

Kultarr (*Antechinomys laniger*) Recovery Plan



Draft for Public Comment

October 2001

**NSW
NATIONAL
PARKS AND
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SERVICE**

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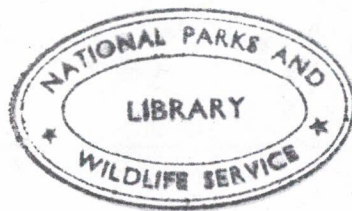
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Executive Summary

Introduction

The Kultarr, *Antechinomys laniger*, is widespread across arid Australia but is uncommon over much of its range. Declines have occurred regionally in NSW, Queensland, and South Australia, but are not apparent in Western Australia or the Northern Territory (Dickman *et al.* 1993, Ayers *et al.* 1996). The Kultarr appears to have disappeared from Victoria, south-eastern SA, some parts of QLD (Sandringham Station) and southern NSW (Maxwell *et al.* 1996). Throughout the remainder of its range in NSW, the population is suspected to have declined to a critical level.

Legislative Context

The Kultarr is listed as Endangered in New South Wales on Schedule 1, Part 1, of the *Threatened Species Conservation Act 1995* (TSC Act). It is not listed nationally on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) but is listed as "data deficient" in the IUCN (2000) Red List of Threatened Species. It is considered by Dickman *et al.* (1993) to be Vulnerable on both a national and state level, given its scarcity, paucity of records on reserved land, and regional declines in distribution.

Recovery Plan Preparation

The TSC Act provides a legislative framework to protect and encourage the recovery of threatened species, endangered populations and endangered ecological communities in NSW. Under this legislation the Director-General of National Parks and Wildlife (NPW) has a responsibility to prepare Recovery Plans for all species, populations and ecological communities listed as Endangered or Vulnerable on the TSC Act schedules. The TSC Act includes specific requirements for the matters to be addressed by Recovery Plans and the administrative process for preparing Recovery Plans.

Recovery Plan Implementation

The TSC Act requires that a public authority must take any appropriate measures available to implement actions included in a Recovery Plan for which they have agreed to be responsible. Public authorities including councils identified as responsible for the implementation of Recovery Plan actions are required by the TSC Act to report on measures taken to implement those actions. In addition, the Act specifies that public authorities must not make decisions that are inconsistent with the provisions of the Plan.

The only public authority responsible for the implementation of this Recovery Plan is the NSW National Parks and Wildlife Service.

Recovery Objectives

The overall objectives of this Recovery Plan are to prevent the continuing decline in population numbers and increase the size of selected representative populations through appropriate management across the range of the species within NSW.

Specific objectives of this Recovery Plan are to:

1. determine the distribution and habitat requirements of the species in NSW from existing sources;
2. locate populations in known and potential habitat, particularly in the stronghold of the species around Cobar;
3. identify known and potential threats;
4. identify primary habitat areas for the Kultarr;
5. identify and implement strategies for alleviating threatening processes and protecting remaining populations; and
6. increase awareness in the wider community of the plight of the Kultarr.

Recovery Criteria

Recovery criteria are that:

1. all known information on the distribution and habitat use of the species in NSW is collated;
2. current distribution is determined, particularly around Cobar;
3. primary habitat is identified;
4. ameliorative measures are established to reduce potential threats;
5. habitat of selected populations is maintained or enhanced; and
6. relevant and interested stakeholders are aware of the species and its conservation requirements through their involvement in recovery actions.

Recovery Actions

Recovery actions for the Kultarr will be directed towards:

1. collating existing information;
2. survey;
3. habitat model;
4. management of selected populations;
5. ameliorating impacts of locust spraying; and
6. community liaison and awareness.



BRIAN GILLIGAN
Director-General

Table of Contents

| | |
|--|-----------|
| Acknowledgments | |
| Executive Summary | |
| 1 Relevant Legislation | 1 |
| 1.1 Commonwealth Legislation | 1 |
| 1.2 State Legislation | 1 |
| 1.3 Recovery Plan Preparation | 2 |
| 1.4 Recovery Plan Implementation | 2 |
| 1.5 Critical Habitat | 2 |
| 1.6 Environmental Assessment | 3 |
| 2 Current Conservation Status..... | 3 |
| 3 Description..... | 4 |
| 3.1 General..... | 4 |
| 3.2 Taxonomic Significance..... | 5 |
| 3.3 Capture Techniques | 6 |
| 4 Distribution..... | 6 |
| 4.1 Historical and Current Distribution..... | 6 |
| 4.2 Tenure | 9 |
| 4.3 Translocation and <i>Ex-situ</i> Populations..... | 9 |
| 5 Ecology | 9 |
| 5.1 Life Cycle | 9 |
| 5.2 Diet | 10 |
| 5.3 Habitat..... | 10 |
| 5.4 Home Range, Movement and Social Organisation | 10 |
| 6 Management Issues..... | 11 |
| 6.1 Extent of Decline | 11 |
| 6.2 Threats and Reasons for Decline..... | 11 |
| 6.2.1 Habitat degradation | 11 |
| 6.2.2 Predation by feral cats and foxes | 12 |
| 6.2.3 Severe local flooding | 12 |

| | | |
|---|--|-----------|
| 6.2.4. | Fire | 13 |
| 6.2.5. | Insecticides used to control locusts | 13 |
| 6.3 | Social and Economic Consequences..... | 14 |
| 6.4 | Biodiversity Benefits..... | 14 |
| 7 | Previous Actions Undertaken..... | 14 |
| 8 | Species Ability to Recover..... | 14 |
| 9 | Recovery Objectives and Performance Criteria..... | 15 |
| 9.1 | Objectives of the Recovery Plan..... | 15 |
| 9.2 | Recovery Performance Criteria..... | 15 |
| 10 | Recovery Actions | 15 |
| 10.1 | Action 1 – Collate existing information | 15 |
| 10.2 | Action 2 – Survey..... | 16 |
| 10.3 | Action 3 – Habitat Model..... | 16 |
| 10.4 | Action 4 – Management of selected populations..... | 17 |
| 10.5 | Action 5 – Insecticides used in Locust Spraying..... | 17 |
| 10.6 | Action 6 – Community Liaison and Awareness | 18 |
| 11 | Alternative Management Strategies | 19 |
| 11.1 | Option 1. No Management Action..... | 19 |
| 11.2 | Option 2. Investigate Impacts from Locust Spraying.. | 19 |
| 11.3 | Option 3. Investigate Ecological Aspects..... | 19 |
| 12 | Implementation and Review | 19 |
| 13 | Preparation details | 20 |
| 14 | References..... | 22 |
| Appendix 1 Species profile for the Kultarr (<i>Antechinomys laniger</i>) | | 27 |

1 Relevant Legislation

1.1 Commonwealth Legislation

The Kultarr (*Antechinomys laniger*) is not listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999. The EPBC Act regulates actions that may result in a significant impact on nationally listed threatened species and ecological communities. It is an offence to undertake any such actions in areas under State or Territory jurisdiction, as well as on Commonwealth-owned areas, without obtaining prior approval from the Commonwealth Environment Minister.

