



Western Pygmy-possum (*Cercartetus concinnus*) Recovery Plan



July 2001

**NSW
NATIONAL
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NSW National Parks and Wildlife Service Recovery Planning Program

**Western Pygmy-possum
(*Cercartetus concinnus*)
Recovery Plan**

**Prepared in accordance with the New South Wales
*Threatened Species Conservation Act 1995***

July 2001

Acknowledgments

This plan was prepared by Robyn Molsher, NSW National Parks and Wildlife Service, Western Directorate.

Some of the information pertaining to the biology of the species is based on information collated by Anne Kerle, and by Alistair Glen (Institute of Wildlife Research, University of Sydney) under contract to NPWS. Additional information that was useful in the preparation of this Recovery Plan was obtained from Dani Ayers (NPWS), Murray Ellis (NPWS), Terry Mazzer and James Val (DLWC), Patrick Tap (SFNSW), Sue Carthew (University of Adelaide) and Peter Robertson (Wildlife Profiles Pty Ltd).

Foreword

The conservation of threatened species, populations and ecological communities is crucial for the maintenance of this State's unique biodiversity. In NSW, the *Threatened Species Conservation Act 1995* (TSC Act) provides the framework to conserve and recover threatened species, populations and ecological communities through the preparation and implementation of recovery plans.

The preparation and implementation of recovery plans is identified by both the National Strategy for the Conservation of Australia's Biological Diversity and the approved NSW Biodiversity Strategy as a key strategy for the conservation of threatened flora, fauna and invertebrates. The object of a recovery plan is to document the research and management actions required to promote the recovery of a threatened species, population or ecological community and to ensure its ongoing viability in nature.

This plan describes our current understanding of the Western Pygmy-possum, documents the research and management actions undertaken to date and identifies the actions required and parties responsible to ensure ongoing viability of the species in the wild.

NSW National Parks and Wildlife Service has prepared the Western Pygmy-possum Recovery Plan with the assistance of a number of people. I thank these people for their efforts to date and look forward to their continued contribution to the recovery of the species.

BOB DEBUS MP

Minister for the Environment

Executive Summary

Introduction

Legislative context

The *Threatened Species Conservation Act 1995* (TSC Act) is NSW's most comprehensive attempt at establishing a legislative framework to protect and encourage the recovery of threatened species, populations and communities. Under the TSC Act, the Director-General of National Parks and Wildlife has certain responsibilities including the preparation of recovery plans for threatened species, populations and ecological communities. This Recovery Plan has been prepared in accordance with the provisions of the TSC Act.

Preparation of Plan

This Recovery Plan has been prepared with the assistance of interested parties with relevant expertise. Components within the plan do not necessarily represent the views nor the official positions of all the individuals or agencies consulted. The information in this Recovery Plan was accurate to the best of the NPWS' knowledge on the date that it was approved.

Current Species Status

The Western Pygmy-possum, *Cercartetus concinnus*, was listed as an endangered species on Schedule 1 of the *Threatened Species Conservation Act 1995* (TSC Act) because it was known from only two records in NSW and, therefore, exhibited a restricted distribution within the State. In addition, *C. concinnus* was found in habitat that was threatened by clearing for cropping, inappropriate fire regimes and contained introduced predators. It was previously not known to have existed in the State and the size and extent of the NSW population is unknown. Throughout the remainder of its range in Western Australia, South Australia and Victoria, *C. concinnus* is classified as common but limited (Smith 1995).

C. concinnus is not listed nationally on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 or in the IUCN (1994) Red List of Threatened Species.

Recovery Objectives

The overall objective of this Recovery Plan is to clarify the conservation status of *C. concinnus* in NSW.

Specific objectives of this Recovery Plan are to:

1. improve our knowledge of the distribution and habitat requirements of *C. concinnus* in south-west NSW;
2. encourage the location and identification of any extant populations; and
3. identify any current or potential threats to identified populations.

Recovery Criteria

Recovery criteria for *C. concinnus* are:

1. to determine current conservation status; and
2. to ensure that relevant and interested stakeholders are aware of the species and its conservation requirements through their involvement in recovery actions.

Recovery Actions

Recovery actions for *C. concinnus* will be directed towards:

1. surveying for further individuals/populations in south-west NSW;
2. monitoring known populations; and
3. encouraging landholders, community groups and the general public to become aware of and be involved in the recovery effort for *C. concinnus*.



BRIAN GILLIGAN
Director-General

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1 **Current Conservation Status**

The Western Pygmy-possum, *Cercartetus concinnus*, was listed in August 1997 as an endangered species on Schedule 1 of the *Threatened Species Conservation Act 1995* (TSC Act) because it was known from only two records in NSW and, therefore, exhibited a restricted distribution within the State. In addition, *C. concinnus* was found in habitat that was threatened by clearing for cropping, had inappropriate fire regimes and contained introduced predators. It was previously not known to have occurred in the State and the size and extent of the NSW population is unknown. The NSW population is also geographically separate from the known Victorian population and may represent a genetically distinct population. Throughout the remainder of its range in Western Australia, South Australia and Victoria, *C. concinnus* is classified as common but limited (Smith 1995).

