Threatened Species Assessment

Eulamprus tympanum marnieae
Corangamite Water Skink

Taxonomy

Eulamprus tympanum marnieae Hutchinson & Rawlinson, 1995

The Corangamite Water Skink is currently recognised as a subspecies of the widespread, cool temperate Southern Water Skink (*Eulamprus tympanum tympanum*) (Hutchinson and Rawlinson 1995). It is distinguished morphologically from *E. t. tympanum* by very small mid-body and paravertebral scales, the black dorsal markings arranged as short irregular transverse bars and the bold ventral patterns of black longitudinal strips on a yellow background. The initial conclusion following the discovery of *E. t. marnieae* was that it represented a new species. Subsequent collections of individuals intermediate in both colour pattern and scalation, however, suggested that intergradation with *E. t. tympanum* had occurred (Hutchinson and Rawlinson 1995). The notion of intergradation was further supported with the discovery of additional morphologically intermediate populations (Peterson 1999; Robertson and Lowe 1999). Recent molecular analysis also did not support the view of a new species. To the contrary, this work revealed that *E. t. marnieae* as currently recognised, is comprised of populations from two distinct genetic groups, each with separate evolutionary origins (Scott and Keogh 2003). These independent origins are aligned with a deep genetic separation identified within *E. t. tympanum* in south-western Victoria (Scott and Keogh 2003). As a consequence, a revision of the taxonomy of *E. t. marnieae* and *E. t. tympanum* within south-western Victoria is required.

Current conservation status

Listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1996).

Categorised as Critically endangered in the 2013 Advisory list of threatened vertebrate fauna in Victoria (DSE 2013).

Proposed conservation status

Endangered in Victoria

Criteria B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)

Species Information

Description and Life History

The Corangamite Water Skink is a medium-sized lizard of the family Scincidae. Adults grow to 100 mm snout-vent length, with a tail length up to 150 mm and up to 25 grams. The Corangamite Water Skink is a diurnally active, basking skink. However, unlike other water skinks, it is extremely shy. It occupies small defined home ranges (most <10m2) and is territorial (Malone and Peterson in prep). Home range size is influenced by proximity to a waterbody and increases as a function of the distance from the edge of the water-line, indicating that optimal microhabitats are situated close to water (Malone and Peterson in prep).

It is viviparous, producing one clutch per year of 2-7 live young (Peterson 2002). Juveniles generally occupy separate microhabitats and activity periods from that of adults (Peterson 2002). It is not known whether this is due to agonistic behaviour of adults towards juveniles or specific ecological requirements of juveniles, such as smaller prey items in the microhabitat they occupy. Offspring mortality appears high following birth, while sub-adult and

adult survivorship is relatively high (G. Peterson unpubl. data 2009). Subadult survivorship is, however, influenced by population density.

The diet is mainly invertebrates such as spiders, beetles and ants, as well as aquatic prey including mayfly and dragonfly nymphs (Knights 2003). It also consumes the fruit of the Tree Violet (*Melicytus dentata*), which may be an important component of the diet during some periods 4 (Peterson 1997). The lizard may also play an important role in the dispersal and germination of this plant. The seeds of the introduced African Boxthorn (*Lycium ferocissimum*) and other unidentified seeds have also been found in scats (Knights 2003).

Generation Length

The generation length of *Eulamprus tympanum marnieae* is estimated to be 6 to 9 years. Females first reproduce at two or three years of age, depending on the population (G. Peterson unpubl. data 2009). Once mature, most females breed every year. Estimated longevity in the field is nine years (G. Peterson unpubl. data 2009), although life expectancy may well be similar to that of *E. t. tympanum*, up to 15 years (Rohr 1997). The lizards keep breeding all their lives, and litter size and mass increase with female size (Peterson 2002). On this basis, the average age of successfully breeding females is likely to be at the higher end of their lifespans.

Distribution

The Corangamite Water Skink is endemic to the Victorian Volcanic Plain IBRA bioregion in south-western Victoria, where it occurs as several isolated populations between Colac and Lake Bolac, over a maximum distance of about 100 km. Its historical distribution is not known, however it is highly likely that it was within the existing range.

