

Threatened species nomination

For nominations to the WA Threatened Species Scientific Committee (and the Minister for Environment) to amend threatened species listings under the WA *Wildlife Conservation Act 1950* or their assigned IUCN Red List threat status ranking.

Cover Page *(Office use only)*

Species name (scientific and common name):	<i>Hesperocolletes douglasi</i> (Douglas's broad-headed bee)
Nomination for (addition, deletion, change):	Addition
Nominated conservation category and criteria:	Critically Endangered D

Scientific committee assessment of eligibility against the criteria:		
A.	Population size reduction	•
B.	Geographic range	•
C.	Small population size and decline	•
D.	Very small or restricted population	•
E.	Quantitative analysis	•

Outcome:			
Scientific committee meeting date:			
Scientific committee comments:			
Recommendation:			
Ministerial approval:		Government Gazette/ Legislative effect:	

Nomination summary *(to be completed by nominator)*

Current conservation status				
Scientific name:	<i>Hesperocolletes douglasi</i>			
Common name:	Douglas's broad-headed bee			
Family name:	Colletidae	Fauna <input checked="" type="checkbox"/>	Flora <input type="checkbox"/>	
Nomination for:	Listing <input checked="" type="checkbox"/>	Change of status <input type="checkbox"/>	Delisting <input type="checkbox"/>	
1. Is the species currently on any conservation list, either in a State or Territory, Australia or Internationally? 2. Is it present in an Australian jurisdiction, but not listed?		Provide details of the occurrence and listing status for each jurisdiction in the following table		
Jurisdiction	List or Act name	Date listed or assessed (or N/A)	Listing category i.e. critically endangered or 'none'	Listing criteria i.e. B1ab(iii)+2ab(iii)
International	IUCN Red List			
National	EPBC Act			
State of WA	Threatened list	8/04/1994	Presumed extinct	
		10/4/2018 TSSC	Critically Endangered	D
	Priority list		1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/>	
Other State / Territory				
Nominated conservation status: category and criteria (including recommended categories for deleted species)				
Critically endangered (CR) <input checked="" type="checkbox"/> Endangered (EN) <input type="checkbox"/> Vulnerable (VU) <input type="checkbox"/> Presumed extinct (EX) <input type="checkbox"/>				
Other Specially Protected (Conservation Dependent) <input type="checkbox"/> Priority 1 <input type="checkbox"/> Priority 2 <input type="checkbox"/> Priority 3 <input type="checkbox"/> Priority 4 <input type="checkbox"/> None <input type="checkbox"/>				
What criteria support the conservation status category above? <i>Refer to Appendix A table 'Summary of the five criteria (A-E)' and the check version that can be completed to indicate all criteria options</i>			D	
Eligibility against the criteria				
Provide justification for the nominated conservation status; is the species eligible or ineligible for listing against the five criteria. For delisting , provide details for why the species no longer meets the requirements of the current conservation status.				
A.	Population size reduction (evidence of decline)	<ul style="list-style-type: none"> The population size is unknown. Possibly inferred population size reduction due to reduction in 		

		<p>habitat EOO, AOO and quality. The species is presumed extinct on Rottnest Island due to loss of habitat in the past. However this reduction occurred > 10 years/3 generations ago. The Banksia woodland TEC met eligibility for listing due to loss of geographic extent, which may be inferred as a reduction in bee habitat and population size that occurred in the past and is likely to continue into the future. A proportion of this reduction may have occurred in the last 10 years and may occur in the next 10 years, however, actual percentage of reduction applicable to the bee is unknown.</p> <ul style="list-style-type: none"> • Insufficient information to assess
B.	Geographic range (<i>EOO and AOO, number of locations and evidence of decline</i>)	<ul style="list-style-type: none"> • The geographic range is unknown. • The species is only known to be extant at 1 location, Pinjar, with the EOO and AOO calculated as 4 km² based on the 2 km x 2 km grid method. • There is the historical loss of EOO and AOO on Rottnest Island and could be continuing decline in mainland habitat EOO, AOO and quality based on the Banksia Woodland TEC, but given the lack of knowledge of the habitat requirements of the species, this cannot be inferred. • Insufficient information to assess
C.	Small population size and decline (<i>population size, distribution and evidence of decline</i>)	<ul style="list-style-type: none"> • The population size is unknown. • There is likely a small population size (< 250 mature individuals) as there have only been two individuals ever found, even though there has been intensive searching and targeted surveys. • There may be a continuing decline based on the TEC habitat and 100 % of individuals are within the 1 known extant subpopulation, but given only one individual found a continuing decline in population cannot be determined. • Insufficient information to assess
D.	Very small or restricted population (<i>population size</i>)	<ul style="list-style-type: none"> • The population size and number of mature individuals is unknown. • There is likely to be a very small (< 50 mature individuals) and restricted population as there have only been two individuals ever found despite intensive searching, even at known locations, and only one extant location. • Assessed as eligible for listing as CR D
E.	Quantitative analysis (<i>statistical probability of extinction</i>)	<ul style="list-style-type: none"> • NA

Reasons for change of status

Genuine change ☒ New knowledge ☒ Taxonomic change ☐ Previous mistake ☐ Other ☐

Provide details:

The monotypic bee genus *Hesperocolletes* and its type species *H. douglasi* were erected in 1965 based on a single male specimen collected in 1938 from Rottnest Island. The species was listed as 'presumed extinct' after no other specimens were found, despite extensive searches for the bee in the Perth Region (including Rottnest and Garden Islands).

A female of *Hesperocolletes* collected during 2015 in *Banksia* woodland on the western extremity of the RAAF Weapons Range east of Muchea on the Swan Coastal Plain is considered by Terry Houston to be *H. douglasi*, and hence the species is now not considered to be extinct. (Pille Arnold *et al.* (in prep) The 'Rediscovery of the 'extinct' bee *Hesperocolletes douglasi* Michener, 1965 (Colletidae: Paracolletinae) in Western Australia and first description of the female')

Surveys of the collection site failed to re-locate the species, indicating that the species was not common at the collection site.

Summary of assessment information (detailed information to be provided in the relevant sections of the form)

EOO	4 km ² (as per IUCN guidelines, EOO cannot be less than AOO, therefore EOO must be at least equal to AOO)	AOO	4 km ² (One 2 km x 2 km grid square)	Generation length	1 year
No. locations	1	Severely fragmented	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>		
No. subpopulations	1	No. mature individuals	Unknown		
Percentage global population within WA			100 %		
Percentage global population within Australia			100 %		
Percentage population decline over 10 years or 3 generations			Unknown		

Summary of subpopulation information (detailed information to be provided in the relevant sections of the form)						
Subpopulation location	Land tenure	Survey information: Date of survey and No. mature individuals	Area of subpopulation	Site / habitat Condition	Threats (note if past, present or future)	Specific management actions
Extant						
Pinjar	UCL (Dept. of Defence)	8 October 2015 (1 female collected)	4 km ² (One 2 km x 2 km grid square)	"The collection site was in an area of almost pristine Banksia woodland but dissected by roads and firebreaks." (Pille Arnold <i>et al.</i> , in prep)	Past, present, future: Vegetation clearing and land development, land degradation, fire, herbivore grazing and possibly the use of pesticides.	Prevent negative impacts to the Banksia woodland in the vicinity to where the bee was captured. Prescribed burns not to be conducted during the time when adults are flying (spring), but may be when the immature stage is below ground (autumn, winter).
Presumed extinct						
Rottneest Island	Crown Reserve (Class A)	9-12 November 1938 (1 male collected)	0	No details of the circumstances of capture (i.e. flowers visited, vegetation type) or exact location on the island were recorded (Houston 2014)	Past: Land degradation, fire, and herbivore grazing. Dramatic changes to the island vegetation has occurred since European settlement; caused by human activities, frequent fire and overgrazing by quokkas and that probably eliminated the bee's food plants (Burbidge 2004). However as the bee's floral preferences are not yet known, and not all native flora has been eliminated on the island and not every kind of flowering plant was surveyed on the island, it is possible that the bee is still extant on the island (Houston pers. comm. 2018).	NA

