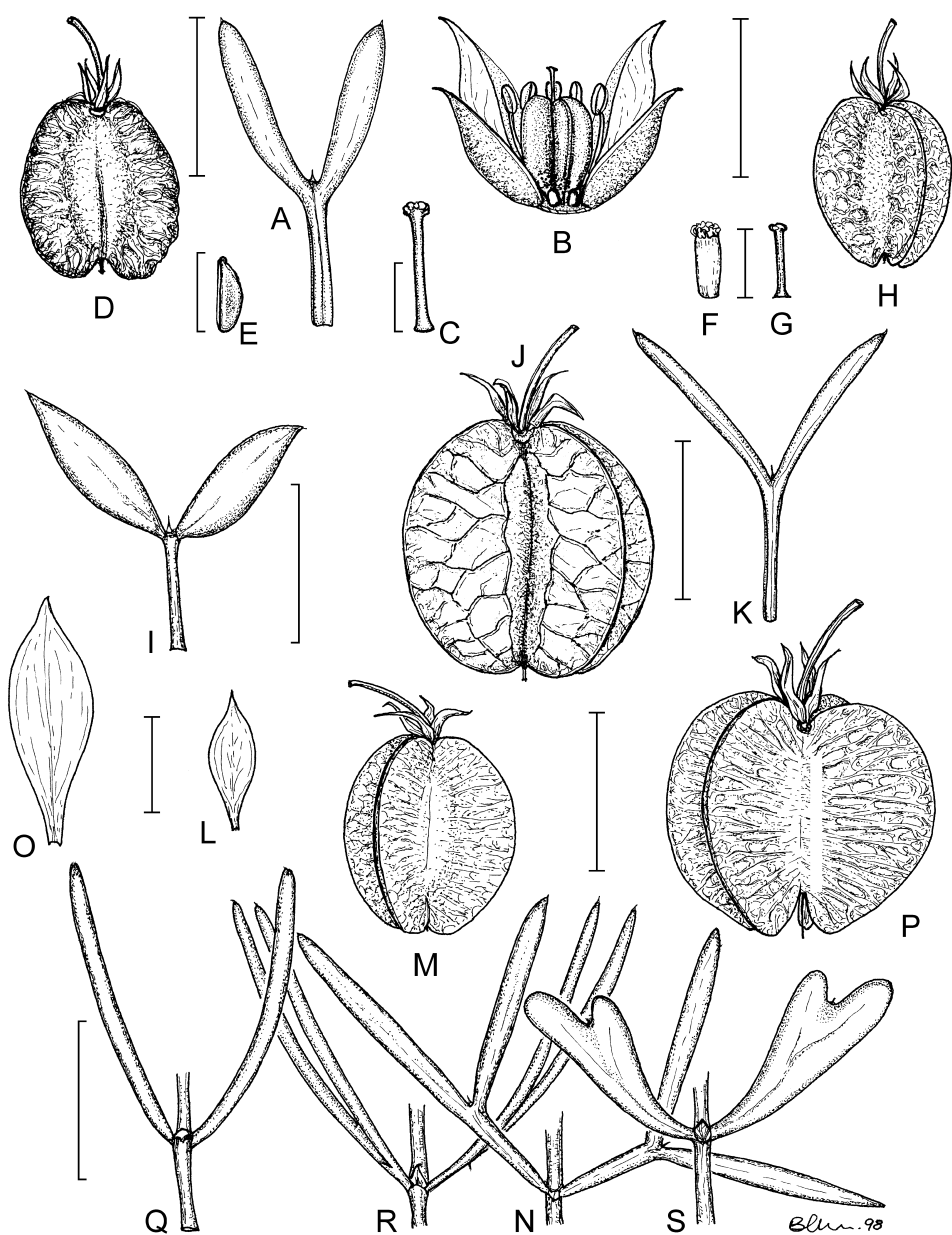


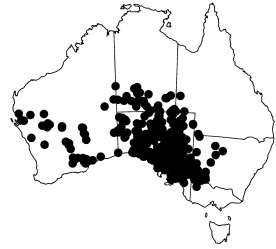
Figure 84. *Zygophyllum*. A–E, *Z. halophilum*. A, leaf; B, lateral view of flower; C, style and stigma; D, fruit; E, seed (A–E, R.M.Barker 1269, AD). F–H, *Z. tetrapterum*. F, disc or nectary; G, style and stigma; H, fruit (F–H, R.M.Barker 1052, AD). I, J, *Z. fruticosum*. I, leaf; J, fruit (I, J, J.Z.Weber 5051, AD). K, *Z. reticulatum*, leaf (R.M.Barker 1306, AD). L, M, *Z. eremaeum*. L, petal; M, fruit (L, M, R.C.Shearer 15, AD). N–P, *Z. aurantiacum* subsp. *aurantiacum*. N, pair of leaves; O, petal; P, fruit (N–P, Hj.Eichler 18814, AD). Q, *Z. aurantiacum* subsp. *simplicifolium*, pair of leaves (Hj.Eichler 23172, AD). R, *Z. aurantiacum* subsp. *verticillatum*, pair of leaves (R.H.Kuchel 2899, AD). S, *Z. aurantiacum* subsp. *cuneatum*, pair of leaves (Hj.Eichler 18837, AD). Scale bars: A, D, H, I–K, M, N, P–S = 10 mm; B, O, L = 3 mm; C, F, G = 0.5 mm; E = 5 mm. Drawn by B.Chandler.

31a. *Zygophyllum aurantiacum* (Lindl.) F.Muell. subsp. *aurantiacum*

Low, spreading, perennial undershrub, 20–50 cm high, 30–100 cm wide. Leaves petiolate, 2 per node, Y-shaped; petiole 2.5–9 mm long, flattened, similar width to leaflets; leaflets narrowly elliptic, 3–19 mm long, 1–1.9 mm wide, continuous with petiole, obtuse, truncate, emarginate or, rarely, 3-lobed at apex. Fruit 8–15 mm long; fruiting style 2.2–3.7 mm long. Plate 67; Fig. 84N–P.

