



FAUNA *of* AUSTRALIA

61. CERVIDAE

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DEFINITION AND GENERAL DESCRIPTION

Within the Pecora, the Cervidae are differentiated by the possession in males (and in females of one non-Australian species, the Reindeer) of branching horns called antlers. These are epiphyseal in nature and are shed and re-grown every year. The bone, of which they essentially consist, is laid down by a highly vascularised skin cover called velvet. Contrary to most other Pecora, especially the other Australian family Bovidae, the Cervidae may possess upper canines, at least for part of their life. The cheekteeth are brachyodont. There are two lacrymal orifices on the border of each orbit. The tympanic bullae are less inflated. The anterior groove on the cannon bone (fused metatarsals) is covered distally by a bony bridge.

HISTORY IN AUSTRALIA

Several species of cervids were introduced at different times in Australia, mostly by acclimatisation societies. These introductions have had variable success, and some failed altogether. The earliest introduction was of Chital (*Cervus axis*). These were brought to Australia first in the period 1800–1803 (Deer Advisory Council of Victoria 1979), but the first introduction, in New South Wales, did not survive. The present population in Queensland derives from later introductions. Brief histories of the seven species present, or possibly present in Australia are as follows [generic usage after CAVS 1998; ed.].

Fallow Deer (*Cervus dama*) were released at Campbelltown, Tasmania, in 1834 (Allison & Coombes 1969) and at Albury, New South Wales in 1884. The species has spread and has a patchy distribution in New South Wales and Victoria (Bentley 1978) as well as Tasmania.

Hog Deer (*Cervus porcinus*) were introduced in a herd of mixed origin, some individuals from Calcutta and others from Colombo, to Cape Liptrap in 1866 and Gembrook in 1870. The former release was successful and has spread in south-eastern Victoria; the latter release did not survive (Bentley 1978).

Chital (*Cervus axis*) were introduced in 1802 at Rose Hill, west of Sydney (Allison & Coombes 1969) and later successively to Sugarloaf Mountain, Wilson's Promontory, the Grampians, Darling Downs and Maryville Station on the Burdekin River. Only the last of these releases was successful, though possibly some animals may survive in the Grampians (Bentley 1978).

Several Red Deer (*Cervus elaphus*) were sent from parks in England and probably also Scotland between 1860 and 1874 to Melbourne and Werribee, Victoria, Western Australia and Queensland. The present stocks, which survive in restricted areas, were supplied mainly by Thomas Chirnside of Werribee, as was the New Zealand stock.

Some Barasingha (*Cervus duvauceli*) were imported from Calcutta in 1867–8, but it is doubtful whether any survive.

The earliest importation of Sambar (*Cervus unicolor*) was probably that by Edward Wilson in 1861 from Galle, Sri Lanka, according to Bentley (1978). Five were released in 1862 at Mt Sugarloaf and a few other small liberations were followed by a major release near Tooradin in 1868 and another in 1873. Descendants of these introductions survive and their range is spreading. Three animals were released on the Cobourg Peninsula, Northern Territory in 1912 and their descendants survive and have spread (both naturally and by human agency) whereas 54 Fallow Deer and five Barasingha released at the same time failed to survive.

Rusa Deer (*Cervus timorensis*), were introduced several times — Gembrook, 1890; Royal National Park, 1907; Friday and Prince of Wales Islands, 1912; Possession Island, 1914 and Groote Eylandt, 1952. These stocks have survived and flourish while other introductions (Gippsland and Western Australia) have failed.

MORPHOLOGY AND PHYSIOLOGY

Cervids are in most respects similar to Bovidae (see Chapter 62) and only points of difference will be given here.

External Characteristics

All deer are of gracile build, usually long-limbed and always slender, though males (stags) may be quite massive on the forequarters and neck. The muzzle has a moist, blunt rhinarium. The size ranges from 33 kg for a female Hog Deer to perhaps 300 kg for some Sambar males; a male Sambar collected by J. F. Bishop near Tumut, New South Wales in 1976, weighed in excess of 220 kg. The antlers grow only in males. One year old males grow short, usually unbranched antlers and each successive set is larger than the last, until a plateau is reached at some 6 – 7 years of age (in Red Deer; probably earlier in other species), after which there is some degeneration. In the larger deer species, males and females are known as stags and hinds, respectively; in smaller species they are called bucks and does.