Nomination detail

Please refer to the Departments guidelines on nominating species for amendment of the Western Australian threatened species lists at http://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Threatened_Species_Nomination_Guidelines_2014.pdf

For technical information on terminology used in this form, and the intent of information requirements, as they relate to an assessment of this nomination against the IUCN Red List criteria, refer to the 2001 *IUCN Red List Categories and Criteria. Version 3.1 Second Edition* http://s3.amazonaws.com/iucnredlist-newcms/staging/public/attachments/3192/redlist_cats_crit_en.pdf

and *Guidelines for Using the IUCN Red List Categories and Criteria Version 13* (March 2017) <http://cmsdocs.s3.amazonaws.com/RedListGuidelines.pdf>

Section 1: Taxonomy

1.1 Current taxonomy			
Species name and Author:		<i>Hesperocolletes douglasi</i> Michener, 1965	
Subspecies name(s) and Author:		NA	
Is the species/subspecies conventionally accepted?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Is there any controversy about the taxonomy?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If not conventionally accepted and/or if there is any controversy; provide details:			
Has the species/subspecies been formally named?		Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Has the species/subspecies been recently described?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If the species has not been formally named or described; is it in the process of being described? Is there an anticipated date for the publication of the description? Has a type specimen been deposited? And if so provide the registration number and where deposited.			
If there are any closely related taxa provide details and include key distinguishing features:		<p><i>"Hesperocolletes douglasi</i> is superficially like a number of other native bees and careful examination under a microscope would be required to distinguish a specimen. The bee is about the same size as a honeybee (body length approximately 12 mm), generally black and brown and moderately hairy." (Houston 2014)</p> <p>It is similar in appearance to bees from the genera <i>Trichocolletes</i>, <i>Paracolletes</i> and <i>Leioproctus</i> (Michener 2007).</p>	
1.2 Taxonomic history			
Are there recent synonyms for the species?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes; provide details of synonyms:			
Have there been recent changes in the taxonomy or nomenclature?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes; provide details of changes:			
1.3 Hybridisation			

Is there any known hybridism with other species in the wild?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
If Yes; Where does this occur and how frequently?				

Section 2: Species information

2.1 Morphology / physical description

Insert photograph(s) of species or provide as an attachment:

Photo credits Figures 1-6: WA Museum (Houston 2014), Figure 7: Mark Murphy UWA (DPaW 2016).



Fig. 1. Facial view of holotype, male (WAM 38-2607).

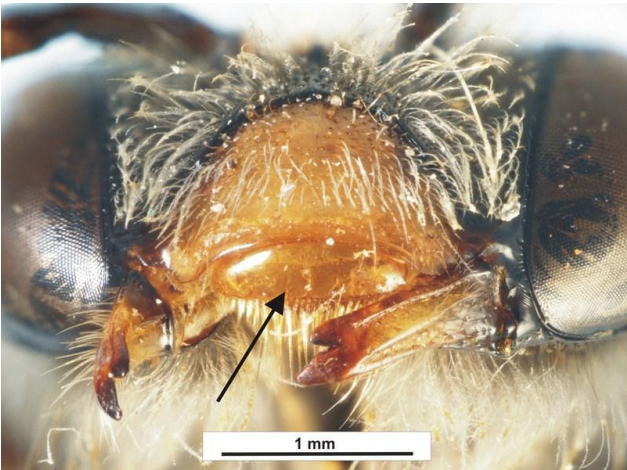


Fig. 2. Ventral view of head showing labrum (arrowed).



Figs 3 and 4. Lateral and dorsal views of holotype male, respectively.



Fig. 5. Fore wing (the three submarginal cells are numbered). **Fig. 6.** Apical segment of tarsus showing flattened inner prong of tarsal claw (arrowed.)



Fig. 7. Female specimen (WAM entomology collection registration no. 97779) collected in 2015 by Juliana Pille Arnold.

Species description:

“Hesperocolletes douglasi is superficially like a number of other native bees and careful examination under a microscope would be required to distinguish a specimen. The bee is about the same size as a honeybee (body length approximately 12 mm), generally black and brown and moderately hairy” (Houston 2014).

It is a moderate-sized, non-metallic species similar in appearance to bees from the genera *Trichocolletes*, *Paracolletes* and *Leioproctus* (Michener 2007). Measurements from holotype male: length 12 mm, forewing length probably nearly 8 mm (wing margins entirely worn off so that length cannot be accurately determined); unusually broad head that measures: width 8.3 mm, length 6.5 mm (Michener 1965).

“The species belongs to the large family Colletidae and, in particular, the subfamily Paracolletinae. Colletids are characterized by having a short, broad, blunt tongue (or ‘glossa’) (a flexible, hairy appendage at the end of the proboscis; not always visible as it can be retracted). Paracolletines (at least in most species, including *H. douglasi*) have three submarginal cells in the fore wing (Fig. 5) and females usually have densely hairy hind legs (for carrying pollen). The diagnostic characters of *Hesperocolletes* can occur individually in various paracolletine bees and it is the *combination* of those features that one must look for: lower part of face yellow-brown (Figs 1, 2); labrum (a hinged flap attached to the lower margin of the face) more than twice as wide as long and not strongly convex (Fig. 2); a distinct carina (sharp edge) around and especially behind each compound eye; tarsal claws with inner prongs expanded and flattened (Fig. 6). For some other diagnostic characters which are too technical to mention here, the reader is referred to Michener (1965)” (Houston 2014).

The most distinctive generic characters (male only) are (1) the strong carina around, and especially behind, each eye; (2) the near absence of the episternal groove (only a shallow concavity) below the scrobal groove; and (3) the deeply cleft claws, their inner prongs broad, flat, and directed more or less ventrally (Michener 2007).

2.2 Biology (provide details)

The biology of *Hesperocolletes douglasi* is unknown, however, there are likely similarities with other genera within the colletid tribe Paracolletini, particularly *Paracolletes* and *Trichocolletes*.

Solitary, with each female constructing its own nest and rearing its own offspring and male bees playing no part in nest construction or brood care, ground-nesting and univoltine (single generation per year) with the emergence of adult bees timed to coincide with flowering of the food plants. Adults probably live for no more than a few weeks. The population is probably carried over most of the year in the prepupal stage (Houston pers. comm. 2009).

In general for Colletinae, the bees are ground-nesting, making below ground burrow structures. Bees of the genera *Paracolletes* and *Trichocolletes* make burrows from near the ends of which laterals diverge, each lateral usually ending in a single cell, but sometimes there may be two or more cells in series. The cells are homomorphic, being uniform in size and shape, and lined with a thin secreted membrane. The larval food is a pollen mass, the egg laid on top of it (Michener 2007).

Burrowing bees usually push up conical heaps of loose soil at the entrances of their shafts as they burrow down to depths of a metre or more. Some prefer bare ground and many may nest close together. Their males may hover about over the nesting areas awaiting the emergence of unmated females (Houston 2011).

Some Colletinae are specialised foragers and have special features adapting them to the preferred flowers (Michener 2007).

2.3 Ecology (provide details)

As above

Section 3: Habitat

3.1 Habitat (provide details in response to the question below)

Described the habitat suitable for the species (biological and non-biological). Include descriptions of specific purpose habitat (e.g. foraging, breeding, roosting, seasonal migration, different life stages).

The recently found female specimen was collected as a 'floral visitor' on a Pepper and Salt shrub (*Philotheca spicata*) during a survey of plant-pollinator interaction networks in Banksia woodland remnants in the Swan Coastal Plain (SCP) in the Perth Region for a PhD research project on the spatial energetics of pollination failure in habitat restoration. The collection site is described as being "in an area of almost pristine Banksia woodland but dissected by roads and firebreaks" (Pille Arnold *et al.*, in prep.). The pollen load analysis revealed grains from eight different plant species of seven different families. Although the plant identification to species level has not yet been completed, the currently known list is *Philotheca spicata*, *Patersonia occidentalis*, two species of *Stylidium*, a species of *Scaevola* and species from Fabaceae and Myrtaceae.

