



# Consultation document for *Stipiturus malachurus halmaturinus* (Kangaroo Island Southern Emu-wren)

In effect under the *Environment Protection and Biodiversity Conservation Act 1999* from 14 December 2021.

This document combines the approved conservation advice and listing assessment for the species. It provides a foundation for conservation action and further planning.



Kangaroo Island Southern Emu-wren © Copyright, Kristian Bell (from Shutterstock)

## Conservation status

*Stipiturus malachurus halmaturinus* (Kangaroo Island Southern Emu-wren) is listed in the Endangered category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) effective from 14 December 2021.

*Stipiturus malachurus halmaturinus* was assessed by the Threatened Species Scientific Committee to be eligible for listing as Endangered under Criterion 1. The Committee's assessment is at Attachment A. The Committee's assessment of the subspecies' eligibility against each of the listing criteria is:

- Criterion 1: A2c: Endangered
- Criterion 2: B1ab(ii, iii) + 2ab(ii, iii): Vulnerable
- Criterion 3: Not eligible

- Criterion 4: Not eligible
- Criterion 5: Not eligible

The main factor made the subspecies eligible for listing in the Endangered category is the severe (>50%) reduction in population size in the last 10 years (Paton et al. 2021). This major reduction in population was caused by the largest recorded wildfire on Kangaroo Island that burned for six weeks from late December 2019 to early February 2020 (Government of South Australia 2020a). The subspecies' extent of occurrence (EOO) is estimated to be stable (4,550 km<sup>2</sup>), however the area of occupancy (AOO) has contracted to 430 km<sup>2</sup>. There are estimated to be 5,000 mature individuals in the wild (low reliability) with a declined trend (high reliability), however the decline is probably not continuing (Paton et al. 2021).

An analysis by a team from the National Environmental Science Program (NESP) Threatened Species Recovery Hub showed that a large proportion of the range of Kangaroo Island Southern Emu-wren was affected by these fires: 57% was burnt in high to very high severity fire, and a further 11% was burnt in low to moderate severity fire (Legge et al. 2021). A structured expert elicitation process was used to estimate the proportional population change for this species from pre-fire levels to immediately after the fire and then out to 10 years after the fire, when exposed to fires of varying severity. These results, combined with the spatial analyses of fire overlap, suggested that one year after the fire, the species experienced an overall decline of 56% from pre-fire levels, but that the decline could be as large as 68% (bound of 80% confidence limits) (Legge et al. 2021). After 10 years, the estimate for the overall population decline relative to the pre-fire population was predicted to be 30%, but potentially as much as 61% (bound of 80% confidence limit) (Legge et al. 2021). For comparison, experts also estimated the population change over time in the absence of fire; by 10 years, the overall population of Kangaroo Island Southern Emu-wren after the fire was estimated to be 5% lower than it would have been, had the 2019/2020 fire not occurred (Legge et al. 2021).

The subspecies is also eligible to be listed in the Vulnerable category based on the limited EOO and AOO, occurring at 10 locations (range 5 to >10; Table 4), and the continuing decline of AOO and area, extent, and quality of habitat due to future wildfires.

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

## Species information

### Taxonomy

Conventionally accepted as *Stipiturus malachurus halmaturinus* (Parsons 1920).

The subspecies is one of eight recognised. Subspecies from the Eyre Peninsula (*S. m. parimeda*), Mount Lofty Ranges and Fleurieu Peninsula (*S. m. intermedius*) are Endangered. The subspecies on Dirk Hartog Island (*S. m. hartogi*) is Vulnerable and the remaining subspecies (*S. m. malachurus*, *S. m. littleri*, *S. m. polionotum*, *S. m. westernensis*), either have not been assessed or are considered Least Concern (Paton et al. 2021).

