



Conservation Advice for *Stipiturus malachurus parimeda* (Eyre Peninsula southern emu-wren)

**This draft document is being released for consultation on the species
listing eligibility and conservation actions**

The purpose of this consultation document is to elicit additional information to better understand the eligibility of the species for listing and inform conservation actions, further planning and the potential need for a Recovery Plan.

The draft assessment below should therefore be considered **tentative** at this stage, as it may change as a result of responses to this consultation process.

Note: Specific consultation questions relating to the below draft assessment and preliminary determination have been included in the consultation cover paper for your consideration.

This document combines the draft conservation advice and listing assessment for the subspecies. It provides a foundation for conservation actions and further planning.



Southern emu-wren © Copyright, Shutterstock

Conservation status

Stipiturus malachurus parimeda (Eyre Peninsula southern emu-wren) is proposed to be transferred from the Vulnerable category to the Endangered category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999*.

Stipiturus malachurus parimeda is being assessed by the Threatened Species Scientific Committee to be eligible for listing as Endangered under criteria 2 and 3. The Committee's assessment is at Attachment A. The Committee's assessment of the species' eligibility against each of the listing criteria is:

- Criterion 1: Insufficient data
- Criterion 2: B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v): Endangered
- Criterion 3: C2a(i): Endangered
- Criterion 4: D: Vulnerable
- Criterion 5: Insufficient data

The main factors that make the species proposed for listing in the Endangered category are the restricted distribution and small, continuing declining population. The subspecies has a restricted extent of occurrence (EEO) and area of occupancy (AOO) of 2,100 and 54 km², respectively (Table 3). The subspecies is considered severely fragmented as the 11 subpopulations (see Distribution) are isolated by cleared land and is assumed there is little genetic exchange among them (Van Weenen & Garnett 2021). The subspecies is considered severely fragmented as the 11 subpopulations (see Distribution) are isolated by cleared land, all contain fewer than 250 mature individuals, and it is assumed there is little genetic exchange among them (Van Weenen & Garnett 2021). Continuing decline is assumed to be occurring on the AOO, area, extent and quality of habitat, number of subpopulations, and number of mature individuals (Van Weenen & Garnett 2021). The estimated number of mature individuals is 750, with an observed and inferred continuing decline (Table 3).

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see the [Species Profile and Threat Database](#).

Species information

Taxonomy

Conventionally accepted as *Stipiturus malachurus parimeda* Schodde & Weatherly 1981.

The subspecies is one of eight recognised of the southern emu-wren. Subspecies *S. m. intermedius* (Mount Lofty Ranges) and *S. m. halmaturinus* (Kangaroo Island) are Endangered, the nominate subspecies *S. m. malachurus* and the other four subspecies are not listed threatened under the EPBC Act.

Description

The Eyre Peninsula southern emu-wren is a small bird with an overall length of 17-19 cm (including tail) and body mass between 5 - 9 g. It has short, rounded wings and a relatively long

tail (11 - 13 cm) comprised of six emu-like feathers. Like the other two species of emu-wrens *Stipiturus*, they are sexually dimorphic (Higgins et al. 2002; Pickett 2002; Menkhorst et al. 2017).

The plumage of the Eyre Peninsula southern emu-wren is very pale in comparison to most other subspecies of southern emu-wrens. The upperparts of adult birds are pale olive-grey or brown-grey, with brown to dark brown streaking across the head, neck and back, and dull white streaks on the ear-coverts. The underparts are a pallid light-yellowish brown or tawny colour, except for the white belly. The bill is black, the iris dark brown, and the legs and feet are a brownish colour. The adult male differs from the adult female in having a uniform rufous forehead and forecrown (olive-grey or brown-grey in the female), a large patch of light grey-blue or pale sky-blue on the chin, throat and upper breast (yellow-brown or tawny in the female), and a sky-blue stripe above the eye (yellow-brown or tawny in the female). The plumages of juvenile and immature birds have not been described (Schodde & Weatherley 1981; Higgins et al. 2001; Pickett 2002).