However the use of the habitat is unknown in regards to breeding and it is unknown if there is some other particular habitat requirement that may restrict the species to a specific area or location, i.e. they may require a specific substrate for making burrows, and the substrate may be associated with seasonal wetlands or seasonally inundated areas.

The Rottnest Island habitat is unknown as no details of the circumstances of capture (i.e. flowers visited, vegetation type), or exact location on the island, were recorded (Houston 2014).

If the species occurs in a variety of habitats, is there a preferred habitat?

It is unknown if the species occurs in a variety of habitats or if there is a preferred habitat.

The two specimens have been collected in different habitats. Banksia

	woodland is not present on Rottnest Island but there is no information on the collection site or habitat where the type specimen bee was collected on the island. Michener 2007 expressed doubt in the accuracy of the labelled collection locality of Rottnest Island, and only confirmed that the specimen was collected in WA. However according to Pille Arnold <i>et al.</i> (in prep.) the WA Museum register tends to corroborate the label, as the specimen was among a batch of various insects collected by A.M. Douglas on Rottnest Island from 9-12 November 1938.
Does the species use refugia? (include what is it and when is it used)	Adult bees are not known to use refugia. Immature individuals are below ground.
Is the habitat restricted in extent or number of locations?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
If Yes, provide details:	
Is this species reliant on a threatened or priority species or ecological community?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
If Yes, provide details:	The 2015 bee was collected within Banksia Woodland that is mapped as the Endangered <i>Banksia Woodlands of the Swan Coastal Plain ecological community</i> ; an EPBC Act listed Threatened Ecological Community (TEC) (DoEE 2018, TSSC 2016). However it is unknown if the bee is reliant on the Banksia woodland, as the type specimen was collected on Rottnest Island where there is no Banksia woodland.
Are there any other species (sympatric species) that may affect the conservation status of the nominated species?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
If Yes, provide details:	Other native bee species and the introduced European honey bee (<i>Apis mellifera</i>) are likely to use the same foraging plants. "European honey bees visit the flowers of at least 200 Australian plant genera and interact with a wide diversity of native flower-visiting animals. Feral European honey bees may out compete native fauna for floral resources, may disrupt natural pollination processes and may displace endemic wildlife from tree hollows. However, there is insufficient research about interactions between European honey bees and Australian biota to fully describe their impacts" (DoEE undated).
What is the area, extent, abundance of habitat?	As the specific habitat requirements are unknown, therefore the habitat area, extent or abundance is unknown. If the bee is a floral generalist, then there may be a large area of available habitat based on spring flowering plants. However there may be other unknown factors that limit the area, extent and abundance of suitable habitat for the bee.
What is the quality of habitat?	<p>The recent collection site was reported as being almost pristine condition Banksia woodland and that more than 90 % the remainder of the UCL remnant vegetation was in pristine to excellent condition (Pille Arnold <i>et al.</i>, in prep.). However the surrounding areas include vegetation remnants with differing levels of degradation, cleared land, pine plantation and agricultural land uses.</p> <p>If the bee was naturally occurring on Rottnest Island then the suitable habitat may no longer be present. Dramatic changes to the island vegetation has occurred since European settlement; caused by human activities, frequent fire and overgrazing by quokkas and the probably eliminated the bee's food plants (Burbidge 2004). However as the bee's floral preferences are not yet known, and not all native flora has been eliminated on the island and not every kind of flowering plant was surveyed on the island, it is possible that the bee is still extant on the</p>

		island (Houston pers. comm. 2018).		
Is there a decline in habitat area, extent or quality?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
If there is a decline, is the decline continuing?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
<i>Provide details:</i>	<p>Although the specific habitat requirements are unknown, there may be decline and continuing decline in the area, extent and quality of habitat. It is likely that the habitat on Rottnest Island has declined historically to the point where it is no longer suitable for the bee (Burbidge 2004). The bee has been collected within Banksia woodland, an Endangered EPBC Act listed TEC. The woodland met eligibility for listing due to a 50-60 % decline in geographic extent across the SCP with patches of severe decline and fragmentation especially around the Perth metropolitan area (meeting vulnerable), small patch sizes that are highly fragmented and facing demonstrated threats with significant reduction in median patch size from an estimated pre-European value of 146 ha to a current value of 1.6 ha (meeting endangered) and a severe reduction in community integrity due to threats (meeting endangered) (DoEE 2018). However, the level of dependence of the species on this community, and what would constitute decline in habitat condition, is not known.</p>			
What is the critical habitat or habitat important for the survival of the species?	The critical habitat is unknown. However it is likely that the foraging habitat within a close radius to the breeding area, suitable burrowing substrate, is the most important to the species.			

Section 4: Survey

4.1 Survey methods <i>(Provide details)</i>	
What survey methods are applicable to the species?	General collecting methods for bees, including, sweep nets, observations at flowering plants and direct trapping in screw-top vials, and blue ultra-violet reflective vane traps.
Are there preferred or recommended survey methods that yield better results for the species?	<p>Significant amount of survey effort and repeated surveys are required in order to yield better results.</p> <p>Mainland habitat that has some edaphic and floral characteristics in common with Rottnest Island should be surveyed as a priority.</p>
Are there special requirements, techniques, expertise or other considerations that are necessary when surveying for this species?	<p>Opportunistic collection may occur during generalised insect collection activities using sweep nets.</p> <p>However targeted collection requires a discerning keen-eye for native bees, patience and quietness in observation of flowering plants for visiting bees, and swift and careful net use to capture the bees without causing damage. Multiple visits during the adult season, and possibly over a series of years, may be required to detect the species. For example, the site of the recently collected <i>Hesperocolletes douglasi</i> specimen has subsequently been surveyed the following two spring seasons and no <i>Hesperocolletes</i> bees have been collected.</p>
Are there reasons why the species may not be detected during surveys?	<p>Many general fauna surveys conducted for environmental impact assessment do not systematically survey for insects and are therefore not adequately represented in survey results.</p> <p>Surveys may not detect the species if not conducted at the appropriate time of year or conditions are not optimal or there is not enough effort. Surveys must coincide with the time of year that adults have emerged.</p>

	Food plants are required to be flowering. Climatic conditions may alter the bee flight times during a day. Repeated surveys are likely to be required.
Can the species be identified in the field?	
Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Provide details:	Careful examination under a microscope would be required to distinguish a specimen (Houston 2014).
Can the species be easily confused within similar species in the field?	
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/> Unknown <input type="checkbox"/>
Provide details:	<p>The species may be confused with other native bee species from the family Colletidae. It is similar in appearance to bees from the genera <i>Trichocolletes</i>, <i>Paracolletes</i> and <i>Leioproctus</i> (Michener 2007).</p> <p><i>"Hesperocolletes douglasi</i> is superficially like a number of other native bees and careful examination under a microscope would be required to distinguish a specimen. The bee is about the same size as a honeybee (body length approximately 12 mm), generally black and brown and moderately hairy." (Houston 2014)</p>
<p>List any published survey guidelines, guidance statements, protocols, standard operating procedures or other documents that are relevant to conducting surveys for this species.</p> <p>Australian Museum (2007). Invertebrate Collection Manual: A guide to traditional invertebrate collection methods. Prepared by Matthew Bulbert, John Gollan, Andrew Donnelly and Lance Wilkie, for the BugWise Project, Australian Museum. Available from: https://australianmuseum.net.au/uploads/documents/9382/the%20invertebrate%20collection%20manual.pdf</p>	
4.2 Survey effort	
Has the species been well surveyed?	
Yes <input type="checkbox"/>	No <input type="checkbox"/>
Have targeted surveys been conducted for the species?	
Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Provide details of the successful and unsuccessful surveys undertaken for the species:	<p>The recently found female specimen was collected in the Pinjar Locality (City of Wanneroo) as a 'floral visitor' during surveys of plant-pollinator interaction networks in Banksia woodland remnants in the Swan Coastal Plain (SCP) in the Perth Region for a PhD research project on the spatial energetics of pollination failure in habitat restoration. There were a total of 3168 specimens (bees, wasps, flies and beetles) collected using sweep-net during 156 surveys at 23 study sites within a 152 km² study area located within or close vicinity to the Gnangara-Moore River State Forest over the spring seasons of 2015 and 2016. An additional 17980 bees and wasps were collected at the same 23 study sites using blue ultra-violet reflective vane traps deployed during spring, summer and autumn 2012-2013 (Pille Arnold <i>et al.</i>, in prep.).</p> <p>After the discovery of the female of <i>Hesperocolletes douglasi</i> in 2015, T. Houston conducted targeted surveys of 3-4 hours duration on days with fine, mild to warm weather (maxima 22–36 °C), during spring of 2016 and 2017 at the specimen collection site in search of further specimens (Pille Arnold <i>et al.</i>, in prep.). However no <i>H. douglasi</i> were found. Further surveys of the specimen collection site are planned for spring 2018, in addition, surveys of more coastal areas of bushland that have similarities with Rottnest Island and possibly search again on the island (Houston pers. comm. 2018).</p> <p>Intense collecting on Rottnest Island, Garden Island (in 1988) and in the Perth region (particularly 1978-1992) failed to locate the species (Houston 1991, Pille Arnold <i>et al.</i>, in prep.). The bulk of the WA Museum bee collection has been acquired in the last 70 years, with most effort by T. Houston since 1978 (Houston 2000).</p>

