

NSW Threatened Species Scientific Committee

Conservation Assessment of *Dasyercus cristicauda*

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Dasyercus cristicauda Crest-tailed Mulgara (Dasyuridae)

Distribution: Northern Territory, Queensland and South Australia

Current EPBC Act Status: Not listed (Vulnerable up to February 2019)

Current NSW BC Act Status: Extinct

Proposed listing on NSW BC Act: To maintain the Extinct status in the NSW *Biodiversity Conservation Act 2016*

Conservation Advice: *Dasyercus cristicauda*

Summary of Conservation Assessment

Dasyercus cristicauda was found not to be eligible for change of its listing status in NSW.

The main reasons for this species not being eligible are: i) there is no evidence of an established population of Crest-tailed Mulgara in New South Wales as the female individual found about 750 m from the South Australia (SA)/New South Wales (NSW) border could have been a transient individual; ii) there is potential habitat available in NSW for this species, however, an establishment of a new population in NSW may be difficult due to a higher density of predators (foxes and cats) than on the SA side of the fence. It is recommended to continue/implement a monitoring program for this species in NSW.

Description and Taxonomy

Description

“The Crest-tailed Mulgara, family Dasyuridae, is a carnivorous marsupial with a distinctive fin-like crest of black hairs on the tail. The coat is tan to ginger above and creamy white on the belly. Females have eight nipples in the pouch. The hind foot has long hair that folds over a third of the sole from the lateral side. Males are up to 230 mm long with a 125 mm long tail and weigh up to 185 g. Females are up to 170 mm long with a 110 mm long tail and weigh up to 120 g (Masters, 2008)” (TSSC 2019).

“It can be distinguished from the Brush-tailed Mulgara by generally being larger, more brightly coloured (fur tan to ginger above as opposed to light sandy brown in the Brush-tailed Mulgara), and by the form of its tail (Masters 2008). The Brush-tailed Mulgara’s tail is short, generally fattened at the base and covered in black hairs for much of its length (Woolley 2008)” (TSSC 2019).

Taxonomy

In 2005, “Woolley investigated the taxonomic status of mulgaras and concluded on morphological and genetic grounds that there are two species: The Crest-tailed Mulgara (*Dasyercus cristicauda*) and the Brush-tailed Mulgara (*Dasyercus blythi*)” (DE 2019), and that “*Dasyercus hillieri* is a synonym of *Dasyercus cristicauda* (Woolley 2005)” (DE 2019). Previous to 2005, the taxonomy of this species has been uncertain.

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“Four named forms of carnivorous marsupials have been assigned to the genus *Dasyercus* Peters, 1875” (Woolley 2005).

- The first form was *Chaetocercus cristicauda* described by Krefft in 1867, a second as *Phascogale blythi* described by Waite in 1904, followed by a third form *Phascogale hillieri* described by Thomas in 1905 (Woolley 2005).
- “Iredale and Troughton (1934) and Tate (1947) recognised two species of *Dasyercus*, namely *D. blythi* and *D. cristicauda* and these authors placed *D. hillieri* in the synonymy of *D. cristicauda*” (Woolley 2005).
- Ride (1970) referred to only a single species, *D. cristicauda* and later Mahoney and Ride (1988) formally placed all three-nominal species in the synonymy of *D. cristicauda* (Woolley 2005).
- A fourth species, *Dasyuroides byrnie* described by Spencer in 1896, was included by Mahoney and Ride, however a lack of consensus resulted in its inclusion in the genus *Dasyercus* (Woolley 2005).
- Adam *et al.* (2000) “presented evidence for the existence of two clades using mitochondrial gene sequencing” (Woolley 2005).
- Finally, Woolley resolved the taxonomic and nomenclatural issues in 2005 and the species was re-named to two genetically distinct forms, *Dasyercus cristicauda* previously *D. hillieri* (Ampurta) and *Dasyercus blythi* previously named *D. cristicauda* (Mulgara) (Woolley 2005).

Distribution and Abundance

“The Crest-tailed Mulgara has been recorded in the southern Simpson Desert, where the borders of the Northern Territory (NT), Queensland (QLD) and South Australia (SA) converge, and the Tirari and Strzelecki Deserts of SA (Masters 2008). Records since 1990 indicate that the Crest-tailed Mulgara has a more restricted contemporary range than previously known, although a lack of survey effort in suitable habitat may be a factor (Woolley *et al.*, 2013)” (DE 2019).