This species is not currently listed nationally on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999 or in the IUCN (1994) Red List of Threatened Species.

2 **Description**

2.1 **General**

Scientific Nomenclature: *Cercartetus concinnus* (Gould 1845)
Family: Burramyidae
Common Name: Western Pygmy-possum
Other Names: South-western Pygmy-possum, Lesser Dormouse-phalanger, Elegant Dormouse Possum and Mundarda (Wakefield 1963).

Cercartetus concinnus is a small nocturnal marsupial that is fawn or reddish-brown above and white below with a finely-scaled, naked tail. Adult Western Pygmy-possums weigh 8-20 g (average 13 g) and have a head/body length of 71-106 mm (average 81 mm) and a tail length of 71-96 mm (average 86 mm) (Wakefield 1963). *C. concinnus* is adapted for climbing and forages at night both on the ground and in shrubs and trees (Smith 1995). It has a prehensile tail and well-developed toe-pads which aids movement through the foliage (Bennett and Lumsden 1995). The forefoot, which has small claws on the upper surface of the toes, is used to grasp food while it is being eaten.

During the day, *C. concinnus* usually shelters in leaf-lined nests in tree hollows or in the leaves of grass-trees (*Xanthorrhoea* sp.) (Misso 1997). Individuals have also been observed using nest sites such as disused nests of Babblers, leaf clumps on the ground, under stumps (Wakefield 1963, Smith 1995) and hollows in mallee lignotubers at the base of live trees (P. Robertson pers. comm.). *C. concinnus* may

also use artificial shelter such as farm machinery, containers or nest boxes (Wakefield 1963, Bennett and Lumsden 1995).



Photo J. Smith

Figure 1. Western Pygmy-possum (*Cercartetus concinnus*)

2.2 Taxonomic significance

C. concinnus was originally described by Gould (1845) from specimens collected from the Swan River in Western Australia and assigned the name *Dromicia concinna*. Waterhouse (1846) also named the Western Pygmy-possum *Phalangista neillii*, which is an equivalent synonym for *D. concinna*. Iredale and Troughton (1934) replaced the genus name *Dromicia* with *Cercartetus* (which has been used interchangeably with *Cercaërtus*) and adjusted the specific name to *concinnus*.

The Western Australia populations were thought to be geographically separated from those in South Australia and Victoria and were considered subspecifically distinct by Wakefield (1963) who proposed the division into two subspecies; *C. concinnus concinnus* (western population) and *C. concinnus minor* (eastern population). Wakefield (1963) found that individuals of the eastern population were smaller and had shorter nasal bones in relation to skull length than individuals of the western population. Differences in colouration were also observed, with older individuals of the eastern population sometimes having a “warm” red-brown body (Wakefield 1963). However, a specimen found by Bolam (1923) in South Australia and another by Lundelius (1957) in the east of Western Australia suggests that the distribution of *C. concinnus* may be continuous from west to east. If this is the case, the division of the two subspecies is questionable (Wakefield 1970). In addition, Ryan (1963) found no significant differences between individuals from the eastern and western extremes of the species distribution.

3 Distribution

3.1 Geographical distribution

C. concinnus occurs in areas with high temperatures and low rainfall (Ryan 1963). It is found in the south of Western Australia, the south of South Australia, western Victoria and southwest New South Wales (Figure 2). Glauert (1933) described the species distribution as extending northward in Western Australia as far as Sandstone, north-east to Bulong and east to Balladonia. However, Wakefield (1963) places the northern limit of the range at Moora, south of Sandstone. In South Australia, Waite and Wood Jones (1927) and Wood Jones (1924) reported *C. concinnus* on Kangaroo Island and the Mt. Lofty Ranges. In western Victoria, the present distribution of *C. concinnus* includes the Lowan Mallee, western Wimmera and the northern Wannon region (Bennett and Lumsden 1995). Several museum specimens collected from Trentham Cliffs, near Mildura in 1958 indicate that this species formerly occurred as far north as the Murray River, however, the Berrook land system in the southern half of the Sunset Country is the northern limit of the present distribution in Victoria (Bennett and Lumsden 1995). Edenhope represents the most southerly record and privately-owned mallee blocks east of the Annuello Flora and Fauna Reserve represents the eastern limit of the species in Victoria (P. Robertson pers. comm. 2000).



Figure 2. Distribution of *Cercartetus concinnus*. (Adapted from Wakefield 1963, Smith 1995 and Ayers *et al.* 1996).