	<p>'Rare Native Bee Surveys' were conducted by the DBCA's Swan Region during the summer periods from January 2006 to December 2008. The surveys were targeting the two threatened bee species, <i>Leioproctus douglasiellus</i> and <i>Neopasiphae simplicior</i>. However all native bee species that could not be identified in the field were collected and lodged with the WA Museum for identification. There were 36 sites surveyed covering approximately 50 ha of known and potential habitat for the targeted species, including 11 sites within the Banksia woodland TEC. If <i>Hesperocolletes douglasi</i> occurred at any of those sites and adults were flying during the summer months, then it may have been detected. The 2006-2008 surveys were predominantly south of the Swan River but did include some sites within the Shires of Beverley, York and Victoria Plains. There were no surveys conducted within the Gngangara-Moore River State Forest or near vicinity areas surveyed by Pille Arnold <i>et al.</i> (in prep.).</p>
4.3 Research (Provide details)	
Has the species been well researched?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Partially <input type="checkbox"/> Unknown <input type="checkbox"/>
What research has been or is being conducted?	The Holotype and new specimen have been examined and morphology described (Michener 1965, Pille Arnold <i>et al.</i> , in prep.). The new specimen was captured during surveys for a PhD research project on the spatial energetics of pollination failure in habitat restoration (Pille Arnold <i>et al.</i> , in prep.). Additional targeted surveys have been conducted at the site of the recently collected specimen. Surveys are proposed for next spring in the vicinity of this site, more coastal areas of bushland that have something in common with Rottnest Island, and possibly the island again (Houston pers. comm. 2018).
What are the knowledge gaps for the species?	Species specific biology and ecology, including life cycle, nesting requirements, dispersal ability, population size, ecological requirements, habitat preferences and requirements, food plants / foraging resources, and distribution / geographic range. Threats and threatening processes that may impact the species.
Research recommendations:	<p>Research is required to fill knowledge gaps, as above.</p> <p>Mainland habitat that has some edaphic and floral characteristics in common with Rottnest Island should be surveyed as a priority.</p>
4.4 Monitoring (Provide details)	
Is the species being monitored, either directly (targeted) or indirectly (general monitoring)?	<p>The species is not currently being monitored. However targeted surveys are being conducted.</p> <p>Protection of habitat is being considered during land use planning and prescribed burn operations.</p>
What methods are used for monitoring?	Currently only conducting additional surveys at the specimen collection site and other areas of potentially suitable habitat.
Monitoring recommendations:	<p>Once the species habitat requirements have been determined, appropriate monitoring methods can be considered.</p> <p>Monitoring of habitat condition, plant flowering, and disturbance and development of appropriate mitigation.</p>

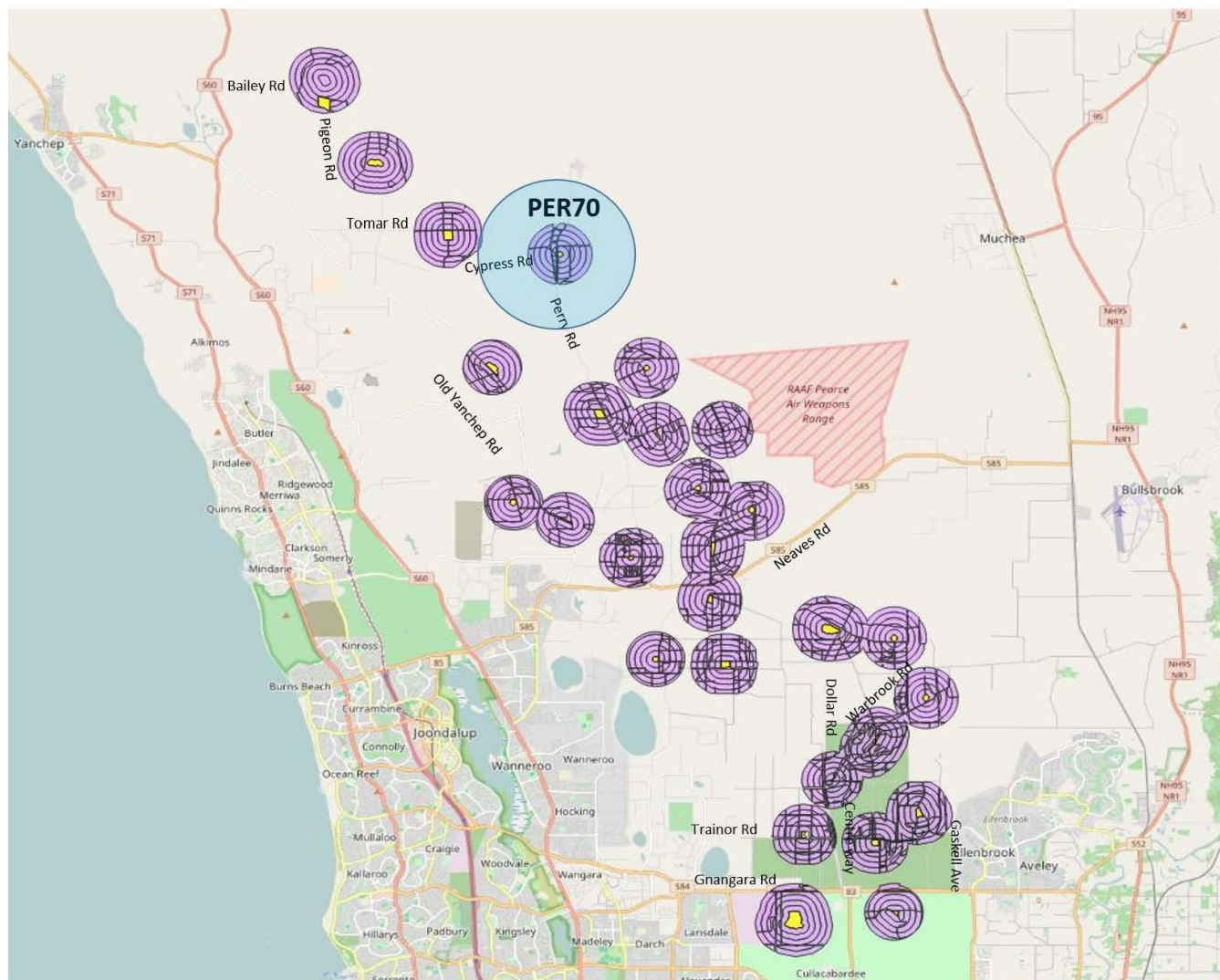
Section 5: Geographic range

5.1 Distribution

Insert map(s) of the species distribution, or provide as an attachment:

