Conservation Status of Mammals in Western Australia and Threatening Processes Affecting Them.

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Western Australia has a very rich mammal fauna with elements from both marsupial and eutherian families. Marsupials make up almost 40 percent and cetaceans a further 19 percent of the indigenous fauna. The total fauna includes 202 mammal species, comprising 184 indigenous species and 18 exotic species (Table 1). Only a few species of native mammal have benefited from the human-induced changes to the Australian landscape (eg large kangaroos *Macropus* sp.), although some smaller species may have been able to expand their range in the face of agriculture (eg Long-haired Rat *Rattus villissimus* into the Ord River Irrigation Area).

Table 1. Summary of Western Australian mammal fauna.

Monotremes	1 species
Marsupials	72
Bats	40
Rodents	33 indigenous, 4 exotic
Pinnipeds	2
Dugong	1
Cetaceans	35
Other Exotics	18
Total	202 species (184 indigenous, 18 exotic)

In general Australian native mammals have suffered declines in distribution and abundance as a result of changes to the environment following the arrival of European man. Ten indigenous mammal species (and 1 exotic) have become extinct since European settlement (Table 2). Somewhat surprisingly, the majority of the extinct species came from the central and northern desert regions of the State and the adjacent pastoral regions. Far fewer extinct species occupied the area now cleared for agriculture in the southwest of the State. In contrast, the south-west agricultural region has the highest number of species that are currently threatened with extinction. There are currently 33 indigenous mammal species listed as 'threatened fauna' under the provisions of the *Wildlife Conservation Act 1950*, with a further 10 species listed as 'presumed extinct' (Appendix 1).

This begs the questions - what are the processes that have lead to the extinction of our native mammals, and are they the same processes that are threatening our native fauna today?

Table 2. List of indigenous and exotic mammal families present in Western Australia, and showing their current conservation status. (Note: *Exotic families.)

Family		**No. Species in Family**	**No. Species Threatened**	**No. Species Extinct**
Tachyglossidae	Echidna	1	0	0
Dasyuridae	Dasyurids	31	6	0
Myrmecobidae	Numbat	1	1	0
Peramelidae	Bandicoots	6	2 (1 as spp.)	2
Thylacomelidae	Bilbies	2	1	1
Notoryctidae	Marsupial Moles	2	2	0
Vombatidae	Wombats	1	0	0
Potoroidae	Potoroos and Bettongs	4	2	1
Macropodidae	Wallabies and Kangaroos	18	6 (2 as spp.)	2
Phalangeridae	Possums	2	0	0
Petauridae	Sugar Gliders	2	0	0
Pseudocheiridae	Ringtail Possums	2	1	0
Burramyidae	Pygmy Possum	1	0	0
Tarsipedae	Honey Possum	1	0	0
Pteropidae	Flying Foxes, Fruit Bats	3	0	0
Emballonuridae	Sheathtail Bats	3	0	0
Megadermatidae	Ghost Bat	1	0	0
Hipposideridae	Leaf-nosed Bats	3	1	0
Vespertillonidae	Vespertilonid Bats	24	0	0
Mollossidae	Free-tail Bats	6	0	0
Muridae	Rodents	37 (incl. 4 exotic sp)	6	4
*Sciuridae	Palm Squirrel	1	0	0
*Leporidae	Rabbit	1	0	0
Ziphiidae	Beaked Whales	8	0	0
Physetidae	Sperm Whale	1	0	0

Family		No. Species in Family	No. Species Threatened	No. Species Extinct
Kogiidae	Pygmy, Dwarf Sperm Whales	2	0	0
Delphinidae	Dolphins	16	0	0
Balaenopteridae	Baleen Whales	6	4	0
Balaenidae	Baleen Whales	2	1	0
*Canidae	Dingo, Fox	2	0	0
*Felidae	Cat	1	0	0
*Mustelidae	Ferret	1	0	0
Otariidae	Seals, Sea lion	2	0	0
Dugongidae	Dugong	1	0	0
*Equidae	Horse, Donkey	2	0	0
*Suidae	Pig	1	0	0
*Camelidae	Dromedary Camel	1	0	0
*Bovidae	Cattle	2	0	0
*Cervidae	Deer, Antelope	2	0	1
*Capridae	Goat	1	0	0
	Totals	204	33 (3 as ssp)	11 (10 native, 1 exotic)