Distribution

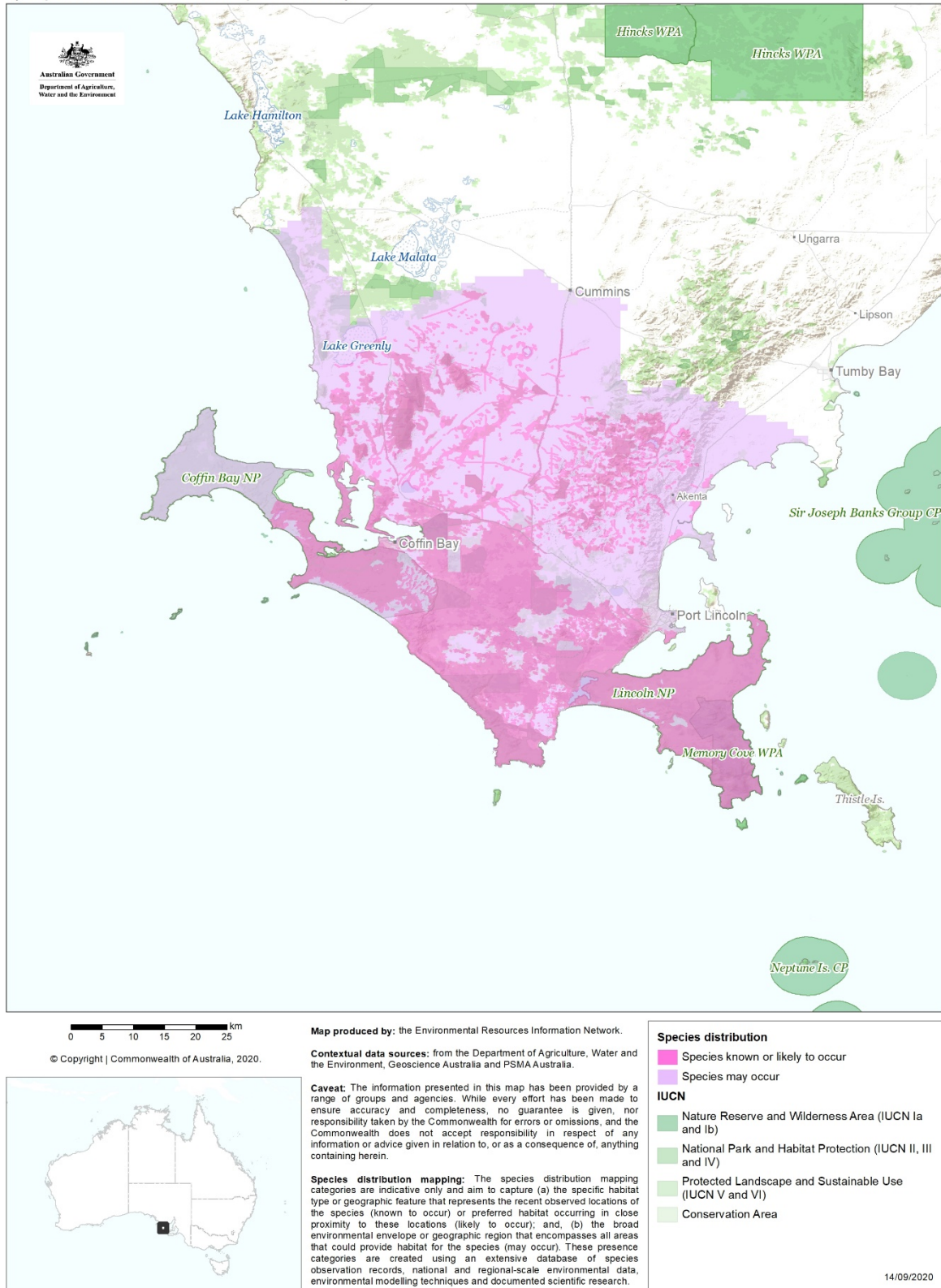
The Eyre Peninsula southern emu-wren can be found at the southern tip of Eyre Peninsula, South Australia. The subspecies is known from 11 sites, all likely to be isolated (Pickett 2009; DEWNR 2015):

- 1) South Block (private land).
- 2) Marble Range (heritage agreement, private land).
- 3) Edillilie – Salt Creek – Duck Lake (road reserve).
- 4) Keillidie Bay – Wanilla (Kellidie Bay Conservation Park, Murrumbidgee Conservation Park, road reserve, private land).
- 5) Yangie Bay (Coffin Bay National Park).
- 6) Point Avoid (Coffin Bay National Park).
- 7) Shoal Point – D’Anville Bay – Whalers Way – Fishery Bay (SA Water reserve, heritage agreement area, private land).
- 8) Sleaford Bay West – Tulka (Lincoln National Park, Sleaford Conservation Park, road reserve, private land).
- 9) Wanna – Cape Tournefort (Lincoln National Park).
- 10) Carcass Point – McLaren Point – Point Haselgrove – Taylors Landing (Lincoln National Park).
- 11) West Point – Jussieu Bay (Memory Cove Wilderness Protection Area).

Most (68%) of the sites are located in nature conservation areas, with the other sites on private property (19%), on roadsides in the care and control of the District Council of Lower Eyre Peninsula (10%) and within SA Water reserves (3%). Undoubtedly the subspecies was more widespread historically, but no further historical records are available (Schodde & Mason 1999). Range decline and fragmentation of its former range is most likely due to extensive clearance for agriculture (Garnett & Crowley 2000), although large scale fires may be another contributing factor (Pickett 2009; Garnett et al. 2011). Van Weenen & Garnett (2021) made the assumption that three out of the 11 locations have been extirpated, based on historical rate of decline.

Map 1 Modelled distribution of Eyre Peninsula southern emu-wren

Indicative distribution of Southern Emu-wren (Eyre Peninsula)
(*Stipiturus malachurus parimeda*)



Source: Base map Geoscience Australia; species distribution data [Species of National Environmental Significance](#) database.

Cultural and community significance

The southern emu-wren has a relatively high profile, especially locally within each subspecies' regions. The 2019/2020 bushfires severely impacted Kangaroo Island, resulting in the subspecies *S. m. halmaturinus* being identified as a priority species for conservation planning. The related mallee emu-wren (*Stipiturus mallee*) was a priority bird in the [Threatened Species Strategy 2015-2020](#).

The Eyre Peninsula southern emu-wren occurs on the lands of the Barngarla and Nauo Indigenous Peoples. Aboriginal Nations in the Eyre Peninsula all have significant cultural stories associated with the region. Further research into the subject area may benefit the conservation planning of the subspecies by providing insights about traditional land management.

This statement of significance is not intended to be comprehensive, applicable to, or speak for, all Indigenous Australians and it is acknowledged that Indigenous groups and individuals are the custodians of this knowledge.

Relevant biology and ecology

Published information on the Eyre Peninsula southern emu-wren is limited, consequently, data from other subspecies has been used here to infer relevant biological and ecological information.

Habitat

The southern emu-wren inhabits a range of habitats characteristically comprising low dense vegetations, such as shrub thickets, sedgelands, and heathy shrubland, mallee, woodland or forest (Schodde 1982; Rowley & Rossell 1997; Higgins et al. 2001).

Eyre Peninsula southern emu-wren has been recorded in shrubland, mallee and sedgeland, all of which are characterised by one or two low, dense layers of vegetations (Pickett 2002). It has been suggested that emu-wrens (*Stipiturus* spp.) are more likely to choose habitats based on vegetation structure rather than floristics (Wilson & Paton 2004; Maguire 2006b). Dense vegetation is important for shelter and because it has higher insect abundance (Maguire 2006a).

