

Amended on 29/03/2023.

Change to Clause 4.2. The Committee found the species ineligible for listing under Criterion A but this was not reflected in the notice and reasons for the Determination, which stated eligibility for Endangered under Clause 4.2 (b) 2 (b,c).

Notice and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the Mukarrthippi grasswren *Amytornis striatus striatus* Gould, 1840 as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act and, as a consequence, to omit reference to striated grasswren *Amytornis striatus* in Part 3 of Schedule 1 (Vulnerable species) of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Mukarrthippi grasswren *Amytornis striatus striatus* was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3 (a) (d) (e ii, iii, iv), Clause 4.4 (a)(d)(e i, ii A) and Clause 4.5 (a) because: i) the distribution of the sub-species is very highly restricted; ii) the sub-species is known from a small number of locations; iii) there is a continuing decline in the geographic distribution and the habitat area, extent and quality of the sub-species and iv) there is an extremely low number of mature individuals.

The NSW Threatened Species Scientific Committee has found that:

1. The striated grasswren, of which the mukarrthippi grasswren is a subspecies, is a medium sized grasswren, similar in appearance to the related fairy-wrens (*Malurus* spp.), though significantly larger in size (14.5–19 cm; 15–23 g) (Rowley *et al.* 2020). It has a relatively slender bill, long tail, which is held cocked and is blackish-brown in colour (Rowley *et al.* 2020). The upperparts are a soft reddish-brown, with white streaks while the underparts are buff with heavy white streaking on the breast. The eyebrow is rufous-brown and a heavy black whisker-streak is present. The throat is white, the bill blackish or grey and legs grey. The sexes differ slightly in plumage with the female having pale chestnut flanks. The mukarrthippi grasswren and the Murray Mallee striated grasswren are similar in appearance but the white dorsal feather striations are narrower in mukarrthippi grasswren (Black *et al.* 2020a) and the sub-species are allopatric (geographically distinct).
2. A recent taxonomic revision has distinguished seven sub-species of the striated grasswren *Amytornis striatus* complex, within which the mukarrthippi grasswren *Amytornis striatus striatus sensu stricto* is contained (Black *et al.* 2020b). The mukarrthippi grasswren *Amytornis striatus striatus* Gould, 1840 was recently recognised by Black *et al.* (2020a) who separated allopatric populations of striated

NSW Threatened Species Scientific Committee

grasswren *A. striatus striatus sensu lato* sub-specifically, resulting in the mukarrthippi grasswren *A. striatus striatus sensu stricto* (Gould 1840) and Murray Mallee striated grasswren *A. striatus howei*. The Murray Mallee striated grasswren is under concurrent review (Hope *et al.* 2021, which follows Verdon *et al.* 2020) and based on drastic decline is considered to be Endangered.

3. The mukarrthippi grasswren is endemic to New South Wales (NSW), Australia. Todd *et al.* (2020) state that “mukarrthippi grasswrens occur only in central New South Wales. They are known to persist with certainty only on a single 30 ha sandhill on the western side of Yathong Nature Reserve and have not been found elsewhere in the reserve despite searching. They may persist 60 km to the north at two sites, separated by 11 km, on the border of the Paddington and Hampton stations, but were last seen there in 2012 (M Todd, G Chapman unpublished). Historically, there are specimens from the Liverpool Plains (type locality), Namoi Valley, Coronga Peak and 'the Mossgiel district', and sight records from Coonamble in 1905 and Cobar in 1974 (McAllan 1987, Black *et al.* 2014). The 'Mossgiel' population was rediscovered at Taringo Downs north of Yathong in 1973 (Izzard *et al.* 1973; Miller 1973) and in Yathong Nature Reserve in 1975 (J Brickhill unpublished). However, the last record within the 60 km gap between recent records was in 2002 (M Todd unpublished).”
4. Like many grasswrens, mukarrthippi grasswrens are inferred to be habitat specialists. Todd *et al.* (2020) state that “mukarrthippi grasswrens are thought to be confined to mature spinifex *Triodia* spp. patches with an overstorey of mallee eucalypts, particularly the *Eucalyptus socialis*–*E. dumosa*–*E. gracilis* community that covers most of the sandplain and dune areas in the central and western parts of the parks (NSW NPWS 1996). Striated grasswrens forage mostly on the ground, eating seeds, fruits, insects and other invertebrates (Higgins *et al.* 2001). Striated grasswrens may recolonise habitat within three years after fires (Carpenter and Matthew 1986) but prefer habitat that has not been burnt for 5–15 years (S Vernon, ML Clarke unpublished). In Yathong Nature Reserve, the habitat last burnt in 1985 and is known to have been occupied since 1998. The Paddington/Hampton sites also last burnt in 1985, and birds were known to be present after 2002 (Cullenward 1989).”
5. Grasswrens are typically found in pairs, are strongly territorial and nest in cryptic nests on the ground (Karubian 2001). The breeding of this sub-species has not been studied and the following information is from a closely related sub-species. Nests are built by the female and are a substantial dome (with a side entrance) of interwoven grasses, bark and spinifex, well-hidden towards the top or edge of a spinifex clump (Rowley *et al.* 2020; DPIE 2021). Breeding has been recorded between Aug–Jan, and also following rainfall (Rowley *et al.* 2020). Breeding territory is approximately 3 hectares and there is some evidence of cooperative breeding (Rowley *et al.* 2020). Clutch size is 2–3 eggs with an incubation of 14 days, chicks fed by both parents, independent at 4 weeks, but probably stay with family for a longer period (Rowley *et al.* 2020). Generation length of the mukarrthippi grasswrens is estimated at 3 (2.3–3.8) years (Bird *et al.* 2020; Todd *et al.* 2020).