The most widespread of the subspecies, occurring in drier areas of the S states from Norseman in W.A. through to Hay, N.S.W. and Hattah, Vic., and S parts of N.T. Flowers chiefly July–Oct., with rarer occurrences outside these months in response to rain.

W.A.: edge of salt lake immediately NW of Norseman, *Hj.Eichler* 21250 (AD, B, CANB). N.T.: Karinga Ck, *J.R.Maconochie* 2437 (AD, CANB, DNA, K, MO, NSW, PAUH). S.A.: unnamed Conservation Park, c. 30 km E of Serpentine L. along track to Vokes Corner, *J.Z.Weber* 6481 (AD, HO, MEL, NSW). N.S.W.: 18.6 km N of Tibooburra on Silver City Hwy, Sturt Natl Park, *B.Wieczek* 366 *et al.* (AD, MEL, NSW). Vic.: Rock Salt Plains, 9 miles [14.4 km] WNW of Hattah P.O., *A.C.Beauglehole* 40588 (AD).

**31b. *Zygophyllum aurantiacum* subsp. *simplicifolium* H.Eichler ex R.M.Barker, *J. Adelaide Bot. Gard.* 18: 61 (1998)**

Roepera aurantiaca subsp. *simplicifolia* (H.Eichler ex R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: 5 km SE of Wudinna, above the shores of the salt lake on the SW side of Eyre Hwy towards Kyancutta, S.A., 35° 05'S 135° 30'E, 9 Oct. 1972, *Hj.Eichler* 23172; holo: CANB.

Z. fruticosum DC. var. *brevilobum* J.M.Black, *Trans. & Proc. Roy. Soc. S. Australia* 54: 60 (1930), *p.p.* T: 17 miles [27 km] N of Tarcoola, S.A., 30 Oct. 1929, *J.B.Cleland s.n.*; holo: AD.