Shrubland

Habitats include wet and dry heathlands. They are usually dominated by one or two major plant species. The most common include myrtles such as mallee honey-myrtle (*Melaleuca brevifolia*) and less frequently, totem poles (*M. decussata*) and black paperbark (*M. lanceolata*). Other prominent species are samphire (*Gahnia* spp.), coast beard-heath (*Leucopogon parviflorus*), dysentery bush (*Alyxia buxifolia*) and coast velvet bush (*Lasiopetalum discolor*).

Shrubland and heathland habitats can also contain a variety of other shrubs and trees such as umbrella bush (*Acacia ligulata*), eucalypts (*Eucalyptus* spp.), *Casuarina* spp., *Allocasuarina* spp., bristly bush-pea (*Pultenaea acerosa*) and Tate's grasstree (*Xanthorrhoea semiplana*). The understorey vegetation in these habitats is comprised mainly of low sedges and rushes (*Juncus* spp.) and can include species such as samphire (Possingham 1993; Pickett 2002).

Mallee

Mallee habitats used by the Eyre Peninsula southern emu-wren can be open or closed, and can include low mallee. They are typically dominated by soap mallee (*Eucalyptus diversifolia*) and

ridge-fruited mallee (*E. incrassate*) in association with a variety of shrubs including myrtle species and coast beard heath, and a lower layer (often dense) of heathy shrubs and sedges.

In some locations, mallee habitats include areas of more typical inland mallee that are dominated by ridge-fruited mallee and have a dense understory of heathy shrubs such as *Banksia* spp., green tea-tree (*Leptospermum coriaceum*) and hummock grasses (*Triodia* spp.) (Pickett 2002).

Sedgeland

The sedgeland habitats of the Eyre Peninsula southern emu-wren are dominated by coast saw-sedge (*Gahnia trifida*) and usually have a dense understorey of bare twigrush (*Baumea juncea*) or other sedges and rushes. These habitats are located around seasonal swamps in coastal regions of the subspecies' range (Pickett 2002).

Diet

Southern emu-wrens feed almost entirely upon insects, including seed or chinch bugs (Hemiptera: Lygaeidae, including Nysius), psyllids (Hemiptera: Psyllidae), katydids (Orthoptera: Tettigoniidae) and beetles (Coleoptera), including weevils (Coleoptera: Curculionidae). Other items recorded in their diet include eggs of katydids (and possibly other insects or spiders), and wasp cocoons (Hymenoptera). They forage systematically around and up through shrubs to the top, before moving to the next shrub, sometimes also capturing flying insects (Lea & Gray 1935; Higgins et al. 2001).

Breeding

Southern emu-wrens are monogamous pair breeders, producing one (mostly) or two broods, from the beginning of August until the end of March. This includes nesting and rearing young until independence, but most young hatch during September-December. Cooperative breeding and extra-pair paternity have been recorded in the other subspecies of southern emu-wrens, and may also occur in the Eyre Peninsula southern emu-wren. They occupy territories during the breeding season, each pair usually occupying around one hectare of good quality habitat, with little overlap with the ranges of neighboring pairs (Higgins et al. 2001).

Southern emu-wrens construct domed nests, mainly from loosely woven fine-leaved grasses and sedges, usually near (around 0.3 m) the ground or sometimes water, in dense vegetation. Both parents feed the young but only the female incubates the eggs and broods the nestlings. The usual clutch size is three eggs, which are laid on successive days. The incubation period is around 10-20 days and nestling period around two weeks. Young remain in highly cryptic dense cover for up to two weeks after fledging, until they are more capable of flight and foraging. Young are independent by about three months of age and can breed in the breeding season following hatching (Fletcher 1915; Higgins et al. 2001; Maguire & Mulder 2004). They have an estimated generation length of 2.1 years (Bird et al. 2020).

Movement

Movement and dispersal of southern emu-wren is poorly known, but the species is generally thought to be sedentary (Higgins et al. 2001). As they are not great flyers due to their long tails and they prefer dense cover, the Eyre Peninsula southern emu-wren is presumed to be poor at dispersing, although there is little available empirical information regarding dispersal. In the Mount Lofty Ranges subspecies (*S. m. intermedius*), movements of up to 2.5 km have been

recorded between sites connected by dense vegetation (Pickett 2000; MLRSEW & FPS Recovery Team 2007).

Habitat critical to the survival

Eyre Peninsula southern emu-wren has been recorded in shrubland, mallee and sedgeland, all of which are characterised by one or two low, dense layers of vegetations (Pickett 2002). Habitat critical to the survival of the Eyre Peninsula southern emu-wren should consist of:

All known sites where the subspecies occurs (see *Distribution*);

Specific habitat types identified above (see *Relevant biology and ecology*) that may be potential habitat for the subspecies; and

Surrounding matrix of these areas for the role of providing corridors for dispersal between suitable habitat patches.

Further research would allow the definition of habitat critical to the survival of the subspecies to be refined (e.g., through the availability of higher resolution vegetation mapping layers and ground-based surveys). A systematic approach to identify and rank critical Eyre Peninsula southern emu-wren habitat should consider factors such as population parameters (e.g., size, extent, viability, and likely source-sink dynamics), surrounding landscape (e.g., matrix quality), habitat quality, patch configuration and connectivity. Assessments of the habitat critical to the survival of the subspecies should also consider the potential future impacts of threats (e.g., climate change that may change the spatial location/configuration of habitats).