Colours and colour patterns of different species are described later in this Chapter. Only Fallow Deer, the most domesticated of the deer, has a wide variety of colour types whose frequency varies from place to place (white ones occur only in Tasmania, for example).

Body Wall

Skin is not thick; hairs grow in groups with apocrine sweat glands and sebaceous glands. Histological structure of the skin has not been studied fully. Male deer develop a throat swelling in the rut (Schaller 1967).

Skeletal System

The skull resembles that of smaller Bovidae, with a long post-cornual part and little flexion. The development of antlers makes the skulls of males more massive than those of females. Antlers grow from prominent pedicels just above and behind the orbits and these remain even when the antlers have been shed (Figures 61.1 & 2). The first set of antlers are direct outgrowths from these pedicels. When shed, a bony plate forms at the junction of pedicel and antler to form a seal so that the antler simply falls off when knocked. Subsequent growths are in the nature of epiphyses: thickly furred skin (velvet) grows over the seal and this is full of blood vessels which lay down bone. The antlers grow very rapidly, reaching their full development in a few weeks (varying according to species). In all antlers except the first set, therefore, there is a sharp division between the antler and the pedicel. Around the division is a bony ring, the burr. The frontal sinuses extend into the first set of antlers, but are cut short by the formation of the first seal. As the subsequent set forms as epiphyses, it is solid.

The branches of the antlers are known as tines. In all of the Australian species the first branch is immediately above the burr; it is a simple, slightly curved prong, directed forward and upward and known as the brow tine. In all species a long, unbranched section of the antler, extends upward and backward. In some species there is then a simple bifurcation at the top of the antler (the crown), but in others there are a series of further tines (Figure 61.3). In Red Deer, a series of

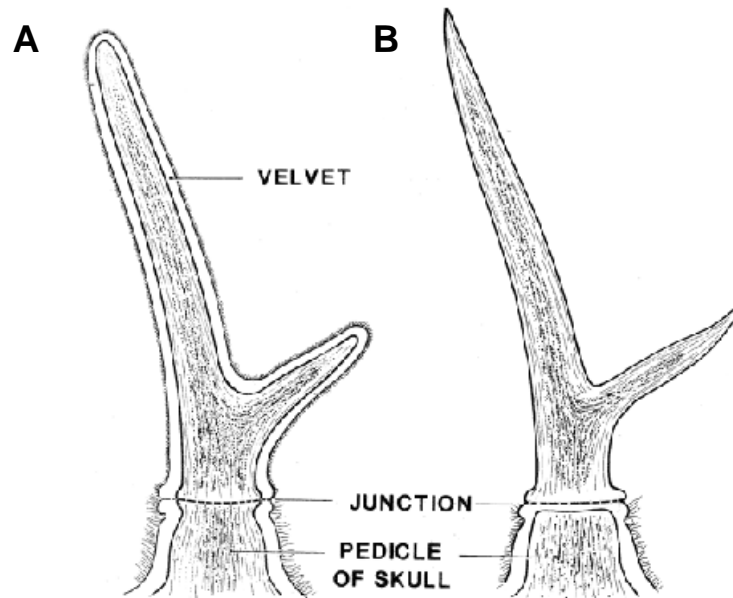


Figure 61.1 The internal structure of the cervid antler: **A**, the velvet stage; **B**, the stage after the velvet has been shed and the bone is exposed. The antler breaks off at the junction at the time of annual shedding. (After Modell, 1969; © ABRS) [M. Thompson]

tines extend from the beam, pointing forward and outward, below the crown. The upper part of the beam is flattened in Fallow Deer, the tines partially joined together (palmation).

Feeding and Digestive System

Permanent dentition of females is: I 0/3 C 0/1 PM 3/3 M 3/3. Males (and some females) have an upper canine in addition (except in Fallow Deer, some Hog Deer and Chital). Deciduous dentition is the same, but without molars or upper canine. Food is cropped between the mandibular incisor-canine row and a hard premaxillary pad. The lower incisors are expanded to a greater or lesser degree to enlarge the cutting edge (Figure 61.4). Deer are predominantly browsers, but larger species do graze to some extent. As in Bovidae, deer chew on one side at a time.

The stomach is divided into four compartments exactly as in the Bovidae and there is degradation of cellulose and hemicelluloses by the gastric flora. Again, as in Bovidae, deer regurgitate their food in successive boluses and rechew it (rumination or chewing the cud).