Low spreading, or upright rounded, perennial shrub, 30–100 cm high, wider than high. Leaves apparently simple and sessile, 2 per node, linear, subterete, 9–40 mm long, 0.8–1.7 mm wide, rounded, truncate or shallowly or deeply emarginate at apex. Fruit 12.5–15 mm long; fruiting style 2.6–5.5 mm long. Fig. 84Q.

Found in the Simpson Desert, N.T., with an apparent disjunction to the Gawler Ra. and N Eyre Penin., S.A. Occurs on the slopes of sand dunes at edges of salt lakes, usually in gypseous areas. Flowers July–Sept.

N.T.: Kilpatha Native Well, Simpson Desert, *G.Leach* 1486 (AD, DNA). S.A.: Poeppel Corner, *P.E.Conrick* 2187 (AD, RSA, SYD); Gawler Ra., *D.E.Symon* 8205 (AD, CANB, MO).

**31c. *Zygophyllum aurantiacum* subsp. *cuneatum* H.Eichler ex R.M.Barker, *J. Adelaide Bot. Gard.* 17: 163 (1996)**

Roepera aurantiaca subsp. *cuneata* (H.Eichler ex R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: stockyards, Head Stn, Koonamore, S.A., 23 Aug. 1956, *R.Schodde s.n.*; holo: AD; iso: CANB.

Spreading, woody, perennial shrub, 15–100 cm high, 30–200 cm wide. Leaves apparently simple and flat, 2 per node, obcordate or obovate with bi-, or more rarely, tri-lobed apex; basal part (petiole) 13.5–18.5 mm long, 6.5–13 mm wide (at widest point), flattened, cuneate; apical lobes (leaflets) broadly to transversely ovate, 1–6 mm long, 2–4 mm wide, rounded-obtuse at apex. Fruit 15–20 mm long; fruiting style 3–4 mm long. Fig. 84S.

Found in L. Eyre, Gairdner-Torrens and Flinders Ra. areas, S.A., with one old outlier record from W.A. and a modern one from W Qld. Recorded from limestone areas, from clay pans, from gibber and from red sand, but mostly in association with kopi or gypseous areas. Flowers July–Oct., with one record for Dec., presumably in an unusually wet year.



W.A.: [Elder Exploring Expedition], Victoria Desert, Camp 54, *R.Helms s.n.* (AD). S.A.: 1 km NW of HS, Billa Kalina Stn, *F.J.Badman 10193* (AD, BRI, NY, PRE); Koonamore, near HS on Horse Paddock, *Hj.Eichler 17998* (AD); Morolana Stn, Whim Paddock, *D.E.Symon 16674* (AD). Qld: 16 km E of Ethabuka HS; Gypsum Hill, *P.K.Latz 21467* (AD, DNA, BRI).

Distinctive by the shape of the leaves, but no other character difference is apparent. Leaf shape runs into subsp. *simplicifolium* but leaves of subsp. *cuneatum* are wider. There are some intermediate specimens between subsp. *aurantiacum* and subsp. *cuneatum*, chiefly from the Serpentine L. area of NW S.A. and near Manangatang in Vic. Leaves are distinctly Y-shaped but flattened and wider than in typical subsp. *aurantiacum*, the petiole being gradually widening to the apex. Eichler included these specimens in his concept of subsp. *cuneatum*.

31d. *Zygophyllum aurantiacum* subsp. *verticillatum* H.Eichler ex R.M.Barker, *J. Adelaide Bot. Gard.* 17: 164 (1996)

Roepera aurantiaca subsp. *verticillata* (H.Eichler ex R.M.Barker) Beier & Thulin, *Pl. Syst. Evol.* 240: 30 (2003). T: S.A., N Flinders Ranges, 5 km S of Leigh Ck, 17 July 1964, *Hj.Eichler 17952*; holo: AD; iso: CANB.