In New South Wales, *C. concinnus* was first recognised when a young male was pitfall trapped in Mallee Cliffs National Park in March 1996 (Mazzer *et al.* 1998). Subsequently, a specimen that was collected in 1958 from the same general area (near Gol Gol) was located in 1996 in the National Museum of Victoria (Ayers *et al.* 1996, Mazzer *et al.* 1998, Atlas of NSW Wildlife 1999). More recently, a further six individuals were pitfall trapped in the region (Figure 3). Two of these

were a young male and a female that were trapped in September and October 1998 on a property (Boree Plains Station) adjacent to Mungo National Park (Val *et al.* 2000). The other four individuals (two young males, one young female and one adult male) were trapped in November 1999 at Prungle Station (approximately 50km N of Euston) (P. Robertson pers. comm.).

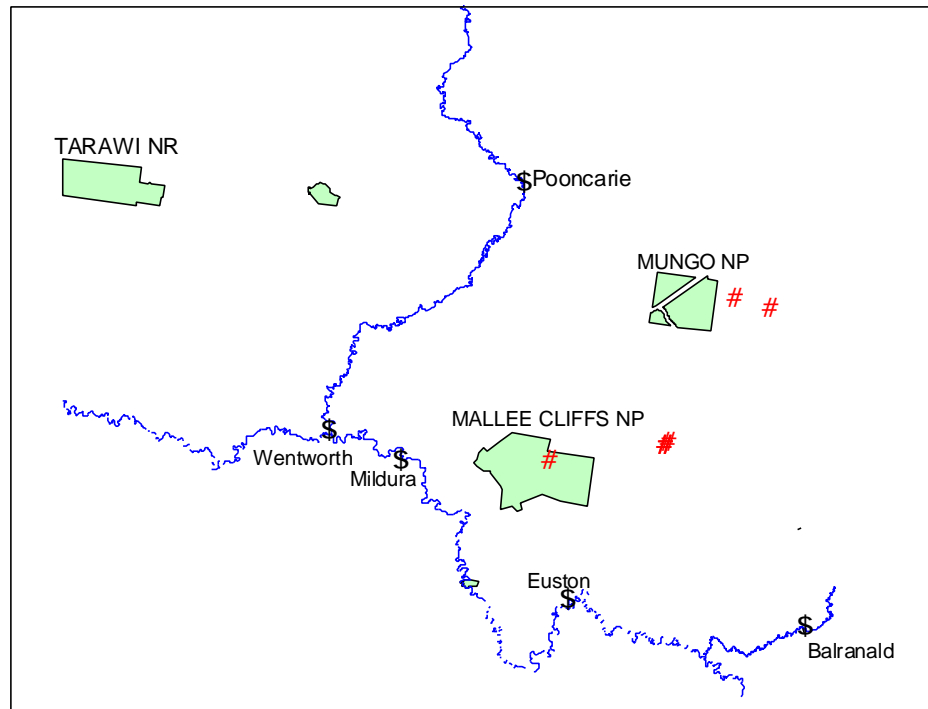


Figure 3. Localities of *Cercartetus concinnus* in New South Wales.

3.2 Translocation

There has been no known translocation of *C. concinnus* in NSW nor are any proposed in this Recovery Plan.

3.3 Critical habitat

The TSC Act makes provision for the identification and declaration of critical habitat for species, populations and ecological communities listed as endangered. Once declared, it becomes an offence to damage critical habitat (unless the action is specifically exempted by the TSC Act) and a species impact statement is mandatory for all developments and activities proposed within critical habitat. At present, no critical habitat has been identified or declared for *C. concinnus*.

4 Ecology

4.1 Life cycle

Breeding occurs in all months of the year (except possibly April and December) and females can rear two or three litters in close succession (Ward 1990). Although most records of juveniles and lactating females have occurred in spring, when many *Banksia* species are in flower, this may reflect a sampling bias rather than a seasonal breeding peak (Ward 1990). For example, in south east South Australia, Horner (1994) found pouch young in February, April and May when *Banksias* were in flower. Similarly, in the Middleback Ranges on Eyre Peninsula in South Australia, (where shrubs and trees flower only occasionally and animals are probably less reliant on nectar and pollen), pouch young were only ever recorded in September of one year, when population sizes increased substantially (S. Carthew pers. comm.).

Females are thought to reach sexual maturity at 12-15 months (Tyndale-Biscoe and Renfree 1987) and have an anterior-opening pouch with six teats. As many as twelve embryos have been recorded in an individual female (Bennett and Lumsden 1995). Litter size declines during pouch development with an average of 3.5 young surviving to the late stages of dependent life (Ward 1990). The young leave the pouch at around 25 days (Tyndale-Biscoe and Renfree 1987) but remain in a nest (Bowley 1939, Casanova 1958). At this stage, the young are still semi-naked and dependent on the mother (Casanova 1958). The young are suckled until they reach 50 days (Tyndale-Biscoe and Renfree 1987).

The females enter oestrus and mate within a few days of giving birth but the resulting embryos may undergo a period of diapause when development is temporarily suspended or delayed implantation (Ward 1990, Bennett and Lumsden 1995). This litter is then born 50 days later, following the weaning of the older litter. Often only one or two days separate the weaning of one litter and the commencement of suckling the next (Clark 1967).