Circulatory System

The most remarkable aspect of the circulatory system is its proliferation in the antler velvet of males. There has been much discussion over whether heat is lost from the velvet blood vessels. Undoubtedly it is, but this is certainly not the sole or even the main function of antlers. When the blood vessels are constricted, after antler growth is finished each year, the blood supply is cut off and the velvet dies and is shed, leaving the bony antler exposed (Figure 61.2).

Exocrine and Endocrine Systems

Invaginated glands on the face, just below the eyes, secreting sticky odoriferous fluid apparently of importance in social communication, occur in all deer. In addition, glands are present between the hooves on the hind feet in Fallow Deer, and on fore and hind feet in Hog Deer and Chital.

Reproduction

As in the Bovidae, there are two pairs of mammae in the groin. Testes in an adult Chital male each weighed 14.9 grams. In adult male Fallow Deer they range from 20 g in late summer to 90 g just before the commencement of the rut (Chapman & Chapman 1975), whereas Red Deer show a similar change in testes weight with reproductive condition, with a peak weight of 170 g (Clutton-Brock, Guinness & Albon 1982).

Most deer are polyoestrus. Some (Red Deer, Fallow Deer) have a single, circumscribed breeding season. Sambar have two breeding seasons 6 months apart. The other species breed year-round, but with distinct peaks at certain times. Dioestrus in Red Deer averages 18.3 days and in Sambar 17. There is a post-partum oestrus. In Australia, Fallow Deer only are monoestrus.

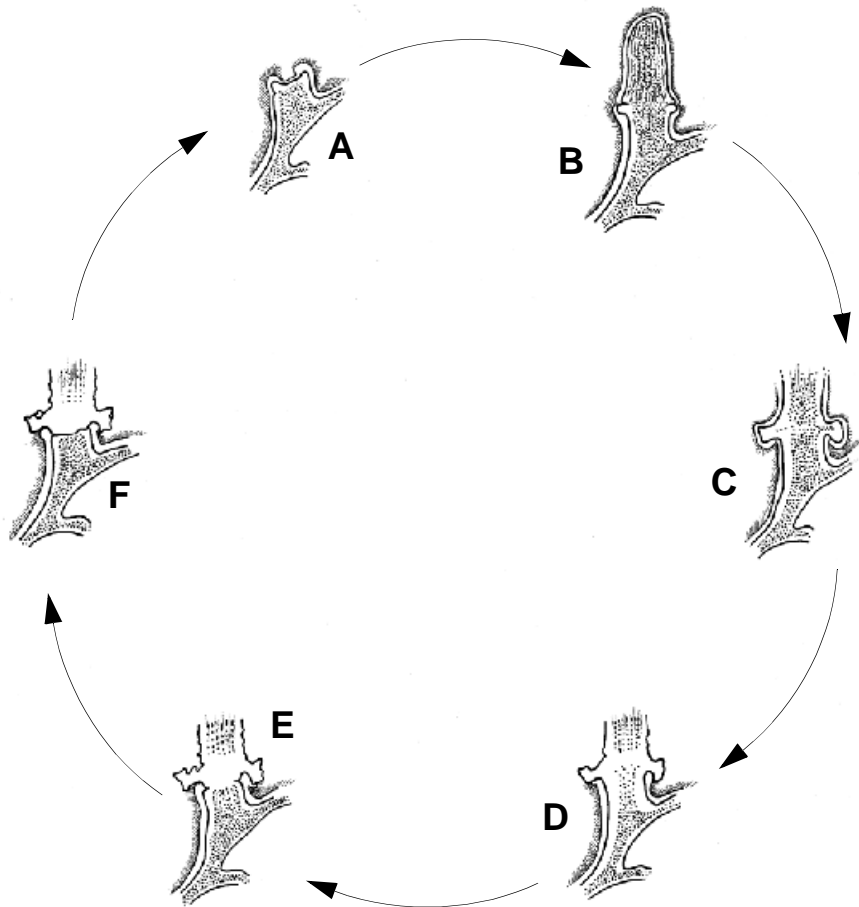


Figure 61.2 The cycle of antler growth and loss: **A**, pedicle after antler shed and before next cycle of growth starts; **B**, new antler covered with velvet begins to grow; **C**, full sized antlers with velvet beginning to degenerate; **D**, antler after velvet shed; **E** and **F**, seal begins to form between the antler and the pedicle of the skull. (After Bubenik, 1984; © ABRS) [M. Thompson]