1.2 State Legislation

Threatened Species Conservation Act 1995 (TSC Act): Provides for the protection and recovery of threatened species, the declaration of critical habitat for those species; the proper assessment of any action affecting threatened species, or their habitat; and the licensing of actions that are likely to result in harm to a threatened species or damage to its habitat. The Kultarr is listed on Schedule 1 of the TSC Act as 'Endangered'.

National Parks and Wildlife Act 1974 (NPW Act): Provides for the reservation, protection and management of natural areas, and the protection of native fauna. Includes provisions for conservation agreements with other landholders, and provisions for licensing of scientific investigation of threatened species. The Act has been amended in regard to threatened species by the TSC Act. In NSW, the Kultarr has been recorded in Sturt, Gundabooka and Kinchega National Parks and Round Hill Nature Reserve.

Environmental Planning and Assessment Act 1979 (EP&A Act): Provides for the proper assessment of the environmental impact of proposed activities. Assessment of the impact on threatened species has been integrated into the Act through amendments under the TSC Act. Clearing and development applications under consideration by Local Government and other public authorities, which are within the predicted range of the Kultarr and contain suitable habitat, will need to consider the impact of the proposal on this species. The Kultarr occurs in the following Local Government Areas; Bogan, Bourke, Central Darling, Cobar and Unincorporated Area.

Native Vegetation Conservation Act 1997 (NVC Act): The clearing of native vegetation in NSW is subject to consent from the Department of Land and Water Conservation in accordance with the NVC Act. The Act is integrated with the EP&A Act, and requires that threatened species are taken into account by the

consent authority when considering clearing applications under Part 4 of the EP&A Act. The Kultarr occurs in the following Regional Vegetation Management Areas; Bogan/Nth Lachlan and Cobar (proposed).

Western Lands Act 1901: Under the *Western Lands Act 1901*, the Department of Land and Water Conservation may be a determining authority under the EP&A Act. Recovery Plans are one of the matters which should be taken into account by consent and determining authorities as identified under the Department of Urban Affairs and Planning's "Guide to Section 79C" guidelines.

1.3 Recovery Plan Preparation

The TSC Act provides a legislative framework to protect and encourage the recovery of threatened species, endangered populations and endangered ecological communities in NSW. Under this legislation the Director-General of National Parks and Wildlife (NPW) has a responsibility to prepare Recovery Plans for all species, populations and ecological communities listed as endangered or vulnerable on the TSC Act schedules. Similarly, the EPBC Act requires the Commonwealth Minister for the Environment to ensure the preparation of a Recovery Plan for nationally listed species and communities or adopt plans prepared by others including those developed by State agencies. Both Acts include specific requirements for the matters to be addressed by Recovery Plans and the administrative process for preparing Recovery Plans.

1.4 Recovery Plan Implementation

The TSC Act requires that a public authority must take any appropriate measures available to implement actions included in a Recovery Plan for which they have agreed to be responsible. Public authorities including councils identified as responsible for the implementation of Recovery Plan actions are required by the TSC Act to report on measures taken to implement those actions. In addition, the Act specifies that public authorities must not make decisions that are inconsistent with the provisions of the Plan.

Public authorities responsible for the implementation of this Recovery Plan include NSW National Parks and Wildlife Service and the Australian Plague Locust Commission.

1.5 Critical Habitat

The TSC Act makes provision for the identification and declaration of Critical Habitat. Under the TSC Act, Critical Habitat may be identified for any endangered species, population or ecological community occurring on NSW lands. Once declared, it becomes an offence to damage Critical Habitat (unless the action is exempted under the provisions of the TSC Act) and a Species Impact Statement is

mandatory for all developments and activities proposed within declared Critical Habitat.

To date, Critical Habitat as defined by the TSC Act has not been declared for the Kultarr. The declaration of Critical Habitat in NSW is not considered to be a priority for the species, at this stage, as other mechanisms provide for its protection.

1.6 Environmental Assessment

The New South Wales *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that consent and determining authorities, and the Director-General of National Parks and Wildlife, as a concurrence authority, consider relevant Recovery Plans when exercising a decision-making function under Parts 4 and 5 of the EP&A Act. Decision-makers must consider known and potential habitat, biological and ecological factors and the regional significance of individual populations.

The only public authority that has a decision making function in relation to the Kultarr is the NSW NPWS. Activities as defined under the EP&A Act require the approval of the Director-General. Any other action not requiring approval under the EP&A Act, and which is likely to have a significant impact on the Kultarr, will require a Section 91 Licence from the NPWS under the provisions of the TSC Act. Such a licence can be issued with or without conditions, or can be refused.

2 Current Conservation Status

Although the Kultarr is widespread across arid Australia, it is rare over much of its range. Declines have occurred regionally in NSW, Queensland, and South Australia (Bennett *et al.* 1989, Dickman *et al.* 1993), but are not apparent in Western Australia or the Northern Territory (Burbridge and McKenzie 1989, Ayers *et al.* 1996). The Kultarr appears to have disappeared from Victoria, south-eastern SA, some parts of QLD (Sandringham Station) and southern NSW (Maxwell *et al.* 1996). Throughout the remainder of its range in NSW, the population is suspected to have declined to a critical level.

The Kultarr is listed as Endangered in New South Wales on Schedule 1, Part 1, of the *Threatened Species Conservation Act 1995* (TSC Act). It is not listed nationally on the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) but is listed as "data deficient" in the IUCN (2000) Red List of Threatened Species. It is considered by Dickman *et al.* (1993) to be Vulnerable on both a national and state level, given its scarcity, paucity of records on reserved land, and regional declines in distribution. The Kultarr is "rare" in South Australia, "possibly threatened" in the Northern Territory and "data deficient" in the Commonwealth Territories (Stanger *et al.* 1998). No gazetted protection status is provided for this species in Victoria or Western Australia (Stanger *et al.* 1998).