NSW Threatened Species Scientific Committee

6. The mukarrthippi grasswren is known only from a small number of remote locations in low abundance (Todd *et al.* 2020) and its distribution is considered to be very highly restricted. This sub-species occupies an extent of occurrence (EOO) estimated to be in the range of 4-600 km² with a best estimate of 386 km² (Todd *et al.* 2020), based on a minimum convex polygon enclosing all known mapped occurrences of the sub-species, the method of assessment recommended by IUCN (2019). The area of occupancy (AOO) is estimated to be 4-16 km², with a best estimate of 8 km² (Todd *et al.* 2020), based on 2 x 2 km grid cells, the scale recommended for assessing area of occupancy by IUCN (2019). For both AOO and EOO the lower range is the single pair known from Yathong Nature Reserve, while the upper range includes all known records and the best estimate is all records since 2012.
7. Although there is limited information available on the mukarrthippi grasswren, available evidence indicates a restricted distribution, which suggests a need for specific habitats which are uncommon and limited further by habitat degradation, fire and grazing regimes. Many grasswrens have, as a result of historic land degradation, suffered large reductions in their geographic ranges, with some sub-species now extinct (*Amytornis modestus inexpectatus*, *Amytornis whitei parvus* (possibly extinct), *Amytornis textilis carteri*, *Amytornis textilis giganturus*, *Amytornis textilis macrourus*, *Amytornis modestus modestus*), and most others threatened at the sub-species level (Garnett and Baker 2021). Grasswrens are poor flyers, with limited dispersal capability, specific habitat requirements and as such, are highly susceptible to population fragmentation (Karubian 2001; Garnett and Crowley 2000; Higgins *et al.* 2001; Black 2016). The limited information available for mukarrthippi grasswrens (Black *et al.* 2020a) fits the pattern seen in other threatened grasswren sub-species, which are of high conservation concern due to fragmented or isolated small populations.
8. Based on targeted surveys for mukarrthippi grasswrens, the population size of this sub-species is considered to be extremely low. The number of mature individuals estimated by Todd *et al.* (2020) is 4-20, who list the reliability of this estimate as low. It is considered unlikely that further survey is likely to increase this estimate by an order of magnitude given this sub-species has been listed as a threatened species in NSW since 1995 (which increases targeted survey effort; Lunney *et al.* 2018), has been of considerable interest to birdwatchers and any new sub-populations are also likely to have few mature individuals, be in decline and at high risk of local extinction. Todd *et al.* (2020) state that "One mukarrthippi grasswren pair has been recorded regularly on the sandhill site at Yathong Nature Reserve since 2010, and two pairs were found on one occasion (D Egan unpublished). There were known to be two pairs at one of the Paddington/Hampton sites in 2012 and a small number at the other site, but their persistence needs confirmation."
9. Populations of mukarrthippi grasswrens are threatened by fire which could adversely impact an entire sub-population, or the entire sub-species in a single event (Todd *et al.* 2020). Drought and heat waves impact this sub-species even in the absence of fire and all of these phenomena are predicted to increase in severity in the future across all tenures. As such the entire sub-species represents a single location under these threats (Evans *et al.* 2017; Herold *et al.* 2018; Eldridge and