Low, spreading, perennial shrub, 30–60 cm high and wide. Leaves sessile, bilobed from base, appearing as if 4 per node; leaflets linear or narrowly elliptic, 5–20 (–28) mm long, (0.6–) 0.9–1.9 (–3.2) mm wide. Fruit (8–) 12–15 mm long; fruiting style 2.9–4.2 mm long. Fig. 84R.

Confined to S.A., recorded from the L. Eyre, Gairdner-Torrens and Flinders Ra. area from a variety of habitats, ranging from sand dunes to gibber, gilgai and calcareous mesas. Flowers July–Sept.

S.A.: 8 km S of Brachina, Flinders Ra., *N.N.Donner 133* (AD); c. 5 km NE of Koonamore HS along mail track to Curnamona, *Hj.Eichler 12506* (AD); Leigh Ck, at the N end of the township along road to Marree, *Hj.Eichler 17950* (AD, CANB); between Wilpena and Hawker, c. 6.5 km S of Arkaba, *Hj.Eichler 17960* (AD, CANB); Muloorina Stn, Frome R., c. 30 miles [48 km] N of Marree, *R.Hill 454* (AD).



Doubtful Names

Tribulus littoralis Sweet, *Hort. Brit.* 3rd edn, 766 (1839), *nom. nud.*

This is probably *T. cistoides* but no material annotated as such has been seen.

Zygophyllum fruticosum var. *platypterum* Benth., *Fl. Austral.* 1: 294 (1863)

T: Port Jackson, *L.Leichhardt (Herb. F.Mueller) s.n.*; syn: MEL.

The specimens, which were cultivated at Sydney Botanic Gardens, are insufficient for accurate identification. They are not of a native Australian species but appear to be close to the S African *Z. morganiana* L.

Zygophyllum glaucescens var. *minutiflorum* F.Muell., *Fragm.* 11: 29 (1878)

T: “ad Shark-Bay, et eadem allata a Great Bight (Richards) et a Lake Eyre (E. Giles)”.

It is questionable whether Mueller was actually creating a name or merely referring to a small-flowered variety. No specimens bearing this name from the localities cited or by the collectors named have been located.

APPENDIX

New taxa, combinations and lectotypifications

New taxa, combinations and lectotypifications occurring in this volume of the *Flora of Australia* are formally published here. Taxa are arranged in the order they appear in the text. For economy the entries are brief; the treatment in the main text is more comprehensive. Accepted names are in **bold**, basionyms and synonyms in *italic*. The date of publication of this Volume will be given in Volume 38B.

RUTACEAE

COATESIA

T.G.Hartley

Coatesia paniculata F.Muell., *Fragm.* 3: 26 (1862)

Geijera muelleri Benth., *Fl. Austral.* 1: 364 (1863), *nom. illeg.*; *G. paniculata* (F.Muell.) Druce, *Bot. Exch. Club Soc. Brit. Isles* 1916: 624 (1917). T: Moreton Bay [Qld], 1857, *F.Mueller*; lecto (here chosen): MEL.

The lectotype is one of the three syntypes of this species housed at MEL. Of the remaining two, *collector unknown*, from the Bowen R., Qld, is also *Coatesia paniculata*, whereas *D.Henne*, from Curtis Is., Qld, is misidentified *Geijera salicifolia*.

HALFORDIA

T.G.Hartley

Halfordia scleroxyla F.Muell., *Fragm.* 7: 142 (1871)

T: Coast Ra. [Rockingham Bay], Qld, 27 July 1868, *J.Dallachy*; lecto (here chosen): MEL.

Among the possible types housed at MEL the lectotype best matches Mueller's protologue.

BROMBYA*T.G.Hartley***Brombya smithii** T.G.Hartley, *sp. nov.*

Frutex vel arbor usque 12 m alta; ramulis novellis ut foliis, inflorescentiis, sepalis, ovario, et folliculis pubescentibus; foliis 10–22 cm longis, lamina elliptica vel elliptico-obovata, 8–20 cm longa; inflorescentiis 2.5–13 cm longis; petalis 3.5–4 mm longis; filamentis staminum ellipticis; folliculis 5–8 mm longis.