3 Description

3.1 General

| | |
|--------------------------|--|
| Scientific Nomenclature: | <i>Antechinomys laniger</i> (Gould 1856) |
| Family: | Dasyuridae |
| Subfamily: | Sminthopsinae |
| Common Name: | Kultarr |
| Other Names: | Jerboa-marsupial, Jerboa Pouched-mouse, Jerboa Marsupial mouse, Wuhl-wuhl, Pitchi-pitchi, Yurndu (Happold 1972, Woolley 1984, Tunbridge 1991). |

The Kultarr is fawn or brown to sandy above and white on the chest and belly. Ears are large, eyes are protruding, and the hindfoot is elongated with only four toes. The tail is long and thin, usually 1.5 times the length of the head and body, and has a sparse tuft of darker hairs at the tip. Size varies with locality but on average adult males weigh 30 g and are 80-100 mm long and adult females weigh 20 g and are 70-95 mm long (Valente 1995). Closely resembles a dunnart except for the long brush-tipped tail and very long hindlegs.

Terrestrial and strictly nocturnal, the Kultarr shelters by day in logs or stumps, beneath saltbush and spinifex tussocks, and in deep cracks in the soil at the base of *Acacia* and *Eremophila* trees (Valente 1995). It is also found in the burrows of other animals, such as trapdoor spiders and hopping mice, goannas and agamids, but it is not known whether they dig their own burrows in the wild (Watts and Aslin 1974, Valente 1995). Burrowing has been observed in captive animals where shallow burrows were dug and the entrances covered with grass (Valente 1995).

At Wire Creek Bore in South Australia, all burrows in which Kultarrs were found were in open gibber habitat that was generally associated with low sandy rises (Owens 1997). No burrows were found in dense vegetation or among *Atriplex* bushes. Three burrows were simple vertical shafts, approximately 10cm deep. Two of these burrows opened up at the bottom and provided enough space for two individuals, although Kultarrs were not observed sharing the burrows (Owens 1997). A fourth burrow ran parallel with the surface, was 50cm long, 5cm deep and very shallow. The greater complexity of this latter burrow may have been related to the rearing of young (Owens 1997). The shallow design, however, increased the likelihood of disturbance from stock and vehicles (Owens 1997).

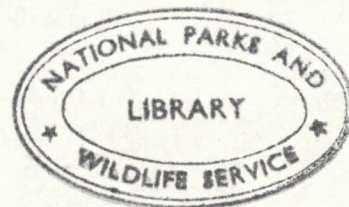
Once considered the marsupial equivalent of the hopping-mouse, studies of its locomotion using high-speed film and smoked paper strips, have shown that the Kultarr is quadrupedal, bounding from hindlegs to forelegs, as though it was leap-frogging (Ride 1965, Ride 1970, Marlow 1969). To escape capture, the Kultarr has

been frequently observed crouched behind small clumps of vegetation, relying on concealment to escape, rather than its high speed movement (Marlow 1969).



Photo by Ray Williams

Figure 1. Kultarr (*Antechinomys laniger*)



3.2 Taxonomic Significance

The first specimens were captured by Sir Thomas Mitchell in NSW or Victoria and described by Gould in 1856 as *Phascogale lanigera*. Gould knew little about the animal and thought it was arboreal. In 1867, Krefft placed it in the new genus of *Antechinomys*. In 1888, Thomas changed the species name to *laniger*, such that it became *A. laniger* (Lidicker and Marlow 1970). In 1906, Thomas described a second species of *Antechinomys*, *A. spenceri*, based on specimens collected by Baldwin Spencer during the Horn Expedition to Central Australia. The taxonomic status of the two described species was reviewed by Lidicker and Marlow (1970) and Archer (1977). Lidicker and Marlow (1970) concluded that the two species, *A. laniger* and *A. spenceri*, should continue to be recognised, based on morphological and ecological features. In contrast, Archer (1977), who used specimens from localities unknown to Lidicker and Marlow (Woolley 1984), interpreted the differences as clinal, rather than as indicators of full specific status and concluded that *Antechinomys* contained only one species, *A. laniger*. This has generally been accepted, although it is believed that there are two subspecies of the Kultarr, *Antechinomys laniger laniger* in eastern Australia and *Antechinomys laniger spenceri* in central and western Australia.

Archer (1981) also argued that *Antechinomys* is not sufficiently distinct from the genus *Sminthopsis* and should be regarded as a sub-genus. However, an isozyme study by Baverstock *et al.* (1982) did not support such a close relationship, nor did phallic morphology (Woolley unpublished in Woolley 1984) or recent

mitochondrial analyses (Krajewski *et al.* 1997). For these reasons, *Antechinomys* is here considered generically distinct from *Sminthopsis*.

3.3 Capture Techniques

Kultarrs have been captured on gibber plain using spotlight and hand capture techniques (Watts and Aslin 1974, Woolley 1984) and Sherman traps (23 by 8 by 9 cm) baited with bacon and peanut butter (Woolley 1984). Trapping success (number of individuals per 100 trap nights) using Sherman traps at Sandringham Station (QLD) ranged from 0 (August 1971) to 1.1 (June and November 1968) to 3.3 (December 1967) (Woolley 1984).

At Wire Creek Bore in South Australia, *A. laniger* has been captured in Gibber using both Elliott traps and pitfall traps and recaptures were recorded (Owens 1996, 1997, Bice and Bolton 2000). Trapping success varied from 0 to 6.67 using Elliott traps, and from 0 to 2.35 using a combination of Elliott and pitfall traps (60cm deep). Bait comprised peanut butter and oats. Increased trapping success may have been related to local increases in invertebrates (Bice and Bolton 2000).

At Gundabooka National Park, Kultarrs were trapped in narrow, deep (approximately 60cm deep and 15cm diameter) pitfall traps (made from pvc pipe), and were observed escaping from shallower plastic bucket pitfall traps (40cm deep and 29cm diameter) (D. Ayers pers. comm.).

4 Distribution

4.1 Historical and Current Distribution

The Kultarr was originally distributed across arid and semi-arid zones of Australia (Figure 2) but has now disappeared from the southern part of its range in Victoria, south-eastern SA, and southern NSW (Wakefield 1974, Valente 1995) as well as parts of Queensland (Sandringham Station).

The actual distribution of the Kultarr throughout Australia appears to be somewhat confused. The map provided in Valente (1995) does not include many of the records in NSW (Ayers *et al.* 1996), the records north of Alice Springs (Parker 1973, Strong and Low 1986), the mouth of the Roper River (Readers Digest 1997), or the eastern pastoral area and Eyre and Yorke Peninsulas of South Australia (Watts 1991).