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

Key considerations in environmental impact assessments

Assessments relevant to the Eyre Peninsula southern emu-wren must consider that the subspecies:

- 1) Is severely fragmented, the 11 sites occupied identified in this document are isolated from each other by cleared land, with the largest subpopulation being around 150 mature individuals (Van Weenan & Garnett 2021).
- 2) Is dispersal limited and largely sedentary, such that re-colonisation following local extinction of any subpopulation is limited: for example, the population in the Koppio Hills (Possingham 1993) has not been found since a fire in 2005 (Pickett 2009). Therefore, further loss of connectivity between suitable habitat patches, or fragmentation of habitat patches, would lead to further fragmentation of the population and increase risk of extinction of isolated subpopulations.
- 3) May occupy habitat based on structural rather than floristic composition (Maguire 2006b), therefore the subspecies may occur in vegetation beyond what has been described in this document.

Habitat critical to the survival of the Eyre Peninsula southern emu-wren occurs across a range of land tenures. Habitat critical to the survival of the subspecies should not be destroyed or degraded, and all habitats should be maintained and/or increased. Actions that have indirect

impacts on habitat critical to the survival should be minimised. Actions that compromise adult and juvenile survival, by exacerbating threats other than habitat loss, should also be avoided.

Actions that remove habitat critical to the survival of this subspecies would interfere with the recovery of the Eyre Peninsula southern emu-wren and reduce the area of occupancy of the subspecies. It is important to retain all suitable habitat described above and maintain connectivity between habitat patches. Actions should not be assessed in isolation and consideration must be given to existing and future activities that may impact the subspecies to ensure conservation outcomes on a landscape scale are achieved.

Important populations

All subpopulations identified in this document should be considered as important and should be managed for their protection. Subpopulations at five of the 11 known sites (see *Distribution*) have been identified as critical for the long-term survival and recovery of the subspecies (Pickett 2006).

Subpopulation 2 (Marble Range)

Contains sparse numbers, but is probably a major source for regional dispersal within Marble Range and to Glengyle Creek system, and possibly to the west of Marble Range where Eyre Peninsula southern emu-wren has not been recorded.

Subpopulation 4 (Keillidie Bay – Wanilla)

Considered to be relatively large and includes the largest swamp population. This subpopulation is likely a major source for regional dispersal to Merintha Creek, greater Cummins – Wanilla Basin and possibly Coffin Bay National Park.

Subpopulation 7 (Shoal Point – D’Anville Bay – Whalers Way – Fishery Bay)

Considered to be relatively large and is likely a major source for regional dispersal in Sleaford and Uley Basin district.

Subpopulation 10 (Carcass Point – McLaren Point – Point Haselgrove – Taylors Landing) and 11 (West Point – Jussieu Bay)

Considered relatively large and is a likely source for regional dispersal within Lincoln National Park and Memory Cove Wilderness Protection Area. Both subpopulations have shown decline in the Eyre Peninsula southern emu-wren density and distribution since 2002.

Threats

The main threat to the Eyre Peninsula southern emu-wren is the loss, degradation and fragmentation of habitat. Fire is a major threat to the subspecies, although the three subpopulations that live in samphire may be at lower risk (Pickett 2002). Extreme fire weather (Di Virgilio et al. 2019; Dowdy et al. 2019), driven by longer droughts (Evans et al. 2017) and more frequent heatwaves (Herold et al. 2018), is likely to occur more often in the near future, under the changing climate.

The subspecies is also currently threatened by a variety of land use and management processes, including clearance of native vegetation, grazing of livestock, water extraction and swamp drainage. Other minor threats in terms of habitat loss and degradation includes weed invasion and *Phytophthora*-induced dieback (Pickett 2002; DEWNR 2015; Van Weenen & Garnett 2021).

With fragmented habitat, isolated populations face the loss of genetic diversity, especially in smaller populations. This could lead to inbreeding depression and potentially local extinctions. Additionally, demographic stochasticity is a greater risk in small, isolated populations. Introduced predators are not currently considered as a major threat, but further investigation is needed before determining the extent of threat they pose on the subspecies.

Table 1 Threats

Threats in Table 1 are noted in approximate order of highest to lowest impact, based on available evidence.

Threat	Status ^a	Evidence
Habitat loss, degradation, and fragmentation		
Inappropriate fire regimes	<ul style="list-style-type: none"> • Timing: current & future • Confidence: observed • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across the entire range 	<p>Increase in frequency, scale and severity of wildfires</p> <p>Wildfire is the major threat to the subspecies (Pickett 2002). Fires can cause catastrophic loss of habitat and kill individual birds. It can result in long-term loss of the subspecies from specific areas (Pickett 2002). Fires remove the dense vegetation required by the subspecies for protection. Reoccupation of regenerating habitat can be expected provided there is adjacent unburnt occupied habitat or adequately connected occupied habitat. The time required for recolonisation is likely to vary in different habitat types (DEWNR 2015).</p> <p>Two major bushfires in 2005 extinguished all habitat at five or six sites, leading to local extinction of the Koppio Hills subpopulation (Garnett et al. 2011). Most recently (December 2021), during the Edillilie-Marble Range bushfire the inselberg 'South Block' containing an isolated subpopulation (see <i>Distribution</i> subpopulation 1), was almost entirely affected. Unburnt pockets of habitat are thought to remain, but no on-ground survey has been conducted yet to assess the impact (P Wilkins 2022, pers comm 25 January).</p> <p>Inappropriate fire management</p> <p>Inappropriate fire management (e.g., prescribed fires too intense or too frequent) may significantly impact the subspecies' habitat, rendering areas unsuitable for long periods of time or slowing the regeneration rate.</p>
Land clearance	<ul style="list-style-type: none"> • Timing: historical, current & future • Confidence: observed • Likelihood: likely • Consequence: major • Trend: static • Extent: across part of its range 	<p>Although broad-scale land clearance has ceased, minor clearance can still be authorised. This, together with the likelihood of a small amount of illegal clearance, results in incremental habitat loss which may be substantial overall. A number of mines and exploration programs in the Koppio Hills area</p>