T: Gap Ck, c. 38 km SE of Cooktown, Qld, 7 Sept. 1960, *L.S.Smith 11116*; holo: BRI; iso: A, LAE.

Occurs in NE Qld from the Annan R. south to the Bloomfield R.

The epithet commemorates Lindsay Stewart Smith, 1917–1970, specialist in Australian rain forest botany.

MEDICOSMA*T.G.Hartley***Medicosma forsteri** T.G.Hartley, *sp. nov.*

Arbor usque 12 m alta; foliis oppositis vel suboppositis, simplicibus, 6.5–16 cm longis; inflorescentiis 1- vel plurifloris, usque 2 cm longis, pedicellis usque 2 mm longis; sepalis 1.5–2 mm longis; petalis abaxialiter dense appresse pubescentibus, adaxialiter in c. $\frac{1}{2}$ distali puberulis, 6–6.5 mm longis; folliculis c. 6.5 mm longis.

T: London Ck, 2.5 km NNW of Mt Mellum, 12 km WSW of Landsborough, Qld, 26 Apr. 2000, *P.I.Forster 25572* & *P.D.Bostock*; holo: CANB.

Known only from the type locality, in SE Qld.

The epithet commemorates Paul Irwin Forster, whose good eye in the field has contributed much to our knowledge of the Qld flora.

Medicosma mulgraveana T.G.Hartley, *sp. nov.*

Arbor usque 7 m alta; foliis oppositis, digitate trifoliolatis (foliis infrequentibus palmate 4- vel 5-foliolatis vel simplicibus), 6–27 cm longis; inflorescentiis plurifloris, 2.5–12 cm longis; sepalis 4–4.5 mm longis; petalis abaxialiter dense adpresse pubescentibus, 4–4.5 mm longis; folliculis 7.5–8 mm longis.

T: East Mulgrave R., Qld, 25 Nov. 1995, *R.L.Jago 3696 et al.*; holo: CANB; iso: BRI, CANB.

Known only from the East Mulgrave R., Bellenden Ker Ra., NE Qld.

The epithet refers to the type locality.

Medicosma heterophylla T.G.Hartley, *sp. nov.*

Arbor usque 7 m alta; foliis oppositis, digitate trifoliolatis et simplicibus, 4–14 cm longis; inflorescentiis 1- usque plurifloris, usque 1.2 cm longis; sepalis 1.5–2 mm longis; petalis abaxialiter dense adpresse pubescentibus, 3–4 mm longis; folliculis 4.5–5 mm longis.

T: track to Pinnacle Rock, 4 km W of Karnak, Qld, 12 July 1994, *P.I.Forster 15541 et al.*; holo: CANB.

Occurs in NE Qld along Roaring Meg Ck and in the vicinity of Karnak.

The epithet is from the Greek *hetero-* (different-) and *-phyllus* (-leaved), referring to the species' mixed trifoliolate and simple leaves.

ACRONYCHIA

T.G.Hartley

Acronychia peninsularis T.G.Hartley, *sp. nov.*

Frutex vel arbor usque 30 m alta; foliis digitate trifoliolatis, glabris; inflorescentiis axillaribus et/vel infrafoliaribus, 2–4 cm longis; pedicellis saltem basin versus puberulis; petalis 6–7 mm longis; ovario ut fructu cum fissuris septicidalibus $\frac{1}{3}$ – $\frac{3}{4}$ longitudine extensis; fructu 6–10 (–15) mm longo, pericarpio externo (mesocarpio et exocarpio) in sicco minus quam 0.5 mm crasso, carnosus.

T: mouth of Pascoe R., Cape York Penin., Qld, 28 Apr. 1993, *D.G.Fell 3132A & W.Butcher*; holo: CANB.

Occurs in NE Qld from Batavia Downs south to the McIlwraith Ra.

The epithet refers to the species' occurrence in Cape York Penin.