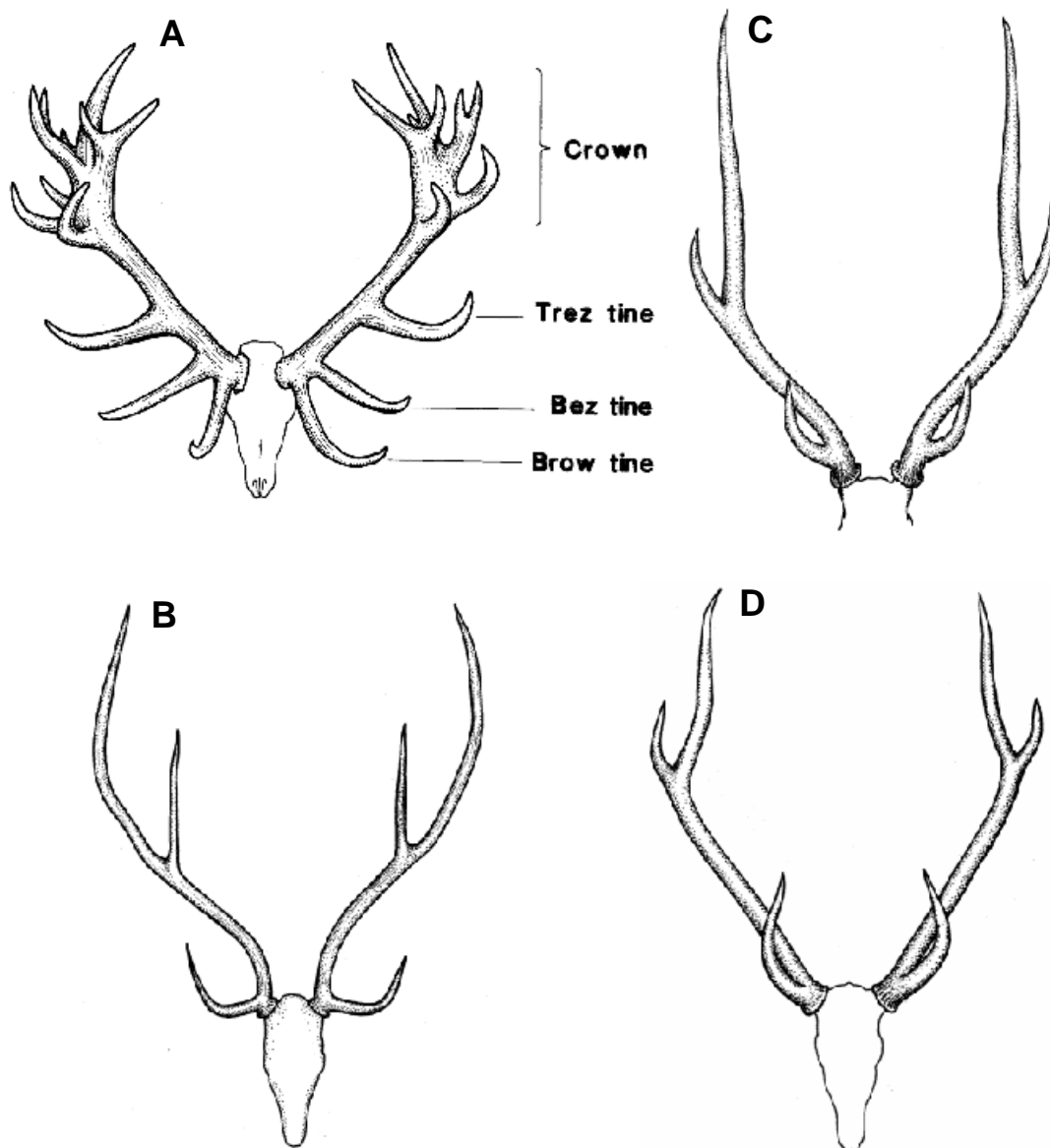


Figure 61.3 Frontal view of the antlers. **A**, Red Deer, which has antlers of the 'breaker-type'; **B**, Chital, in which the antlers are slender and simple; **C**, Rusa Deer, in which the postero-internal fork continues line of beam of antler; **D**, Sambar, in which the antero-external fork continues line of beam. (After Dansie & Wince, 1970; © ABRS) [M. Thompson]

Embryology and Development

Gestation lasts on average about 230 days in Red, Fallow and Hog Deer as well as Chital, but about 245 days in Sambar, Rusa Deer and Barasingha. Most species bear single young (fawns). Only Chital commonly bear twins.