NSW Threatened Species Scientific Committee

Beecham 2018; Di Virgilio *et al.* 2019; Dooley 2019; Dowdy *et al.* 2019; Todd *et al.* 2020). Predicted decreased rainfall and reduced ground-storey plant cover (Eldridge and Beecham 2018) are also expected to negatively impact this sub-species. Habitat degradation and loss is likely to occur from grazing by rabbits *Oryctolagus cuniculus*, sheep *Ovis aries*, feral goats *Capra hircus* and overgrazing kangaroos *Macropus* and *Osphranter* spp., given the sensitivity of the vegetation this sub-species prefers (Giljohann *et al.* 2017; Verdon *et al.* 2021; Mills *et al.* 2020). Populations on private land (Paddington and Hampton, NSW) face additional threats which include intensive grazing, browsing and trampling of habitat by sheep and feral and semi-domesticated goats (Todd *et al.* 2020). Grasswrens nest on or very close to the ground, which makes the nest accessible to a range of predators including cats, foxes, birds and monitors. Ground nesting exposes them to a similar suite of threats (predation, trampling, loss of cover) as for small terrestrial mammals, many of which have declined dramatically in the arid zone (Reid and Fleming 1992; Smith *et al.* 1994; Short and Smith 1994; Short 2004). In the arid parts of Australia, densities of these feral predators peak after large rainfall and breeding events of prey species (Pavey *et al.* 2008), however their densities remain high after the 'boom' phase and are likely to heavily impact on a wide range of vertebrates. 'Clearing of native vegetation', 'Competition and grazing by the feral European rabbit', 'Competition and habitat degradation by Feral Goats, *Capra hircus* Linnaeus 1758', 'Ecological consequences of high frequency fires', 'Human-caused Climate Change', 'Predation by feral cats' and 'Predation by the European Red Fox' are listed as Key Threatening Processes under the Act.

10. The threats to this sub-species occur over a wide area and are likely to suppress the floating population (non-breeding animals that usually persist in sub-optimal habitat) which reduces the resilience of known populations (Robles and Ciudad 2017) and the ability to recover from adverse events such as fire. The failure to detect this sub-species at more than one location in Yathong Nature Reserve (Todd *et al.* 2020) indicates that even in a threat managed landscape, abundance remains low and that some threats cannot currently be adequately managed. All known populations of mukarrthippi grasswren are very small and at elevated extinction risk from stochastic events and inbreeding depression (Keller and Waller 2002; O'Grady *et al.* 2006; Todd *et al.* 2020).
11. The mukarrthippi grasswren *Amytornis striatus striatus* Gould, 1840 is eligible to be listed as a Critically Endangered sub-species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

NSW Threatened Species Scientific Committee

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome: Critically Endangered under Clause 4.3 (a) (d) (e ii, iii,iv), Clause 4.4 (a) (d) (e i,iiA) and Clause 4.5 (a).

Clause 4.2 – Reduction in population size of species

(Equivalent to IUCN criterion A)

Assessment Outcome: Not eligible

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)

Assessment Outcome: Critically Endangered under Clause 4.3 (a) (d) (e ii, iii, iv).

The geographic distribution of the species is:			
	(a)	for critically endangered species	very highly restricted, or
	(b)	for endangered species	highly restricted, or
	(c)	for vulnerable species	moderately restricted,
and at least 2 of the following 3 conditions apply:			
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,	
	(e)	there is a projected or continuing decline in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	habitat area, extent or quality,
		(iv)	the number of locations in which the species occurs or of populations of the species,

NSW Threatened Species Scientific Committee

	(f)	extreme fluctuations occur in any of the following:	
		(i)	an index of abundance appropriate to the taxon,
		(ii)	the geographic distribution of the species,
		(iii)	the number of locations in which the species occur or of populations of the species.

Clause 4.4 - Low numbers of mature individuals of species and other conditions

(Equivalent to IUCN criterion C)

Assessment Outcome: Critically Endangered under Clause 4.4 (a) (di) (e i,iiA)

The estimated total number of mature individuals of the species is:				
	(a)	for critically endangered species		very low, or
	(b)	for endangered species		low, or
	(c)	for vulnerable species		moderately low,
and either of the following 2 conditions apply:				
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):		
		(i)	for critically endangered species	very large, or
		(ii)	for endangered species	large, or
		(iii)	for vulnerable species	moderate,
	(e)	both of the following apply:		
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and	
		(ii)	at least one of the following applies:	
		(A)	the number of individuals in each population of the species is:	
			(I)	for critically endangered species extremely low, or
			(II)	for endangered species very low, or
			(III)	for vulnerable species low,
		(B)	all or nearly all mature individuals of the species occur within one population,	
		(C)	extreme fluctuations occur in an index of abundance appropriate to the species.	

Clause 4.5 - Low total numbers of mature individuals of species

(Equivalent to IUCN criterion D)

Assessment Outcome: Critically Endangered under Clause 4.5 (a)

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

NSW Threatened Species Scientific Committee

Clause 4.6 - Quantitative analysis of extinction probability

(Equivalent to IUCN criterion E)

Assessment Outcome: Data Deficient

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high.

Clause 4.7 - Very highly restricted geographic distribution of species–vulnerable species

(Equivalent to IUCN criterion D2)

Assessment Outcome: Vulnerable

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.
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Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Hope B, Bray C, Pennay M (2021) NSW Threatened Species Scientific Committee (2021) Conservation assessment of mukarrhippi grasswren *Amytornis striatus striatus* Gould 1840 (Maluridae). NSW Threatened Species Scientific Committee.

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NSW Threatened Species Scientific Committee

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NSW Threatened Species Scientific Committee

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NSW Threatened Species Scientific Committee

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