In Western Australia, the species occurs in the western Goldfields, at Ashburton and at Carnarvon Basin (Maxwell *et al.* 1996). In Queensland, it was recently (1994) quite abundant in the Mulga lands around Charleville (Maxwell *et al.* 1996). In South Australia, it has been recorded recently from Yellabinna Regional Reserve, western SA, south of Lake Frome and on Macumba Station in the stony desert area

of northern SA (Maxwell *et al.* 1996). Kultarrs were trapped at the latter site on every visit between July 1992 and mid-1996, and drier conditions and increasing cattle degradation over that period did not lead to any noticeable drop in numbers (Maxwell *et al.* 1996). Evidence for the presence of Kultarrs in the Flinders Ranges has been found in fossil deposits as well as from two road kill specimens in 1986 and 1988 on the southeastern edge of the Ranges (Tunbridge 1991). In Victoria, two specimens were collected around the junction of the Murray and Darling Rivers in 1856-57 (Krefft 1866), however, this record is considered unsubstantiated and was probably collected further north in NSW (Williams and Menkhorst 1995).

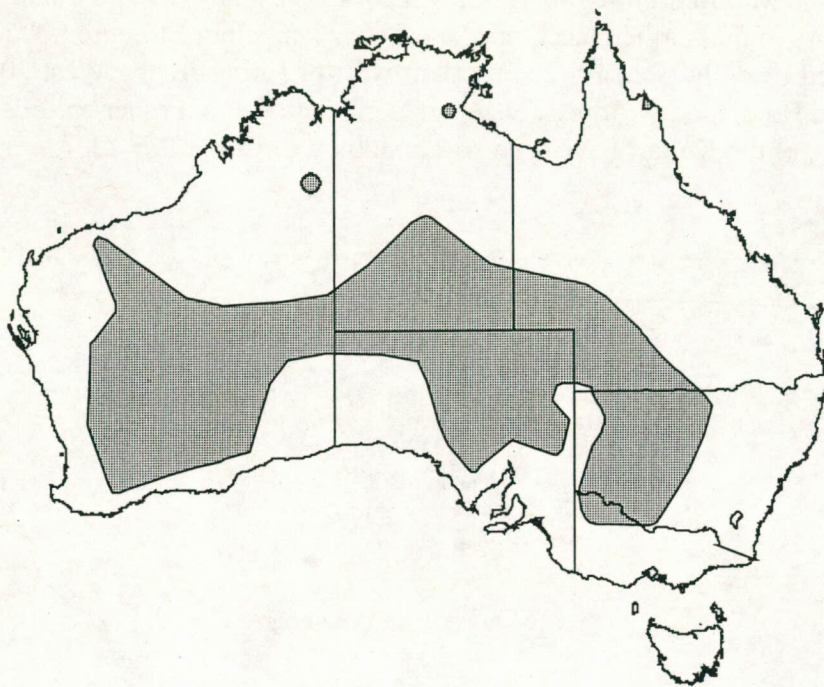


Figure 2. The distribution of the Kultarr in Australia (adapted from Strahan 1995, NSW NPWS Wildlife Atlas, Lidicker and Marlow 1970, Smith and Medlin 1982).

In New South Wales, the Kultarr was known in the south of the state from the Murray-Darling Junction and from near Deniliquin, but has not been recorded there since 1890 (Figure 3). The majority of subsequent records, until 1975, were from the floodplain of the Bogan River near Nyngan and in gently undulating country between Nyngan and Cobar (Dickman and Read 1992). Kultarrs appear to be rare in the far west of the state with the only records being a single sighting at Kinchega National Park (Ellis and Henle 1988), a second sighting a couple of years later near Kinchega on the northern edge of Lake Menindee, and a probable sighting at Mungo National Park (M. Ellis pers. comm., Tidemann 1988). The species appears to be extinct in the adjacent Danggali region in South Australia (Bennett *et al.* 1989).

The Kultarr is now restricted to the northern half of western New South Wales, particularly around Cobar (Dickman and Read 1992). Fauna surveys in 1994 located the species in Bourke on the Darling floodplain and in the Gundabooka region (Ayers *et al.* 1996).

Recently, five opportunistic sightings of Kultarrs were obtained during the NPWS flora and fauna surveys for the Cobar Peneplain Project (Masters and Foster 2000). These sightings occurred while spotlighting or driving in the following areas: Gundabooka National Park, "Mt Oxley" region, near Quanda Nature Reserve (near Nyngan), the Mt Grenfell region (northwest of Cobar), and a station near Cobar. All records were in the northern section of the Cobar Peneplain Bioregion. A Kultarr was also sighted recently (January 2000) 50km west of Cobar by the West 2000 Woody Weeds and Biodiversity Project (D. Ayers pers. comm.). All other records in the last seven years of the Kultarr have been within 300km of Cobar ($n = 5$).

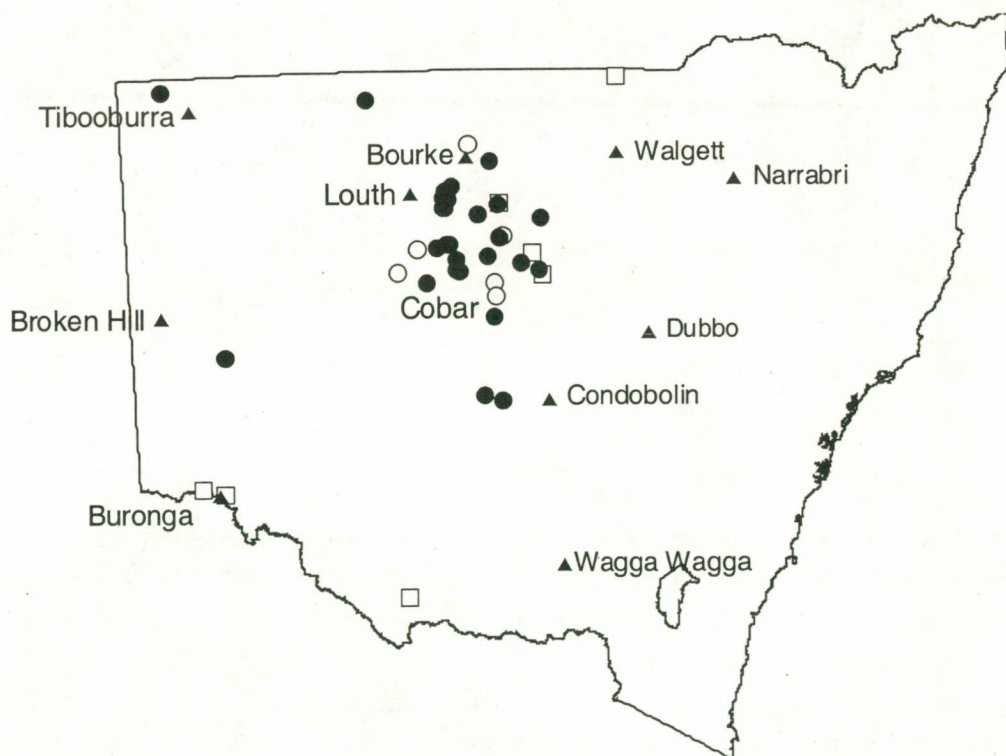


Figure 3. Localities of the Kultarr in New South Wales ($n = 47$)

- Records prior to 1890 ($n = 7$)
- Records 1890 to 1975 ($n = 8$)
- Records 1976 to present ($n = 32$)
- ▲ Major towns

4.2 Tenure

The Kultarr has been recorded in a variety of land tenures including National Parks (Gundabooka, Kincheha and Sturt), Nature Reserves (Round Hill) and State Forests (Barrow). The remaining 79% of records are on private land (NPWS Wildlife Atlas 2001).