Within the general classification of 'threatened' fauna four categories are recognised. These categories are defined using internationally agreed criteria. Fauna defined as 'Extinct' are those for which there is no reasonable doubt that the last individual has died. Fauna is defined as 'Critically Endangered' if it is 'facing an extremely high risk of extinction in the wild in the immediate future'. Fauna is defined as 'Endangered' if it is 'facing a very high risk of extinction in the wild in the near future'. Those species defined as 'Vulnerable' are of those that are not Critically endangered or Endangered, but are facing a high risk of extinction in the wild in the medium-term future. These rankings help determine which species require remedial work as a priority and provide a standardized method by which the relative plight of unrelated species can be compared.

In Western Australia the IUCN rankings for threatened fauna (and flora) are reviewed annually by a CALM appointed expert scientific committee to ensure that the limited funds and resources are being directed at those species most in need. Those same criteria also help demonstrate when recovery actions have been successful, and allow species to be downgraded. It is the aim of all recovery programs to improve the conservation status of threatened species sufficiently to remove them from the threatened fauna list completely.

Table 3. Threatened native fauna declared under the provisions of the *Wildlife Conservation Act 1950*, according to IUCN rank (as of July 1998).

IUCN Rank	No. Species
Critically Endangered (CR)	2
Endangered (EN)	8
Vulnerable (VU)	23
Extinct (EX)	10
Total	43 (33 extant species + 10 extinct species)

In addition to the 43 species listed in Table 3, a further three species have recently been downgraded from VU to Lower Risk (Conservation Dependent) status. This rank identifies a species as no longer threatened, but acknowledges that if particular actions (such as control of predators) are not continued then the species would clearly decline again and most likely be returned to one of the threatened categories. The three lower risk (conservation dependent) species are the Woylie (*Bettongia penicillata ogilbyi*), Quenda (*Isoodon obesulus fusciventer*) and the Tammar wallaby (*Macropus eugenii derbianus*).

Threatening Processes

Threatening processes are those direct or indirect activities that lead to a reduction in the distribution and/or abundance of native species. Some processes are well known in their effects on native species, but others that are equally important are less well documented.

1. Habitat Loss

The most significant process threatening native fauna is loss of habitat. For terrestrial mammals this is most obvious in clearing of native vegetation for agriculture or building development. Habitat fragmentation can be equally damaging to populations of native mammals as it can prevent dispersal of juvenile animals into vacant habitat, or it can prevent re-colonization of areas after local populations have died out. Habitat fragmentation can also cause declines in abundance because the carrying capacity of remnant habitat varies with the seasons and over time as the vegetation community progresses towards the climax stage. This means that at some times small fragments can sustain populations of mammals, but at others the populations decline and may even die out due to lack of resources.

2. Predation

Predation of native fauna by exotic mammals is considered to have been an important contributing factor in the extinction process for the ten species of native mammal listed in Table 2. Australian mammals have evolved in the presence of few large carnivores and most show little or no predator avoidance behaviour. Predation has its greatest impacts on those species that have naturally restricted distributions (eg island populations), or those populations that are normally at low levels of abundance. The potential for native mammals to recover from the effects of predation is influenced largely by their reproductive capacity, and the productivity of their environment.

3. Disease

Disease is a naturally occurring process in the life cycle of most native mammals. There are a number of native diseases that affect native mammals (eg kangaroo viral blindness, lumpy jaw, psittacine beak and feather disease, and *Salmonella*), and these seldom have any long-term affect on mammal populations. However, along with the exotic mammals that European man has brought to Australia have come exotic diseases. Diseases such as *Toxoplasmosis gondii* that is typically transmitted by feral cats can have significant impacts on native species such as bandicoots. Other diseases, like *Mycobacterium tuberculosis* have been found to cause mortality in fur seals and sea lions. Disease has been suggested as playing a major role in the decline in several mammal populations in southwest WA in the early part of this century, at a time prior to the arrival of the fox in this region.