Individuals readily enter a state of torpor or dormancy, particularly during periods of cold weather or rain (Wakefield 1970). These periods may last up to eleven days (Geiser 1987) but are usually much shorter (Wakefield 1970, Geiser 1987). Such periods probably serve to conserve energy at times when energetic returns from foraging are low (Bennett and Lumsden 1995). During torpor, body temperature remains within 1^oC of the air temperature and can reach as low as 5^oC (Geiser 1987). In laboratory experiments, *C. concinnus* entered torpor when food and water were not provided and the temperature dropped below 20^oC (Geiser 1987). These animals also frequently entered torpor when food and water were available and temperature was low. Individuals usually entered torpor early each morning, arousing spontaneously in the afternoon. During torpor, metabolic rate was reduced to less than 1% of the resting value (Geiser 1987). Torpor appears to be an

opportunistic response to unpredictable conditions rather than to seasonal temperature stress and food shortages (Geiser 1987).

Little information exists on the social organisation, movements, size and spacing of home ranges of this species (Bennett and Lumsden 1995). However, in south east South Australia, the mean distance moved by individuals between captures ranged from 24m to 60m and the maximum distance recorded between captures was 195m (Horner 1994). Males tended to move further than females. In the Middleback Ranges in South Australia, mean distances travelled were 56m for males and 50m for females and the maximum recorded distance was 195m (S. Carthew pers. comm.).

4.2 Diet

The diet (largely based on laboratory studies) consists of nectar, pollen, insects and other small arthropods, and may also include small lizards (Wakefield 1963, Bennett and Lumsden 1995, C. Dickman, pers. comm.). Pollen and nectar from eucalypts, *Banksia marginata*, and to a lesser extent *Banksia ornata*, have been recorded in the diet of *C. concinnus* in the wild (Turner 1982, Horner 1994). Nectar is probably an important food source, but is not essential (Landwehr *et al.* 1990).

5 Habitat

The Western Pygmy-possum is generally found in heathlands, shrublands and dry forests with a heathy understorey. The understorey characteristically includes a range of myrtaceous and proteaceous shrubs (such as banksias, grevilleas, callistemons, hakeas and melaleucas). These vegetation types are usually associated with the deep sands of dunes or sand plains and include mallee scrub and Brown Stringybark scrub, Jarrah, tall Broombush shrubland and dry heath (Clark 1967, Woinarski 1987, Bennett and Lumsden 1995, Smith 1995, Ayers *et al.* 1996). Other records include Yellow Gum woodland on clay soaks adjacent to heath (Menkhorst and Beardsell 1982). Although heathland is ideal for foraging it lacks sufficient living spaces such as tree hollows (Wakefield 1963).

In South Australia, Misso (1997) trapped *C. concinnus* in an area with the upper vegetation strata dominated by *Eucalyptus* (particularly *E. brachycalyx*). Lower strata were dominated by *Triodia* and *Melaleuca*, but also included *Alyxia*, *Eremophila*, *Acacia*, *Westringia*, *Daviesia*, *Dianella*, *Lasiopetalum* and *Scaevola*. Density of vegetation cover ranged from 0-35% in the lower strata and 5-45% in the upper strata. Detailed examination of the habitat use revealed that animals appeared to prefer trees with overlapping canopies. Tree hollows comprised 16 of 25 nesting sites. Hollows in branches were most commonly used although hollows in tree trunks and hollows formed by broken-off branches and stems were also commonly used. Fissures in branches or stems appeared to be the least favoured hollows. Most nesting hollows were located in dead wood within a living tree. Misso (1997) suggests that *C. concinnus* may use different types of hollows for different purposes, such as breeding and the avoidance of predators.

Misso (1997) also observed the use of refuges other than tree hollows, including *Triodia* hummocks, bushes, piles of dead branches and bark strips, a depression in the ground under a shrub and the canopy of a tree. Most ground nesting sites were located at the base of a tree, which may serve as a potential escape route for the animals. Refuge sites were also located in dense cover where the animals were difficult to see and often protected by thick vegetation and sharp stems (Misso 1997).



Photo Jo Smith

Figure 4. Habitat of the *C. concinnus* individual that was trapped in Mallee Cliffs National Park in NSW.

In NSW, the *C. concinnus* individual that was trapped in Mallee Cliffs National Park was in a Belah patch (*Casuarina pauper*) in a mixed woodland with a well developed understorey of shrubs, including Cottony Saltbush (*Chenopodium curvispicatum*), Bitter Saltbush (*Atriplex stipitata*), Ruby Saltbush (*Enchylaena tomentosa*) and Mueller's Daisy Bush (*Olearia muelleri*) (Mazzer *et al.* 1998). This habitat differed from the usual mallee with heathy shrubs in which *C. concinnus* are often trapped in Victoria and South Australia. The two individuals trapped at Boree Plains Station were in habitat that was described as mallee spinifex shrubland with an understorey of *Leptospermum coriaceum* (J. Val pers. comm.). The four individuals trapped at Prungle Station were from *Triodia* dominated mallee (P. Robertson pers. comm.).