“Historically, the species was known from the Canning Stock Route and near Rawlinna on the Nullarbor Plain in Western Australia, Ooldea on the eastern edge of the Nullarbor Plain and the Musgrave Ranges in South Australia, and Sandringham Station in Queensland (Woolley *et al.*, 2013)” (DE 2019).

“The Crest-tailed Mulgara has been extinct in NSW for more than a century, known only from fossilised bone fragments (UNSW 2017)” (TSSC 2019). A recent (2017) small mammal monitoring program discovered the species in the deserts of Sturt National Park north-west of Tibooburra (TSSC 2019). A single record of a female with a virgin pouch was found in a pitfall trap within Sturt National Park, ~750m from the South Australian Border (R. West *in litt.* December 2017). However, searches in the surrounding areas could not detect any burrows, scats or additional tracks of the species suggesting this animal is likely a dispersing individual (R. West *in litt.* December 2017) from a South Australia established population (C. Dickman *pers. comm.* July 2019), and potentially that the species is not currently established within the area in the Sturt National Park (R. West *in litt.* 2017), given the known mobility of Mulgaras (C. Dickman *pers. comm.* 2019). Radio-tracking found Brush-tailed Mulgaras forage about 900 m from their burrow each night (C. Dickman *pers. comm.* 2019). Unfortunately, subsequent survey work (Appendix A) has not found any more

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individuals of the species in NSW. Therefore, this single record is considered a transient individual. Currently (2019), there is no evidence of a population in NSW.

Population

“The Crest-tailed Mulgara is sparse but widespread in southern parts of the Simpson Desert, Tirari and Strzelecki Deserts in the NT, SA and Queensland (Masters 2008)” (DE 2019).

“The Crest-tailed Mulgara occurs in higher densities in the central part of the Simpson Desert, where vegetation cover is low and surface water is scarce, compared with surrounding pastoral properties on the fringes of the Simpson Desert” (Masters 2012).

Ecology

“The Crest-tailed Mulgara occurs on sand dunes with a sparse cover of Sandhill Canegrass (*Zygochloa paradoxa*) or areas around salt lakes with Nitre Bush (*Nitraria billardieri*) (Masters 2008)” (DE 2019).

The Crest-tailed Mulgara is a mostly nocturnal marsupial (Masters 2008) and “an opportunistic or non-specialist carnivore, feeding on a range of invertebrates, lizards and small mammals. It forages along the dune crests and flanks, with forays down onto swales. Scat samples (recorded as *Dasyercus hillieri*) contained remains of vertebrates (reptiles, birds, mammals), centipedes and insects (Orthoptera, Coleoptera, Lepidoptera, Formicidae) (Queale *et al.* 2000). Birds and frogs are eaten less frequently (Chen *et al.* 1998). They have also been observed eating plant food (fruits and seeds) (Anon. 2000b; Masters 1998)” (DE 2019).

“The Crest-tailed Mulgara maintains complicated, extensive burrow systems with multiple entrances (Woolley 1990). The burrows are typically located at the base of grass clumps or bushes (Woolley 1990), predominantly on the eastern side of dunes (Foulkes & Canty 2000). Latrines are commonly located near the burrow entrance, with scats being up to 90 mm long and 6 mm wide (Masters 2012)” (TSSC 2019).

“The Crest-tailed Mulgara has a lifespan in captivity of five years, but under natural conditions it is likely to live for only 2-3 years. Based on knowledge of the Brush-tailed Mulgara, females probably mature in their first year (Masters 2012). The species is a seasonal annual breeder, producing one litter of two to eight in early winter to early spring (Woolley 1990; Masters 2008). Generation length is taken here to be 2 years” (TSSC 2019).

Extreme fluctuation

Mulgara populations go through ‘boom and bust’ cycles, depending on rainfall and the availability of food (Bush Heritage 2019). “Population densities fluctuate seasonally, and populations may persist at locations at very low densities during periods of depressed resource availability” (Masters 1998).

In the desert in Queensland, Chris Dickman (2019) observed during long term monitoring and research that there have been years (up to 5 years) when a single Mulgara was not recorded but then they suddenly appear when conditions are favourable. They fluctuate strongly in numbers and almost certainly in distribution (Dickman *pers. comm.* 2019).

Threats

“The main identified threats to the Crest-tailed Mulgara are predation by feral cats (*Felis catus*) and foxes (*Vulpes vulpes*) (Masters 2012); grazing and habitat degradation by livestock, rabbits (*Oryctolagus cuniculus*) and camels (*Camelus dromedarius*) (Masters 2012); and changed fire regimes (Woolley *et al.* 2013)” (TSSC 2019).

