

THREATENED SPECIES SCIENTIFIC COMMITTEE

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

The Minister's delegate approved this Conservation Advice on 16/12/2016.

Conservation Advice

Delma impar

striped legless lizard

Conservation Status

Delma impar (striped legless lizard) is listed as Vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from 16 July 2000. The species is eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Vulnerable under Schedule 1 of the preceding *Endangered Species Protection Act 1992* (Cwlth).

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 www.environment.gov.au/cgi-bin/sprat/public/sprat.pl.

The main factors that are the cause of the species being eligible for listing in the Vulnerable category are major loss and degradation of its natural temperate grassland habitat since European settlement which has likely caused an associated decline in population size.

Description

The striped legless lizard is a member of the family Pygopodidae, and as with other members of this family, it lacks forelimbs and has very reduced vestigial hind limbs. While it has considerable variation in colour and pattern, it has a pale grey-brown dorsal surface and cream ventral surface, with a series of dark brown or blackish dorso lateral and lateral stripes along the length of the body and tail. It is distinguishable from other *Delma* spp by scales in 13-16 rows at its mid-body, by one or two narrow, whitish dorso lateral stripes on its body and tail and by the fusion or partial fusion of the nasal and first supra-labial scale (Cogger, 2014).

Distribution

The striped legless lizard is patchily distributed throughout south-eastern New South Wales (NSW), the Australian Capital Territory (ACT), north-eastern, central and south-western Victoria (Vic), and south-eastern South Australia (SA). There are outlying records from Gilgandra and Muswellbrook in NSW.

Relevant Biology/Ecology

The striped legless lizard is a grassland specialist, found only in areas of native grassland and nearby grassy woodland and exotic pasture. The lizard's primary habitat is encompassed by four nationally threatened ecological communities each of which has detailed floristic and physical descriptions in their respective Listing Advice, Conservation Advice or Recovery Plan. These communities are:

- [Natural Temperate Grassland of the Victorian Volcanic Plain.](#)
- [Grassy Eucalypt Woodland of the Victorian Volcanic Plain.](#)
- [Natural Temperate Grassland of the South Eastern Highlands, and](#)
- [White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.](#)

The life history of the striped legless lizard is poorly known. Estimates of lifespan start at about 10 years but individuals may live significantly longer (ARAZPA, 1996). Age at first reproduction is thought to be 2 – 3 years for males and 3 – 4 years for females (ARAZPA, 1996). Each female lays two eggs, and females are capable of breeding every year. Eggs are laid in December / January and hatch in January / February. Females deposit two elongated soft-shelled eggs in a soil cavity or under a rock with communal clutches of up to 36 eggs and repeated use of communal nests recorded (Peterson & Rohr 2010). The lizard feeds primarily on spiders, crickets, grasshoppers, Lepidopteran larvae and cockroaches (Kutt et al., 1998; Nunan, 1995).

There have been a number of important research findings, conservation outcomes and actions commenced since publication of the previous recovery plan for the species in 1999. These, in conjunction with previously established knowledge of the species, have been used to develop the conservation objective and actions in this advice and include;

- The higher probability of encountering the striped legless lizard in grasslands when grassland structural complexity is high (Howland et al., 2015).
- The importance of managed grazing regimes, particularly the need to avoid high intensity grazing but ensuring enough grazing is maintained to promote the formation of complex grass structures (Howland et al., 2015; Howland et al., 2014).
- The identification of four distinct historically isolated lineages of striped legless lizard with high levels of genetic divergence and which have been recognised as Evolutionary Significant Management Units (Maldonado et al., 2012).
- Evidence suggesting that striped legless lizard do not disperse long distances as they are genetically differentiated at distances of less than 400 m (Maldonado et al., 2012).
- A number of areas set aside or announced to protect the species which include the Jerrabomberra East Grasslands, Kenny Grassland Reserve, extensions to Mulanggari and Gungaderra Grassland Reserves, the Western Grasslands Reserve in Victoria and several private land agreements on the Monaro Plains of NSW near Nimmitabel. These new areas substantially increase the area of habitat under conservation management across the species range.
- High levels of uncertainty regarding the effectiveness of salvage and translocation for the striped legless lizard in the Melbourne Urban Growth Area as well as technology and knowledge gaps in the understanding of the species population dynamics that present additional limitations (DELWP 2015).
- Recommendations for salvage and translocation of striped legless lizard to only be used for trial purposes in an appropriate experimental framework (O’Shea 2013; DELWP2015).
- Concern around the habitat quality and condition of sites that are chosen as offsets for the species (DELWP 2015).
- Collaborative, well designed research between the ACT Government and Bush Heritage Australia in trialling and monitoring the salvage and translocation of the striped legless lizard from the ACT to the Bush Heritage owned Scottsdale Reserve.
- The potential to restore grassland habitat for threatened reptiles in urban environments through the introduction of rocks, reduction of fire fuel load and weed management (McDougall et al., 2016).
- Recommendations for conservation efforts for the striped legless lizard to include smaller patches of floristically degraded habitat (Howland et al., 2015).