4.3 Translocation and *Ex-situ* Populations

There has been no known translocation of the Kultarr in NSW nor are any proposed in this draft Recovery Plan. There are also currently no known *ex-situ* programs operating for the Kultarr.

5 Ecology

5.1 Life Cycle

The breeding season is long and timing of breeding varies between geographically distinct populations. In Queensland, the Kultarr is in breeding condition from mid-winter to mid-summer and oestrus cycles occur in females from July to January (Woolley 1984). In Western Australia, oestrus occurs from August to January (Valente 1995). In the laboratory, both sexes are capable of breeding in more than one season but it is not known whether individuals survive more than one season in the wild (Woolley 1984).

A pouch consisting of a crescent-shaped fold of skin develops in females during the breeding season, and then regresses post-breeding. Females have 6 or 8 teats and are known to rear up to six young. Young are attached for about 30 days at which time they are about 25 mm long. Once detached, they are left in the nest while the mother forages. Young are weaned at three months (Valente 1995). Pouch young have been recorded in Queensland from August to December (Woolley 1984). Little is known of survival rates of the young or longevity of the individuals.

Kultarrs have a marked tendency to enter torpor, or dormancy, which conserves energy and water (Geiser 1986). This ability is also correlated with an extended lifespan and thus appears to be an important survival mechanism in unpredictable environments characterised by aridity and variation in energy availability (Geiser 1986).

Populations appear to undergo marked fluctuations in abundance, depending on seasonal conditions (Maxwell *et al.* 1996). Declines after excessive rain have been recorded, possibly through drowning or a reduced food supply (Valente 1982, Woolley 1990).

5.2 Diet

The Kultarr is largely insectivorous, feeding on invertebrates such as spiders, crickets and cockroaches (Valente 1995). In captivity, they also eat mice (Lidicker and Marlow 1970).

5.3 Habitat

Habitat of the Kultarr is generally described as sparsely vegetated arid and semi-arid plains on stony, sandy and clayey soils. Specific habitat types include gibber plains, open shrubland, mallee woodland, hummock grassland, flood plains, stony areas with sparse ground cover, and acacia shrubland and woodland (particularly Mulga) with sparse groundcover (Lidicker and Marlow 1970, Ellis and Henle 1988, Maxwell *et al.* 1996).

The preferred habitat type of the Kultarr is not known. However, the eastern Australian subspecies appears to prefer sparsely vegetated claypans among *Acacia* woodland, while the central and Western Australian form prefers stony, granite plains dominated by *Acacia eremophila* and *Cassia* shrubland (Valente 1995).

The Cobar Peneplain Project (see section 4.1) observed the Kultarr in mallee and mulga habitats (NSW NPWS 2000). The West 2000 Woody Weeds and Biodiversity Project observed a Kultarr in low undulating hills with much surface stone, hard red ground, with dead standing timber and few live trees and moderately dense shrub cover dominated by turpentine (*Eremophila sturtii*) and narrow-leaf hop bush (*Dodonaea viscosa* subsp. *angustissima*) (D. Ayers per. comm.). At Wire Creek Bore in South Australia, Kultarrs were most often trapped in open areas of gibber and decreases in capture rates were thought to be related to increases in plant cover (Owens 1998).

5.4 Home Range, Movement and Social Organisation

Little is known of the home range, movement or social organisation of the Kultarr, although Strong and Low (1986) suggest that a mixture of bare ground and open sparsely vegetated ground is important for foraging.

At Wire Creek Bore in South Australia, four Kultarrs (three male, one female) were fitted with radio-transmitters in April 1997 and their movements tracked. Maximum distances moved in four days ranged from 400m (female) to 1700m (male) (Owens 1997). In August 1997, subsequent tracking showed the three animals (one had died) had remained in the same general area.

6 Management Issues

6.1 Extent of Decline

Quantitative assessments of decline cannot be reliably made given the lack of distributional data in the past. However, it is of note that Troughton (1973) quotes Krefft who wrote in 1865 that two specimens were obtained by "natives" of Gol Creek on the Lower Murray but it was very rare according to the "natives who failed to secure others although a high reward was offered" (p38). In 1923, Wood Jones also considered that it "remains an extremely rare animal and specimens are very difficult to obtain". In contrast, Finlayson (1961) found it "fairly plentiful" in the 1930s and 1950s in central Australia, "much more so than any of the *Sminthopsis* species".

It is also of note that the early distribution maps placed the NSW distribution of the species as being from Cunnamulla in Qld, through western NSW between Nyngan and Wentworth to northern Victoria (Marlow 1962). These maps excluded the western half of the Western Division. This could simply be due to lack of information in far western NSW or that it was always very uncommon in the far west. Most of the Western Division was heavily degraded by overgrazing in the 1890's and did not have a real opportunity to recover until the significant rains of the 1960's.

6.2 Threats and Reasons for Decline

Potential threats to this species include habitat degradation, predation by feral cats and foxes, local flooding, fire and insecticides used to control locusts. These threats are ongoing and may have served to reduce population sizes, either singularly or in combination.

6.2.1 Habitat degradation

Habitat degradation through grazing by sheep and cattle, and possibly pigs, goats and kangaroos, may have greatly reduced the available habitat for Kultarrs and the diversity of prey (insects). Overstocking of cattle and sheep can cause considerable destruction of the vegetation and soil structure (e.g. collapse of deep soil cracks), which reduces the availability of shelter sites. Cultivation also eliminates refuge habitat, specifically deep soil cracks (Ayers *et al.* 1996).

Although grazing by sheep and cattle does not appear to have eliminated Kultarrs from affected areas (Strong and Low 1986, Ayers *et al.* 1996), this may reflect the previous relatively high productivity of these landscape types, rather than any benign effect of cattle (Maxwell *et al.* 1996).

6.2.2 Predation by feral cats and foxes

Kultarrs are taken by feral cats (Finlayson 1961) and by owls (Morton *et al.* 1977), but the impact on population size is not known. Finlayson (1961) reports that the Kultarr was frequently being brought into homesteads at night by cats in the 1950s in central Australia. Ayers *et al.* (1996) reports of cats taking Kultarrs around Cobar and Bourke, and Woolley (1984) reports of a freshly killed specimen being brought to a station homestead in south-western Queensland by a cat. More recently (October 2001), two Kultarrs were brought to a homestead by a domestic cat near Gongolgon (east of Bourke) (N. Covey pers. comm.).