The extent and reasons for the decline of the Crest-tailed Mulgara in NSW are unclear (Masters 2012) but predation is likely to have been the main cause. “Predation pressure is probably greatest a few years after heavy summer rainfall when predators have increased in numbers and rodent populations begin to crash (Masters 2012)” (DE 2019). “Cats and foxes may periodically exert excessive predation and decimate, and possibly extirpate, populations (Masters 2012)” (DE 2019).

“Responses to fire are not well defined. Wildfire is rare to infrequent throughout most of Crest-tailed Mulgara distribution, however, when fires happen they can operate over a large extent. For example, much of the Simpson Desert burnt in 2011. Areas of the species former range in the Great Sandy Desert/Canning Stock Route are also subject to large scale wildfire on a more frequent basis. While fire may not pose a significant threat across a lot of the species range, in less arid areas (such as the Great Sandy Desert) it may be an issue when rapid plant growth follows monsoonal rains. Furthermore, there is a growing evidence base for interaction between predation and reduced ground cover caused by fire and grazing” (TSSC 2019).

In NSW

The Sturt National Park area, where the only NSW Crest-tailed Mulgara record is located, “was settled by pastoralists in the 1870s, with initial stocking densities unsustainably high (Gerritsen 1981). Substantial and irreversible changes to soil and vegetation are thought to have occurred with the arrival of rabbits in the 1890s, combined with high stocking densities supported by artificial waters, and the erosional power of wind (Newman and Condon 1969; NPWS 2017)” (Pedler *et al.* 2018).

More recently, “high densities of kangaroos have detrimentally affected grass and forb cover and the soil nutrient pool in the area (Morris and Letnic 2017; Rees *et al.* 2017). High kangaroo numbers in western NSW have been attributed to the removal of dingoes and possibly the proliferation of artificial waters (Caughley *et al.* 1980; Lavery *et al.* 2018)” (Pedler *et al.* 2018).

“The introduction of domestic cats and red foxes to Australia in the late 18th and 19th centuries (Abbott 2008) impacted on endemic mammals in the critical weight range, potentially causing extinction of 10% of Australian terrestrial mammal species (Burbidge and McKenzie 1989; Woinarski *et al.* 2014)” (Pedler *et al.* 2018). The loss of these mammal species (such as bilbies, bandicoots and bettongs) “undoubtedly changed the landscape and ecological processes in Sturt National Park” (Pedler *et al.* 2018). “Increases in woody cover have been linked to the loss of ecosystem functions performed by these once abundant native mammals (Gordon *et al.* 2017a, 2017b)”, as they “create foraging pits in the soil where nutrients and seeds collect providing niches for plant establishment, cycling nutrients and enhancing water infiltration (James *et al.* 2009, 2010)” (Pedler *et al.* 2018).

The presence of the Dingo fence along the NSW/ SA border and associated differences in land use either side of the fence has led to large differences in herbivore and predator densities (Newsome *et al.* 2001; Letnic and Koch 2010). The long-term

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absence of the Crested-tailed Mulgara in NSW (Ellis 1992) is most likely to be associated with differences in threat intensity between NSW and SA (where this species is known to occur), suggesting these threats may be more severe in NSW. The single Crest-tailed Mulgara found (2014) in the Sturt National Park was about 750 m from the SA border (Dingo fence), that is within foraging range of the species from a population that is assumed to be on the SA side of the border. Radio-tracking Brush-tailed Mulgaras has found that on average they move about 900 m in a linear fashion each night, and sometimes animals are found 900 m from their burrow, to which they return to each night (C. Dickman *pers. comm.* July 2019).

It may be unlikely that the Mulgara can establish a population on the NSW side of the Dingo fence due to higher densities of foxes and cats without human intervention. There are more Dingos on the SA side of the fence and as a consequence the fox and cat activity is suppressed (C. Dickman *pers. comm.* July 2019; Letnic *et al.* 2011; Letnic and Koch 2010; Newsome *et al.* 2015). While Dingos prey on Mulgaras, fox and cat predation is assumed to be substantially greater (C. Dickman *pers. comm.* July 2019).

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Dasyercus cristicauda* Crest-tailed Mulgara has been adequate and there is sufficient scientific evidence to support the listing outcome.