BORONIA

M.F.Duretto

Boronia ser. *Polygalifoliae* Duretto, *ser. nov.*

Differs from the typical series by being glabrous apart from flowers (cf. variously hirsute) and having simple leaves (cf. pinnate leaves); and from series *Defoliatae* Duretto by having small inflorescence bracts (cf. large sepal-like bracts) and white to pink petals (cf. blue).

Type: *B. polygalifolia* Sm.

The series is monotypic.

Boronia ser. *Coerulescentes* Duretto, *ser. nov.*

Differs from the typical series by having simple leaves (cf. pinnate) and the large and globular anther apiculum (cf. small).

Type: *B. coerulescens* F.Muell.

The series is monotypic.

Boronia ser. *Penicillatae* Durretto, ser. nov.

Differs from the typical series by having an indumentum of stellate hairs (cf. simple hairs).

Type: *B. penicillata* F.Muell.

The series contains 3 species: *B. penicillata*, *B. westringioides* and *B. baeckeacea*.

Boronia ser. *Fabianoides* Durretto, ser. nov.

Differs from the typical series by having leaves that are alternate or fasciculate (cf. opposite).

Type: *B. fabianoides* F.Muell.

The series contains two species: *B. fabianoides* and *B. acanthoclada*.

Boronia ser. *Defoliatae* Durretto, ser. nov.

Differs from the typical series by being glabrous apart from flowers (cf. variously hirsute) and having simple leaves (cf. pinnate leaves); and from series *Polygalifoliae* Durretto by having large sepal-like inflorescence bracts (cf. small) and blue petals (cf. white to pink).

Type: *B. defoliata* F.Muell.

The series contains 4 species: *B. defoliata*, *B. busselliana*, *B. subsessilis* and *B. tenuis*.

ZIERIA

A.S.George

Zieria pilosa var. *parviflora* Benth., *Fl. Austral.* 1: 305 (1863)

T: 'Both in Banks' and in R.Brown's collections'; lecto (here chosen): near Sydney, N.S.W., Aug. 1803, *R.Brown*; BM.

In selecting a lectotype for this name, Armstrong (*Austral. Syst. Bot.* 15: 421 (2002)) did not specify which of two sheets at BM he was selecting. One was collected by Joseph Banks, the other by Robert Brown. The collection by Brown was annotated by Armstrong with the name and is here selected as lectotype.

MICROCYPBE

Paul. G.Wilson

Microcybe ambigua (C.A.Gardner) Paul G.Wilson, *comb. nov.*

Phebalium ambiguum C.A.Gardner, *J. Roy. Soc. W. Australia* 27: 180 (1942). T: Near Yellowdine, W.A., Oct. 1937, *W.E.Blackall*; lecto: PERTH, *fide* Paul G.Wilson, *Nuytsia* 1: 65 (1970).

APPENDIX

ZYGOPHYLLACEAE

TRIBULUS

R.M.Barker

Tribulus acanthococcus F.Muell., *Trans. Philos. Soc. Victoria* 1: 9 (1854)

T: Murray, 1853, *F.Mueller s.n.*; lecto (here chosen): MEL110978; isoelecto: MEL (3 sheets); possible isoelecto: MEL79475.

Of the 5 possible sheets in MEL which might be considered as type material of *T. acanthococcus*, only 1 is annotated with this name and it has been chosen as the lectotype. The other specimens are all annotated as “*Tribulus terrestris*”, or in the case of MEL79475, which is undated and without a collector, as “*T. terrestris* var.”.

The lectotype sheet consists of 5 branches, one of these with a mature fruit, identical in all respects with a typical *T. terrestris* fruit, but distinctly smaller than usual, and more the size of *T. minutus*. Another younger fruit has a very short style topped by a stigma of similar length. The collection was made in December 1853 in the Lake Benanee/Mt Dispersion area, near Robinvale, Victoria, according to Mueller’s note on one of the isoelectotypes.

Abbreviations and Contractions

Literature

Author abbreviations follow R.K.Brummitt & C.E.Powell, *Authors of Plant Names* (Royal Botanic Gardens, Kew, 1992).