6 Current *ex-situ* programs

There are currently no known *ex-situ* programs operating for *C. concinnus*.

7 Relevant Legislation

NSW legislation relevant to this recovery plan includes:

7.1 *Threatened Species Conservation Act 1995*

C. concinnus is listed on Schedule 1 of the *Threatened Species Conservation Act 1995* (TSC Act) as an ‘Endangered’ species. It is an offence to harm, pick or damage the habitat of a threatened species unless the damage is the result of activities which have been licensed under section 91 of the TSC Act, or have otherwise gained approval under the *Environmental Planning and Assessment Act 1979*.

7.2 *Environment Protection and Biodiversity Conservation Act 1999*

C. concinnus is not listed nationally on the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) 1999. The EPBC Act protects threatened species in Commonwealth areas and regulates the activities of Commonwealth agencies.

7.3 *National Parks and Wildlife Act 1974*

One *C. concinnus* individual has been trapped in Mallee Cliffs National Park NSW, an area gazetted under the *National Parks and Wildlife Act 1974* (NPW Act), and in the care and management of the New South Wales National Parks and Wildlife Service.

7.4 *Environmental Planning and Assessment Act 1979*

Land use and development on leasehold land in NSW is subject to evaluation in accordance with the *Environmental Planning and Assessment Act 1979* (EP&A Act). Threatened species are to be taken into account by consent authorities when they are considering development applications under Part 4, and by determining authorities undertaking or approving activities under Part 5 of the Act. 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 authorities as identified under the department of Urban Affairs and Planning’s “Guide to Section 79C” guidelines. Recovery plans must also be taken into account by determining authorities under s112A of the EP&A Act.

7.5 *Native Vegetation Conservation Act 1998*

The clearing of native vegetation in NSW is subject to consent from the Department of Land and Water Conservation in accordance with the *Native Vegetation Conservation Act 1998*. The Act is integrated with the *Environmental Planning and Assessment Act 1979*, 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.

7.6 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 determining authorities as identified under the department of Urban Affairs and Planning's "Guide to Section 79C" guidelines.

8 Management Issues

8.1 Threats and reasons for decline

The greatest threats to *C. concinnus* are the removal of habitat by vegetation clearing, the reduction of food sources by overgrazing, and predation by feral cats and foxes (Mazzer *et al.* 1998).

Vegetation clearance for urban or rural development, such as wheat cropping and sand mining, can remove shrubs that are a source of nectar and pollen and leave a fragmented habitat in which the remnant areas may be too small to support viable populations (Smith 1995, Ayers *et al.* 1996). Forestry operations that remove broombush and mallee may also impact on the survival of *C. concinnus* by reducing habitat availability (Woinarski 1987). *C. concinnus* is vulnerable to predation by cats and foxes, as it forages at ground level (Smith 1995, Ayers *et al.* 1996), although its reproductive rate appears to be adapted for heavy predation (Smith 1995).

The effects of various fire regimes on *C. concinnus* are unknown. Frequent burning can remove Mallee, or limit the extent of old Mallee, and is likely to eliminate some shrub species that provide food (Bennett and Lumsden 1995, Ayers *et al.* 1996).

8.2 Social and economic consequences

As only eight individual *C. concinnus* have been recorded in NSW, this plan does not propose to regulate or modify current land use practices. Any adverse social and economic consequences resulting from the implementation of this plan are either unknown or insignificant. The direct costs of achieving the objectives of this Recovery Plan will be minimal and borne by Government.

Social benefits for local communities that may arise from this Recovery Plan include an increased awareness of threatened species.

9 Previous Actions Undertaken

The NSW National Parks and Wildlife Service have undertaken no previous direct actions for *C. concinnus* in NSW. However, a number of general biodiversity surveys have been conducted by the NSW National Parks and Wildlife Service and the Department of Land and Water Conservation over the past decade. These

surveys have added to our knowledge of the distribution of the species and the conditions under which it is found.

10 Species ability to Recover

Given that only eight records of *C. concinnus* have been obtained in NSW, the ability for this species to recover is unknown.

11 Recovery objectives and performance criteria

11.1 Objectives of the Recovery Plan

The overall objective of this Recovery Plan is to clarify the conservation status of *C. concinnus* in NSW.

Specific objectives of this Recovery Plan are to:

1. improve our knowledge of the distribution and habitat requirements of *C. concinnus* in south-west NSW;
2. encourage the location and identification of any extant populations; and
3. identify any current or potential threats to identified populations.

11.2 Recovery performance criteria

Recovery criteria are:

1. to determine current conservation status; and
2. to ensure relevant and interested stakeholders are aware of the species and its conservation requirements through their involvement in recovery actions.