Criterion A Population Size reduction

Assessment Outcome: Criterion not met

Justification: The generation length of Crest-tailed Mulgara is 2 years. However, the population reduction for this species is taken as 10 years. As per IUCN (2017) Guidelines a population reduction is measure over the longer of 10 years or three generations (6 years).

A recent (2014) discovery of the species in the Sturt National Park (NSW) of a single female individual was found in a pitfall trap about 750 m from the SA/NSW border as part of a monitoring program. However, there was no evidence of an established population in NSW as searches in the area at the time did not find burrows, scats or additional tracks of the species suggesting this animal was likely a dispersing individual (R. West *in litt.* December 2017). There is no evidence of an extant population in NSW as records of the species are more than 100 years old, longer than the 10-year window required for this criterion. Therefore, this criterion is not met.

Criterion B Geographic range

Assessment Outcome: Extinct under Criterion B1+2abc(iii)(v)

Justification: The total population of Crest-tailed Mulgara has a wide distribution across central and inland Australia. The AOO is estimated to be about 2,000 – 10,000 km² based on one 2 x 2 grid cell (as recommended by IUCN 2017). Species with an area of occupancy (AOO) of more of 2,000 km² do not qualify under a threatened category.

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The EOO was estimated to be about 156,717 km² based in a convex hull polygon fitted around all the species occurrences but described as equal to the AOO as per IUCN Guidelines (2017). Unfortunately, “precise circumscription of distribution is hampered by long-standing nomenclatural confusion, which renders many previous non-vouchered records ambiguous. As such, distribution maps are likely to be an imperfect representation, particularly of the former distribution” (Woinarski and Burbidge 2016). However, in NSW the EOO and AOO are both zero as there is no evidence of an extant population.

In addition to these thresholds, at least two of three other conditions must be met. These conditions are:

- a) The population or habitat is observed or inferred to be severely fragmented or there is 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

Assessment Outcome: sub criterion not met

Justification: This species does not meet the Severely Fragmented definition.

Location: Crest-tailed Mulgara would occur at one location (if the single record in NSW had an established population), as defined by the most plausible threat, which is predation by feral animals (foxes and cats).

- 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

Assessment Outcome: sub criterion not met

Justification: continuing decline would be inferred/observed in the following;

iii) quality of habitat: alteration of habitat due to grazing of domestic, introduced and native animals. Pastoralists settled in the area in the 1870s and the arrival of rabbits occurred in the 1890's making substantial and irreversible changes to soil and vegetation (Pedler *et al.* 2018). In more recent years, high densities of kangaroos have depleted grass and forb cover and the soil nutrient pool in the area (Morris and Letnic 2017; Rees *et al.* 2017). High kangaroo numbers in western NSW have been attributed to the removal of dingoes and possibly the proliferation of artificial waters (Caughley *et al.* 1980; Lavery *et al.* 2018) (Pedler *et al.* 2018).

v) number of mature individuals: the presence of foxes and cats in higher densities on the NSW side of the Dingo fence is a major threat for the species. Any individuals foraging in the area would be vulnerable to these highly effective feral predators.

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c) Extreme fluctuations.

Assessment Outcome: criterion not met

Justification: The Crest-tailed Mulgara meets the extreme fluctuation definition as population densities fluctuate seasonally, and populations may persist at locations at very low densities during periods of depressed resource availability (Masters 1998). During field research in the Queensland desert Chris Dickman (*pers. comm.* July 2019), did not record Mulgaras for several years (up to 5 years) but they suddenly returned when conditions were appropriate. Mulgaras fluctuate strongly in numbers and almost certainly in distribution (C. Dickman *pers. comm.* July 2019). However, in NSW there is no evidence of any extant population.

Criterion C Small population size and decline

Assessment Outcome: Extinct under Criterion C1+2a(ii)]

Justification: A single individual was recently recorded in 2017 approximately 750 m from the SA border on the NSW side of the Dingo fence (R. West *in litt.* December 2017). It is likely that this was a transient individual as no evidence of an established population has been found in NSW (R. West *in litt.* December 2017). Mulgaras are known to forage about 900 m each night from their burrows (C. Dickman *pers. comm.* July 2019).

At least one of two additional conditions must be met. These are:

- C1. An observed, estimated or projected continuing decline of at least: 25% in 3 years or 1 generations (whichever is longer) (CE); 20% in 5 years or 2 generations (whichever is longer) (EN); or 10% in 10 years or 3 generations (whichever is longer) (VU).