Habitat

Within the Victorian Volcanic Plain, the Corangamite Water Skink inhabits specific geological regions known as the Later Newer Basalts. Known colloquially as the 'stony rises', the Later Newer Basalts are geomorphic areas of extensive sheet basalt lava flows deposited over a period of 1.8 million years, from the late Tertiary to the Holocene (Joyce 1988). The rises are basalt ridges and boulder heaps often left by the collapse of lava tunnels (Skeats and James 1937; Ollier and Joyce 1964). Prior to European settlement, these Later Newer Basalts were broadly vegetated by Stony Knoll Shrubland, Stony Rises Woodland, Plains Grassland and Plains Grassy Woodland vegetation communities and their associated mosaics, on shallow stony loams and dark clay soils (Willis 1964; Ross 1999; NRE 2003).

Threats

Native grassland on the Victorian Volcanic Plain is one of the most threatened ecological communities in Australia, with less than 1% of its original extent remaining (Lunt et. al. 1998), and this community has been listed as Critically Endangered under the EPBC Act (DEWHA 2009). Similarly, the wetland habitat on which this species is dependent is highly threatened with "Wetland loss and degradation as a result of change in water regime, dredging, draining, filling and grazing" listed as a potentially threatening process under the Flora and Fauna Guarantee Act 1988 (Scientific Advisory Committee, 2003) and Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains listed as Critically Endangered under the EPBC Act (DSEWPC 2012).

The main threats for the species are mainly related to habitat loss and degradation. They include habitat loss and fragmentation; changed hydrology and/or water quality; wetland draining; climate change; changed grazing regimes; weed invasion; rock removal; cropping; use of agricultural chemicals; introduced predators (foxes and cats); and introduced herbivorous (rabbits, mice, sheep and cattle).

IUCN Criteria

Criterion A. Population size reduction.
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

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.

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*]

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.

based on any of the following:

(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

Evidence:

Eligible under Criterion A2 as Vulnerable

The population reduction over the past 18 to 27 years is estimated to be 10 to 30 %, based on (a), (b), (c) and (e) above.

This is ased on past monitoring data and knowledge about the changes on habitat quality.

Eligible under Criterion A3 as Vulnerable

The population reduction over the next 18 to 27 years is estimated to be 10 to 35 %, based on (a), (b), (c) and (e) above.

Future decline is variable based on the nature of the wetland used as habitat. Ephemeral wetlands are more likely to be rapidly affected by changes in rainfall, consequently, population living in those habitats are quickly affected. Permanent wetlands are more resilient to changes and the decline in population is more spread or there is no decline. This however is likely to change under climate change if permanent wetlands remain dry for longer periods of time (e.g. 3 - 5 years or more).

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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			

Evidence:

Eligible under Criterion B1 as Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 1,994 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

Considering the limited dispersal ability of the taxon, the barriers to dispersal, or lack of habitat separating them, the subpopulations can be considered severely fragmented.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above. Continuing decline in area, extent and quality of habitat has been observed and it is estimated to continue based on the identified threats in association with climate change. This is likely to affect numbers and range as well. Ephemeral wetlands are more likely to be rapidly affected by changes in rainfall, consequently, subpopulations living in those habitats are quickly affected. Permanent wetlands are more resilient to changes and the decline in population is more spread or there is no decline. This however is likely to change under climate change if permanent wetlands remain dry for longer periods of time (e.g. 3 - 5 years or more).

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 248 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, the taxon is estimated to be severely fragmented, and is inferred to have a continuing decline in (i), (ii), (iii), (iv) and (v) above.

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals				

Evidence:

Ineligible under Criterion C

It is inferred that there are 2,500 to 4,500 mature individuals, but this qualifier is too weak and other thresholds under this criterion have not been met.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	< 50	< 250	< 1,000
D2 Only applies to the VU 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: AoO < 20 km2 or number of locations ≤ 5

Evidence:

Ineligible under Criterion D

It is inferred that there are 2,500 to 4,500 mature individuals, but this qualifier is too weak to meet the criterion.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

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