12 Recovery Actions

12.1 Action 1 – Scientific survey

A targeted survey for *C. concinnus* in potential habitat would improve our understanding of the distribution of this species in NSW. Surveys are to include searches of Babbler and Finch nests in addition to the traditional pitfall trapping methods. Elliott trapping has proved ineffective for trapping this species in the past (S. Carthew pers. comm.). Surveys should coincide with flowering of proteaceous and myrtaceous understorey species and avoid periods of inclement weather when the species is likely to be torpid. The establishment and monitoring of nest boxes may also be a useful and low effort survey technique.

Outcome:

This action will assist in clarifying the distribution of *C. concinnus* in NSW and is expected to contribute to meeting the remaining two specific objectives of the Recovery Plan as outlined above.

Action 1	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005
Survey	10000	8000			
Total					\$18000

Agency responsible for implementation

New South Wales National Parks and Wildlife Service

Funding Source

New South Wales National Parks and Wildlife Service

12.2 Action 2 – Monitor known populations

Monitor known populations of *C. concinnus*. At least three populations are to be monitored annually to gain information on fluctuations in population numbers.

Outcome:

This action will provide information on population trends, which will assist in meeting the overall objective of the Recovery Plan as outlined above.

Action 1	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005
Survey			16000	10000	10000
Total					\$36000

Agency responsible for implementation

New South Wales National Parks and Wildlife Service

Funding Source

New South Wales National Parks and Wildlife Service

12.3 Action 3 – Community liaison and awareness

Encourage landholders, community groups and the general public to become aware of and be involved in the recovery effort for *C. concinnus* through the preparation and distribution of information sheets. On private properties where *C. concinnus* has been found, NPWS will seek to secure sympathetic management of habitat

through a variety of suitable mechanisms such as property management plans and voluntary conservation agreements. The precise nature of management arrangements will depend largely on the circumstances and cooperation of private landholders.

Outcome:

Community appreciation and support for the conservation of *C. concinnus* and threatened species in general. Protection of *C. concinnus* habitat on private land. This action will contribute to meeting all three specific objectives of the Recovery Plan as outlined above.

Action 3	2000/2001	2001/2002	2002/2003	2003/2004	2004/2005
Information sheet	1500				
Total	\$1500				

Agency responsible for implementation

New South Wales National Parks and Wildlife Service

Funding Source

New South Wales National Parks and Wildlife Service

13 Alternative Management Strategies

This section considers a series of options for the recovery of *C. concinnus*.

13.1 Option 1. No management action taken

As the species is common but limited throughout the remainder of its range in Western Australia, South Australia and western Victoria, the occurrence of the species within NSW may simply be the result of the range of the species falling across the border. Accordingly, there may be no requirement for any ‘recovery’ actions for *C. concinnus*.

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. Determination of the edge of range of the species will allow for any contraction to be detected which may be critical in the long term monitoring of the species across all states in which it occurs. In addition, the NSW population is geographically separate from the Victorian population and may represent a genetically distinct population.

13.2 Option 2. Scientific research

A number of areas of scientific research would likely contribute to an understanding of the ecology of *C. concinnus* and thus assist in its recovery. Examining the effects of fire regimes on the population dynamics of *C. concinnus* will improve our understanding of fire as a threat. Understanding more fully the nature of habitat use, especially the use of hollows, and the social organisation of the species will assist in determining population density and in the development of mitigation measures.

This option will not be pursued as the outcomes, while potentially very interesting, are not warranted given the small number ($n = 8$) of individuals that are known from NSW. The NSW National Parks and Wildlife Service will encourage Universities or other organisations wishing to pursue research of this nature.

14 Implementation

The following table allocates responsibility for the implementation of recovery actions specified in this plan to relevant government agencies for a period of five years from 2000 to 2005.

Table 1: Implementation schedule

Section	Description	Responsibility for implementation	Timeframe	Priority
12.1	Scientific survey	NPWS	Ongoing	High
12.2	Monitoring	NPWS	Yr 3-5	High
12.3	Community liaison and awareness	NPWS	Ongoing	High

14.1 Review date

This recovery plan and the conservation status of the species will be reviewed within five years of the date of publication.