Threat	Status ^a	Evidence
		(DEWNR 2015), and a space launch facility in Whalers Way (Southern Launch 2022), have been proposed in areas containing habitat critical to the survival of the subspecies and known to support one of the important populations (AECOM 2020; see <i>Important populations</i>).
Grazing (livestock and wild herbivores)	<ul style="list-style-type: none"> • Timing: current & future • Confidence: known • Likelihood: likely • Consequence: major • Trend: static • Extent: across the entire range 	<p>Livestock grazing (and trampling) has been a major threat to Eyre Peninsula southern emu-wren populations, particularly in swamp habitat as it degrades habitat and impacts on nest success through trampling. Furthermore, inappropriate grazing regimes may have long-term impacts on habitat structure due to changed plant population dynamics, which could affect habitat suitability (DEWNR 2015; Pickett 2017).</p> <p>Grazing by overabundant native species such as kangaroos and emus may also be a minor threat (DEWNR 2015).</p>
Invasive weeds	<ul style="list-style-type: none"> • Timing: current & future • Confidence: observed • Likelihood: likely • Consequence: minor • Trend: static • Extent: across the entire range 	<p>Invasive weeds could degrade the floristic and structural integrity of habitat, and change the availability of resources. Weeds that occur in the range of the subspecies include bridal creeper (<i>Asparagus asparagoides</i>), African boxhorn (<i>Lycium ferocissimum</i>) and buffel grass (<i>Cenchrus ciliaris</i>). Furthermore, the flammable nature of some weeds such as buffel grass may also increase the risk of wildfire (Marshall et al. 2012).</p>
Inappropriate hydrological regimes (water extraction and swamp drainage)	<ul style="list-style-type: none"> • Timing: current & future • Confidence: inferred • Likelihood: likely • Consequence: moderate • Trend: static • Extent: across part of its range 	<p>Water extraction and swamp drainage is considered a major threat to the presence and quality of swamp habitat occupied by the subspecies (Pickett 2002; DEWNR 2015).</p> <p>Water extraction (e.g. dams, wells, bores) and swamp drainage (for agriculture or residential purposes) could have substantial cumulative impacts as they reduce stream flow and lower water tables, thereby affecting the condition of vegetation and soil, and therefore structural integrity of swamp habitat (MLRSEW & FPS Recovery Team 2007).</p> <p>Climate change could potentially further worsen the impacts of water extraction and swamp drainage.</p>
<i>Phytophthora cinnamomi</i> induced diebacks	<ul style="list-style-type: none"> • Timing: current & future • Confidence: suspected • Likelihood: possible • Consequence: minor • Trend: unknown • Extent: across part of its range 	<p><i>P. cinnamomi</i> is a plant pathogen which infects a wide range of native plants, altering structural and floristic characteristics of the vegetation. It is potentially threatening due to its capacity to kill key habitat species with consequent degradation of habitat quality (Commonwealth of Australia</p>

Threat	Status ^a	Evidence
		<p>2018a; Hardham & Blackman 2018). Dieback may be a potential threat in higher rainfall (> 400 mm annual average) areas, which include all of the lower Eyre Peninsula range occupied by the subspecies (DEWNR 2015).</p> <p>There are suspected but unconfirmed infections on Eyre Peninsula, and some suspected sites of infection are near habitat occupied by <i>S. m. parimeda</i> (DEWNR 2015).</p>
Climate change		
Increased likelihood of extreme events (e.g., wildfire, heatwave and drought)	<ul style="list-style-type: none"> • Timing: current & future • Confidence: estimated • Likelihood: almost certain • Consequence: major • Trend: increasing • Extent: across the entire range 	<p>Average temperatures in Australia have increased by around 1.4°C in the past century (BOM & CSIRO 2020; IPCC 2021), and global temperatures are likely to exceed 1.5°C in the next 20 years if global greenhouse gas emissions are not reduced immediately (IPCC 2021). More frequent and extreme heatwaves are projected across Australia (BOM & CSIRO 2020). Rainfall may also vary regionally under the changing climate (Evans et al. 2017), with lowest rainfall records in parts of southern Australia (BOM & CSIRO 2020). These changes will lead to an increase in frequency and intensity of droughts (Evans et al. 2017) and heatwaves (Herold et al. 2018), and thus extreme fire weather.</p> <p>Garnett et al. (2013) identified the subspecies and its habitats as highly sensitive to climate change. The small size and isolation of the subpopulations means that the subspecies is especially susceptible to effects of localised extreme events, or environmental fluctuations.</p>
Predation		
Introduced predators	<ul style="list-style-type: none"> • Timing: current & future • Confidence: inferred • Likelihood: possible • Consequence: minor • Trend: static • Extent: across the entire range 	<p>Larger introduced predators such as cats (<i>Felis catus</i>; Maguire & Mulder 2004; Commonwealth of Australia 2015a) and foxes (<i>Vulpes vulpes</i>; Higgins et al. 2001; DEWHA 2008a) are considered a minor potential threat to <i>S. m. parimeda</i>, due to the dense, structurally complex nature of their habitat providing a substantial amount of protection (DEWNR 2015).</p> <p>Small nest predators such as the Black Rat (<i>Rattus rattus</i>; Caughley et al. 1998) poses a greater threat to <i>S. m. parimeda</i> as their nests are usually close to, or on the ground.</p>
Isolated subpopulations due to habitat fragmentation		
Demographic stochasticity and loss of genetic diversity as a result of small,	<ul style="list-style-type: none"> • Timing: future • Confidence: inferred • Likelihood: unknown 	Small, isolated subpopulations are at an increased risk of extinction due to