Although Kultarrs have not been recorded in the diet of foxes they are within the weight range of species preyed on by foxes and are potentially at risk from predation impacts. Their absence in the diet of foxes presumably reflects their rareness in the environment and the cryptic nature of foxes, such that prey remains are rarely found.

6.2.3 Severe local flooding

The Kultarr is vulnerable to severe local flooding, such as that caused by constructed levee banks (Maxwell *et al.* 1996). The recolonisation of flooded areas is hindered or prevented if populations are isolated (Dickman *et al.* 1993). Severe flooding at Kincheha National Park in 1989 and at Nyngan in 1990 may have affected populations at known sites in NSW. Similarly, at Sandringham Station in south-west Queensland, Kultarr abundance declined from 1967 to 1971 after heavy rainfall (Woolley 1984). In 1967, 17 Kultarrs were trapped in 510 trap nights while in 1968, 7 were trapped in 650 trap nights in each of two trapping sessions and in 1971 none were trapped in 105 trap nights (Woolley 1984). Rainfall in 1968 was unusually high compared to the preceding 11 years and the trapping area was flooded for at least a month, which may have flooded burrows and drowned animals. Alternatively, the generally wet conditions may have reduced the availability of food (insects and other invertebrates) (Woolley 1984) or resulted in increased vegetative growth. In addition, a build up of predators may follow increased prey abundance in good rainfall years and result in increased predation effects when prey numbers subsequently crash and predator numbers remain high.

Further declines in Kultarr abundance were also observed following heavy falls in subsequent years. Habitat destruction caused by increased cattle stocking following 'good' seasons may have been a contributing factor in the declines. Factors such as habitat selection, mobility and abundance of the species, and temperature and period of inundation can influence the ability of small mammal species to survive flooding episodes (Twigg and Kay 1992).



6.2.4. Fire

The lack of mosaic burning and increase in infrequent and large-scale fires since European colonisation has likely reduced the ability for populations to recolonise adjoining areas (Dickman *et al.* 1993). Fire can remove refuge sites of Kultarrs, such as hollow logs and tree stumps (Watts and Aslin 1974).

6.2.5. Insecticides used to control locusts

A potential threat, about which little is known, is the use of insecticides such as Fenitrothion, which is used in Australia to control the Australian Plague Locust (*Chortoicetes terminifera*), the spur-throated locust (*Austracris guttulosa*) and the migratory locust (*Locusta migratoria*). Of the numerous mammal families, dasyurids in particular, are susceptible to Fenitrothion because of their small size, high metabolic rate, use of torpor to conserve energy, insectivorous diet and ability to feed on intoxicated locusts (Story and Cox 2001). Three behavioural characteristics of the Kultarr place it at high risk of being exposed to this insecticide; insectivorous diet, the occurrence of populations in the APLC (Australian Plague Locust Commission) area of responsibility, and the use of habitat that is also preferred by locust populations (APLC web site). Because Kultarrs utilise habitat exposed to locust control they are at risk from both non-target and secondary poisoning. In addition, the removal of a range of invertebrates from an area would potentially reduce the food available for Kultarrs.

Fenitrothion, like all organophosphorus pesticides, has an effect on the brain cholinergic systems of vertebrates (Bunn *et al.* 1993). The chemical is an indirect inhibitor of cholinesterase. Field observations overseas have shown that vertebrates exposed to fenitrothion experience significant reductions in acetylcholinesterase (AChE) levels and consequent changes in behaviour (Bunn *et al.* 1993). Fenitrothion is moderately toxic to mammals with acute oral LD₅₀ values of 250-870 mg kg⁻¹ recorded for mice and rats and dermal LD₅₀ values of over 1000 mg kg⁻¹. No data are available on its toxicity to Australian mammals, or of the feeding and behavioural characteristics of these mammals during locust movement and after locust kills (Bunn *et al.* 1993). However, research is underway investigating whether Fenitrothion suppresses acetylcholinase activity in Fat-tailed Dunnarts (*Sminthopsis crassicaudata*) and House Mice (*Mus domesticus*), the importance of locusts in these species' diet and whether dietary switches occur during locust increases (P. Story pers. comm.).

Secondary poisoning could potentially occur if Kultarrs gorge-feed on sprayed insects. The Kultarr is predominantly insectivorous, feeding on invertebrates such as spiders, crickets and cockroaches (Valente 1995) but its ability to gorge-feed on sprayed insects is not known. However, even if Kultarrs have the ability to avoid contaminated food, such behaviour would limit their accessibility to food resources.

6.3 Social and Economic Consequences

The economic impact of the actions outlined in this plan are unknown but likely to be small. Positive impacts that may result from the implementation of the Recovery Plan include those associated with the maintenance of biodiversity and sustainable ecosystems, tourism and amenity. The plan makes provision for incentive funding for landholders to protect Kultarr habitat.

It is difficult to separate out those costs that might be incurred as a result of this plan being implemented, over and above those that would be incurred as a result of existing environmental legislation, policies and plans. Submissions from the community regarding other likely social and economic consequences of implementing the actions in this Recovery Plan are welcome during the draft exhibition period.

6.4 Biodiversity Benefits

Actions that protect Kultarr habitat will also benefit other threatened species that use similar habitats, such as the Forrest's Mouse, Sandy Inland Mouse, Stripe-faced Dunnart, Long-haired Rat, Western Blue-tongued lizard, Woma, Stimson's Python and Collared Whip-snake. Through awareness of the fate of the Kultarr, the profile of all threatened species will be raised in the general community. This in turn will lead to greater opportunities for the conservation of threatened species and increased protection of biodiversity.

7 Previous Actions Undertaken

We are not aware of any actions that have been specifically targeted toward this species being undertaken previously in New South Wales. A species management report has been prepared for dasyurid marsupials in the arid and semi-arid western parts of New South Wales, which reviews available biological information of the species and defines the minimum requirements for their effective conservation and management (Dickman and Read 1992). This report has not been implemented.

8 Species Ability to Recover

It is difficult to predict the ability of the Kultarr to recover given the lack of past and current distribution records. If this species has been rare always in the state then it seems unlikely that populations will expand the area currently occupied. However, information obtained after the implementation of the actions outlined in this Recovery Plan will assist in predicting their recoverability.

Successful recovery of this species, to meet the criteria of the TSC Act for down-listing, is probably unrealistic given the apparent limited distribution of the species, unless other major extant populations are discovered.