Assessment Outcome: sub criterion not met

Justification: The generation time of Crest-tailed Mulgara is 2 years, and generation length (three generations) is 6 years. However, as per IUCN guidelines, 10 years is a longer period than the 6 years of the three generations.

The species was recently discovered in Sturt National Park (NSW) (2017) with a single female individual in a pitfall trap about 750 m from the SA/NSW border during a scientific monitoring. However, there was no evidence of an established population in NSW (R. West *in litt.* December 2017). The previous records of the species in NSW are more than 100 years old, longer than the 10 year period relevant for this criterion. Therefore, this criterion is not met.

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C2. An observed, estimated, projected or inferred continuing decline in number of mature individuals.

Assessment Outcome: sub criterion not met

Justification: The number of mature individuals is likely to be in continuing decline if there were an extant population in NSW as the in higher densities of foxes and cats on the NSW side of the Dingo fence is a major threat to the species. Any individuals foraging in the area would be vulnerable to these highly effective feral predators

In addition, at least 1 of the following 3 conditions:

- a (i). Number of mature individuals in each subpopulation ≤ 50 (CR); ≤ 250 (EN) or ≤ 1000 (VU).

Assessment Outcome: sub criterion met at presumed extinct category

Justification: There is no evidence of an established population in NSW.

- a (ii). % of mature individuals in one subpopulation is 90-100% (CR); 95-100% (EN) or 100% (VU)

Assessment Outcome: sub criterion met at presumed extinct category

Justification: There is no evidence of an established population in NSW.

- b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: sub criterion not met

Justification: The Crest-tailed Mulgara meets the extreme fluctuation definition as the population densities fluctuate seasonally, and populations may persist at locations at very low densities during periods of depressed resource availability (Masters 1998). During long-term research in the Queensland desert Mulgaras were not observed for several years (up to 5 years) but reappeared when conditions were suitable (Chris Dickman *pers. comm.* July 2019). Mulgara numbers fluctuate significantly and almost certainly in distribution (C. Dickman *pers. comm.* July 2019). In NSW there is no evidence of any extent population.

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Criterion D Very small or restricted population

Assessment Outcome: Extinct under Criterion D

Justification: A single individual was recently recorded in 2017 approximately 750 m from the SA border on the NSW side of the Dingo fence (R. West *in litt.* December 2017). However, it is likely that this was a transient individual as there is no evidence of an established population in NSW (R. West *in litt.* December 2017). Mulgaras are known to forage up to 900 m each night from their burrows (C. Dickman *pers. comm.* July 2019).

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient

Justification: There is no enough data to assess this species under this criterion.

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Expert Communications

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Appendix A – Survey Information

- From 2004-2006, Ulrika Klicker (PhD project) conducted various small mammal trapping surveys in suitable habitat in the Fort Grey area and the species was not detected (R. West *in litt.* July 2019).
- Since 2012, Mike Letnic from the University of NSW has been conducting Pitfall and Elliot trapping three times per year in the dune systems to the west of Fort Grey and no individuals of the species have been found (R. West *in litt.* July 2019).
- In November 2017, Wild Desserts project (observers: Reece Pedler and Rebecca West) found a single female individual of this species with a virgin pouch (R. West *in litt.* December 2017).
 - o “Searches in the surrounding area could not detect any burrows, scats or additional tracks of the species, suggesting this animal is likely a dispersing individual, and potentially that the species is not currently established within the area, but may be colonising. At other sites where the species is established, these signs are common. Both R. Pedler and R. West have previous experience of conducting surveys for this species in SA and will continue to monitor the area for additional signs of establishment” (R. West *in litt.* December 2017).
- In April 2018, during pitfall trapping sessions by the Wild Desert project no individuals of the species were caught in the Sturt National Park (R. West *in litt.* July 2019).
- In April 2019, yet again no Mulgara individuals were found during this year trapping sessions. However, Mulgara tracks were observed. Unfortunately, detailed searches in these areas did not find any burrows and repeat visits to search the same area did not reveal further tracks, suggesting a lack of residency within the area at this stage. Based on track survey only, it is unlikely that there is currently a viable population in NSW (R. West *in litt.* July 2019).
- Currently (2019), the Wild Desert project is using track plot, camera trap, Elliot/pitfall trapping and spotlighting to meet their objectives (see *Survey and Monitoring priorities* in the *Conservation and Management* section. (R. West *in litt.* July 2019).