## **Description**

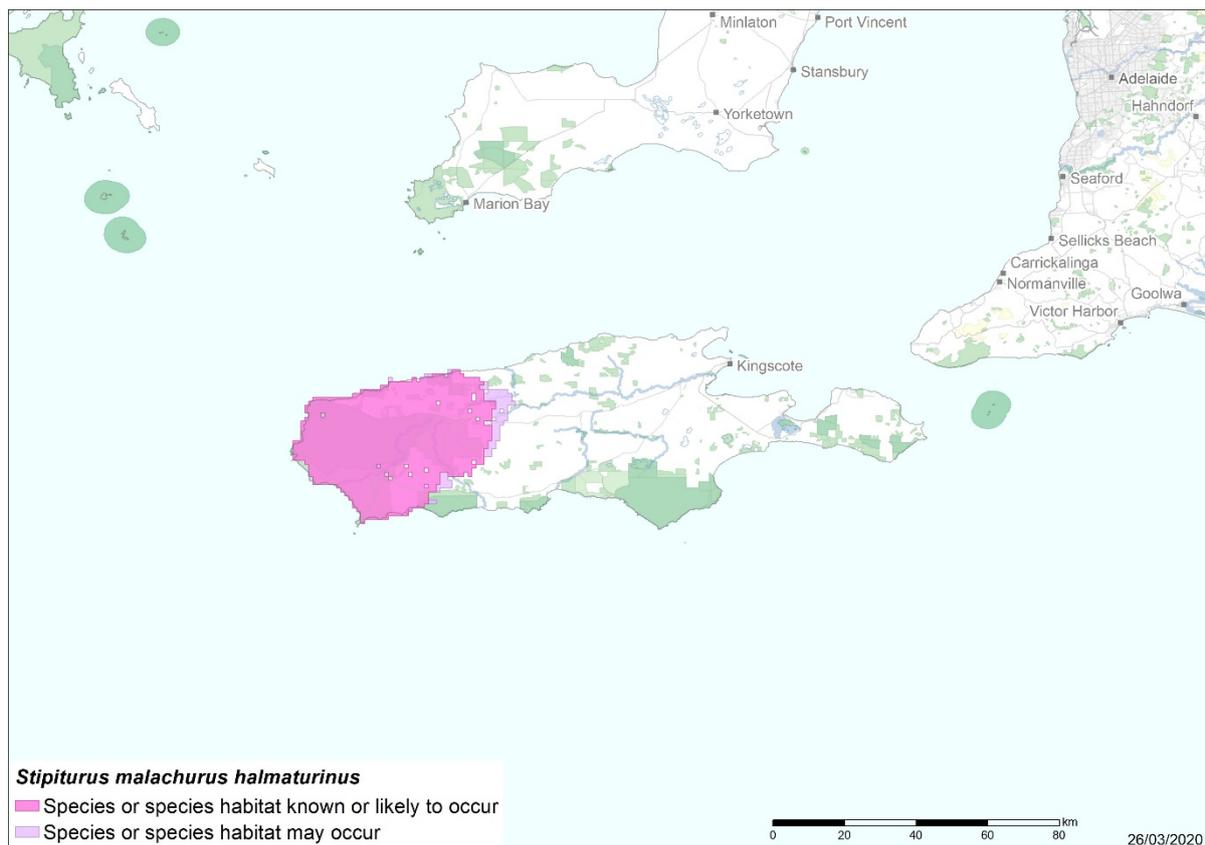
The Kangaroo Island Southern Emu-wren is one of Australia's smallest birds, yet is the largest of the Emu-wrens, with a wingspan of 9 to 19 cm and a weight of 5 to 9 g (Higgins et al. 2001). Body length is around 6 cm and the tail length around 10 cm, with a total length of around 16 cm. Adult birds are olive grey to olive brown streaked black above, while underparts are tawny brown. Male birds have a distinctive blue chin and throat, which is absent in females (Higgins et al. 2001). The Emu-wren's tails are filamentous and comprised of six emu-like feathers. Plumage varies with habitat and in cooler, wetter areas, individuals are darker, with thicker streaks. Eggs are oval shaped and white or cream coloured, moderately speckled with fine reddish-brown spots and flecks (Higgins et al. 2001).

## **Distribution**

The Kangaroo Island Southern Emu-wren is endemic to Kangaroo Island, South Australia. Recent modelling suggests that the western side of the island is key habitat for the subspecies (Map 1). Kangaroo Island was affected heavily during the 2019/2020 bushfires where around half of the island, mostly the western side, was burnt (Todd & Maurer 2020). The EOO is based on all records since 1990. The estimated AOO is the area of habitat thought likely to be supporting birds immediately after the 2019/2020 fire.

Surveys conducted immediately after the 2019/2020 bushfires observed 108 individuals, from 37 out of 145 unburnt fragments within the burnt area, and 4 out of 35 plots outside it (Boulton et al. 2020). Subsequently, from May 2020 to April 2021, 104 transects were established on western Kangaroo Island and repeat surveyed up to 6 times at approximately 6-8 week intervals. This resulted in a total of 238 transect-surveys being undertaken in unburnt patches and 336 in burnt areas. Southern Emu-wrens were recorded at 34% and zero of these respectively (Boulton & Gates 2021).

**Map 1 Modelled distribution of the Kangaroo Island Southern Emu-wren**



[Species of National Environmental Significance](#) database.

### **Cultural and community significance**

The lands and waters of and around Kangaroo Island are of high cultural and spiritual significance to a number of Aboriginal Nations, particularly the Ramindjeri, Ngarrindjeri, Kaurna and Narungga, and all have cultural stories associated with the Island (Paton et al. 2021). The cultural and community significance of the subspecies is not known. Further research into the subject area may benefit the conservation of the subspecies by providing insights about traditional culture and land management.

### **Relevant biology and ecology**

Southern Emu-wrens typically occupy low, dense, intact heath (Higgins et al. 2001). On Kangaroo Island specifically, the subspecies inhabits dry hills supporting low open Mallee with a sclerophyllous understorey of paperbark, banksia, casuarina and grasstrees, sometimes in eucalypt forest in river valleys and on alluvial plains (Higgins et al. 2001; Baxter 2015). They particularly favour the cliff-top heaths but are also widespread on the ironstone plateau of Flinders Chase (Higgins et al. 2001; Baxter 2015).