Threat	Status ^a	Evidence
isolated subpopulations	<ul style="list-style-type: none"> • Consequence: major • Trend: unknown • Extent: across the entire range 	<p>demographic stochasticity and loss of genetic diversity.</p> <p>Demographic stochasticity refers to the unpredictable variability in factors that determines a population's persistence, such as population growth rates arising from differences amongst individuals in seasonal survival, reproduction and sex ratios (Frankham et al. 2002). This means that small populations could be extirpated due to random within-in season variations (Pickett 2017).</p> <p>Another potential threat to small, isolated populations is genetic drift, which could lead to consequences such as the loss of genetic diversity, inbreeding depression and the accumulation of deleterious mutation (Frankham et al. 2002). These could lead to a lower capacity to respond to environmental changes or fluctuations, and increased expression of deleterious recessive alleles, leading to reduced individual survival and reproductive capacity (inbreeding depression; Pickett 2017).</p>
Anthropogenic disturbance		
Noise and light pollution	<ul style="list-style-type: none"> • Timing: future • Confidence: inferred • Likelihood: possible • Consequence: minor • Trend: unknown • Extent: across parts of its range 	<p>With increased industrial development within the subspecies' range (e.g., Whalers Way space launch site), an emerging threat is the noise and light impacts associated with the construction and operations of the sites (AECOM 2020).</p> <p>Artificial light is known to adversely impact many species and ecological communities through change of behaviour, physiology, reducing survival or reproductive success (Commonwealth of Australia 2020). The most significant impacts that it may have on the Eyre Peninsula southern emu-wren is the potential increase in predation, and change in foraging and reproductive behaviour (AECOM 2020; Commonwealth of Australia 2020). Especially if its lighting associated with ongoing operations, which will be long term and localised.</p> <p>Anthropogenic noise could lead to physiological stress in individuals, elicit avoidance and fright-flight responses, and damage to hearing from acoustic over-exposure (Dooling & Popper 2007). It may also reduce the ability of individuals to hear each other or predator, resulting in decreased survival rate or reproductive success (Shannon et al. 2016).</p>

^aTiming—identifies the temporal nature of the threat

Confidence—identifies the nature of the evidence about the impact of the threat on the species

Likelihood—identifies the likelihood of the threat impacting on the whole population or extent of the species

Consequence—identifies the severity of the threat

Trend—identifies the extent to which it will continue to operate on the species

Extent—identifies its spatial context in terms of the range of the species

Categories for likelihood are defined as follows:

Almost certain – expected to occur every year

Likely – expected to occur at least once every five years

Possible – might occur at some time

Unlikely – known to have occurred only a few times

Unknown – currently unknown how often the threat will occur

Categories for consequences are defined as follows:

Not significant – no long-term effect on individuals or populations

Minor – individuals are adversely affected but no effect at population level

Moderate – population recovery stable or declining

Major – population decline is ongoing

Catastrophic – population trajectory close to extinction

Each threat has been described in Table 1 in terms of the extent that it is operating on the species. The risk matrix (Table 2) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; the spatial extent, and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed using available literature.

Table 2 Risk Matrix

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
Almost certain				<ul style="list-style-type: none"> Inappropriate fire regimes Increased likelihood of extreme events (e.g., wildfire and drought) 	
Likely		<ul style="list-style-type: none"> Invasive weeds 	<ul style="list-style-type: none"> Inappropriate hydrological regimes (water extraction and swamp drainage) 	<ul style="list-style-type: none"> Land clearance Grazing (livestock and wild herbivores) 	
Possible		<ul style="list-style-type: none"> <i>Phytophthora cinnamomi</i> induced diebacks Introduced predators Noise and light pollution 			
Unlikely					
Unknown				<ul style="list-style-type: none"> Demographic stochasticity and loss of genetic diversity as a result of small, isolated subpopulations 	

Risk Matrix legend/Risk rating:

Low Risk	Moderate Risk	High Risk	Very High Risk
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Priority actions have then been developed to manage the threats, particularly where the risk was deemed to be 'very high' (red shading) or 'high' (orange shading). For those threats with an unknown or low risk (blue and green shading respectively) research and monitoring actions have been developed to understand and evaluate the impact of the threats, where appropriate.

Conservation and recovery actions

Primary conservation objective

- Existing subpopulations secured and increased in size.

- Improved connectivity between subpopulations.
- Extirpated subpopulations re-established when suitable habitat has been restored.

Conservation and management priorities

Inappropriate fire regimes

- Develop a landscape-scale fire management strategy which minimises the risk of extensive wildfire, whilst considering the ecological needs of the subspecies. For example:
 - Ensure fire suppression strategies also consider impacts on the population or its habitat.
 - Fire management activities to protect key sites and those identified as most at risk from wildfires should be prioritised.
 - Protect unburnt areas within or adjacent to recently burnt ground that may provide refuge, from planned burns, clearing and other disturbance until the burnt areas have recovered sufficiently to support the subspecies once again.
- Integrate the ecological needs of Eyre Peninsula southern emu-wren into fire management plans for the region, such as a dense layer of low vegetation. Where appropriate, extrapolate information from other southern emu-wren subspecies (e.g., [Ecological Fire Management Strategy for Mount Lofty Ranges southern emu-wren](#)).
- Consider impacts of predation on the subspecies and implement control programs if subpopulations are likely to be significantly impacted by predation after fire.
- Provide fire and land managers with maps of known locations of the species, and specific advice to support decision making in wildfire prevention, preparation, response and recovery.

Land clearance, inappropriate hydrological regimes (water extraction and swamp drainage) and grazing (livestock and wild herbivores)

- Avoid any further loss of habitat critical to the survival of the Eyre Peninsula southern emu-wren.
- Undertake strategic restoration and management with the aim of increasing connectivity among subpopulations.
- Protect and enhance known habitat, including all known population sites, and the acquisition of additional sites for conservation.
- Link and expand sites and subpopulations through revegetation and grazing pressure management.
- Fence habitat being detrimentally impacted by livestock where appropriate.

Demographic stochasticity and loss of genetic diversity as a result of small, isolated subpopulations

- Consider translocation of individuals as a management tool to increase viability of smaller populations.
- If feasible, establish new populations in suitable habitat.