Important populations

All populations of the striped legless lizard are likely to be important for the species recovery. The basis for this is the major loss and degradation of its grassland habitat, the ongoing pressures in remaining habitat and the highly fragmented nature of known habitat and populations (see Table 1).

Genetic analysis shows that across the striped legless lizard's geographical range the species forms four distinct genetic lineages: the South Australia & Victorian Wimmera; south-western Victoria (including Melbourne); eastern Victoria and a lineage covering the ACT and Monaro Plains in NSW (Maldonado et al., 2012). The genetic relationships of recently discovered populations north of Gilgandra and near Muswellbrook, NSW are not yet known. Each known lineage has high levels of genetic divergence suggesting isolation over long evolutionary time-frames, and should be considered as a separate Evolutionarily Significant Unit (ESU) for management purposes (Maldonado et al., 2012). Important populations of the striped legless lizard occur at a much finer scale than these ESU's given the fragmented and disturbed nature of the species habitat. The ESU's in concert with finer scale important populations provide a framework for prioritising conservation actions and for fulfilling the species conservation objective (See Appendix A).

Important populations are known to occur on privately owned lands or in reserves (including rail, road and stock routes reserves) in the following areas:

1. Naracoorte, SA
2. North Melbourne, Vic
3. West Melbourne, Vic
4. East and West Volcanic Plains, Vic
5. North Ballarat, Vic
6. East Grampians, Vic
7. Northern alluvial plains, Vic
8. North eastern slopes, Benalla, Vic
9. Horsham, Vic
10. North eastern slopes, Alexandra, Vic
11. South-east Bendigo, Vic
12. Cooma-Monaro Plains, NSW
13. Gilmore, Batlow, Tumut, NSW
14. Yass and Young, NSW
15. Canberra region (Gungahlin, Majura Valley, Jerrabomberra Valley and Yarramundi Reach and Sutton), ACT / NSW
16. Goulburn, Windellama Road, NSW
17. Muswellbrook, Hunter Valley, NSW, and
18. Gilgandra, NSW

State and territory action plans / statements for the striped legless lizard may provide other areas with important populations or lists of important populations at a finer scale. It is likely that further important populations will be found into the future as surveys are carried out in previously unsurveyed or poorly surveyed areas.

The understanding of fine scale population structure is limited and difficult to assess given the fragmented and disturbed nature of the species habitat and the difficulty in detecting the species due to its cryptic nature. For these reasons it is considered that when one or more individuals are found on a site that they are a member/s of an important population. Habitat used by that important population may differ considerably in quality and value to the species on that site or across numerous sites or tenures and therefore determining the fate of a particular site should focus on whether that particular site contains habitat critical to the survival of the striped legless lizard and which may be a part of or a patch of habitat for a more widely occurring important population.

Habitat critical to the survival of the striped legless lizard

The protection, management, improvement in understanding and monitoring of habitat critical to the survival of the striped legless lizard are priority conservation actions in this Conservation Advice. Until such time that further insights are made into understanding habitat variation and importance across and within regions, habitat critical to the survival of the striped legless lizard is likely to include sites that possess more than one of the following characteristics:

- *Provides breeding habitat.*

The presence of two or more adult individuals or juveniles (lizards < 70 mm snout to vent length) is confirmed on site and a habitat assessment confirms that the site contains complex grass structures including areas of tussocks with high biomass, surface rocks or invertebrate burrows necessary as sites for oviposition and which provide protection for eggs from disturbance. This may include sites with exotic grasses.

- *Provides foraging habitat.*

The site is floristically diverse with little to no disturbance and is connected to other nearby grasslands or grassy woodlands providing for a diversity and abundance of foraging resources which is likely to sustain a healthy lizard population.

- *Provides refuge from disturbance events.*

The site is within the 'likely to occur' modelled distribution of the species (Appendix A) and contains surface rocks, arthropod burrows or suitable cracks in the soil where lizards can escape trampling by livestock or fire. Alternatively, it is a site without lizards recorded but has high biomass, surface rocks, arthropod burrows or suitable cracks in the soil and is in close proximity to a known population which is subject to disturbance and therefore provides for refuge during disturbance events and sites by which the lizards can recolonise from after the cessation of the disturbance.