The subspecies is almost entirely insectivorous, rarely consuming seeds or vegetable material (Higgins et al. 2001). Birds have been observed foraging on or near the ground, in and below dense vegetation including low shrubs and grasses, among litter and low vegetation on the ground and in the foliage of shrubs and grasses (Higgins et al. 2001).

Kangaroo Island Southern Emu-wrens breed between September to January and build domed nests made from grass, sedge or rushes in well concealed locations in dense shrubs, on or near

the ground (Higgins et al. 2001; Baxter 2015). Nests are often lined with fine roots, fur, seeds and feathers (Higgins et al. 2001; Baxter 2015). Females typically lay two to four eggs per clutch (Higgins et al. 2001).

### **Habitat critical to the survival of the Kangaroo Island Southern Emu-wren**

Habitat critical to the survival or important habitats of a species or ecological community refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal;
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators);
- to maintain genetic diversity and long-term evolutionary development; or
- for the reintroduction of populations or recovery of the species or ecological community.

Habitat critical to the survival of the Kangaroo Island Southern Emu-wren, is likely linked to its breeding and feeding biology. The Kangaroo Island Southern Emu-wren is a sedentary, dispersal-limited subspecies that occupies a range of habitats on Kangaroo Island that can be considered critical for its survival. The subspecies is common where there is intact heath (Paton et al. 2021). Habitat critical to the survival includes all known Kangaroo Island Southern Emu-wren sites, specific habitat that may be potential habitat, and the surrounding matrix of these areas which provide corridors for dispersal between suitable habitat patches. Areas that are not currently occupied or used by the subspecies because they have been burnt (either in the 2019/2020, or in future fires), but should become suitable again in the future, should also be considered habitat critical to survival.

Habitat critical to survival should not be cleared and the net amount of habitat should be maintained and/or increased. Actions that have indirect impacts on habitat critical to the survival should also be minimised. Actions that compromise adult and juvenile survival, such as the introduction of new diseases, weeds, or predators, should also be avoided. Actions that remove habitat critical to survival would interfere with the recovery of the Kangaroo Island Southern Emu-wren and reduce the area of occupancy of the species. If removal of habitat critical to survival cannot be avoided or mitigated, then as a last resort, an offset should be provided. Actions should not be assessed in isolation and consideration must be given to existing and future activities that may impact the species to ensure conservation outcomes on a landscape scale are achieved.

Additionally, the whole of Kangaroo Island has been identified as a Key Biodiversity Area (KBA) (KBA; BirdLife International 2020), guided by the KBA Standard (IUCN 2016). Although this subspecies has not been identified as a KBA trigger species (KBAs do not recognise subspecies), conservation actions implemented would likely benefit already threatened species and other species with similar ecological needs which were also impacted by the 2019/2020 bushfires.

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

## Threats

The main threat faced by the Kangaroo Island Southern Emu-wren is wildfire as all individuals of the subspecies and all habitat critical to the survival are potentially threatened. The known range of the subspecies occurs in a fire prone area, that has been heavily impacted by wildfires in the past. While fire is integral to the ecology of Kangaroo Island, the 2019/2020 bushfires were the most extreme in recorded history and were unprecedented in their scale, speed and intensity (Government of South Australia 2020b). Extreme fire weather (Di Virgilio et al. 2019; Dowdy et al. 2019) driven by longer and more severe droughts (Evans et al. 2017) and more frequent heatwaves (Herold et al. 2018) is likely to increase in frequency and intensity in coming decades and poses the greatest risk to the subspecies (Paton et al. 2021).

Predation by feral cats (*Felis catus*) is another threat to the subspecies (Woinarski et al. 2017) due to their ground dwelling nature. Fires may further exacerbate the threat posed by cats (McGregor et al. 2015, 2016). Other threats faced by the subspecies include inappropriate fire management (BirdLife Australia 2021, pers comm 02 July), habitat degradation caused by pest species (Cunningham 2016; Government of South Australia 2020b), invasive weeds and *Phytophthora cinnamomi* induced dieback (Burgess et al. 2016). Pest species such as feral Pigs (*Sus scrofa*) may also increase transmission of diseases and the spread of *P. cinnamomi*. The flammable nature of some weeds, including non-endemic species such as Tasmanian Blue Gum (*Eucalyptus globulus*), may also increase fire risk and severity (Government of South Australia 2021).