Stakeholder engagement/community engagement

- Raise the profile of the subspecies and important habitats with landholders and local government stakeholders, and encourage their involvement in conservation actions.
- Create a multi-stakeholder team with the goal of threatened species conservation on Eyre Peninsula.
- Continue to generate awareness amongst landholder/land managers of potential impacts of livestock grazing, as well as legislative requirements.
- Provide advice to managers regarding impacts and management options and facilitate installation of protective fencing where required to protect habitat from livestock.
- Engage the community in research, management, raising awareness and advocacy of the subspecies and important habitats.

Survey and monitoring priorities

- Monitor, at suitable intervals, key factors to track recovery, including population size, breeding success and habitat condition and extent, and relate these to changes in the level of threats, and their management. For example:
 - Continue to monitor bushfire-affected areas to assess the impact of wildfire on the subspecies.
 - Undertake surveys to assess the effectiveness of the control program for *P. cinnamomi* in the region (Threat abatement plans (TAP) addressing the issue of dieback caused by *P. cinnamomi* was updated in 2018 (Commonwealth of Australia 2018b)) and incorporate new knowledge into management preventions.
 - Monitor for impacts of any extreme weather events on the subspecies.
- Report any illegal activities (e.g., burning, grazing, and vegetation clearance).

Information and research priorities

- Use modelling techniques to investigate the potential impact of climate change and determine sensitivity and resilience to climate change and extreme climate events on the subspecies and their habitat critical for survival. For example, examine the likely reduction in inter-fire intervals and comparing that with the recovery times of populations, would be valuable.
- Conduct metapopulation modelling and identify areas where connectivity could be restored between subpopulations.
- Improve knowledge of the impacts of fire on the subspecies including ecology, behaviour and their habitat, and their ability to re-colonise recently burnt areas. This should be used to inform future management.
- Determine genetic diversity and population genetics of the Eyre Peninsula southern emu-wren, and explore the potential for translocation and reconnection between populations.
- Develop strategy and decision framework for undertaking post-fire rescue of birds, including where they can be moved to or temporarily housed.

- Undertake further research to assess the impact of feral predators, and the effectiveness of the current control programs (TAP available for predation by feral cats (Commonwealth of Australia 2015b) and foxes (DEWHA 2008b)) and incorporate new knowledge into management interventions.

Links to relevant implementation documents

- [Treat abatement plan for predation by feral cats](#) (Commonwealth of Australia 2015b).
- [Threat abatement plan for disease in natural ecosystems caused by *Phytophthora cinnamomi*](#) (Commonwealth of Australia 2018b).
- [Threat abatement plan for predation by the European red fox](#) (DEWHA 2008b).

This Conservation Advice is developed to be able to subsequently inform other planning instruments such as a Bioregional Plan or a multi-entity Conservation Plan.

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THREATENED SPECIES SCIENTIFIC COMMITTEE

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

The Threatened Species Scientific Committee finalised this assessment on DD Month Year.

Attachment A: Listing Assessment for *Stipiturus malachurus parimeda*

Reason for assessment

The Eyre Peninsula southern emu-wren was listed as Vulnerable under the *Endangered Species Protection Act 1992* and transferred to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) when it commenced in July 2000.

This assessment follows evaluation by experts of the conservation status of the species and consultation with the States and Territories as part of systematically reviewing species that are inconsistently listed under the EPBC Act and relevant State or Territory legislation.

Assessment of eligibility for listing

This assessment uses the criteria set out in the [EPBC Regulations](#). The thresholds used correspond with those in the [IUCN Red List criteria](#) except where noted in criterion 4, sub-criterion D2. The IUCN criteria are used by Australian jurisdictions to achieve consistent listing assessments through the Common Assessment Method (CAM).

Key assessment parameters

Table 3 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria. The definition of each of the parameters follows the [Guidelines for Using the IUCN Red List Categories and Criteria](#).

Table 3 Key assessment parameters

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Number of mature individuals	750	500	1,000	Updated estimates in Van Weenen & Garnett (2021) based on survey results from Pickett (2002).
Trend	declining			Van Weenen & Garnett (2021)
Generation time (years)	2.1	1.8	2.3	Bird et al. (2020)
Extent of occurrence	2,100 km ²	1,900 km ²	23,010 km ²	Van Weenen & Garnett (2021)
Trend	Contracting			Van Weenen & Garnett (2021)

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Area of Occupancy	54 km ²	24 km ²	256 km ²	<p>As there are no new range wide surveys for the subspecies since Pickett (2009), Van Weenen & Garnett (2021) used the same estimated AOO of 54 km² (range 30 – 230km²) from Garnett et al. (2011), which used 1 x 1 km grids to calculate the AOO.</p> <p>Using all known records (BDBSA and SA Museum), which encompasses records back to 1974, the AOO is estimated at 256 km² (Bachman et al. 2011), the minimum plausible value of 24 km² were estimated using only surveys from 2002 - 2009 (DEW unpublished data).</p>
<p>AOO is a standardised spatial measure of the risk of extinction, that represents the area of suitable habitat known, inferred or projected to be currently occupied by the taxon. It is estimated using a 2 x 2 km grid to enable comparison with the criteria thresholds. The resolution (grid size) that maximizes the correlation between AOO and extinction risk is determined more by the spatial scale of threats than by the spatial scale at which AOO is estimated or shape of the taxon's distribution. It is not a fine-scale estimate of the actual area occupied. In some cases, AOO is the smallest area essential at any stage to the survival of existing populations of a taxon (e.g. breeding sites for migratory species).</p>				
Trend	Contracting			Van Weenen & Garnett (2021)
Number of subpopulations	8	5	11	Van Weenen & Garnett (2021)
Trend	declining			Van Weenen & Garnett (2021)
Basis of assessment of subpopulation number	The subspecies occurs at 11 isolated locations (see Distribution). It is assumed that there is little genetic exchange among these locations that are isolated by cleared land (Van Weenen & Garnett 2021). Van Weenen & Garnett (2021) made the assumption that three of the 11 locations known from 2002 have been extirpated, based on historical rates of change.			
No. locations	8	5	11	Van Weenen & Garnett (2021)
Trend	declining			Van Weenen & Garnett (2021)
Basis of assessment of location number	The subspecies occurs at 11 isolated locations (see Distribution). It is assumed that there is little genetic exchange among these locations that are isolated by cleared land (Van Weenen & Garnett 2021). Van Weenen & Garnett (2021) made the assumption that three of the 11 locations known from 2002 have been extirpated, based on historical rates of change.			
Fragmentation	It is assumed that there is little genetic exchange among these locations that are isolated by cleared land and due to the limited dispersal ability of the subspecies. Furthermore, each subpopulation is estimated to be less than 250 individuals, therefore the subspecies is considered as severely fragmented (Van Weenen & Garnett 2021)			
Fluctuations	Not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals.			