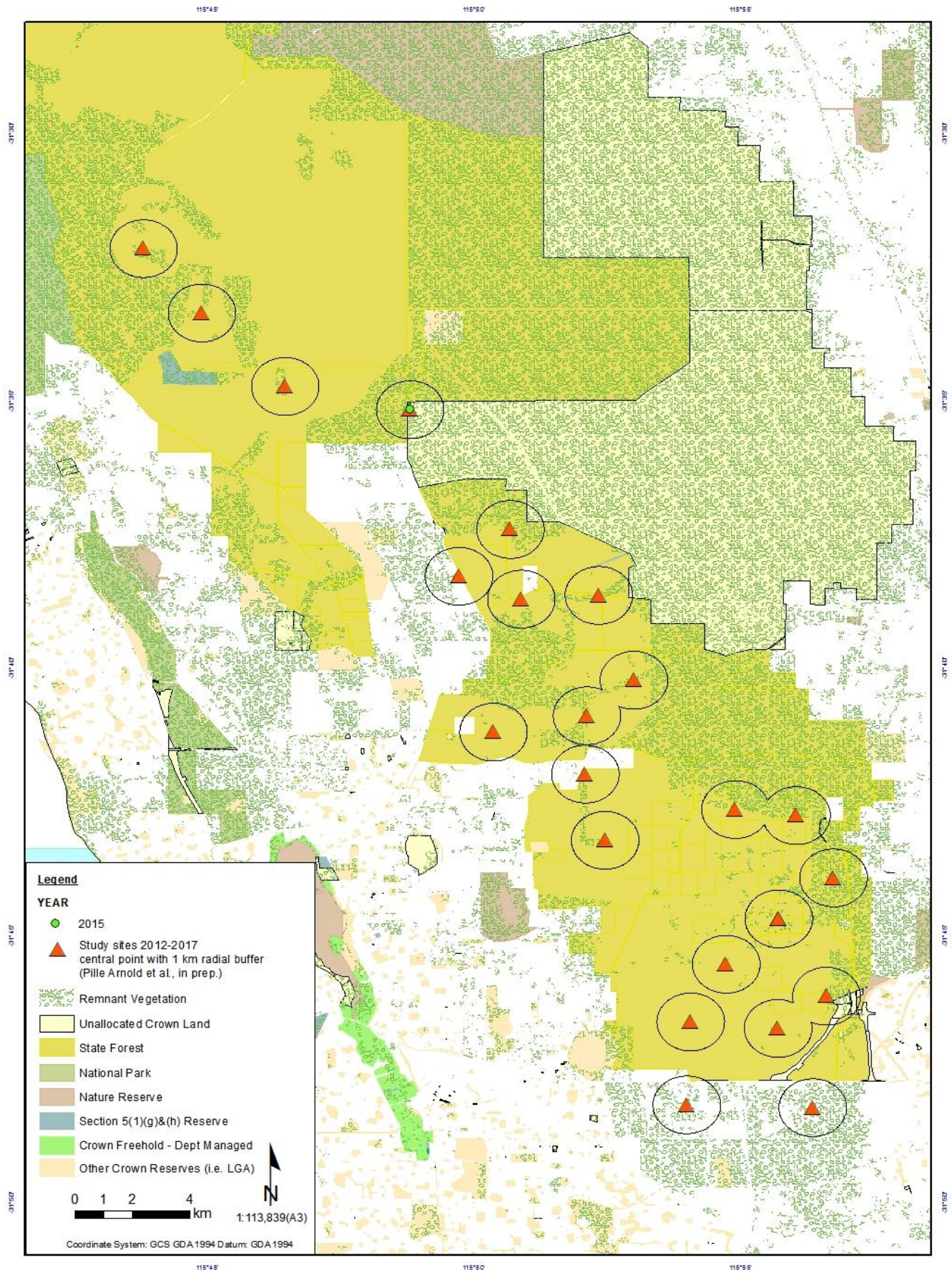
The picture shows all the study sites (polygons in yellow) and the 1km buffer zone surrounding the fragments of Banksia Woodland (purple concentric circles surrounding the yellow polygons). Surveys are being carried out in the fragments and in the 1km purple buffer zone surrounding them.

The study site where I collected the *Hesperocolletes douglasi* is site PER70, located close to the intersection of Cypress Rd and Perry Rd.



(Juliana Pille Arnold pers. comm. 2018)

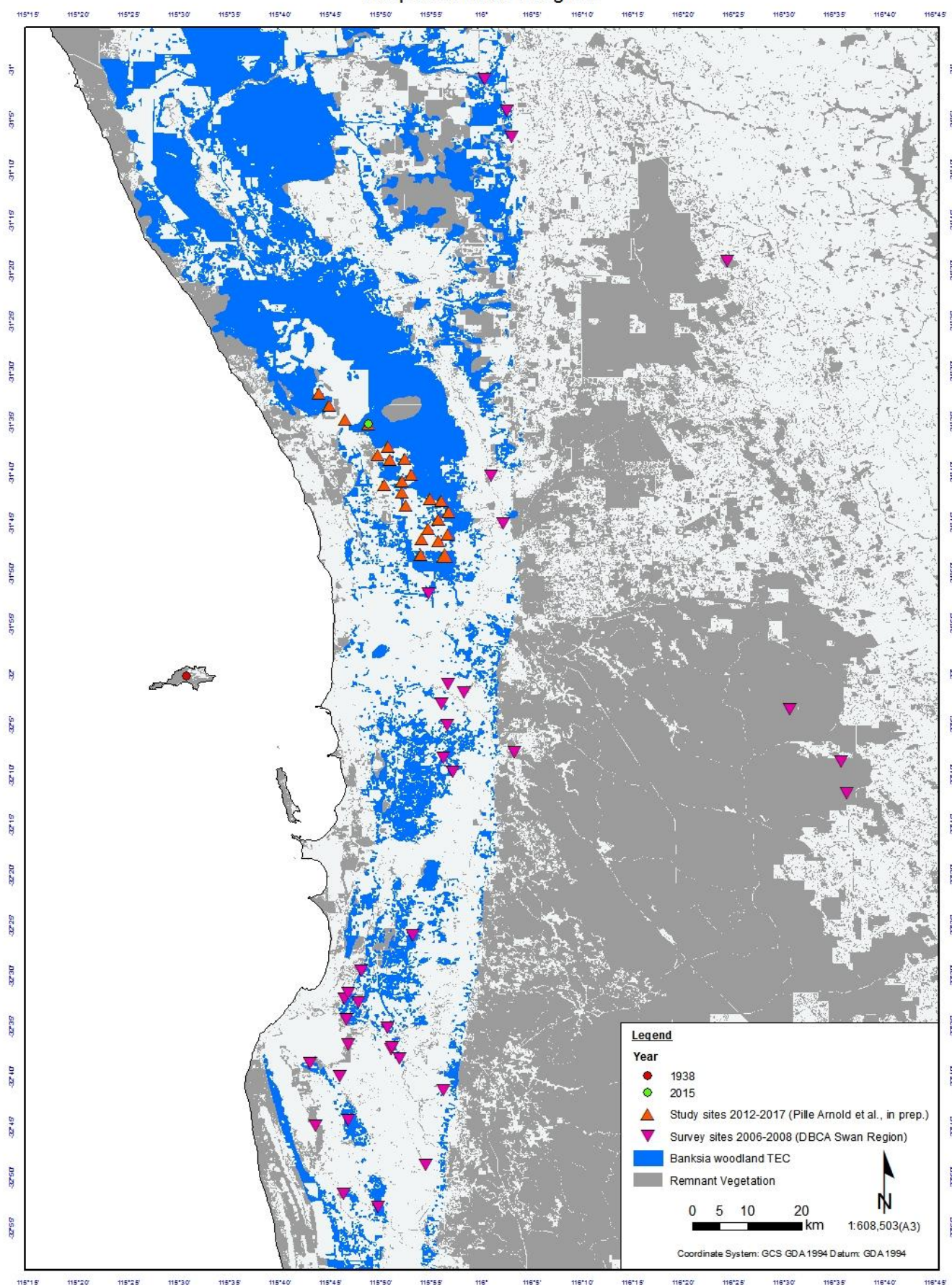
Hesperocolletes douglasi



Graticule shown at 5 minutes intervals

Produced by amym
on Wednesday, 21 March 2018Department of Biodiversity,
Conservation and Attractions

