

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister approved this conservation advice and included this species in the Endangered category, effective from 3/12/15

Conservation Advice

Petrogale concinna canescens

nabarlek (Top End)

Note: The information contained in this conservation advice was primarily sourced from 'The Action Plan for Australian Mammals 2012' (Woinarski et al., 2014). Any substantive additions obtained during the consultation on the draft are cited within the advice. Readers may note that conservation advices resulting from the Action Plan for Australian Mammals show minor differences in formatting relative to other conservation advices. These reflect the desire to efficiently prepare a large number of advices by adopting the presentation approach of the Action Plan for Australian Mammals, and do not reflect any difference in the evidence used to develop the recommendation.

Taxonomy

Conventionally accepted as *Petrogale concinna canescens* (Thomas, 1909).

Three subspecies of *Petrogale concinna* have been described; the other two subspecies are *P. c. concinna* (nabarlek (Victoria River)) and *P. c. monastria* (nabarlek (Kimberley)). Their validity has not been tested by modern genetic methods, and the geographic bounds (particularly of *P. c. concinna* and *P. c. canescens*) are not resolved (Woinarski et al., 2014). However, the subspecies have been accepted by the Australian Faunal Directory.

Summary of assessment

Conservation status

Endangered: Criterion 1 A2(b),(c) and Criterion 3 C1

The highest category for which *Petrogale concinna canescens* is eligible to be listed is Endangered.

Petrogale concinna canescens has been found to be eligible for listing under the following listing categories:

Criterion 1: A2 (b),(c): Endangered

Criterion 2: B2 (a),(b)(ii)(iii)(iv)(v): Vulnerable

Criterion 3: C1: Endangered

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see <http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of new information provided to the Committee to list *Petrogale concinna canescens*.

Public Consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 32 business days between 24 March 2015 and 8 May 2015. Any comments

received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Species/Subspecies Information

Description

The nabarlek is a small wallaby, with a head and body length of 29–35 cm and a tail length of 22–31 cm. Its fur is a dull rufous marbled with light grey and black above, and grey-white below. An indistinct dark grey to black shoulder-stripe is sometimes present. Its tail has a black brush tip. It is unique among the marsupials in apparently producing an unlimited number of supernumerary molars (Sanson & Churchill, 2008).

The nabarlek (Top End) can be distinguished from the other two subspecies by its generally greyer fur colour, which is heavily grizzled with the greyish and blackish tips of the longer hairs (Troughton, 1943). The back is dull instead of brilliant rufous like the Victoria River subspecies, and it does not have the tawny rump of the Kimberley subspecies (Troughton, 1943).

Distribution

The nabarlek (Top End) is restricted to the monsoonal tropics of the Northern Territory, where it has been recorded from a series of isolated rocky sites from the Daly River in the west to Murwangie (Arafura Swamp) in the east – including Brock’s Creek, Nellie Creek, Mary River, Hayes Creek, Litchfield, Robin Falls, Nourlangie Rock, Inbarin Hills, Jim Jim Falls, Deaf Adder Gorge, King River (north-east of Oenpelli), Mt Borradaile, Nimbabbirr Hill, and the East Alligator River area (Parker, 1973; Churchill, 1997). With the exception of a ‘pet’ individual moved to Milingimbi (Churchill, 1997; Woinarski et al., 2008), it has not been recorded from any islands.

The population size has declined markedly since European settlement. In the upper Mary River area in the 1890s, Dahl (1897, 1926) reported that the nabarlek (Top End) occurred in ‘enormous numbers.’ Searches in 1976–77 (Sanson et al., 1985), 1989–1991 (Churchill, 1997) and 2006–2007 (D. Pearson pers. comm., cited in Woinarski et al., 2014) reported apparent absences from some sites at which this subspecies was previously recorded, with the most recent searches resulting in detection of nabarleks only at and near Mt Borradaile. However, while loss of some subpopulations is most likely, many of these surveys were very brief, and can not necessarily be considered to be comprehensive or exhaustive.

Relevant Biology/Ecology

Information is only available at the species level. Nabarleks inhabit rugged rocky areas, typically dominated by sandstones but occasionally by granites (Churchill, 1997; Telfer et al., 2008). They shelter in caves in cliffs and rockpiles during the day, emerging at night to feed, although they can be partly diurnal during cooler months. Studies of Northern Territory subpopulations have reported that the dietary items include a variety of grasses, sedges, ferns and forbs (Sanson et al., 1985; Telfer & Bowman, 2006).