**Table 1 Threats impacting Kangaroo Island Southern Emu-wren**

Threat	Status and severity <sup>a</sup>	Evidence
Fire		
Increase in frequent, large extent, high severity wildfires	<ul style="list-style-type: none"> <li>• Status: historical, current &amp; future</li> <li>• Confidence: known</li> <li>• Consequence: severe</li> <li>• Trend: increasing</li> <li>• Extent: across the entire range</li> </ul>	While fire is vital to the ecology of Kangaroo Island, the 2019/2020 bushfires were the most extreme in recorded history, burning approximately half of the island (DEW 2020; Todd & Maurer 2020). The fire was also unprecedented in its scale, speed and intensity (Government of South Australia 2020a). Legge et al. (2021) estimated over 57% of the subspecies distribution was burnt in high severity fire, with an additional 11% burnt in low-moderate severity fire. The risk of frequent, large extent, high severity wildfires is projected to increase on Kangaroo Island (Marshall et al. 2021).
Inappropriate fire management	<ul style="list-style-type: none"> <li>• Status: historical, current &amp; future</li> <li>• Confidence: known</li> <li>• Consequence: severe</li> <li>• Trend: static</li> <li>• Extent: across the entire range</li> </ul>	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. Following the 2019/2020 bushfire season there is pressure to increase fire management activities on Kangaroo Island (Birdlife Australia 2021, pers comm 02 July); some of these may have negative impacts on the Kangaroo Island Southern Emu-wren. Proposed changes include increased fire prevention works such as prescribed burns, mechanical vegetation removal and increased asset protection zones and buffer

Threat	Status and severity <sup>a</sup>	Evidence
		<p>zones (Birdlife Australia 2021, pers comm 02 July). The implementation of fire management regimes without consideration of the impacts on wildlife and threatened species could result in significant habitat loss, fragmentation, and degradation, and a declined rate of recovery for the Kangaroo Island Southern Emu-wren. Excluding fire from the majority of remaining suitable habitat should be a priority in the next 10 years.</p>
Climate change		
<p>Increased likelihood of extreme events (i.e., heatwave, and drought)</p>	<ul style="list-style-type: none"> <li>• Status: historical, current &amp; future</li> <li>• Confidence: known</li> <li>• Consequence: severe</li> <li>• Trend: increasing</li> <li>• Extent: across the entire range</li> </ul>	<p>Average temperatures in Australia have increased by around 1.4°C in the past century (BOM &amp; 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). As more frequent and extreme heatwaves are projected across Australia (BOM &amp; 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 &amp; CSIRO 2020). Annual rainfall on Kangaroo Island is projected to decline by 7.5 to 8.9% by 2050, and 7.9 to 12.5% by 2070. Maximum temperature is also projected to increase by 1.1 to 1.3°C and 1.2 to 1.9°C by 2050 and 2070, respectively (Resilient Hills and Coasts 2016).</p> <p>The cumulative effect of the climate anomalies has led to, and will continue to, increase the likelihood of extreme events such as droughts and heatwaves (BOM &amp; CSIRO 2020). This change in climate may have detrimental impact on the subspecies and their habitat. Climate anomalies will also increase the risk of wildfire (see <i>Increase in frequent, large extent, high intensity wildfires</i>).</p>
Habitat loss, degradation and modifications		
<p>Invasive weeds</p>	<ul style="list-style-type: none"> <li>• Status: current &amp; future</li> <li>• Confidence: known</li> <li>• Consequence: low</li> <li>• Trend: static</li> <li>• Extent: across part of its range</li> </ul>	<p>Invasive weeds are a minor threat as they can change the availability of suitable habitat and may reduce the quality of feeding habitat (French &amp; Zubovic 1997).</p> <p>Fast-growing Tasmanian Blue Gum (<i>Eucalyptus globulus</i>) is an emerging threat on Kangaroo Island. Seedlings, spread from nearby plantations, that have emerged after the 2019/20 bushfires could threaten native vegetation and fauna species by changing the floristic structure of habitat (Government of South Australia 2021). Fire-competition interactions may exacerbate these effects by accelerating weed invasion.</p> <p>Eight Weeds of National Significance and 27 Declared Weeds of South Australia are found on Kangaroo Island, including several fire-adapted weeds (Invasive Plants and Animals Committee 2016; Kangaroo Island</p>