Hesperocolletes douglasi



Graticule shown at 5 minutes intervals

Produced by amym
on Wednesday, 21 March 2018



Department of Biodiversity,
Conservation and Attractions

What is the current distribution of the species within Western Australia?	The species is only currently known to be extant in Banksia woodland within the City of Wanneroo. The collection site is within UCL (Department of Defence) adjoining the Gnangara-Moore River State Forest (pine plantation).		
What percentage of the species distribution is within WA?	100 %		
What is the current distribution of the species within the other Australian States and Territories?	Nil		
Does the species occur outside of Australia?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes, what percentage of the species distribution is within Australia, or what is the significance of the occurrence in Australia?			
What is the current international trend for the species? (if known)	NA		
5.2 Migration (fauna only)			
Is the species migratory?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>
Is the migration within WA or within Australia or international? (include details of migration routes if known)		NA	
5.3 Extent of Occurrence (EOO) within Australia			
What is the current EOO?	4 km ²		
How has this been calculated?	The usual EEO calculation method using Minimum Convex Polygon (MCP) cannot be used on a single point. As per the IUCN Guidelines, the EEO cannot be less than the AOO, therefore the EEO is considered to be at least equal to the AOO. The AOO is calculated as 4 km ² , being one 2 km x 2 km grid square.		
What is the historical EOO?	<p>8 km²</p> <p>Although historically the species was only known from Rottnest Island, it is presumed that the species also occurred at the mainland site at that time, even though it was not yet discovered.</p> <p>As per the current EEO above the historical EEO is at least equal to the AOO. A MCP calculation cannot be performed using only two points. The two collection sites are approximately 51 km linear distance apart.</p>		
What is the current EEO trend?	Decreasing <input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>		
Provide details on the current trend – quantify if possible	The recent discovery of the species on the mainland increases the EEO when compared to the historical location of Rottnest Island. However the original location and associated portion of the EEO is considered to be presumed extinct actual EEO on the mainland is unknown.		
If there has been a change in EEO when did this change occur?	There has been a historical change in EEO. The species has only been found at two locations – Rottnest Island and the Pinjar site. The species has not been re-found on Rottnest Island, and the habitat on the island may no longer be suitable for the species, and therefore that portion of		

	the EOO has been removed.
Was the change observed, estimated, inferred or projected?	Observed
If the EOO is decreasing / declining, is it continuing?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/> N/A <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected?	<p>Decline in EOO is unknown as the mainland distribution of the species is unknown.</p> <p>However there is an inferred continuing decline in EOO based on the mainland habitat where the species was collected.</p> <p>The bee has been collected within Banksia woodland, an Endangered EPBC Act listed TEC. The woodland met eligibility for listing due to a 50-60% decline in geographic extent across the SCP with patches of severe decline and fragmentation especially around the Perth metropolitan area (meeting vulnerable), small patch sizes that are highly fragmented and facing demonstrated threats with significant reduction in median patch size from an estimated pre-European value of 146 ha to a current value of 1.6 ha (meeting endangered) and a severe reduction in community integrity due to threats (meeting endangered) (DoEE 2018).</p>
Is there extreme fluctuation in EOO?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
If Yes, provide details:	
5.4 Area of Subpopulations within Australia (if not known, go to section 5.5)	
What is the current area of the known subpopulations or occupied habitat?	Unknown
How has this been calculated?	
What is the historical area of subpopulations?	Unknown
What is the current area of subpopulations trend?	Decreasing <input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
Provide details on the current trend – quantify if possible	
If there has been a change in the area of subpopulations when did this change occur?	Historical change. The species is presumed extinct on Rottnest Island.
Was the change observed, estimated, inferred or projected? Give details.	Observed
If the area of subpopulations is decreasing / declining, is it continuing?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/> N/A <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected? Give details.	
Is there extreme fluctuation in the area of subpopulations?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>

If Yes, provide details:	
5.5 Area of Occupancy (AOO) within Australia	
What is the current AOO (estimated using the 2x2km grid method specified in the IUCN guidelines)?	4 km ²
What is the historical AOO?	8 km ² Although historically the species was only known from Rottnest Island, it is presumed that the species also occurred at the mainland site at that time, even though it was not yet discovered.
What is the current AOO trend?	Decreasing <input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
Provide details on the current trend – quantify if possible	The recent discovery of the species on the mainland doubles the previously known AOO. However the original location and associated AOO is considered to be presumed extinct and the actual AOO on the mainland is unknown.
If there has been a change in AOO when did this change occur?	As per EOO, there has been a historical change in AOO. The species was listed as 'presumed extinct' in 1994 due to only a single specimen ever being collected in 1938 and the species not been re-found on Rottnest Island, or at other locations, despite intensive searching and targeted surveys conducted 1978-1992 (Houston 1991, Pille Arnold <i>et al.</i> , in prep.). Suitable habitat is likely to no longer be present on Rottnest Island and therefore that portion of the AOO is removed.
Was the change observed, estimated, inferred or projected? Give details.	Observed
If the AOO is decreasing / declining, is it continuing?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/> N/A <input type="checkbox"/>
Is the continuing decline observed, estimated, inferred or projected? Give details.	As per EOO, decline in AOO is unknown as the mainland distribution of the species is unknown. However there is an inferred continuing decline in AOO based on the mainland habitat where the species was collected. The bee has been collected within Banksia woodland, an Endangered EPBC Act listed TEC. The woodland met eligibility for listing due to a 50-60 % decline in geographic extent across the SCP with patches of severe decline and fragmentation especially around the Perth metropolitan area (meeting vulnerable), small patch sizes that are highly fragmented and facing demonstrated threats with significant reduction in median patch size from an estimated pre-European value of 146 ha to a current value of 1.6 ha (meeting endangered) and a severe reduction in community integrity due to threats (meeting endangered) (DoEE 2018).
Is there extreme fluctuation in AOO?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
If Yes, provide details:	
5.6 Number of Locations	
'Locations' are defined as a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present. The size of the location depends on the area covered by the	

threatening event and may include part of one or many subpopulations. Where a taxon is affected by more than one threatening event, location should be defined by considering the most serious plausible threat. (IUCN 2001).			
At how many locations does the species occur?		The species is currently known to occur at 1 location. It is known to be extant at Pinjar (City of Wanneroo) and presumed extinct on Rottnest Island.	
Has there been a change in the number of locations?		Decrease <input type="checkbox"/> Increase <input type="checkbox"/> No change <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	
If there has been a change, when did this change occur?		The species has recently been discovered at a new location which doubles the known locations. However it is considered to be extinct at the original location, which is a decrease in locations. Although historically the species was only known from Rottnest Island, it is presumed that the species also occurred at the mainland site at that time, even though it was not yet discovered. Therefore the discovery at a new location has not resulted in an increase in actual locations where the bee occurs, but is an increase in known locations.	
Was the change observed, estimated, inferred or projected? Give details.		Observed	
If the number of locations is decreasing / declining, is it continuing?		Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/> N/A <input type="checkbox"/>	
Is the continuing decline observed, estimated, inferred or projected? Give details.		Unknown	
Is there extreme fluctuation in the number of locations?		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Unknown <input type="checkbox"/>	
If Yes, provide details:			
Does this species occur on any off-shore islands?		Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Unknown <input type="checkbox"/>	
If Yes, provide details:		Historically the species occurred on Rottnest Island, however is presumed to be extinct on the island as it is likely that no suitable habitat remains (Burbidge 2004).	
5.7 Fragmentation			
Is the distribution fragmented?		Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	
The phrase ' severely fragmented ' refers to the situation in which increased extinction risks to the taxon results from the fact that most of its individuals are found in small and relatively isolated subpopulations (in certain circumstances this may be inferred from habitat information). These small subpopulations may go extinct, with a reduced probability of recolonization.			
Is the distribution severely fragmented?		Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	
If Yes, provide details:			
5.8 Land tenure			
Is the species known to occur on lands managed primarily for nature conservation? i.e. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation		Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	

If Yes; provide details:	Unknown. Currently the species is not known to occur on conservation lands, although the presumed extinct historical location, Rottnest Island, is a 'A Class' Crown Reserve.	
Is the species known to occur on lands that are under threat? i.e. mining tenement, zoned for development	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
If Yes; provide details:	Unknown	
Provide details of other land tenures where the species occurs as this relates to the species conservation status	The land tenure of the extant site at Pinjar is UCL managed by the Department of Defence.	