4. Competition

Competition for food and shelter is also believed to play in a role in the decline in native mammal populations. The plagues of rabbits that swept across southern Australia in the late part of last century, often following on from high stocking rates of domestic sheep and cattle had a significant and long lasting impact on native vegetation, much of which never fully recovered. The effects of competition for food and shelter are greatest when resources are most limited [eg during drought, after extensive fires or when combined (native + exotic fauna) carrying capacity of the land is exceeded]. Competition is also important in situations where the native mammals are slow to mature and breed, but the exotic competitor matures at a young age and breeds prolifically, or year-round.

5. Altered Fire Regimes

Australian ecosystems are recognised as being nutrient impoverished. Most of the available nutrients are locked up in the above ground components of native plants. These nutrients are only released by fire. In most plant communities there is a requirement for a minimum period of time between fires to allow the plants to mature and set seed. Too frequent fires prevent many species from setting seed, favouring those species that regenerate from below ground roots, tubers or lignotubers. If the frequent burning pattern is continued the vegetation can become dominated by a different suite of plants, and the resultant habitat may no longer be suitable for some native mammals.

Protracted intervals between fires can also create problems. Many Australian plants are adapted to fire and require hot fires in autumn (or the end of the dry season) to release

seeds held in woody pods, or to stimulate germination. If fire is excluded from the local environment, fire-dependant plant species may decline in numbers (although they may still be present in the soil seed bank). Many of these species provide important food and shelter for native mammals.

Fire exclusion in some plant communities can also lead to infrequent but high intensity wildfires that burn over very large areas. If the areas burnt out are too large, it becomes very difficult for native mammals to recolonise the vacant habitat that regenerates simply because they do not have the capacity to disperse such large distances. This problem does not arise if the fires are smaller in area and leave a patchwork mosaic of burnt, partially burnt and unburnt habitat. Small numbers of mammals can survive in the unburnt habitat and then quickly recolonise the burnt areas as they regenerate.

6. Altered Hydrology

Western Australia has only one mammal species that is entirely dependent on a freshwater environment. The Water rat (*Hydromys chrysogaster*) has declined in numbers and distribution in the highly modified parts of the southwest of the State. Removal of fringing vegetation along river and stream banks has lead to a decline in habitat quality with increased turbidity of water and a reduction in important food sources associated with the riparian vegetation.

Removal of deep-rooted native vegetation from much of the southwest landscape and its replacement with shallow-rooted exotic annuals has lead to the water tables rising close to the surface. As the water tables have risen they have brought large salt loads with them. In many places in the wheatbelt the salt has reached the soil surface and then been transported across the land and into lakes, rivers and streams. The salinization of our freshwater bodies has lead to the loss of important food sources that the Water rat was dependent on. Rising water tables, in the absence of excessive salt loads can also lead to the loss of important habitat through water-logging. This is most obvious in woodlands surrounding perched water tables, or in areas with underlying clay soils.

7. Pollutants

Many of the chemicals developed by humans to improve agricultural production can have serious effects on non-target species. Most people will be familiar with the problems caused by insecticides such as DDT which were developed to control insects in crops but also lead to the decline in many species of birds, even ones that did not feed directly on insects (eg Peregrine Falcon *Falco peregrinus*).

Chemical pollutants invariably have their greatest impacts on those species at the top of the food chain, and in those that are long-lived and which reproduce slowly. Research is showing that many species of cetaceans are accumulating very high levels of heavy metals and highly toxic pollutants such as poly-chlorinated biphenyls (PCBs). These chemical contaminants can lead to death in their own right, reduced fertility, increased juvenile mortality and reduced natural immune response.

The impacts caused by pollutants are likely to very long lasting as many of these chemicals do not break down readily in the environment.

8. Hunting

Predation by humans has been directly responsible for the extinction of several species of animal around the world, particularly those with restricted distributions (eg Dodo, Stella's Sea Cow), but also for those species that were very abundant and widespread (eg Passenger Pigeon).