Threat	Status and severity <sup>a</sup>	Evidence
		Landscape Board 2020; KI NRM Board 2020). Bridal Creeper ( <i>Asparagus asparagoides</i> ), Bridal Veil ( <i>Asparagus declinatus</i> ), Perennial Veldt Grass ( <i>Ehrharta calycina</i> ) and Phalaris ( <i>Phalaris aquatica</i> ) have been identified as weed species posing the greatest immediate threat to native flora on Kangaroo Island (Taylor 2003). With the ability to invade coastal vegetation, heath land, woodland, mallee shrubland, grassland, sclerophyll forest, riparian vegetation, rocky outcrop vegetation and roadside vegetation, these weed species have the potential to directly impact on the growth, recruitment and survival of flora (CRC Weed Management 2003; Taylor 2003; Kangaroo Island Natural Resources Centre 2019). They may also cause secondary impacts which include the alteration of hydrological cycles, fire regimes and micro-climate conditions, reducing the quality of habitat for birds (CRC Weed Management 2003; Taylor 2003; Kangaroo Island Natural Resources Centre 2019). Seeds are often spread by birds.
<i>Phytophthora cinnamomi</i> induced diebacks	<ul style="list-style-type: none"> <li>• Status: current &amp; future</li> <li>• Confidence: suspected</li> <li>• Consequence: low</li> <li>• Trend: unknown</li> <li>• Extent: across part of its range</li> </ul>	Due to having ideal climatic conditions (i.e., warm and wet winters, and dry summers), Kangaroo Island is particularly vulnerable to <i>P. cinnamomi</i> (Burgess et al. 2016). <i>P. cinnamomi</i> affects a wide range of native plants, altering their structural and floristic characteristics (Commonwealth of Australia 2018a; Hardham & Blackman 2018). This is potentially threatening because of its capacity to cause widespread dieback and consequently reduce habitat suitability for Kangaroo Island Southern Emu-wren. Fire-disease interactions likely exacerbate these effects.
Vegetation clearing	<ul style="list-style-type: none"> <li>• Status: historical</li> <li>• Confidence: known</li> <li>• Consequence: moderate</li> <li>• Trend: decreasing</li> <li>• Extent: across the entire range</li> </ul>	Historical land clearance for agriculture is the main cause of habitat loss on Kangaroo Island. Following the devastating effects of the 2019/2020 bushfires around the island, there is pressure to increase fire management activities which may include the removal of plant biomass (see <i>Inappropriate fire management</i> ). Further removal of habitat (e.g., roadside vegetation) without consideration of the impacts on threatened species could result in significant habitat loss, fragmentation, and degradation, causing further decline of Kangaroo Island birds. Fire-fragmentation interactions likely exacerbate these effects.
Invasive species (including threats from grazing, trampling, predation)		
Habitat degradation caused by pigs	<ul style="list-style-type: none"> <li>• Status: historical, current &amp; future</li> <li>• Confidence: known</li> <li>• Consequence: low</li> <li>• Trend: static</li> <li>• Extent: across the entire range</li> </ul>	Pest animals poses a threat to native fauna and flora on Kangaroo Island as they cause habitat degradation and increases competition for resources. With feral goat and deer eradicated, the current main pest species is the feral pig ( <i>Sus scrofa</i> ).

Threat	Status and severity <sup>a</sup>	Evidence
		<p>Feral pigs can cause serious habitat degradation through grazing, trampling and digging. They also kill and eat native wildlife and plants, spread weeds and damage streams. Additionally, feral pigs may spread the plant pathogen <i>P. cinnamomi</i> which can cause severe dieback in native vegetation (Commonwealth of Australia 2017a, 2017b). The eradication of feral pigs from Kangaroo Island was previously thought to be not feasible (based on criteria in Bomford &amp; O'Brien 1995). However, the severity of the 2019/2020 bushfires has also significantly reduced the feral pig population on the island, therefore presenting an opportunity for the eradication of the pest species. Currently, the Kangaroo Island Pig Eradication Action Plan is active, and will be reviewed annually (Government of South Australia 2020b).</p>
<p>Predation by cats</p>	<ul style="list-style-type: none"> <li>• Status: historical, current &amp; future</li> <li>• Confidence: known</li> <li>• Consequence: moderate</li> <li>• Trend: static</li> <li>• Extent: across the entire range</li> </ul>	<p>The main species that pose a predation threat to Kangaroo Island Southern Emu-wren are feral cats (<i>Felis catus</i>) (Taggart et al. 2019). The Kangaroo Island Southern Emu-wren is susceptible to cats because it lives close to the ground, and especially so after fire, when it may be forced to spend more time away from thick cover.</p> <p>Kangaroo Island has a higher average density of cats than that on the mainland (Taggart et al. 2019; Hohnen et al. 2020), with a total of around 1,600 individuals on the island (Hohnen et al. 2020). The threat of cats is also amplified by bushfires as they take advantage of recently burnt areas (McGregor et al. 2016), as they prefer to hunt in open habitats (McGregor et al. 2015).</p> <p>Management actions are in place around Dudley Peninsula and the current goal is to eradicate feral cats from Kangaroo Island by 2030 (Kangaroo Island Landscape Board 2015, 2020b). However, an island wide cat eradication plan has not yet been developed and is not currently funded. Fire-predator interactions may exacerbate these effects.</p>

Status—identify the temporal nature of the threat;

Confidence—identify the extent to which we have confidence about the impact of the threat on the species;

Consequence—identify the severity of the threat;

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

Extent—identify its spatial content in terms of the range of the species.

Each threat has been described in Table 1 in terms of the extent that it is operating on the subspecies. The risk matrix (Table 3) 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; and the efficacy of current management regimes, assuming that management will continue to be applied

appropriately (Table 2). The risk matrix (Table 3) and ranking of threats has been developed in consultation with experts, community consultation and by using available literature.