References

- Ayers, D., Nash, S. and Baggett, K. 1996. Threatened species of western New South Wales. New South Wales National Parks and Wildlife Service, Hurstville.
- Bennett, A. F. and Lumsden, L. F. 1995. Western Pygmy-possum, *Cercartetus concinnus* (Gould, 1845). pp. 97-98 in P.W. Menkhorst (ed). "Mammals of Victoria: Distribution, Ecology and Conservation." Oxford University Press, Melbourne.
- Bolam, A. G. 1923. "The trans-Australian wonderland." Barker and Co., Melbourne.
- Bowley, E. A. 1939. Delayed fertilization in *Dromicia*. *Journal of Mammalogy* **20**, 499.
- Casanova, J. 1958. The dormouse or pygmy possum. *Walkabout* **24**, 30-31.
- Clark, M. J. 1967. Pregnancy in the lactating pigmy possum, *Cercartetus concinnus*. *Australian Journal of Zoology* **15**, 673-683.
- Geiser, F. 1987. Hibernation and daily torpor in two pygmy possums (*Cercartetus* spp., Marsupialia). *Physiological Zoology* **60**, 93-102.
- Glauert, L. 1933. The distribution of the marsupials of Western Australia. *Journal of the Royal Society of Western Australia* **19**, 17-32.
- Gould, J. 1845. *Proceedings of the Zoological Society London* (1845) p.2.
- Horner, B. 1994. The importance of *Banksia marginata* and *Banksia ornata* as a food source for *Cercartetus concinnus* (the western pygmy-possum) and *Cercartetus lepidus* (the little pygmy-possum). Unpublished Honours Thesis, University of Adelaide.
- Iredale, T. and Troughton, E. 1934. A checklist of the mammals recorded from Australia. Australian Museum, Sydney.
- Landwehr, G. O., Richardson, K. C., and Wooller, R. D. 1990. Sugar preferences of Honey Possums *Tarsipes rostratus* (Marsupialia: Tarsipedidae), and Western Pygmy-possums, *Cercartetus concinnus* (Marsupialia: Burramyidae). *Australian Mammalogy* **13**, 5-10.
- Lundelius, E. 1957. Additions to our knowledge of the ranges of Western Australian mammals. *Western Australian Naturalist* **5**, 173-182.

Mazzer, T., Ellis, M., Smith, J., Ayers D., Cooper, M., Wallace, G. and Langdon, A. 1998. "The fauna of Western NSW: The Southern Mallee Region". NSW National Parks and Wildlife Service, Hurstville, NSW.

Menkhorst, P. W. and Beardsell, C. M. 1982. Mammals of southwestern Victoria from the Little Desert to the coast. *Proceedings of the Royal Society of Victoria* **94**, 221-247.

Misso, G. E. 1997. Nesting sites and habitat of the Western Pygmy-possum, *Cercartetus concinnus*. Unpublished Honours Thesis, University of Adelaide.

Ryan, R. M. 1963. Occurrence of the Western Pygmy-possum, *Cercartetus concinnus*, in Victoria and New South Wales. *Victorian Naturalist* **79**, 337-340.

Smith, M. J. 1995. Western Pygmy-possum, *Cercartetus concinnus* (Gould, 1845). pp. 213-214 in R. Strahan (ed). "The Mammals of Australia." Reed Books, Chatswood.

Turner, V. 1982. Marsupials as pollinators in Australia. In: Armstrong, J. A., Powell, J. M. and Richards, A.J. Eds., "Pollination and Evolution" Royal Botanic Gardens, Sydney.

Tyndale-Biscoe, C. H. and Renfree, M. B. 1987. "Reproductive Physiology of Marsupials." Cambridge University Press, Cambridge.

Val, J., Foster, E. and LeBreton, M. 2000. Biodiversity survey of the Lower Murray-Darling. Department of Land and Water Conservation, Buronga, NSW.

Waite, E. R. and Wood Jones, F. 1927. The fauna of Kangaroo Island, South Australia. 2. Mammals. *Transactions & Proceedings of the Royal Society of South Australia* **51**, 322-325.

Wakefield, N. A. 1963. The Australian pigmy-possums. *Victorian Naturalist* **80**, 99-116.

Wakefield, N. A. 1970. Notes on the Australian pigmy-possums (*Cercartetus*, Phalangeridae, Marsupialia). *Victorian Naturalist* **87**, 11-18.

Ward, S. J. 1990. Reproduction in the Western Pygmy-possum, *Cercartetus concinnus* (Marsupialia: Burramyidae), with notes on reproduction of some other small possum species. *Australian Journal of Zoology* **38**, 423-438.

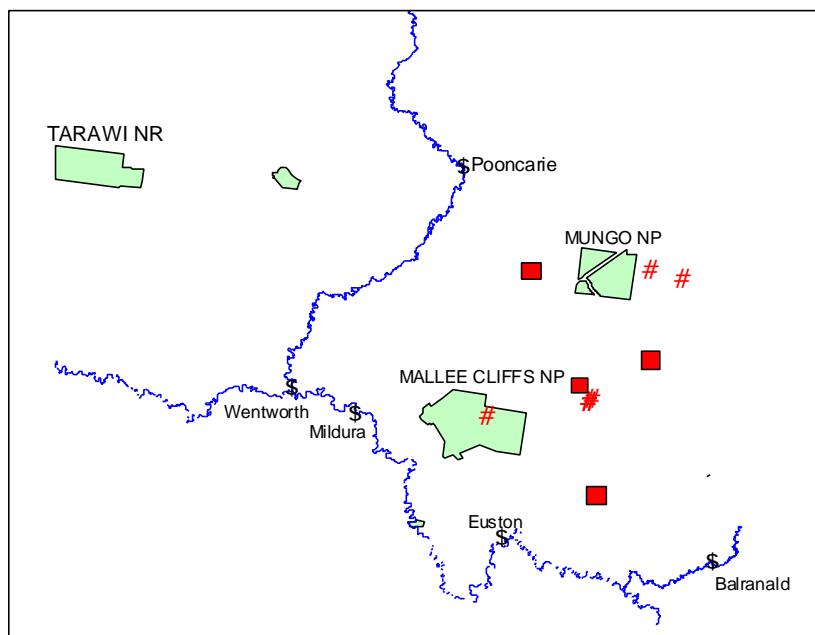
Waterhouse, G. R. 1846. "A natural history of the mammalia, vol. 1." Hippolyte Balliere, London.