The placenta resembles that of the Bovidae, but has fewer cotyledons.

Sexual maturity in Australian female cervids is usually in the third year, but Sambar have been known to be fertilised as young as 15 months and Fallow Deer have bred at 16 months. Males vary: Sambar stags are usually fertile at 19 months, but Red Deer not until their fourth year, though many will try to cover hinds and show other rutting behaviours in their second year.

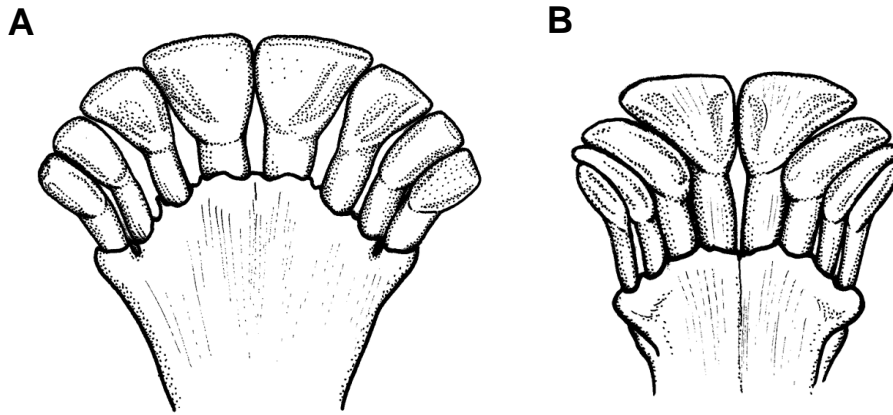


Figure 61.4 Lower incisors and canines of deer. **A**, Red Deer; **B**, Fallow Deer. In Red Deer, I1 is about equal to or slightly narrower than I2+I3+C; in Fallow Deer I1 is broader than I2+I3+C. (After Miller, 1912; © ABRS)
[M. Thompson]

NATURAL HISTORY

Life History

Sex ratio at birth in Red Deer is 120 males to 100 females. Other species are probably similar. Male mortality, thereafter, is much greater than female.

Rut, in Australian populations, tends to be 6 months removed from its timing in the Northern Hemisphere parent populations. Thus, the temperate zone deer (Red Deer and Fallow Deer) still rut in autumn, that is, late March to April (lasting about 6 weeks). The peak of mating in Hog Deer is in January. In Rusa Deer, mating occurs in July and August. There are two fairly well restricted seasons in Sambar, September to early November and March to April.

In a study on the Isle of Rhum, Scotland, over half the breeding each year was done by 6% of the stags (Lincoln & Guinness 1977). In one season, the most successful stag sired twice as many offspring as the second most successful, three times as many as the third. By contrast, in another year the most successful sired only one more calf than the second and only two or three more than the third. In three years all the top three stags changed. Stags usually would begin to breed at 7 – 8 years old, would reach their peak (which may or may not be near the top of the rank hierarchy) at 12 – 13 years, then rapidly decline and die a couple of years later.

Red Deer stags try to collect harems and their success, therefore, is dependent at least in part on age. By contrast, Barasingha stags gather around the herds of females and, rather than collecting harems, each stag attempts to copulate with a hind as she comes into oestrus. In a study in India, the dominant stag (probably on the analogy of Red Deer, the oldest, having the largest antlers) accounted for 48% of all copulations (Schaller 1967). Sambar, being solitary, have a different system again. Stags establish territories and attempt to establish consortships with females as they pass through. This also would seem to be the case with Rusa Deer, although this species is more gregarious than Sambar (Hoogerwerf 1970). Both Hog Deer and Chital, although the latter is the more gregarious of the two, have a similar system whereby stags visit the groups of hinds, copulating with those in oestrus then departing. Fallow Deer have a mating system similar to that of Sambar. The stag establishes a territory by visual and olfactory marking – clearing away bushes with his antlers, stripping off tree bark and marking stems with his preorbital glands – and with a ‘groaning’ vocalisation tries to attract does.

Ecology

Deer live mostly in lightly forested areas interspersed with open glades, but vary in their precise requirements. Fallow Deer require the most open country, needing forest to retire into for resting. Sambar hardly ever emerge from forest (they have adapted well to eucalypt forest in Australia). The observed distribution of species corresponds approximately to the proportion of browse versus grass in their diet. Sambar, however, also feed from cultivated land whereas Fallow Deer eat much fallen fruit.