**Table 2 Risk prioritisation**

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
<b>Almost certain</b>	Low risk	Moderate risk	Very high risk	Very high risk	Very high risk
<b>Likely</b>	Low risk	Moderate risk	High risk	Very high risk	Very high risk
<b>Possible</b>	Low risk	Moderate risk	High risk	Very high risk	Very high risk
<b>Unlikely</b>	Low risk	Low risk	Moderate risk	High risk	Very high risk
<b>Unknown</b>	Low risk	Low risk	Moderate risk	High risk	Very high risk

**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 – such events are known to have occurred on a worldwide basis but only a few times

Rare or Unknown – may occur only in exceptional circumstances; OR it is currently unknown how often the incident 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 stalls or reduces

Major – population decreases

Catastrophic – population extinction

**Table 3 Kangaroo Island Southern Emu-wren risk matrix**

Likelihood	Consequences				
	Not significant	Minor	Moderate	Major	Catastrophic
<b>Almost certain</b>					
<b>Likely</b>		<ul style="list-style-type: none"> <li><i>P. cinnamomi</i> induced diebacks</li> <li>Habitat degradation caused by pigs</li> <li>Vegetation clearing</li> </ul>	<ul style="list-style-type: none"> <li>Predation by cats</li> </ul>	<ul style="list-style-type: none"> <li>Increase in frequent, large extent, high severity wildfires</li> <li>Increased likelihood of extreme events</li> </ul>	
<b>Possible</b>	<ul style="list-style-type: none"> <li>Invasive weeds</li> </ul>			<ul style="list-style-type: none"> <li>Inappropriate fire management</li> </ul>	
<b>Unlikely</b>					
<b>Unknown</b>					

Priority actions have then been developed to manage the threat particularly where the risk was deemed to be 'very high' or 'high'. For those threats with an unknown or low risk outcome it may be more appropriate to identify further research or maintain a watching brief.

## Conservation and recovery actions

### Primary conservation outcome

- Recover the population of the Kangaroo Island Southern Emu-wren to the estimated size before the 2019/2020 bushfires.

### Conservation and management priorities

#### Increase in frequent, large extent, high intensity wildfires

- 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. 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 back burns, clearing and other disturbance until the burnt areas have recovered sufficiently to support the subspecies once again.
- Apply adaptive management to inform future fire management plans and actions.
- Consider impacts of predation on the subspecies and implement control programs if populations are likely to be significantly impacted by predation after fire.

#### Inappropriate fire management

- Develop a landscape-scale fire management strategy with local authorities which considers the ecological needs of the subspecies.
- Minimise or avoid burning unburnt areas within or adjacent to recently burnt ground that may provide refuge, from planned and back burns, clearing and other disturbance until the burnt areas have recovered sufficiently to support the subspecies once again.

#### Predation by cats

- Continue to implement Feral Cat Threat Abatement Plan (Commonwealth of Australia 2015b).

#### Stakeholder engagement/community engagement

- Coordinate conservation efforts with other Kangaroo Island species affected by the 2019/2020 bushfires. Consider the possibility for a regional plan which includes all fire affected species on Kangaroo Island.
- Liaise with landholders to encourage their involvement in bird surveys and monitoring and related conservation activities.

- Continue to raise awareness with the public on the impact of weeds and *P. cinnamomi* have on native vegetation and ecosystems, and how they can help manage the spread of these (e.g., promote the Weed Control App produced by Biosecurity SA, and the Bushwalking guidelines to prevent *P. cinnamomi* (Natural Resources Kangaroo Island 2017)).
- Encourage the community to be involved with research and citizen science (e.g., submit sighting of birds and report signs of *P. cinnamomi* infection).

### **Survey and monitoring priorities**

- Conduct island-wide surveys in suitable habitat to determine the distribution and abundance of the subspecies, with a particular focus on the fire affected areas, and the rate of recolonisation of habitat and recovery of birds within these areas.
- Coordinate surveys and monitoring programs with other bushfire affected species on the island.
- Monitor important parameters such as population size, breeding success, number of mature individuals and the effectiveness of management strategies.
- Monitor for any impacts of any extreme climatic events on the Kangaroo Island Southern Emu-wren.

### **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.
- 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.
- Accurately describe habitat critical to the survival for the subspecies.
- Determine genetic diversity and population structure of the Kangaroo Island Southern Emu-wren, especially smaller populations.
- Undertake further research to assess the impact of feral and introduced species (i.e., predation, disease and habitat alteration) and the effectiveness of the current control programs and incorporate new knowledge into management interventions.

### **Recovery plan decision**

The Conservation Advice is considered to provide sufficient guidance on the recovery of the species and a Recovery Plan is unlikely to lead to substantial additional conservation benefits at this time.

Consequently, the Threatened Species Scientific Committee has not recommended that a recovery plan be required.

## Links to relevant implementation documents

### Threat Abatement Plans (TAPs):

- [Threat abatement plan for predation by feral cats](#) (Commonwealth of Australia 2015b).
- [Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs \(\*Sus scrofa\*\)](#) (Commonwealth of Australia 2017b).
- [Threat abatement plan for disease in natural ecosystems caused by \*Phytophthora cinnamomi\*](#) (Commonwealth of Australia 2018b).