Section 6: Population

<p>'Population' is used in a specific sense in the Red List Criteria that is different to its common biological usage. Population is here defined as the total number of mature individuals of the taxon. In the case of taxa obligately dependent on other taxa for all or part of their life cycles, biologically appropriate values for the host taxon should be used. (IUCN 2001)</p>				
<p>'Subpopulations' are defined as geographically or otherwise distinct groups in the population between which there is little demographic or genetic exchange (typically one successful migrant individual or gamete per year or less).</p>				
6.1 Subpopulations				
Subpopulation location	Land tenure	Survey information: Date of survey and No. mature individuals	Area of subpopulation	Site / habitat Condition
Extant				
Pinjar	UCL (Dept. of Defence)	8 October 2015 (1 female collected)	4 km ² (One 2 km x 2 km grid square)	"The collection site was in an area of almost pristine Banksia woodland but dissected by roads and firebreaks." (Pille Arnold <i>et al.</i> , in prep)
Presumed extinct				
Rottnest Island	Crown Reserve (Class A)	9-12 November 1938 (1 male collected)	0	<p>No details of the circumstances of capture (i.e. flowers visited, vegetation type) or exact location on the island were recorded (Houston 2014).</p> <p>Dramatic changes to the island vegetation has occurred since European settlement; caused by human activities, frequent fire and overgrazing by quokkas and the probably eliminated the bee's food plants (Burbidge 2004).</p>

6.2 Population size (Australian context) <i>(include how numbers were determined/calculated)</i>	
What is the total population size?	Unknown
What is the number of subpopulations?	One
What percentage of the population is within WA?	100 %
What percentage of the population is within Australia?	100 %
6.3 Population dynamics (Australian context) <i>(include how numbers were determined/calculated)</i>	
What is the number of mature individuals?	Unknown
What is the number of immature individuals?	Unknown
What is the number of senescing/past reproductive individuals?	Unknown
What is the maximum number of mature individuals per subpopulation?	Unknown
What is the percentage of mature individuals in the largest subpopulation?	100 %
What percentage of mature individuals is within WA?	100 %
What percentage of global mature individuals is within Australia?	100 %
What is the age of sexual maturity?	Sexually mature at emergence from burrow after pupation
What is the life expectancy?	1 year presumed, as per most similar native bee species, with adults flying a few weeks during spring and most of the year spent in immature stages
What is the generation length?	1 year presumed as per most similar native bee species
What is the reproductive capacity? (i.e. litter size or number of seeds)	Unknown
What is the reproductive success?	Unknown
6.4 Population trend	
What is the current population trend (mature individuals)?	Decreasing <input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
What is the percentage of the population change and over what time period?	Unknown
How has this been calculated?	
If the trend is decreasing; are the causes of the reduction understood?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>
Have the causes of the reduction ceased?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>

Are the causes of the reduction reversible?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
Is the reduction continuing (continuing decline)?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
Has the change been observed, estimated, inferred or is it suspected (direct observation, index of abundance appropriate to the species)? Give details				
When was the reduction or is it anticipated to occur?	Past <input type="checkbox"/>	Present <input type="checkbox"/>	Future <input type="checkbox"/>	
What is the period of time for the reduction (in years and generations)?				
Are there extreme fluctuations in population size?		Yes <input type="checkbox"/>	No <input type="checkbox"/>	Unknown <input checked="" type="checkbox"/>
<i>If Yes, provide details:</i>	The natural life history of the species fluctuates in the number of mature individuals during the year, with adults flying a few weeks during spring and most of the year spent in immature stages.			
6.5 Translocations and captive/enclosed subpopulations				
Have there been translocations (introduction or re-introduction)?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
Are there proposed translocations (introduction or re-introduction)?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
Are there self-sustaining translocated subpopulations?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
Are there translocated subpopulations that are not self-sustaining?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
<i>If Yes is the response to any of the four questions above, provide summary details:</i>				
Are there captive/enclosed/cultivated subpopulations?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
Are there proposed captive/enclosed/cultivated subpopulations?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
Are there self-sustaining captive/enclosed subpopulations?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
Are there captive/enclosed subpopulations that are not self-sustaining?		Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>	Unknown <input type="checkbox"/>
<i>If Yes is the response to any of the four questions above, provide summary details:</i>				
Other information on translocations and captive/enclosed subpopulations for the species (including failures):	N/A			
6.6 Important subpopulations				
<p><i>Identify any subpopulations that are important or necessary for the long-term survival of the species and provide details for why they are considered as such (i.e. key breeding, edge or range, maintenance of genetic diversity):</i></p> <p>There is only 1 known location, the Pinjar collection site and remnant vegetation in the vicinity, therefore the entire population is important and necessary for the long-term survival to the species.</p>				

Section 7: Threats

7.1 Threats (detail how the species is being impacted, i.e. how severe, the extent, evidence of the impact)				
Threat (describe how the threat impacts on the species. Include abiotic and biotic causes, human related e.g. exploitation, and biological characteristics of the species e.g. low genetic diversity)	Extent (give details of impact on whole species or specific subpopulations)	Impact (what is the level of threat to the conservation of the species)	Evidence	Time period (past, present, future)
<p>Clearing of habitat:</p> <p>Removal of the habitat would result in the loss of individuals and possibly the entire population depending on the scale of the area cleared. Clearing may also result in habitat fragmentation, possibly causing the population to become unviable.</p>	Unknown possibly entire	Unknown possibly severe	<p>Vegetation clearing was significantly more extensive in the past, but is still occurring and is expected to continue in the future.</p> <p>Loss of fauna species has occurred at many areas that have been cleared, altered or degraded on the SCP and it is inferred that the same is possible for the bee.</p> <p>Two other mainland native bee species are listed as threatened in WA and under the EPBC Act due to removal and alteration of habitat (DEWHA 2008, DSEWPaC 2013).</p>	Past, present, future
<p>Habitat degradation:</p> <p>Degradation of the vegetation habitat supporting the species may result in loss of food plants or reduced food output for the bees.</p>	Unknown	Unknown	<p>The species is presumed extinct on Rottnest Island due to dramatic changes to the island vegetation that has occurred since European settlement; caused by human activities, frequent fire and overgrazing by quokkas and that probably eliminated the bee's food plants (Burbidge 2004).</p> <p>The following are threats to the Banksia woodland TEC that will result in modification of the availability of food plants: climate change (increasing temperatures, declining rainfall, rainfall timing); groundwater drawdown; altered</p>	Past, present, future