Sambar are largely nocturnal. They usually rest up in thick cover by day and feed in open forested or glade regions at night. Other species are more diurnal, though all tend to concentrate their activities in early morning and late afternoon.

Sambar, Rusa Deer and, to a lesser degree, Red Deer all wallow in mud, especially in hot weather, and rub themselves on trees.

Behaviour

Red Deer live in single sexed herds for most of the year. During the rut, harems are formed and after antler shedding the stags join the herds of females until their antlers begin to regrow. Fallow Deer show similar behaviour. The other species have looser social organisation. Chital sometimes congregate into large grazing herds, over 100 strong, though usually 20 to 40 are seen together. The composition of such herds is fluid, bucks in particular leaving and rejoining herds at will, and tending, during the antler regrowth period especially, to form groups of their own. The herding behaviour of Barasingha is similar. Hog Deer, Sambar (Schaller 1967) and Rusa Deer (Hoogerwerf 1970) live in smaller herds or are even solitary. Males in these three species generally are found alone and, though feeding associations of a dozen or so occur, the only stable group is a female and her offspring (up to 1 or even 2 years of age).

Within herds, however they are formed, there are dominance rankings. Where herds are fairly stable a hierarchy can be said to exist. Hierarchy among males is more obvious although in Chital, in particular, there also is said to be a well marked female hierarchy. Males in all species adopt a head up display, raising the antlers into a conspicuous position. The recipients of this display adopt a submissive looking-away or moving-away response. A more serious threat is the head-down posture, which may be responded to by a similar action on the part of another male, the two standing head-on or flank-to-flank until one moves away. As rut approaches, these threats become more serious and in some species are accompanied by aggressive acts towards the vegetation. Chital strike their antlers against trees. Rusa and Barasingha toss bunches of grass into the air and festoon their antlers with it. Sambar destroy bushes and dig their antlers into the soil, throwing it over their backs.

Herd leadership seems informal. The dominant male or female is not necessarily the initiator of movement. Herds seem to follow any individual who decides to move elsewhere or change direction during flight. Zoo observations reported by Schaller (1967) suggest that, in Chital at least, such leaders tend to be in the top five or so of the dominance hierarchy, but are rarely the alpha members. Some individuals do lead much more than others.

Economic Significance

Deer have acquired great economic significance in a number of ways. They form an easily accessible supply of wild meat. The meat, known as venison, has a characteristic flavour that is an acquired taste, but has ardent devotees and is not fat-marbled like domestic meat. Various parts of deer also are used in Chinese and other East Asian traditional medicines, of which the most valuable

is antler velvet that is used as a sexual stimulant. Attempts have been made to farm deer for both venison and velvet, with varying degrees of success. Whereas venison is a fairly consistent but not particularly profitable source of income, the value of velvet fluctuates enormously and in some years has been extremely lucrative. Fallow Deer are the most commonly farmed deer in Australia, but Rusa Deer are more sought after and their velvet more valuable. The whole subject of deer farming is reviewed by Anderson (1978) and Yerex (1979).

The economic importance of deer in the wild in Australia is disputed. There is no doubt that they have the potential to be exceedingly destructive, although the problems experienced in New Zealand are not encountered to anything like the same degree here. On the other hand, it could be claimed that what damage they do, in the changed environment, no longer has any particularly drastic effect. There is a significant income from hunting, a growing interest in the south-east of Australia.

BIOGEOGRAPHY AND PHYLOGENY

Distribution

The indigenous and Australian ranges of our deer species are as follows.

Red Deer: indigenous in temperate regions of northern Eurasia and North America. The Australian stock derives wholly from England (Windsor Great Park; Knowsley Park, Lancashire) and perhaps Scotland. Current Australian distribution is – Victoria: Grampians, Otway Ranges, ranges west of Ballarat. Snowy River headwaters on both sides of the border. Queensland: valleys of Brisbane and Mary Rivers.

Barasingha: Northern India. Australian stock came from Bengal (it was shipped via Calcutta) and may still exist in Gippsland Victoria, but none has been seen for many years.