9 Recovery Objectives and Performance Criteria

9.1 Objectives of the Recovery Plan

The overall objectives of this Recovery Plan are to prevent the continuing decline in population numbers and increase the size of selected representative populations through appropriate management across the range of the species within NSW.

Specific objectives of this Recovery Plan are to:

1. determine the distribution and habitat requirements of the species in NSW from existing sources;
2. locate populations in known and potential habitat, particularly in the stronghold of the species around Cobar;
3. identify known and potential threats;
4. identify primary habitat areas for the Kultarr;
5. identify and implement strategies for alleviating threatening processes and protecting remaining populations;
6. increase awareness in the wider community of the plight of the Kultarr.

9.2 Recovery Performance Criteria

Recovery criteria are that:

1. all known information on the distribution and habitat use of the species in NSW is collated;
2. current distribution is determined, particularly around Cobar;
3. primary habitat is identified;
4. ameliorative measures are established to reduce potential threats;
5. habitat of selected populations is maintained or enhanced; and
6. relevant and interested stakeholders are aware of the species and its conservation requirements through their involvement in recovery actions.

10 Recovery Actions

10.1 Action 1 – Collate existing information

Specific Actions

- 1.1 Collate all known records and associated habitat information for this species in NSW.
- 1.2 Construct a general habitat model and identify potential habitat for further survey work.

Outcome

This action will provide information on habitat use and identify areas for further survey. Information on threats will be obtained by comparing past and present distribution records.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.2 Action 2 – Survey

Specific Actions

- 2.1 Survey in areas in which the species is known as well as in areas of potential habitat identified in Action 1.
- 2.2 Identify significant populations in the Cobar area that would benefit from appropriate habitat management as outlined in Action 4.

Outcome

A targeted survey for the Kultarr will assist in clarifying the current distribution of the species in New South Wales and identify significant populations that can be protected with appropriate management measures.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.3 Action 3 –Habitat Model

Specific Actions

- 3.1 Collate all known information on Kultarr habitat and requirements from Actions 1 and 2 and develop a detailed habitat model for the species within the state.
- 3.2 All habitat considered important for the Kultarr is to be mapped and primary habitat identified. This information will be provided to relevant agencies and groups.

Outcome

This action will provide information on habitat use and habitat availability of the Kultarr in NSW, which will assist in the protection of remaining habitat for this species.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.4 Action 4 – Management of selected populations

Specific Actions

- 4.1 Management will occur at an increasing number of sites to maintain or enhance habitat for significant populations of Kultarrs identified in Action 2. NPWS will liaise with relevant landholders, Government agencies or other groups and organisations so as to secure sympathetic management of Kultarr habitat. Habitat management of selected populations will occur sequentially, with up to five populations protected within five years. The precise nature of the management will vary depending on the circumstances at the site but may include measures such as fox/feral cat control, fencing, and habitat manipulation and protection. Existing natural resource management grant and incentive schemes will be drawn on to fund works, although some specific funds will be provided directly through NPWS.
- 4.2 These populations will be monitored annually to assess the progress of the management actions and provide information on population stability. Management actions will be adapted where necessary.

Outcome

Habitat enhancement for selected Kultarr populations through appropriate management measures. Regular monitoring will allow trends in population size and the effectiveness of the management measures to be determined.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.5 Action 5 – Insecticides used in Locust Spraying

Specific Actions

- 5.1 NPWS will liaise with NSW Agriculture and APLC to develop an agreed strategy to use more environmentally benign control agents than fenitrothion or fipronil for locust control in areas of important Kultarr habitat. Such control agents include the biopesticide 'Green Guard', which is based on the naturally occurring fungus *Metarhizium anisopliae*. Important habitat for Kultarrs will be identified at Action 3 (detailed habitat model). Monitoring before and after the change in control agents will provide information on

whether the chemical or the decrease in food resources is a limiting factor for Kultarrs.

- 5.2 Prior to the completion of Action 3, NPWS will provide APLC with the location of all known Kultarr records since 1976 (currently 32) to achieve protection of Kultarr habitat in the interim. In areas of locust spraying, NPWS will recommend that Green Guard be used at all Kultarr locations and include a 1km buffer.

Outcome

This action will assist in ameliorating the potential impact of fenitrothion and fipronil on Kultarr populations.

Agency responsible for implementation

NSW National Parks and Wildlife Service

10.6 Action 6 – Community Liaison and Awareness

Specific Actions

- 6.1 Encourage landholders, community groups and the general public to become aware of and be involved in the recovery effort for the Kultarr through the preparation and distribution of information sheets and survey forms.
- 6.2 As many of the remaining significant populations may occur on private land, NPWS will liaise with private landholders and seek to secure sympathetic management of Kultarr habitat. NPWS recognises that a variety of suitable measures may be implemented (e.g. property management plans and voluntary conservation agreements) and the precise nature of management arrangements will largely depend on the circumstances and cooperation of landholders.

Outcome

Community appreciation and support for the conservation of the Kultarr and threatened fauna in general. Further sightings of this species will assist in targeting the proposed survey. Habitat enhancement for some populations. This action will contribute to meeting all specific objectives of the Recovery Plan as outlined above.

Agency responsible for implementation

NSW National Parks and Wildlife Service

11 Alternative Management Strategies

This section considers alternative options for the recovery of the Kultarr.

11.1 Option 1. No Management Action

As this species is widespread throughout Australia and is abundant in some areas within its range, perhaps there is no requirement for any 'recovery' actions for the Kultarr.

This alternative approach is not considered appropriate as the TSC Act has as a stated objective the conservation of biodiversity and the recovery of threatened species within NSW. The Kultarr appears to be in rapid decline and has disappeared completely from some areas within its geographic range. Actions are required to assist the recovery of this species.

11.2 Option 2. Investigate Impacts from Locust Spraying

Characteristics of the Kultarr render the species at high risk of being exposed to the insecticide fenitrothion, which is used in the control of plague locusts (see section 6.1.5). However, a population monitoring study is not recommended at present given the low number of Kultarr records in the state. As well, the use of Greenguard in areas of primary habitat for the Kultarr avoids potential impacts of fenitrothion.

11.3 Option 3. Investigate Ecological Aspects

A number of areas of scientific research would likely contribute to an understanding of the ecology of the Kultarr and thus assist in its recovery. A study on home range, movement, breeding, habitat and food requirements of a population in the field over a 3-5 year term will provide information on the ecology of the species and assist in predicting impacts of potential threats. Investigation in to causes of population fluctuations will also be beneficial.

This option will not be pursued at present given the low number of records of this species in the state. The NSW National Parks and Wildlife Service will, however, encourage Universities or other organisations wishing to pursue research of this nature, and this action may be pursued in the future if sizeable populations are located.