Woinarski, J. C. Z. 1987. The vertebrate fauna of Broombush (*Melaleuca uncinata*) in north-western Victoria, and the environmental effects of the Broombush-harvesting industry. Conservation Council of Victoria, Melbourne.

Wood Jones, F. 1924. "The mammals of South Australia. Pt. II." Govt. Printer, Adelaide.

Postscript

After the draft plan was exhibited, another 149 *C. concinnus* individuals were recorded in three separate surveys in spring 2000 and March 2001. *C. concinnus* were trapped in pitfalls in most habitat types, except open grassland. Although trap nights were variable, most captures were in mallee woodland habitats, either with a dense lower storey of *Triodia*, or a mix of shrub species.



Updated localities of *C. concinnus* in New South Wales

- Denotes broad location of individuals recorded in the three recent surveys

During the first biodiversity survey, 81 individuals (11 recaptures, 1820 trap nights) were captured in pitfall traps at 18 sites in the Prungle Area, 50km north of Euston in October-November 2000 (Robertson 2001). No *C. concinnus* were captured in Elliott traps (495 trap nights). The sex ratio was 1:1 with 78% of mature females carrying pouch young. The weight of females ranged from 3.5 to 18.5g and males ranged from 5 to 12g. *C. concinnus* were found in most broad vegetation types including Dunefield Mallee habitats (34 individuals, 530 trap nights), Chenopod Mallee (27 individuals, 450 trap nights), Belah Woodland (14 individuals, 390 trap nights) and derived shrublands (6 individuals, 270 trap nights), except open grassland (0 individuals, 180 trap nights).

During the second targeted survey, 27 individuals (2 recaptures, 960 trap nights) were captured in pitfall traps at 11 sites on properties near Mungo National Park in November-December 2000 (Carthew and Cadzow 2001). No *C. concinnus* were captured in Sherman traps (415 trap nights). Sex ratio of male:female was 2:1. Three

of the six adult females had pouch young, which were between 7mm and 15mm long. The weight of females ranged from 6.8 to 10.8g and males ranged from 5.6 to 9.1g. *C. concinnus* were found in several categories of mallee woodland habitat (25 individuals, 772 trap nights), eucalypt woodland (1 individual, 44 trap nights) but none were captured in rosewood-belah woodland (0 individuals, 140 trap nights). Of the mallee woodland categories, only one animal was captured in mallee with a sparse understorey, the remainder was in dense understorey. Common to most capture sites was a mix of eucalypt species, and percentage vegetative cover of more than 40% in the mid or lower strata.

During the third survey, 30 individuals (4 recaptures, 800 trap nights) were captured in pitfall traps at 8 sites on a property 40km east of Euston in November 2000 and 11 individuals (1 recapture, 800 trap nights) in March 2001 at the same eight sites (E. Sutherland and A. Willson pers. comm., NPWS biodiversity survey). Elliott traps were not used. In November 2000, the sex ratio of male:female was 1: 1.07 with five of the adult females carrying pouch young. The weight of females ranged from 9 to 16.5g and for males 6.5 to 12.5g. In March 2001, the sex ratio of male:female was 4.5:1 with no adult females carrying pouch young. The weight of females ranged from 8 to 8.5g and for males 6.5 to 9.5g. All eight sites were on long linear dune habitats (mallee-spinifex) about 100-200 meters wide, which adjoined mallee-shrubland. Four of the sites were in “young” mallee that was burnt in 1974 and the other four sites were in mallee that had not been burnt in recorded history. Preliminary analysis suggests that fire history did not influence *C. concinnus* capture rates.

For more detailed information on locations and habitats in which these animals were found please contact the Recovery Plan Coordinator at the Threatened Species Unit, NSW NPWS, Western Directorate on (02) 688 35330.

References:

Carthew, S. M. and Cadzow, B. (2001). Survey for the Western Pygmy-possum in NSW. Unpublished Report for the NSW National Parks and Wildlife Service.

Robertson, P. (2001). The Western Pygmy-possum (*Cercartetus concinnus*) in the Prungle area of south-western New South Wales, 1999-2000. Unpublished Report for the NSW National Parks and Wildlife Service.



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