Sambar: Indian subcontinent, Sri Lanka, mainland South-east Asia, southern China, Sumatra, Borneo. Original stock in south-eastern Australia was sent from Galle, Sri Lanka; some stocks, especially that in the Northern Territory, may be of Indian origin. Current Australian distribution is – Victoria: Mt Cole State Forest; eastern highlands. New South Wales: south-eastern highlands, naturally spread from Victoria and still spreading. Australian Capital Territory: southern and western parts. Northern Territory: Cobourg Peninsula, perhaps Melville Island.

Rusa Deer: Java, Bali, Lesser Sunda Islands, Timor, Moluccas, Sulawesi. The stock in the Royal National Park is of Javan origin; that in the Torres Straits islands came from the Moluccas. Current Australian distribution is – Victoria: perhaps western Gippsland, but not seen for some years. New South Wales: Royal National Park (*C. t. russa*). Northern Territory: Groote Island (*C. t. moluccensis*). Queensland: Friday Is., Prince of Wales Is.; Possession Is. (*C. t. moluccensis*).

Chital: Indian subcontinent and Sri Lanka. The exact source of the Australian stock is unclear but it is currently found in the Maryville Creek area of Queensland.

Hog Deer: Indian subcontinent, Sri Lanka and mainland South-east Asia. The Australian stock is descended from a herd of mixed stock, some individuals came from Calcutta, others from Colombo. It occurs in south-east Victoria as far as Orbost, and on Snake Island.

Fallow Deer: the original distribution of this species seems to have been Turkey, but for a millennium or more it has been established successfully, originally by introduction, throughout western Europe. The Australian stock is from Britain. Its present distribution is – Tasmania. Victoria: Healesville, Kinglake, Yarra Glen, Grampians, near Wodonga. New South Wales: sporadic in south-east. Queensland: Warwick.

Affinities with other Groups

Other representatives of the suborder Pecora are listed under Bovidae.

Affinities within the Cervidae

Although the classification and inter-relationships within the Cervidae are matters for dispute, all the Australian representatives belong to the subfamily Cervinae and are interrelated closely. They are considered congeneric by some authors (for example, Flerov 1952) and placed in the genus *Cervus*. Groves & Grubb (1987), however, argued that *Axis* (Hog Deer and Chital) and *Dama* (Fallow Deer) retain primitive character states whereas *Cervus* (Red Deer, Sambar, Rusa and Barasingha) and the universally recognised genus *Elaphurus* (Père David's Deer) share a number of derived states. Therefore, it seems more sensible to retain *Elaphurus* in which case *Cervus* and *Dama* would also be confirmed as separate genera.

Subsidiary problems concern the interrelationships within the genera. Hog Deer and Chital are very distinct and there is doubt whether they exhibit any tangible synapomorphies. If generic separation is required, the name *Hyelaphus* is available for Hog Deer.

Within *Cervus*, the Australian species fall into three groups: (1) *C. elaphus*, (2) *C. duvauceli*, (3) *C. unicolor* and *timorensis*. *Cervus elaphus* is the type species of *Cervus*; the name *Rucervus* is available for *duvauceli* and *Rusa* for the other two (type species *unicolor*). These could be recognised as three subgenera. *Cervus duvauceli*, however, does share some derived features with the Sambar and Rusa Deer. Groves & Grubb proposed, following Flerov (1952), to include it in the subgenus (*Rusa*) as well.

A formal classification follows:

Genus *Cervus*

Subgenus (*Cervus*)

Cervus elaphus (Red Deer)

The Australian subspecies is *Cervus elaphus scoticus*, the British Red Deer, which currently is threatened with extinction through genetic swamping by imported deer from the mainland of Europe and by introgression from *Cervus nippon*, a related East Asian species.

Subgenus (*Rusa*)

Cervus duvauceli (Barasingha)

The Australian subspecies is *Cervus duvauceli ranjitsinhi*, the Assam Barasingha, currently threatened with extinction in its native range.

Cervus unicolor (Sambar [Sambhur])

The Australian subspecies are *Cervus unicolor unicolor*, the Ceylon Sambar, and *C. u. niger*, the Indian Sambar; these may not be distinct.

Cervus timorensis (Rusa or Timor Deer)

The Australian subspecies are *Cervus timorensis russa*, the Javan Rusa, and *C. t. moluccensis*, the Moluccan Rusa. Interestingly, these two subspecies, while apparently quite distinct, have a common origin a few hundred years ago:

Moluccan (and other eastern Indonesian) Rusa are derived ultimately from Java by importation (Groves, 1984). There are several other species of the subgenus *Rusa* (non-Australian).