In the Northern Territory, nabarleks probably breed throughout the year, but a greater number of pouch young have been observed in the wet season than in the dry season. Young leave the pouch at about six months of age and reach sexual maturity in the second year of life (Sanson & Churchill, 2008). Longevity in captivity is 11.7 years (AnAge, 2012). Generation length is assumed to be around five years.

Threats

Threats to the nabarlek (Top End) are outlined in the table below (Woinarski et al., 2014).

| Threat factor | Consequence rating | Extent over which threat may operate | Evidence base |
|---|--------------------|--------------------------------------|--|
| Predation by feral cats | Severe | Entire | Not demonstrated but highly plausible; ameliorated by rugged nature of habitat, which may limit hunting success by cats. |
| Inappropriate fire regimes | Severe | Entire | Not demonstrated but highly plausible; current regime includes frequent, extensive, and high intensity fires in much of range (although this may be ameliorated somewhat by rugged nature of terrain). |
| Habitat loss and fragmentation | Severe | Localised | Some loss of suitable habitat in parts of range (e.g. mining activities in Mary River – Pine Creek area). |
| Habitat degradation due to invasive grasses | Minor | Minor | Invasive pasture grasses may change floristic composition and propensity for intense fire. |
| Habitat degradation due to livestock and feral herbivores | Minor | Minor | Feral herbivores may change floristic composition, and reduce the abundance of preferred plant foods, at some sites; however their abundance in rugged areas favoured by nabarleks is typically low. |
| Human interference | Minor | Minor | Visitors at some popular sites may cause behavioural interference |

How judged by the Committee in relation to the EPBC Act Criteria and Regulations

| Criterion 1. Population size reduction (reduction in total numbers) | | | |
|--|---|--|---|
| Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4 | | | |
| | Critically Endangered Very severe reduction | Endangered Severe reduction | Vulnerable Substantial reduction |
| A1 | ≥ 90% | ≥ 70% | ≥ 50% |
| A2, A3, A4 | ≥ 80% | ≥ 50% | ≥ 30% |
| <p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p> | <p>based on any of the following:</p> <p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p> | | |

Evidence:

Eligible under Criterion 1 A2 (b),(c) as Endangered

The nabarlek (Top End) has declined by >30% (and possibly >50%) over the last three generations (i.e. 15 years), with apparent losses of some subpopulations (Woinarski et al., 2014). Based on sampling in 1989–1991, Churchill (1997) concluded that '*P. concinna* is more common than previously thought' and that 'the subspecies has not undergone a drastic decline in recent decades and that it is likely to be relatively widespread throughout the rocky hills and escarpments of the Top End.' However, Press (1988) reported declines in the Kakadu area, based partly on information from Indigenous sources, and Ray Petherick (who had collected samples in the Litchfield area in 1951) reported that they had disappeared from the Litchfield area around the mid 1970s (D. Pearson pers. comm., cited in Woinarski et al., 2014).

In 2006–07, Pearson re-sampled many of the sites previously sampled by Churchill (1997) and reported absence from most sites, only detecting the subspecies around Mt Borradaile (Woinarski et al., 2014). Although these surveys were not exhaustive, the detection of the subspecies at only one site in 2006–07 compared to eight sites in 1989–1991 suggests a precipitous decline, and a decline of >50% in the past three generations is plausible (Eldridge pers. comm., 2015). This suspected decline meets the threshold for a severe reduction in population under Criterion A2(b),(c); the causes of the reduction are unclear and declines may be continuing.