Criterion 1 Population size reduction

Reduction in total numbers (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> <ul style="list-style-type: none"> (a) direct observation [except A3] (b) an index of abundance appropriate to the taxon (c) a decline in area of occupancy, extent of occurrence and/or quality of habitat (d) actual or potential levels of exploitation (e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites 			

Criterion 1 evidence

Insufficient data to determine eligibility

There has been no attempt in assessing the population size in the last two decades, where they were provisionally thought to be fewer than 1,000 mature individuals with no subpopulation likely to exceed 100 pairs (Pickett 2002). Another survey of 35 sites in 2009, including 21 that were burnt during bushfires in 2001 or 2005, 36-37 birds were recorded at 11 sites, including 6/16 survey sites at which they had previously been recorded during 2002-2008 and five new sites. Birds were recorded in post-fire regeneration at two sites that had been completely burnt in 2001 with breeding at one and four sites burnt in 2005 with breeding at two. Birds were recorded up to 3.5 km inside the burnt area (Pickett 2009). Surveys conducted in June 2020 in Whalers Way observed 18 individuals, including four pairs and a group of three (Sinell 2020).

Van Weenen & Garnett (2021) made the assumption that three out of the 11 locations have been extirpated, based on historical rate of decline. However, there is insufficient evidence to quantify the population decline in the last 10 years. Therefore, the Committee considers that there is insufficient information to determine the eligibility of the subspecies for listing under this criterion.

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			

Criterion 2 evidence

Eligible under Criterion 2 B1ab(ii,iii,iv,v)+2ab(ii,iii,iv,v) for listing as Endangered

The subspecies has a restricted EOO and AOO of 2,100 and 54 km², respectively (Table 3). The subspecies occurs at up to 11 isolated locations (see *Distribution*). It is assumed that there is little genetic exchange among these locations that are isolated by cleared land and due to the limited dispersal ability of the subspecies. Furthermore, each subpopulation is estimated to be less than 250 individuals, therefore the subspecies is considered as severely fragmented (Van Weenen & Garnett 2021). Continuing decline is assumed to be occurring, based on periodic fires and historical rate of change, in the AOO, area, extent and quality of habitat, number of locations and subpopulations, and the number of mature individuals (Van Weenen & Garnett 2021).

The Committee considers that the subspecies' geographic distribution (EOO and AOO) is restricted, the geographic distribution is severely fragmented, and continuing decline is observed and inferred from historical rate of decline.

Therefore, the subspecies has met the relevant elements of Criterion 2 to make it eligible for listing as Endangered.

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 generation (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:			
(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			

Criterion 3 evidence

Eligible under Criterion 3 C2a(i) for listing as Endangered

The estimated total number of mature individuals of this subspecies is low at 750. There is an observed and inferred continuing decline of population and the geographic distribution is precarious for the survival of the species because number of mature individuals in each subpopulation is <250 (Table 3; Van Weenen & Garnett 2021).

Therefore, the subspecies has 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
D. Number of mature individuals	< 50	< 250	< 1,000
D2. ¹ Only applies to the Vulnerable category Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time			D2. Typically: area of occupancy < 20 km ² or number of locations ≤ 5

¹ The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments may include information relevant to D2. This information will not be considered by the Committee in making its recommendation of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the [common assessment method](#).

Criterion 4 evidence

Eligible under Criterion 4 D for listing as Vulnerable

The most recent population size estimated is from 2002, where the number of mature individuals was thought to be less than 1,000 (Pickett 2002). Another survey was conducted in 2009, primarily focussing on important populations and burnt areas from bushfires in 2001 or 2005 (Pickett 2009). However, no attempt of population size reassessment has been conducted since 2002.

The Committee considers that the total number of mature individuals is less than 1,000, which is very low. Therefore, the subspecies has met the relevant elements of Criterion 4 to make it eligible for listing as **Vulnerable**.

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

Criterion 5 evidence

Insufficient data to determine eligibility

Population viability analysis has not been undertaken. Therefore, there is insufficient information to determine the eligibility of the subspecies for listing in any category under this criterion.

Adequacy of survey

Although there is sufficient evidence to support the assessment, there has been no new surveys or monitoring for over a decade. Updated information would benefit any conservation planning for the Eyre Peninsula southern emu-wren.

Public consultation

Notice of the proposed amendment and a consultation document is made available for public comment for a minimum of 30 business days. Any comments received relevant to the survival of the species/subspecies are considered by the Committee as part of the assessment process.

Listing and Recovery Plan Recommendations

A decision about whether there should be a Recovery Plan for this species has not yet been made. The purpose of this consultation document is to elicit additional information to help inform the decision.

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Version history table

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Conservation Advice	Approved Conservation Advice for <i>Stipiturus malachurus parimeda</i> (southern Emu-wren - Eyre Peninsula)	17/12/2013