Genus *Axis*

Axis axis (Chital or Spotted Deer)

Axis porcinus (Hog Deer)

The Australian stock is a mixture of *Axis porcinus porcinus*, (Indian Hog Deer) and *A. p. oryzus*, (Ceylon Hog Deer – if these two are themselves distinct).

Genus *Dama*

Dama dama (Common Fallow Deer)

COLLECTION AND PRESERVATION

Collection

There is some value in collection of specimens of Australian deer, considering that some species are derived from pure-bred stock that is now in danger of extinction in its homeland. With due attention to conservation principles (emphasis on collection of adult males and post-reproductive females) and to the usual ethical practices (non-disruption of social groups, following up of wounded individuals), collection is therefore more than mere pest control or shooting for sport in some instances.

Preservation

Sport hunters like to cut off the heads of their prey and mount them on wooden shields for display; or even to preserve the antlers alone. It is recommended that the whole skull, at least, should be kept in the case of some of the deer. Examples of the skins would be also valuable.

KEY TO AUSTRALIAN TAXA

- 1 Large species, the adult stags 1,100–1,200 mm high; males with a neck mane; antlers at an angle to the facial profile; hindfoot glands absent or rudimentary; upper canines present; lower first incisors at most twice the breadth of the second, equal to or slightly less than the combined breadth of second and third + canine (see Figure 61.4) 2

Smaller species, the adult stags under 950 mm high; males without mane; antlers go back in line with facial profile; hindfoot glands well developed; upper canines absent or nearly always so; lower first incisors at least twice the breadth of second, broader than second and third + canine combined 7
- 2 Ears pointed; fur fine; rump patch large, spreading over tail and surrounding region; young spotted; general colour reddish brown; mane longer on lower part of neck; antlers with two tines emerging from beam, a 'crown' of several tines at top; antlers 750 – 900 mm long *Cervus elaphus*

Ears large, rounded; rump patch absent, at most a lightening over rump; young unspotted; colour not reddish; mane evenly developed over neck; antlers with no tines emerging from beam 3
- 3 Antlers dichotomously branched above brow tine, each branch being itself again dichotomously branched; yellow-brown colour; mane very poorly developed; antlers 600 – 700 mm long *Cervus duvauceli*

Antlers simple, forked once (sometimes with one or more subsidiary forks) high above brow tine; dark brown colour; mane very bushy, well developed 4

- 4 Tail bushy, blackish; belly darker hued than back; forehead flat; antlers heavy, stout, rugose; brow-tine pointing upward; anterio-external fork continues line of beam *Cervus unicolor* 5
- Tail longer, narrower, coloured like body; belly lighter hued than back; forehead concave; antlers more slender, less rugose; brow-tine pointing more forward, curved; postero-internal fork continues line of beam *Cervus timorensis* 6
- 5 Antler length 650 – 700 mm *C. u. unicolor*
- Antler length 950 – 1,200 mm. *C. u. niger*
- 6 Larger, height 1,100 mm in male, 1,000 mm in female; antlers usually 700 – 800 mm long; male dark brown, female more yellowed; throat dark *C. t. russa*
- Smaller, height 980 mm in male, 860 mm in female; antlers usually 500 – 650 mm long; colour more grey-brown; throat grey-white *C. t. moluccensis*
- 7 Rump patch present, restricted to hind surface of buttocks, outlined in black; no dark muzzle band; antlers palmated from about halfway up beam; lower first incisor more than twice as broad as second; auditory bullae not enlarged; colour usually fawn-brown, but polymorphic: a rare pale phase called menil; black (mainly in Tasmania); white (Tasmania); tends to be spotted, especially in summer; velvet brown *Cervus dama*
- Rump patch absent; dark band around muzzle; antlers not palmated, very simple with one main fork; lower central incisor four times as broad as second; auditory bullae enlarged 8
- 8 Antlers large, 700 – 750 mm long, not on a pedicel; large size, long-legged, male 900 mm high, female 800 mm; colour bright pinky-fawn, lighter below, spotted at all seasons; a white throat patch; velvet reddish *Cervus axis*
- Antlers short, 300 – 450 mm long, on prominent furred pedicel; small and short-legged, male 650 mm high, female 550 mm; colour dull yellow-brown, darker below, unspotted except when young; no white on throat; velvet brown *Cervus porcinus*

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