

Threatened Species Assessment

Engaeus sternalis Warragul Burrowing Crayfish

Taxonomy

Engaeus sternalis (Clark, 1936)

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988*.

Categorised as Critically endangered in the 2009 Advisory list of threatened invertebrate fauna in Victoria (DSE 2009).

Proposed conservation status

Critically Endangered in Australia

Criteria A3c+4c

This taxon falls just over the threshold of placing it in the Critically Endangered Category as previously assessed in 2010 (EoO 117 km² compared to the threshold of 100 km²). It could be argued that the precautionary principle be applied and this taxon remain in the Critically Endangered category given the amount of development occurring for the Baw Baw Shire Urban Growth Zone encompassing a large proportion of this taxon's range. Whilst the distribution of this taxon has recently been increased, the massive development in Warragul destroying most of its habitat in a short period of time would suggest a Critically Endangered category.

Species Information

Description and Life History

The Warragul Burrowing Crayfish is a small burrowing crayfish, with adults having a carapace length of about 20 mm and a total length of about 70 mm (Horwitz 1990). The taxon is characterised by its very small eyes and fine downy hairs covering its carapace. It is usually a pale, cream colour but may also present in shades of blue and grey. It builds small chimneys, composed of small, spherical balls of soil with small entrances. Several adults and young have been found in the same burrow system. While the specific life-cycle of the Warragul Burrowing Crayfish is unknown, in most burrowing crayfish, breeding occurs over spring and summer (Doran 1999).

Generation Length

The generation length of the Warragul Burrowing Crayfish is inferred to be 3 to 5 years. Tasmanian species from the genus are known to have 3 to 5 years generation length.

Distribution

The taxon was originally described in 1886 but no precise locality data was given. The description of this "lectotype" corresponds with that of *E. sternalis* given by Clark (1936) for a specimen that was found in "Warragul". Up until 1995, this taxon was only known from one locality at Wattle Creek, a tributary of Labertouche Creek, just north of Old Telegraph Rd, Labertouche (Horwitz 1990, Morey and Hollis 1997). Surveys by Shaw (1996) extended the known range of this taxon to include sections of the Labertouche Creek within the Janet Clarke Reserve and a site further downstream near the junction with the Tarago River. Morey and Hollis (1997) collected three Warragul Burrowing Crayfish using pitfall traps in grazing land adjacent to Labertouche Creek, 50 m downstream from the 1983 site of Horwitz. However, extensive searches around Warragul and surrounding areas failed to locate the



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taxon outside the Labertouche Creek area (Horwitz 1990, Morey and Hollis, 1997, Shaw 1996 and Van Praagh and Hinkley 1999, Van Praagh 2010). This has led to the supposition that either the original "Warragul" locality referred to the Labertouche area or that the taxon had become extinct from the Warragul region. However, during fauna surveys in October 2010, Warragul Burrowing Crayfish were located along a drainage line in a cleared paddock at Warragul (Van Praagh 2010).

Surveys in the past possibly relied on the thought that this taxon did not build chimneys surrounding the entrances to their burrows making them extremely difficult to survey. The identification of distinctive chimneys belonging to this taxon (Van Praagh 2011) along with an increased survey effort has increased the known range of this taxon. Further surveys since this time have found the crayfish in pasture around wetlands in Drouin and Warragul. While the new locality records represent a range expansion from its previously thought range, the threatening processes operating within the Drouin and Warragul region, particularly in relation to urban expansion are much higher than those at Labertouche where a proportion of the taxon's habitat is afforded some protection within the Janet Clarke Flora and Fauna Reserve. There is a gap north-west of Drouin to Longwarry and Labertouche but it is unclear whether this reflects lack of survey effort rather than a true absence of the taxon.

In addition to the Labertouche creek system, the taxon has been recorded from creeks and drainage lines in the Hazel and Spring Creek catchments of Warragul and Gum Scrub Creek and King Parrot Creek in Drouin.

Habitat

The taxon's habitat at Labertouche is remnant Swampy Woodland where the taxon occurs within the clay creek banks. Remnant patches of indigenous vegetation, some of which is in a relatively natural condition, and scattered eucalypts (*Eucalyptus viminalis* and *E. ovata*) are present along these creeks (Morey 1999). This contrasts with the taxon's habitat in Warragul and Drouin where it is found in clay soils within open pasture along edges of creek banks, drainage lines and within floodplains. The crayfish can be found some distance from open waterways. It tends to be found in the less saturated areas of flood zones.

Threats

Burrowing crayfish are very dependent on soil moisture and local wetland systems for survival. It is thought removal of indigenous vegetation, cattle trampling of both the ground and creek banks and alteration of the water table may adversely affect this taxon (Morey 2004).

In Labertouche, most of the creek frontage at the known localities is unfenced and where cattle have had unrestricted access to creeks in the catchment, the understorey is virtually absent. Cattle has been grazed in the area for the past 100 years (B. Whiting pers. comm. to J. Morey undated). Cattle may have affected this taxon by compacting the ground and possibly collapsing burrows as well as causing streamside erosion, bank damage and loss of native vegetation. Gold-mining was apparently conducted along the creek and its tributaries earlier this century. Rock may still be mined within the catchment.

In Warragul and Drouin, the main threats include the development of land for housing and industry which is impacting on the hydrology of the taxon's habitat locally, as well as potentially at a larger catchment scale and some agricultural practices.

All the potential habitat is disturbed and is highly modified by agriculture and urban development. Approximately 2026ha of land will be impacted by the Baw Baw Shire Council's Urban Growth Zones in Warragul and Drouin, and much of the taxon's known habitat will be impacted by this current and future development.

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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%
<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 			

Evidence:

Eligible under Criterion A3 as Critically Endangered

The population reduction over the next 9 to 15 years is projected to be 60 to 80%, based on (c) above.

Much of the taxon's known habitat will be impacted by development related to Baw Baw Shire Council's Urban Growth Zones.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 9 to 15 year period, including both past and future (up to 100 years in the future), is suspected to be 40 to 80%, based on (c) above. The causes of reduction may not have ceased, be understood or be reversible.

Past decline has been a result of habitat loss and development impacts. Future decline may result from development in Baw Baw Shire Council's Urban Growth Zones.

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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 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			

Evidence:

Eligible under Criterion B as Endangered

The Extent of Occurrence (EoO) is estimated to be 117 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The Area of Occupancy (AoO) is estimated to be 64 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

Any two of (a), (b) or (c) above are also satisfied.

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				

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Evidence:

Ineligible under Criterion C

It is suspected that there are 500 to 10,000 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 km ² or number of locations < 5

Evidence:

Eligible under criterion D2 as Vulnerable

The taxon is estimated to be very restricted.

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

References

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