Commercial hunting of several of the great whale species including three species found in waters off Western Australia (Blue whale *Balaenoptera musculus musculus*, Humback whale *Megaptera novaeangliae* and Southern right whale *Eubalaena australis*) almost lead to their extinction. Intensive unregulated hunting of several of our native pinniped species (New Zealand fur seal *Arctocepahlus forsteri* and Australian sea lion *Neophoca cinereus*) also lead to serious declines in populations which these species are only now beginning to recover from.

All of the native mammal species that are the subject of commercial harvesting in Western Australia are taken according to carefully regulated management programs (eg Red kangaroo *Macropus rufus*, Western Grey kangaroo *M. fuliginosus* and Euro *M. robustus* and Saltwater and Freshwater crocodiles *Crocodylus porosus* and C. *johnstoni*). These management plans are designed to ensure that the level of harvesting does not lead to any declines in the wild populations.

Further Reading

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Appendix 1. Threatened and presumed extinct native mammal fauna in Western Australia (as of July 1998).

SCHEDULE 1 --- FAUNA WHICH IS RARE OR LIKELY TO BECOME EXTINCT

Mammals

	Scientific Name	*Common Name*
1.	*Balaenoptera borealis*	Sei Whale
2.	*Balaenoptera musculus musculus*	Blue Whale
3.	*Balaenoptera physalus*	Fin Whale
4.	*Bettongia lesueur*	Burrowing Bettong or Boodie
5.	*Dasycercus cristicauda*	Mulgara or Minyi-minyi
6.	*Dasycercus hillieri*	Ampurta
7.	*Dasyurus geoffroii*	Chuditch or Western Quoll
8.	*Eubalaena australis*	Southern Right Whale
9.	*Isoodon auratus auratus*	Golden Bandicoot or Wintarru
10.	*Lagorchestes conspicillatus conspicillatus*	Barrow Island Spectacled Hare-wallaby
11.	*Lagorchestes hirsutus*	Rufous Hare-wallaby or Mala
12.	*Lagostrophus fasciatus*	Banded Hare-Wallaby or Muning
13.	*Leporillus conditor*	Greater Stick-nest Rat
14.	*Macropus robustus isabellinus*	Barrow Island Euro
15.	*Macrotis lagotis*	Dalgyte or Bilby or Ninu
16.	*Megaptera novaeangliae*	Humpback Whale
17.	*Mesembriomys gouldii gouldii*	Black-footed Tree-rat
18.	*Myrmecobius fasciatus*	Numbat or Walpurti
19.	*Notoryctes caurinus*	Northern Marsupial Mole or Kakarratul
20.	*Notoryctes typhlops*	Southern Marsupial Mole or Itjaritjari
21.	*Parantechinus apicalis*	Dibbler
22.	*Perameles bougainville*	Western Barred Bandicoot
23.	*Petrogale lateralis*	Black-footed Rock-wallaby or Warru
24.	*Phascogale calura*	Red-tailed Phascogale
25.	*Potorous gilbertii*	Gilbert's Potoroo
26.	*Pseudocheirus occidentalis*	Western Ringtail Possum
27.	*Pseudomys australis*	Plains Rat
28.	*Pseudomys fieldi*	Shark Bay (or Alice Springs) Mouse
29.	*Pseudomys shortridgei*	Heath Rat
30.	*Rhinonicteris aurantius*	Orange Horseshoe Bat
31.	*Setonix brachyurus*	Quokka
32.	*Sminthopsis psammophila*	Sandhill Dunnart
33.	*Zyzomys pedunculatus*	Central Rock-rat or Antina

SCHEDULE 2 --- FAUNA PRESUMED TO BE EXTINCT

Mammals

	Scientific Name	*Common Name*
1.	*Chaeropus ecaudatus*	Pig-footed Bandicoot or Kantjilpa
2.	*Lagorchestes asomatus*	Central Hare-wallaby or Kuluwarri
3.	*Leporillus apicalis*	Lesser Stick-nest Rat
4.	*Macrotis leucura*	Lesser Bilby or Tjunpi
5.	*Notomys amplus*	Short-tailed Hopping Mouse or Yoontoo
6.	*Notomys longicaudatus*	Long-tailed Hopping-mouse
7.	*Notomys macrotis*	Big-eared Hopping-mouse
8.	*Onychogalea lunata*	Crescent Nailtail Wallaby or Tjawalpa
9.	*Perameles eremiana*	Desert Bandicoot or Walilya
10.	*Potorous platyops*	Broad-faced Potoroo