- *Provides for long term protection from development.*

The site is currently covenanted for conservation management or has existing sympathetic management practices in place and or meets the threshold criteria of one of the four Endangered Ecological Communities (hence has a higher potential to be afforded protection under the EPBC Act).

- *Has connectivity value and contributes to the evolutionary potential of the species in the wild across its natural geographical range.*

The site is or forms part of a large area of habitat that is not in an urban area or zoning and contains and is connected to breeding habitat or to a site subject to conservation management such as a managed reserve. This can include sites where the lizard has not been recorded through surveys but the site must be free from adverse practices in the last 10 years such as ploughing, cropping, cultivation, fertiliser use or heavy grazing.

Where uncertainty may exist with regard to habitat critical to the species survival, for example small, fragmented, highly modified or exotic habitats in urban areas between 0.1 and 10 ha, the critical nature of the habitat on a site is likely to depend on one or more of the following characteristics:

- occurs at the edge of the species known and likely modelled distribution (see Appendix A),
- represents a newly discovered range extension (see Appendix A),
- has not been subject to adverse practices in the last 10 years such as ploughing, cropping, cultivation, fertiliser use or intense farming, or
- contains a high density of lizards found through surveys on the site.

Targeted field surveys will be an important step for determining the presence of habitat critical to the survival of the striped legless lizard on a particular site. Acceptable approaches can differ across the species range and state / territory action statements or plans may provide specific recommendations for certain parts of the species range. In some situations where it is clear that the habitat on a site is critical to the species survival i.e. has a previously recorded high density of lizards, is large in size and has complex grass structures and refuges, then targeted surveys may not be required. Actions under this Conservation Advice aim to improve methodologies and guidance for surveying for this species.

Threats

The striped legless lizard has undergone both historical climatic and recent anthropogenic distributional changes (Maldonado et al., 2012). It is estimated that more than 99 percent of its natural temperate grassland habitat has been destroyed or drastically altered since European settlement (Kirkpatrick et al., 1995). Ongoing loss, modification, degradation and fragmentation of striped legless lizard habitat are the major obstacle to its survival and conservation.

Table 1 – Threats impacting the striped legless lizard in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Loss, modification, degradation and fragmentation of habitat		
Urban development	current	Native temperate grassland in Victoria has been substantially reduced, modified and fragmented as a result of urban development and associated impacts (Williams et al., 2005; Clemann 2015). Large urban planning schemes are resulting in the loss of habitat and populations of striped legless lizard (DELWP 2015). Native temperate grassland, including habitat for the striped legless lizard, has been lost due to urban development in the ACT (ACT Government 2005).
High intensity grazing by livestock and kangaroos	current	High intensity grazing by livestock and native herbivores can degrade natural grassland and woodland habitat, cause mortality through trampling and displacement and increase predation risk to the striped legless lizard (Howland et al., 2015; Sato et al., 2016, Dorrrough & Ash 1999).
Ploughing and pasture improvement including use of superphosphate and sowing of introduced species	current	These are both historical and current practices in temperate grassland and woodlands of south east Australia which degrade striped legless lizard habitat (Whalley et al., 2005; Dorrrough & Ash 1999; Williams et al., 2015).
Rock collection or destruction	current	The species shelters beneath rocks at numerous sites in Victoria and near Cooma in NSW. Rock removal and rock crushing activities can substantially degrade these habitats (Schlesinger & Shine, 1994; Williams et al., 2015).

Invasive species		
Spread of exotic grasses	current	Exotic species such as African lovegrass (<i>Eragrostis curvula</i>) and serrated tussock (<i>Nassella trichotoma</i>) are outcompeting natural grasses and degrading habitat for reptiles in south east Australia by changing the structure, removing basking sites and increasing fire intensity (Williams et al., 2015).
Predation by cats and foxes	suspected	Cats (both ferals and domestics) are likely to prey upon the striped legless lizard (Smith & Robertson, 2003), as there is significant evidence of cat predation on reptiles throughout Australia (Doherty et al., 2015). This is particularly a threat in urban areas which adjoin high density lizard populations (e.g. in the ACT and Melbourne). Foxes also occur throughout the range of the striped legless lizard and may prey upon the species.
Fire		
Inappropriate burn timing of grasslands including urban and roadside reserves and travelling stock reserves	current	Fire has been recorded as causing mortality in the species (Coulson 1995; Walton 1995), but the extent to which populations are affected is unknown. Burning at an intensity of greater than once every three years could be detrimental to the striped legless lizard as it may reduce vegetation cover and complexity, thus reducing prey availability and potentially increasing the risk of predation. Lack of fire (or analogous biomass reduction) may also threaten populations through a reduction in inter-tussock space and senescence of tussock-forming species such as Kangaroo Grass (Morgan and Lunt 1999).