The Committee considers that the subspecies has undergone a severe reduction in numbers over three generation lengths (15 years for this assessment), equivalent to at least 50% and the reduction has not ceased, the cause has not ceased and is not understood. Therefore, the subspecies has been demonstrated to have met the relevant elements of Criterion 1 to make it eligible for listing as Endangered.

| Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy | | | |
|---|--|----------------------------------|-------------------------------|
| | Critically Endangered Very restricted | Endangered Restricted | Vulnerable Limited |
| B1. Extent of occurrence (EOO) | < 100 km ² | < 5,000 km ² | < 20,000 km ² |
| B2. Area of occupancy (AOO) | < 10 km ² | < 500 km ² | < 2,000 km ² |
| AND at least 2 of the following 3 conditions: | | | |
| (a) Severely fragmented OR Number of locations | = 1 | ≤ 5 | ≤ 10 |
| (b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals | | | |
| (c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals | | | |

Evidence:

Eligible under Criterion 2 B2 (a),(b)(ii)(iii)(iv)(v) as Vulnerable

There are no robust estimates for extent of occurrence or area of occupancy. However, Woinarski et al. (2014) consider that the area of occupancy is likely to be < 2000 km², which meets the threshold for restricted under Criterion B2. The nabarlek (Top End) is thought to persist at three locations, which is restricted under Criterion B2(a). There is an inferred continuing decline in population size, number of subpopulations and area of occupancy (see also Criterion 1). There is also an inferred decline in habitat quality, due to loss of suitable habitat in parts of the range and habitat degradation from invasive grasses, livestock and feral herbivores (Woinarski et al., 2014). These inferred declines satisfy Criterion B2(b)(ii)(iii)(iv)(v).

Following assessment of the information the Committee has determined that the subspecies has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as Vulnerable.

| Criterion 3. Population size and decline | | | |
|---|--|--|--|
| | Critically Endangered Very low | Endangered Low | Vulnerable Limited |
| Estimated number of mature individuals | < 250 | < 2,500 | < 10,000 |
| AND either (C1) or (C2) is true | | | |
| C1 An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future) | Very high rate 25% in 3 years or 1 generation (whichever is longer) | High rate 20% in 5 years or 2 generations (whichever is longer) | Substantial rate 10% in 10 years or 3 generations (whichever is longer) |
| C2 An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions: | | | |
| (a) (i) Number of mature individuals in each subpopulation | ≤ 50 | ≤ 250 | ≤ 1,000 |
| (a) (ii) % of mature individuals in one subpopulation = | 90 – 100% | 95 – 100% | 100% |
| (b) Extreme fluctuations in the number of mature individuals | | | |

Evidence:

Eligible under Criterion 3 C1 as Endangered

There has been no published estimate of total population size, size of particular subpopulations, or density. In the Mt Borradaile area, Sanson et al. (1985) reported sightings of 20–30 per hour. More recent surveys in the Mt Borradaile area have reported fewer than 10 individuals (over several nights of spotlighting), but this does not constitute a population estimate (D. Pearson pers. comm., cited in Woinarski et al., 2014). Population size and distribution is difficult to assess, as field discrimination from co-existing short-eared rock-wallabies (*P. brachyotis*) may be difficult (S. Ward pers. comm., cited in Woinarski et al., 2014).

However, based on counts of few individuals reported recently at the few known sites, Woinarski et al. (2014) estimate the total population to be around 3000 mature individuals. Based on the optimistic assumptions that the subspecies is extant at all eight sites where they were recorded by Churchill in 1997 (unlikely), and that each population consists of 100 individuals (also unlikely as most rock-wallaby populations are 5–20 individuals in most habitats), Eldridge (pers. comm., 2015) estimates the population size to be less than 1000. From these two estimates, one can infer that the population is likely to have < 2500 mature individuals, which meets the threshold for a low population size. There are also likely to be more than 250 mature individuals, noting that the surveys undertaken by Pearson in 2006-07 were not exhaustive.

Woinarski et al. (2014) infer that there is a continuing decline of >10% over a three generation period, with no subpopulation inferred to contain >1000 mature individuals. However, if the population is continuing to decline at the same rate as in the past (>50% over the last three generations; see Criterion 1), which is plausible, then it can be inferred that the subspecies is at least declining at a high rate (> 20%) in two generations, which meets Criterion C1.

The Committee considers that the estimated total number of mature individuals of this subspecies is low, and it is continuing to decline at a high rate. Therefore, the subspecies has been demonstrated to have met the relevant elements of Criterion 3 to make it eligible for listing as Endangered.

| Criterion 4. Number of mature individuals | | | |
|--|--|--------------------------------|---------------------------|
| | Critically Endangered Extremely low | Endangered Very Low | Vulnerable Low |
| Number of mature individuals | < 50 | < 250 | < 1,000 |

Evidence:

Insufficient data to determine eligibility

There has been no published estimate of total population size, size of particular subpopulations or density. The two available estimates for the number of mature individuals – 3000 (Woinarski et al., 2014) and <1000 (Eldridge, pers. comm. 2015) – are not derived from survey data and are therefore not reliable or robust estimates. Given that this criterion relies on the population size alone, and these two estimates differ by a factor of three, it cannot be concluded with any confidence that the number of mature individuals is less than 1000.