### Other relevant implementation documents:

- [Action Plan for the eradication of Feral Pigs from Kangaroo Island](#) (Government of South Australia 2020b).
- [Australian Weeds Strategy 2017-2027](#) (Invasive Plants and Animals Committee 2016).
- [Bushfire recovery where it matters most: Impacts and actions in Key Biodiversity Areas affected by the 2019/20 Bushfire Crisis](#) (BirdLife Australia 2020)
- [Feral cat eradication on Kangaroo Island 2015-2030 PROSPECTUS](#) (Kangaroo Island Landscape Board 2015).
- [Kangaroo Island Biosecurity Strategy 2017-2027](#) (Triggs 2017).
- [Kangaroo Island Feral Cat Eradication Program](#) (Kangaroo Island Landscape Board 2020).
- [Kangaroo Island Wildlife and Habitat Recovery Planning Workshop Summary Report DRAFT](#) (National Environmental Science Program 2020)

## Conservation Advice and Listing Assessment references

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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 9 September 2021.

## Attachment A: Listing Assessment for *Stipiturus malachurus halmaturinus*

### Reason for assessment

This assessment follows prioritisation of a nomination from the TSSC.

### 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 4 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria.

**Table 4 Key assessment parameters**

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Number of mature individuals	5,000	4,800	5,100	<p>Based on the following record/assumptions:</p> <ul style="list-style-type: none"><li>Densities recorded across their range (Higgins et al. 2001);</li><li>Area of vegetation types likely to have been occupied before the 2019/2020 bushfires;</li><li>An allowance for patchiness within the vegetation before the fire (10% suitable habitat occupied; DC Paton unpublished, cited in Paton et al. 2021); and</li><li>Maps of fire severity in 2019/2020 within the pre fire range; and initial assumptions about mortality at different fire severity classes.</li></ul> <p>Based on these assumptions, 60% of the population perished in the fire with a spread of estimates from 34% to 63% depending on the fire related mortality assumed under different scenarios (Paton et al. 2021). Legge et al. (2021) estimated that the subspecies has experienced an overall decline of 52% from pre-fire levels, but that the decline could be as large as 57 % (bound of 80% confidence limits). After 10 years, the estimate for the overall population decline relative to the</p>

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
				pre-fire population is predicted to be 30%, but potentially as much as 61% (bound of 80% confidence limit) (Legge et al. 2021).
<b>Trend</b>	Declined			Paton et al. (2021)
<b>Generation time (years)</b>	2.1	1.6	2.6	Bird et al. (2020)
<b>Extent of occurrence</b>	4,550 km <sup>2</sup>	4,550 km <sup>2</sup>	6,400 km <sup>2</sup>	The EOO is based on all records since 1990 (Paton et al. 2021).
<b>Trend</b>	Stable			Paton et al. (2021)
<b>Area of Occupancy</b>	430 km <sup>2</sup>	74 km <sup>2</sup>	930 km <sup>2</sup>	The estimated AOO is the area of habitat thought likely to have been supporting birds immediately after the 2019/2020 fire. The minimum is the number 2x2 km squares encompassing sites at which birds have been documented since 1990 that were unburnt. The maximum is the area of suitable habitat before the fires. The 2019/2020 fire burnt an estimated 78% of all 1x1 km squares from which birds have been recorded since 1990 (Legge et al. 2020) and 69% of suitable habitat
<b>Trend</b>	Contracting			Paton et al. (2021)
<b>Number of subpopulations</b>	1	1	1	Paton et al. (2021)
<b>Trend</b>	Stable			Paton et al. (2021)
<b>Basis of assessment of subpopulation number</b>	The entire population occurs on a single island.			
<b>No. locations</b>	10	5	>10	TSSC (2021, pers comm 15 Sept); Paton et al. (2021)
<b>Trend</b>	Not calculated			Paton et al. (2021)
<b>Basis of assessment of location number</b>	<p>Kangaroo Island Southern Emu-wren is estimated to occur between 5-10 locations (TSSC 2021, pers comm 15 Sept) but could be &gt;10 (Paton et al. 2021) locations, based on the most plausible serious threat – fire (IUCN Standards and Petitions Committee 2019). The number of locations was determined using the 2019/2020 fire extent on Kangaroo Island, which heavily impacted the western side of Kangaroo Island, though unburnt habitat fragments remained within the fire-affected area.</p> <p>Birds are mobile and are able move away from fire and persist in habitat refuge sites, recolonising burnt areas once they become suitable again. Therefore, given the nonuniform nature of fire severity, and the subspecies' ability to persist in refuge sites, it is unlikely that a single fire event would extirpate all individuals within one generation (2.1 years) across the entire island (Paton et al. 2021; TSSC 2021, pers comm 15 Sept). The geographic position of unburnt locations will vary between fires, but there are always likely to be 5-10 (TSSC 2021, pers comm 15 Sept) or &gt;10 locations (Paton et al. 2021) occurring at least within known sites at: Vivonne Bay Conservation Park, Cape du Couedic to Remarkable Rocks, and Flinders Chase National Park.</p>			
<b>Fragmentation</b>	Not severely fragmented.			