Journal titles are abbreviated in accordance with G.H.M.Lawrence *et al.*, *Botanico-Periodicum-Huntianum* (Hunt Botanical Library, Pittsburgh, 1968) and G.D.R.Bridson, *BPH-2* (Hunt Institute for Botanical Documentation, Pittsburgh, 2004).

Other literature is abbreviated in accordance with F.A.Stafleu & R.S.Cowan, *Taxonomic Literature*, 2nd edn and supplements (Bohn, Scheltema & Holkema, Utrecht, 1976–2009), except that upper case initial letters are used for proper names and significant words. The *Flora of Australia* is abbreviated to *Fl. Australia*.

Herbaria

Abbreviations of herbaria are in accordance with P.K.Holmgren, N.H.Holmgren & L.C.Barnett, *Index Herbariorum* Part I, 8th edn (New York Botanical Garden, 1990). Those most commonly cited in the *Flora* are:

AD	State Herbarium of South Australia, Adelaide
BM	The Natural History Museum, London
BRI	Queensland Herbarium, Brisbane
CANB	Australian National Herbarium, Canberra
CBG	Australian National Botanic Gardens Herbarium, Canberra
CNS	Australian Tropical Herbarium, Cairns
DNA	Northern Territory Herbarium, Darwin
HO	Tasmanian Herbarium, Hobart
K	Royal Botanic Gardens, Kew
MEL	National Herbarium of Victoria, Melbourne
NSW	National Herbarium of New South Wales, Sydney
PERTH	Western Australian Herbarium, Perth

States, Territories

Abbreviations of Australian States and Territories as used in statements of distribution and citation of collections are:

A.C.T.	Australian Capital Territory
N.S.W.	New South Wales
N.T.	Northern Territory
Qld	Queensland
S.A.	South Australia
Tas.	Tasmania
Vic.	Victoria
W.A.	Western Australia

General abbreviations

add.	addendum
alt.	altitude
app.	appendix
auct.	<i>auctoris/auctorum</i> (of an author or authors)
auct. mult.	<i>auctorum multorum</i> (of many authors)

Abbreviations and Contractions

<i>auct. non</i>	<i>auctorum non</i> (of authors [but] not....), used for misapplied names
BP	before present
c.	<i>circa</i> (about)
cf.	<i>confer</i> (compare)
Ck	Creek
cm	centimetre
coll.	collector
colln	collection
<i>comb.</i>	<i>combinatio</i> /combination
<i>cons.</i>	<i>conservandus</i>
cult.	cultivated
cv.	cultivar
d.b.h.	diameter at breast height
Dept	Department
<i>descr.</i>	<i>descriptio</i>
diam.	diameter
E	east
ed./eds	editor/editors
edn	edition
<i>e.g.</i>	<i>exempli gratia</i> (for example)
<i>et al.</i>	<i>et alii/et aliorum</i> ; and others/and of others
f.	<i>forma</i> /form
fam.	<i>familia</i> /family
fig./figs	figure/figures (in other works)
Fig.	Figure (referring to a Figure in this volume of the <i>Flora</i>)
gen.	<i>genus</i> /genus
<i>gen. nov.</i>	<i>genus novus</i> (new genus)
Gt	Great
holo	holotype
<i>hort.</i>	<i>hortus</i> (garden) or <i>hortensis</i> (of a garden)
HS	Homestead
Hwy	Highway
<i>i.e.</i>	<i>id est</i> (that is)
<i>ined.</i>	<i>ineditus</i> (unpublished)
<i>in litt.</i>	<i>in litteris</i> (in correspondence)
<i>in obs.</i>	<i>in observatio</i> (in observation)
Is.	Island/s
iso	isotype
isolecto	isolectotype
km	kilometre
L.	Lake
L.A.	Logging Area
lat.	latitude
lecto	lectotype
<i>loc. cit.</i>	<i>loco citato</i> (in bibliographic citations: in the same work and page as just cited)
<i>loc. id.</i>	<i>loco idem</i> (in specimen citations: in the same place as just cited)
long.	longitude
L.S.	longitudinal section
l:w	length to width ratio
m	metre
mm	millimetre
Mt/Mts	Mount/Mounts
Mtn/Mtns	Mountain/Mountains
N	north
<i>n</i>	haploid chromosome number