The Committee considers that there is insufficient information to determine the eligibility of the subspecies for listing in any category under this criterion.

| Criterion 5. Quantitative Analysis | | | |
|---|---|---|--|
| | Critically Endangered Immediate future | Endangered Near future | Vulnerable Medium-term future |
| Indicating the probability of extinction in the wild to be: | ≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.) | ≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.) | ≥ 10% in 100 years |

Evidence:

Insufficient data to determine eligibility

Population viability analysis has not been undertaken

Conservation Actions

Recovery Plan

The Committee recommends that there should not be a national recovery plan for *Petrogale concinna canescens* (nabarlek (Top End)), as a recovery plan would not have a conservation benefit above existing mechanisms.

A recovery plan for nabarleks and some other rock-wallabies that occur in the Northern Territory, South Australia and Western Australia has been prepared by the Western Australian Department of Parks and Wildlife (Pearson, 2013). Other management advice is presented in Roache (2011).

Conservation and Management Actions

There is currently no species-specific management applied for the nabarlek (Top End). Parts of its range are within conservation reserves, e.g. Litchfield and Kakadu National Parks, in which some fire management occurs. Recommended management actions are outlined in the table below.

| Theme | Specific actions | Priority |
|-----------------------------------|--|-------------|
| Active mitigation of threats | Develop or maintain regimes that reduce frequency of fire, especially extensive high intensity fires | High |
| | Develop cost-effective control measures to reduce the abundance of feral cats. | High |
| | Seek to constrain further encroachments of invasive pasture grasses. | Medium |
| | Minimise access by visitors to populations | Low |
| | Reduce populations of feral herbivores | Medium |
| Captive breeding | Establish captive insurance population. | Medium |
| Quarantining isolated populations | n/a | |
| Translocation | Assess options for re-introduction to formerly-occupied sites (where threats have now been reduced). | Medium-High |
| Community engagement | Involve Indigenous ranger groups in survey, monitoring and management. | Medium-High |

Survey and monitoring priorities

| Theme | Specific actions | Priority |
|---|---|-------------|
| Survey to better define distribution | Define fine-scale distribution patterns, and the number of individuals (or relative abundance) in subpopulations | High |
| | Determine appropriate survey techniques that efficiently and reliably distinguish between this taxon and short-eared rock-wallabies | High |
| Establish or enhance monitoring program | Design monitoring program, integrated across range | Medium-High |
| | Implement integrated monitoring program linked to assessment of management effectiveness | Medium-High |

Information and research priorities

| Theme | Specific actions | Priority |
|------------------------------------|---|----------|
| Assess relative impacts of threats | Assess the extent to which predation by feral cats is responsible for decline. | High |
| | Quantify the relative impacts upon population of a range of current fire regimes, and the mechanisms by which those fire regimes have impacts on this subspecies. | High |

| | | |
|---|---|-------------|
| Assess effectiveness of threat mitigation options | Assess landscape-scale options for retention of longer-unburnt (greater than five years) patches. | Medium-High |
| | Assess the extent to which feasible management options for feral cats can lead to population recovery. | Medium-High |
| Resolve taxonomic uncertainties | Assess taxonomic status. | Medium |
| | Assess genetic relatedness of spatially disparate populations to identify whether there are genetically distinct subpopulations, and for consideration of re-introductions. | Medium |
| Assess habitat requirements | Assess key components that define habitat suitability. | Medium-High |
| Assess diet, life history | Describe life history parameters, and causes of mortality. | Medium-High |
| | Assess key dietary components, and the influence of fire regimes upon these. | Low-Medium |
| Undertake research to develop new or enhance existing management mechanisms | Develop broad-scale, targeted feral cat control technology. | Medium-High |

Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Endangered category:
- Petrogale concinna canescens*
- (ii) The Committee recommends that there should not be a recovery plan for this subspecies.

Threatened Species Scientific Committee

02/09/2015

References cited in the advice

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