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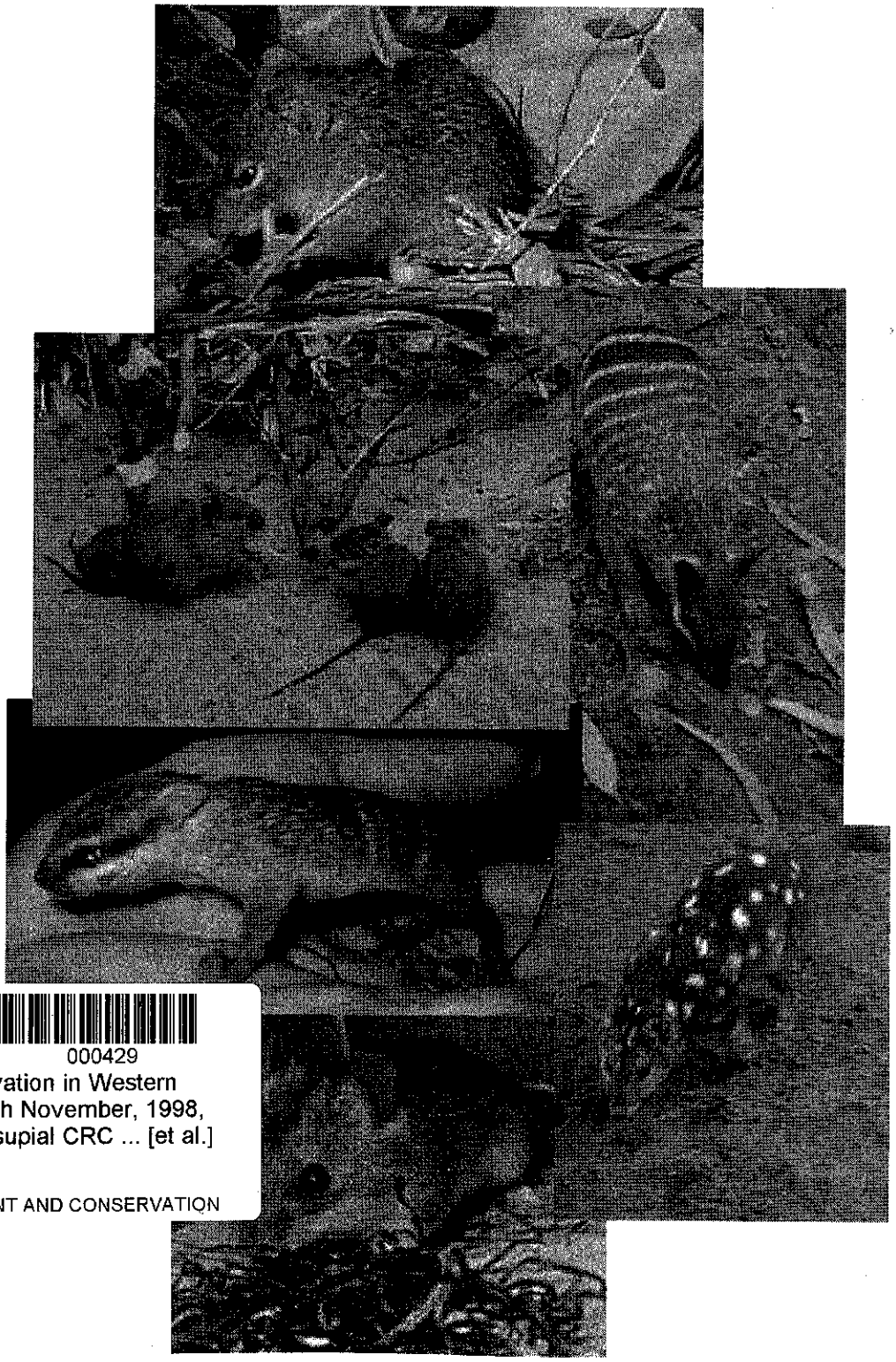
Mammal Conservation in Western Australia



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