12 Implementation and Review

Estimated costs of implementing the actions identified in this Recovery Plan are provided in Table 1. The total estimated cost for the implementation of these actions is \$292,200.

This Recovery Plan will be reviewed and updated within five years of the date of publication.

13 **Preparation details**

This plan was prepared by Robyn Molsher (NPWS-Western). Matt Cameron (NPWS-Western) edited the plan and contributed to the development of the recovery actions.



Table 1: Costing Table

| Action No: | Description | Priority | Estimated Cost/yr | | | | | Total Cost | Responsible party/funding source | In-kind | Cash |
|--------------|-------------------------------|----------|-------------------|----------|-----------|----------|----------|------------------|----------------------------------|---------|-----------|
| | | | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | | | | |
| 10.1 | Collate existing information | 1 | \$4000 | | | | | \$4,000 | NPWS | | \$4000 |
| 10.2 | Survey | 1 | | \$32000 | \$32000 | | | \$64,000 | NPWS | | \$64000 |
| 10.3 | Habitat model and mapping | 1 | | | \$110,000 | | | \$110,000 | NPWS | | \$110000 |
| 10.4 | Habitat Management Monitoring | 1 | | \$4000 | \$8000 | \$12000 | \$16000 | | NPWS | | \$40000 |
| | | 1 | \$7500 | \$12500 | \$12500 | \$12500 | \$12500 | \$97,500 | NPWS | | \$57500 |
| 10.5 | Locust spraying | 1 | | | | | | Ψ | NPWS | Ψ | |
| 10.6 | i. Community liaison | 2 | \$1700 | | | | | | NPWS | \$700 | \$16000 |
| | ii. Habitat protection | 1 | \$3000 | \$3000 | \$3000 | \$3000 | \$3000 | \$16700 | | | |
| Total | | | \$16,200 | \$51,500 | \$165,500 | \$27,500 | \$31,500 | \$292,200 | | \$700 | \$291,500 |

Priority ratings are: 1- Action critical to meeting plan objectives, 2- Action contributing to meeting plan objectives, 3-Desirable, but not essential action.

'In-Kind' Funds represent salary component of permanent staff and current resources.

'Cash' Funds represent the salary component for temporary staff and other costs such as the purchasing of survey and laboratory equipment.

Ψ No direct cost as action is liaison.

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Appendix 1 Species profile for the Kultarr (*Antechinomys laniger*)

THREATENED SPECIES INFORMATION

Kultarr

Antechinomys laniger (Gould 1856)

Other common names: Jerboa-marsupial, Jerboa Pouched-mouse, Wuhl-wuhl, Pitchi-pitchi

Conservation Status

The Kultarr is listed as 'endangered' on the NSW *Threatened Species Conservation Act 1995* (TSC Act).

Description

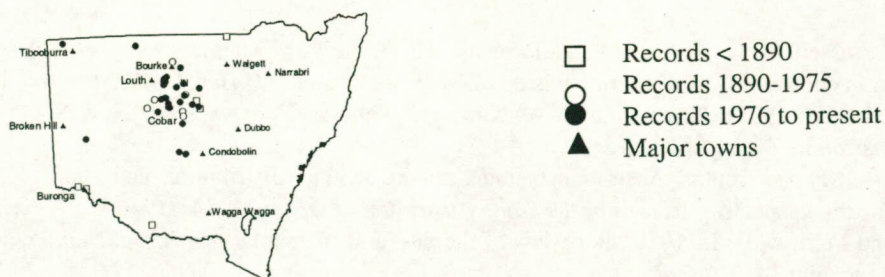
Fawn or brown to sandy above and white on the chest and belly. Ears are large, eyes are protruding, and the hindfoot is elongated with only four toes. The tail is long and thin, usually 1.5 times the length of the head and body, and has a sparse tuft of darker hairs at the tip. Size varies with locality but on average adult males weigh 30g and are 80-100 mm long and adult females weigh 20g and are 70-95 mm long (Valente 1995). Closely resembles a dunnart except for the long brush-tipped tail and very long hindlegs.

Ecology

Terrestrial and strictly nocturnal, the Kultarr shelters by day in logs or stumps, beneath saltbush and spinifex tussocks, and in deep cracks in the soil. It is also found in the burrows of other animals, such as trapdoor spiders and hopping mice, goannas and agamids. The Kultarr is largely insectivorous, feeding on invertebrates such as spiders, crickets and cockroaches (Valente 1995).

Distribution

The Kultarr was originally distributed across arid and semi-arid zones of Australia but has now disappeared from the southern part of its range in Victoria, south-eastern SA, and southern NSW as well as in parts of Queensland. Throughout the remainder of its range in NSW, the population is suspected to have declined to a critical level.



Localities of the Kultarr in New South Wales ($n = 47$)

In New South Wales, the Kultarr is now restricted to the northern half of western New South Wales, particularly around Cobar. Fauna surveys in 1994 located the species in Bourke on the Darling floodplain and in the Gundabooka region.

Habitat

Sparsely vegetated arid and semi-arid plains on stony, sandy and clayey soils. Specific habitat types include open shrubland, mallee woodland, hummock grassland, gibber, flood plains, stony areas with sparse ground cover, and acacia shrubland and woodland (particularly Mulga) with sparse groundcover (Lidicker and Marlow 1970, Ellis and Henle 1988, Maxwell *et al.* 1996).

Ecology

The breeding season is long and timing of breeding varies between geographically distinct populations, usually from mid-winter to mid-summer. Up to six young are carried in the pouch for about 20 days and then are left in the nest attached to the teats while the mother forages or they ride on their mother's back. Young are weaned at three months (Valente 1995). Pouch young have been recorded from August to November (Valente 1995).

Threats

- overstocking of cattle can cause considerable destruction of the vegetation and soil structure (e.g. collapse of deep soil cracks), which reduces the availability of shelter sites. Cultivation can eliminate refuge habitat, specifically deep soil cracks (Ayers *et al.* 1996).
- predation by feral cats and foxes (Finlayson 1961, Woolley 1984)
- severe local flooding can result in the drowning of individuals
- the increase in infrequent and large-scale fires since European colonisation has likely reduced the ability for populations to recolonise adjoining areas (Dickman *et al.* 1993)
- characteristics of the Kultarr (e.g. insectivorous, habitat overlap with locusts) place it at high risk of being exposed to fenitrothion, an insecticide used to control plague locusts.

Management

- collate existing information on the species;
- survey for additional populations;
- construct a habitat model and identify primary habitat;
- management of selected populations;
- ameliorate impacts of locust spraying; and
- encourage community liaison and awareness.

Recovery Plan

A Recovery Plan is currently being prepared for this species.

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