Abbreviations and Contractions

2n	diploid chromosome number
Natl	National
n.d.	no date
NE	north-east (ern)
nom. cons.	<i>nomen conservandum</i> (conserved name)
nom. cons. prop.	<i>nomen conservandum propositus</i> (proposed conserved name)
nom. illeg.	<i>nomen illegitimum</i> (illegitimate name)
nom. inval.	<i>nomen invalidum</i> (name not validly published)
nom. nov.	<i>nomina nova</i> (new name)
nom. nud.	<i>nomen nudum</i> (name published without a description or reference to a published description)
nom. prov.	<i>nomen provisorium</i> (provisional name)
nom. rej.	<i>nomen rejiciendum</i> (rejected name)
nom. superfl.	<i>nomen superfluum</i> (superfluous name)
nov.	<i>novus</i> /new
n. ser.	new series
n.v.	<i>non vidi</i> (not seen)
NW	north-west (ern)
op. cit.	<i>opere citato</i> (in the work cited above)
opp.	opposite
orth.	orthography, orthographic
p./pp.	page/pages
penin.	peninsula
pers. comm.	by personal communication
pl./pls	plate/plates
p.p.	<i>pro parte</i> (in part)
p.p. max	<i>pro parte maxima</i> , the larger part
p.p. min	<i>pro parte minore</i> , the smaller part
q.v.	<i>quod vide</i> (which see)
R.	River
Ra.	Range
Rd	Road
Res.	reserve
rly	railway
S	south
SE	south-east (ern)
sect.	<i>sectio</i> /section
SEM	Scanning Electron Micrograph
ser.	series
S.F.R.	State Forest Reserve
s. lat.	<i>sensu lato</i> (in a wide sense)
s. loc.	<i>sine loco</i> (without locality)
s.n.	<i>sine numero</i> (without number)
sp./spp.	species (singular/plural)
sp. aff.	<i>species affinis</i> (species related to)
sp. nov.	<i>species nova</i> (new species)
specim.	specimen
s. str.	<i>sensu stricto</i> (in a narrow sense)
St	Saint/Street
stat.	<i>status</i> /status
Stn	(pastoral) Station
subg.	subgenus
subsp./subspp.	subspecies (singular/plural)
subsp. nov.	<i>subspecies nova</i> (new subspecies)
suppl.	supplement

Abbreviations and Contractions

SW	south-west (ern)
syn	syntype
synon.	synonym
T	Type (collection)
t./tt.	<i>tabula/tabulae</i> (plate/plates)
T.R.	Timber Reserve
trib.	<i>tribus</i> /tribe
trig.	trigonometric station
T.S.	transverse section
<i>typ. cons.</i>	<i>typus conservandus</i> (conserved type)
var.	<i>varietas</i> /variety
<i>viz.</i>	<i>videlicet</i> (namely)
UV	ultraviolet
W	west
<i>x</i>	basic chromosome number

Symbols

†	taxon included in key but not treated further in text
*	naturalised taxon, not originally native
#	native taxon now naturalised in Australia beyond its natural range
[]	misapplied name or <i>nomen invalidum</i> ; also, in localities, denotes a place name later than that originally cited or on the herbarium sheet
±	<i>in species descriptions</i> , more or less
±	<i>in lichen chemistry</i> , with or without
<	less than
≤	less than or equal to
>	more than
≥	more than or equal to
μm	micrometre
♀	female
♂	male

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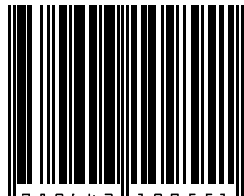
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