			fire regimes; plant pathogens (dieback); invasive flora and fauna; and other disturbances to patches.	
<p>Fire</p> <p>Heat produced in high-intensity fires and conducting through soils is unlikely to penetrate soils to a depth of > 10 cm. So, given that <i>Hesperocolletes douglasi</i> is a ground-nesting species, likely to nest at the same depth as other ground-nesting species occurring in the region which are all known to burrow nests ≥ 1 m underground, fire is unlikely to affect the immature stages. Fire may directly kill adults, if during their flight period in spring, and will rob adults of the food plants during their brief flight season (Houston pers. comm. 2017). Therefore, a fire occurring in spring, regardless of its intensity, may destroy a subpopulation or severely affect its breeding potential and the survival.</p>	Unknown possibly entire	Unknown possibly severe	Knowledge of fire impacts on similar species and the habitat.	Past, present, future
<p>Pesticides (and possibly herbicides)</p> <p>Chemicals may kill adults if they are directly sprayed or if they consume sprayed food. A chemical may penetrate the ground and kill the immature stages.</p>	Unknown	Unknown	Chemicals may be used in land management practices.	Past, present, future
<p>Competition with feral introduced honey bees</p> <p>The introduced European honey bee (<i>Apis mellifera</i>) are likely to use the same foraging plants and may out-compete the native bees, however there is no published evidence for this and so further research is required.</p>	Unknown possibly entire	Unknown Possibly moderate to severe	“European honey bees visit the flowers of at least 200 Australian plant genera and interact with a wide diversity of native flower-visiting animals. Feral European honey bees may out compete native fauna for floral resources, may disrupt natural pollination processes and may displace endemic wildlife from tree hollows. However, there is insufficient research about interactions between European honey bees and Australian biota to fully describe their impacts” (DoEE undated).	Past, present, future

Section 8: Management

8.1 Current management		
Is the species managed?	Yes, directly <input type="checkbox"/>	Yes, indirectly <input type="checkbox"/> No <input checked="" type="checkbox"/>
If Yes; provide details of current or past management actions:		
Does the species benefit from the management of another species or ecological community?	Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown <input checked="" type="checkbox"/>	
If Yes; provide details:	It is possible that management of the Banksia Woodland TEC may benefit the species, depending on the management action, i.e. the use of pesticide, and possibly herbicide, would not benefit the bee.	
8.2 Recovery planning		
Is there an approved Recovery Plan (RP) or Interim Recovery Plan (IRP) for the species?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	
List all relevant recovery plans or interim recovery plans (including draft, in-preparation, out-of-date, national and other State/Territory plans, and plans for other species or ecological communities that may benefit or be relevant to the nominated species)		
List other documents that may be relevant to the management of the species or the lands on which it occurs (i.e. area management plans, conservation advices, referral guidelines)		
<p>Threatened Species Scientific Committee (2016). <i>Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community</i>. Canberra: Department of the Environment and Energy. In effect under the EPBC Act from 16-Sep-2016. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/131-conservation-advice.pdf</p> <p>Department of the Environment and Energy (2016). <i>Banksia Woodlands of the Swan Coastal Plain: a nationally protected ecological community</i>. Administration guideline companion to the Approved Conservation Advice. In effect under the EPBC Act from 23-Dec-2016. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/banksia-woodlands-swan-coastal-plain-guide</p> <p>Department of the Environment and Energy (in prep.). <i>Banksia Woodlands of the Swan Coastal Plain: Draft guidance for part 7 referrals under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>. Companion to the Approved Conservation Advice. Available from: http://www.environment.gov.au/biodiversity/threatened/publications/banksia-woodlands-swan-coastal-plain-guide</p> <p>Department of Sustainability, Environment, Water, Population and Communities (2013). <i>Approved Conservation Advice for Leioproctus douglasiellus (a short-tongued bee)</i>. Canberra: Department of Sustainability, Environment, Water, Population and Communities. In effect under the EPBC Act from 14-May-2013. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66756-conservation-advice.pdf</p> <p>Department of the Environment, Water, Heritage and the Arts (2008). <i>Approved Conservation Advice for Neopasiphae simplicior (a short-tongued bee)</i>. Canberra: Department of the Environment, Water, Heritage and the Arts. In effect under the EPBC Act from 08-Jan-2009. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/66821-conservation-advice.pdf</p>		
8.3 Management recommendations		
Management and preservation of the vegetation at and in the vicinity of the Pinjar specimen collection site:		
<ul style="list-style-type: none"> Protect the habitat from land clearing by including consideration of habitat protection for the species in vegetation clearing and land development assessments. 		

- Plan prescribed burning to minimise impact to the bees' life cycle and control wildfire to minimise impact on the habitat.
- Maintain hygiene standards to reduce the risk of introduction of *Phytophthora* species.
- Control rabbits where degradation of the habitat is identified.
- Control European honey bees if further research identifies this as a threat.

Research requirements include:

- Survey potential habitat for further subpopulations.
- Increased knowledge of the life cycle.
- Investigate ecological requirements of the species, including habitat requirements, resilience to fire, food plants and effect of fragmentation.
- Determine what affect the European honey bee has on the species and/or its habitat.

Section 9: Nominator details

Nominator name(s):	Species and Communities Branch
Contact details:	
Date submitted:	31/01/2018
<i>If the nomination has been refereed or reviewed by experts, please provide their names and contact details:</i>	
<p>Terry Houston WA Museum Research Associate, Department of Terrestrial Zoology (Entomology)</p> <p>Juliana Pille Arnold PhD Candidate, School of Biological Sciences, University of Western Australia</p>	

Section 10: References

9.1 References
<p>Australian Museum (2007). Invertebrate Collection Manual: A guide to traditional invertebrate collection methods. Prepared by Matthew Bulbert, John Gollan, Andrew Donnelly and Lance Wilkie, for the BugWise Project, Australian Museum. Available from: https://australianmuseum.net.au/uploads/documents/9382/the%20invertebrate%20collection%20manual.pdf</p> <p>Burbidge, A.A. (2004). Threatened animals of Western Australia. Department of Conservation and Land Management, Perth.</p> <p>Department of Parks and Wildlife (2016). <i>Bushland News</i> - Summer 2016-2017 - Issue 100. Urban Nature, Department of Parks and Wildlife, Perth. Available from: https://www.dpaw.wa.gov.au/management/off-reserve-conservation/urban-nature/93-bushland-news</p> <p>Department of Sustainability, Environment, Water, Population and Communities (2013). <i>Approved Conservation Advice for Leioproctus douglasiellus (a short-tongued bee)</i>. Canberra: Department of Sustainability, Environment, Water, Population and Communities. In effect under the EPBC Act from 14-May-2013.</p>

Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/66756-conservation-advice.pdf>

- Department of the Environment and Energy (2016). *Banksia Woodlands of the Swan Coastal Plain: a nationally protected ecological community*. Administration guideline companion to the Approved Conservation Advice. In effect under the EPBC Act from 23-Dec-2016. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/banksia-woodlands-swan-coastal-plain-guide>
- Department of the Environment and Energy (2018). Banksia Woodlands of the Swan Coastal Plain ecological community in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <http://www.environment.gov.au/sprat>
- Department of the Environment and Energy (in prep.). *Banksia Woodlands of the Swan Coastal Plain: Draft guidance for part 7 referrals under the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*. Companion to the Approved Conservation Advice. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/banksia-woodlands-swan-coastal-plain-guide>
- Department of the Environment and Energy (undated). Invasive bees. Webpage accessed 2018, page content undated. Available from: <http://www.environment.gov.au/biodiversity/invasive-species/insects-and-other-invertebrates/invasive-bees>
- Department of the Environment, Water, Heritage and the Arts (2008). *Approved Conservation Advice for Neopasiphae simplicior (a short-tongued bee)*. Canberra: Department of the Environment, Water, Heritage and the Arts. In effect under the EPBC Act from 08-Jan-2009. Available from: <http://www.environment.gov.au/biodiversity/threatened/species/pubs/66821-conservation-advice.pdf>
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- Houston, T.F. (2000). Native Bees on Wildflowers in Western Australia. Special Publication no. 2 of the Western Australian Insect Study Society Inc., WA Museum, Perth.
- Houston, T.F. (2011). Information Sheet: Native Bees. Western Australian Museum, Perth. Available from: <http://museum.wa.gov.au/research/collections/terrestrial-zoology/entomology-insect-collection/entomology-factsheets/>
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