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
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><b>A1</b> 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><b>A2</b> 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><b>A3</b> 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><b>A4</b> 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>	Based on any of the following		<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>

### Criterion 1 evidence

#### Eligible under Criterion 1 A2c for listing as Endangered

Kangaroo Island Southern Emu-wrens are endemic to Kangaroo Island, occurring widely across the island (Boulton 2020). Kangaroo Island was heavily impacted during the 2019/2020 bushfires, where around half of the island was burnt (DEW 2020; Todd & Maurer 2020). Paton et al. (2021) estimated that 60% of the population perished in the fire with a spread of estimates from 34% to 63% depending on the fire related mortality assumed under different scenarios.

Legge et al. (2021) estimated that the subspecies has experienced an overall decline of 52% from pre-fire levels, but that the decline could be as large as 57% (bound of 80% confidence limits). After 10 years, the estimate for the overall population decline relative to the pre-fire population is predicted to be 30%, but potentially as much as 61% (bound of 80% confidence limit) (Legge et al. 2021). For comparison, experts also estimated the population change over time in the absence of fire; by 10 years, the overall population of Kangaroo Island Southern Emu-wren after the fire was estimated to be 25% lower than it would have been, had the 2019/2020 fire not occurred (Legge et al. 2021).

The average reporting rate (the proportion of lists on which a species occurs) across the island for the period before the fire was 4% (1977–1981, 1998–2018; BirdLife Australia 2020) and 2% in 465 lists collected from 375 sites in 2012–2014 (DC Paton unpublished, cited in Paton et al. 2021). Two months after the fire it was 26% in 110 unburnt fragments within the burnt area and 11% in 35 plots outside it (Boulton et al. 2020), but the survey was targeted towards habitats likely to be suitable for emu-wrens, which explains the much higher reporting rate. Surveys conducted since the 2019/2020 bushfires recorded a reporting rate of 4% in 336 burnt and 34% in 238 unburnt transects (Boulton & Gates 2021).

The Committee considers that the subspecies has undergone a severe reduction in numbers over ten years, which is equivalent to at least 56% and the cause has not ceased. Mortality from the 2019/2020 bushfires has ceased, however the frequency and extent of intense wildfire is predicted to increase. Therefore, the species has met the relevant elements of Criterion 1 to make it eligible for listing as **Endangered**.

**Criterion 2 Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy**

	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
<b>B1.</b> Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
<b>B2.</b> Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
<b>AND at least 2 of the following 3 conditions:</b>			
(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)+2ab(ii, iii) for listing as Vulnerable**

The EOO is estimated at 4,550 km<sup>2</sup> (range 4,550–6,400 km<sup>2</sup>) and the AOO estimated at 430 km<sup>2</sup> (range 74–930 km<sup>2</sup>) (Paton et al. 2021). The EOO for the subspecies is thought to be stable, however the AOO for the subspecies has contracted (Paton et al. 2021).

The subspecies does not appear to be severely fragmented however further investigation is needed to confirm this (S Legge 2021, pers comms 20 February). The subspecies is estimated to occur at 10 locations (range 5 to >10; Table 4). The subspecies is not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals.

The Committee considers that the subspecies' EOO and AOO is limited, occurring at 10 locations and the AOO and quality of habitat is experiencing continuing decline due to the ongoing threat of frequent, large extent, high intensity wildfires on Kangaroo Island. Therefore, the species has met the relevant elements of Criterion 2 to make it eligible for listing as **Vulnerable**.

**Criterion 3 Population size and decline**

	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	< 250	< 2,500	< 10,000
AND either (C1) or (C2) is true			
<b>C1.</b> 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)
<b>C2.</b> An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
(a) (ii) % of mature individuals in one subpopulation =	90 - 100%	95 - 100%	100%
(b) Extreme fluctuations in the number of mature individuals			

**Criterion 3 evidence**

**Not eligible**

The subspecies consists of a single population (Paton et al. 2021). The total population size is now generally accepted to be 5,000 mature individuals (range 4,800–5,100) (Paton et al. 2021). The population appears to have declined by over 50% due to the 2019/2020 fires on Kangaroo Island, but is unlikely to be experiencing ongoing, continuous decline. The subspecies' geographic distribution is not precarious for its survival and it is not subject to extreme fluctuations (Paton et al. 2021).

Although the number of mature individuals of the subspecies is limited, there is no continuing decline, therefore the subspecies does not meet the required elements to be listed as threatened under this criterion.

### 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. <sup>1</sup> 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 <sup>2</sup> or number of locations ≤ 5

<sup>1</sup> 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

#### Not eligible

The total population size of the subspecies is estimated to be 5,000 mature individuals (range 4,800–5,100) (Paton et al. 2021). The total number of mature individuals is not considered low. Therefore, the subspecies has not met this required element of this criterion.

### Criterion 5 Quantitative analysis

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

### 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**

The survey effort has been considered adequate and there is sufficient scientific evidence to support the assessment.

### **Public consultation**

Notice of the proposed amendment and a consultation document was made available for public comment for 34 business days between 14 May and 2 July 2021.

### **Listing and Recovery Plan Recommendations**

The Threatened Species Scientific Committee recommends:

- (i) that the list referred to in section 178 of the EPBC Act be amended by **including** *Stipiturus malachurus halmaturinus* in the list in the Endangered category.
- (ii) that there not be a recovery plan for this species.

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