Conservation Objective

The conservation objective provides the goal and rationale for the priority actions identified in this Conservation Advice. The objective is to protect and manage the striped legless lizard's habitat to maintain the potential for its evolution in the wild across its natural geographical range.

This objective can be achieved through the protections provided under the *Environment Protection and Biodiversity Conservation Act 1999*; and through implementing the conservation actions outlined below.

Conservation Actions

Conservation and Management priorities

Loss, modification, degradation and fragmentation of habitat

- Protect and prevent impacts to habitat critical to the survival of the species in the planning, construction and post construction phases of developments. Important components of this action are:
 - ensuring that robust field surveys are undertaken, which account for the species' detectability, to identify the habitat areas that are critical to the survival of the species. Those assessing striped legless lizard presence or population demographics should consult with their relevant state government

- who each have survey guidelines relevant to their habitat types and conditions, and
- ensuring connectivity is maintained between and within populations through appropriate siting of infrastructure and revegetation and management of natural grassland, and
- promoting and educating stakeholders in the application of the assessment and approval process under the EPBC Act and their obligations under the Act to avoid significant impacts to the striped legless lizard.
- Negotiate and implement conservation agreements or reserves for striped legless lizard on privately owned land which do not allow high intensity grazing, cropping and pasture improvement activities and involve ongoing management.
- Improve the quality and condition of reserves which have been set aside for the species.
- If after an extensive and rigorous scientific assessment of translocation is found to be feasible and beneficial to the species and if suitable recipient sites can be identified, implement the translocation of animals to appropriate recipient locations.

Invasive species

- Identify, control and reduce the spread of invasive grasses including escaped pasture species.
- Control feral cats and foxes in areas where striped legless lizards occur within or adjacent to urban areas or other areas harbouring these species (i.e. waste facility depots, golf courses etc).

Fire

- Work with fire authorities and private landholders to plan and undertake any burns proposed in areas of habitat critical to the survival of the species in a way that will maintain or improve the habitat for the species.

Stakeholder Engagement

- Support and improve collaboration amongst stakeholders who are managing grassland reserves or are involved in surveying or monitoring populations on private land. Stakeholders include but are not limited to: private landholders, state and local governments, the Department of Defence, Friends of Grasslands, Cairnlea Conservation Reserves Committee of Management, Nature Glenelg Trust, Bush Heritage Australia and Zoos South Australia.
- Engage with local Indigenous communities to better understand pre European temperate grassland management practices relating to fire. This includes but is not limited to the Wurundjeri people of Victoria, Ngannawal and Ngambri people of the ACT and NSW.
- Educate public in areas adjacent to striped legless lizard habitat about the predation risk posed by domestic cats, and the principles of responsible cat ownership

Survey and Monitoring priorities

- Implement survey and monitoring programs in areas where the species is, or has been, known to occur.

- Ensure careful consideration is given to the type of survey appropriate to the subject site i.e. for detection purposes or to precisely assess population size, distribution, ecological requirements and the relative impacts of threatening processes.
- Monitor the response of populations to fire, using an appropriate measure (occupancy, population abundance, individual mortality, ranging behaviour, breeding success, etc) based on knowledge of the ecology of the species, and with a monitoring design that aims to improve understanding of the species' response to fire.

Information and Research priorities

The priority for the striped legless lizard is to develop and publish range-wide guidelines for its management in reserves and in habitat on privately managed lands. These guidelines should account for the different management regimes that may be necessary for different populations and should address grazing regimes by livestock and native herbivores, machinery use, mowing, weed control, fire, recreation and pest animals.

Research to date has allowed the identification of the broad distribution and habitat use of the species, and has provided some insights into the species biology. However, better information is required to improve the species likelihood of recovery. Further research is required into:

- how habitat management practices, specifically grazing, fire and weed control influence site occupancy and species persistence.
- the species demographics – abundance, life-span, reproductive age, size-class distribution, mortality and recruitment, etc.
- seasonal behaviour, movements, microhabitat use and dispersal ability.
- the genetic variation between populations to ensure complete representation in reserves of the range of genetic differentiation within the species.
- reliable and effective detection/tracking/monitoring techniques.
- understanding the differences and intensity of threats between populations, and how threats might potentially interact.
- the feasibility of salvage and translocation of the species to improve techniques to maximise translocation success and to identify the most effective translocation techniques.

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Appendix A - Modelled distribution map for the striped legless lizard showing the Evolutionary Significant Units (Maldonado et al., 2012) and locations which are known or are likely to support populations.

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