



Engaeus rostrogaleatus Strzelecki Burrowing Crayfish

Taxonomy

Engaeus rostrogaleatus Horwitz, 1990

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2000).

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

Proposed conservation status

Endangered in Australia

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

Species Information

Description and Life History

There is very little information regarding the biology of this taxon. Adults have an occipital carapace length of between 24-31 and total length up to 90 mm (Horwitz 1990, Van Praagh and Hinkley 1999). They are found in boggy seepages, springs and shallow creeks in the ferny gullies of the Eastern Strzelecki Ranges. Van Praagh and Hinkley (1999) made the following general observations on burrow/social structure. Burrows found in close proximity to, or within the sand bars of water. Burrow systems generally consisted of multiple openings and were usually found in groups, often in high densities. Burrows found between rocks and also under logs and fern roots. In general, only one individual was collected from each burrow system. However, on one occasion, two crayfish were collected from the same burrow system. One crayfish was collected at a depth of 40 cm while the second, larger crayfish was found below the main chamber. While crayfish may not be communal per se, a burrow can often be the product of several generations of crayfish activity (Horwitz et al. 1985). Nothing is known of reproductive biology, but it is likely to be similar to other taxa that have been found to breed in spring and summer (Suter 1977). Males enter burrows of females to mate and females carry clusters of eggs under the tail throughout summer. Young most likely hatch in February and may remain in maternal burrow system for some time. They feed on plant material such as roots, decomposing leaves, rotting logs and small invertebrates (Lake and Newcome 1975, Suter and Richardson 1977).

Generation Length

The generation length of the Strzelecki Burrowing Crayfish is inferred to be 2 to 4 years. Age at first breeding and generation time is unknown for this taxon, however Tasmanian species from the same genus are known to have 3 to 5 years generation length.

Distribution

This taxon is endemic to southern Victoria, Australia. It is restricted to the high altitude regions of the Eastern Strzelecki Range in South Gippsland, Victoria. All sites at which it was collected were over 400 m altitude (Horwitz 1990). This taxon is restricted to an area of habitat occurring along streams over approximately 30 x 30 km in two river basins, namely the Latrobe and South Gippsland drainages (Horwitz 1990, Van Praagh & Hinkle 1999). This includes the Tarra-Bulga National Park, Gunya Gunya Rainforest, Turtons Creek and Agnes Scenic Reserves and leased land for private forestry and some privately owned land.



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The taxon's distribution falls within the Strzelecki Ranges Bioregion (DSE Website 2005). This region is approximately 340,000 ha and was once entirely forested, predominantly by Wet Forest, Damp Forest and Cool Temperate Rainforest. This forest has been depleted with only around 65,000 ha (19%) of original forest remaining comprising approximately 50,000 ha of Wet Forest and 10,000 ha of Damp Forest. The remaining forest area may support potentially suitable crayfish habitat. Whilst there are no data available on the historical distribution of the taxon, it can be inferred that such significant habitat loss and decline in habitat quality in the last 150 years has also resulted in a comparable decline in population size (Van Praagh and Hinkley 1999).

Habitat

The Strzelecki Burrowing Crayfish is found in heavy clay or clay loam soils along creek banks, flood beds and boggy seepage areas under native vegetation, particularly ferny gullies. They are more likely to be found along small tributaries and away from larger waterways (Van Praagh and Hinkley 1999). Their main habitat is in Wet Forest often dominated by Mountain Ash with abundant tree ferns or sites entirely dominated by tree-ferns. They can also be found in Cool Temperate Rainforest with a canopy that includes Myrtle Beech trees (*Nothofagus cunninghamii*), such as at Tarra-Bulgua National Park.

The Strzelecki Burrowing Crayfish digs burrows that are connected to the water table (Type 2) and vary in complexity from shallow burrows, especially in seepage areas where they are often found under the roots of tree ferns to more complex, horizontal branching burrows that descend into water-filled or muddy chambers at around 30 cm. The crayfish are often be found residing in these muddy chambers. The taxon has been largely recorded from the very high, steep parts of the Eastern Strzelecki Ranges, in wetter gullies where there is no clear demarcation between the gully and the hillside (Horwitz 1990).

Threats

The region where the Strzelecki Burrowing Crayfish now occur was once covered in tall forest. These forests included Wet Forest dominated by Mountain Ash and Cool Temperate Rainforest dominated by Myrtle Beech. However, most of the native vegetation has been cleared for settlement, agriculture and large scale timber plantations. The original forests now cover only about 10% of the Strzelecki Bioregion (Zhang 2007).

Burrowing crayfish are very dependent on soil moisture and local wetland systems for survival. Changes in drainage, water table level, stream channelization, water pollution, soil compaction and removal of vegetation all contribute to loss and degradation of the habitat. Any activity which may lead to an alteration in the nature of the stream-side water table or drainage patterns could impact on the taxon's survival locally.

Crayfish that are restricted to high altitudes such as this taxon are generally thought to be more sensitive to changes in water quality due to their occurrence within cooler temperature regimes and clear water, compared to more opportunistic lowland crayfish. All freshwater crayfish appear to be highly susceptible to chemical pollutants such as herbicides and insecticides, and this taxon has not been found in areas cleared of native vegetation (P. Horwitz pers. comm. to B. Van Praagh undated).

On privately-owned land, removal of riparian vegetation combined with the impacts of stock grazing contribute to soil erosion, stream bank damage, and siltation of streams resulting in damage to the crayfish burrows. While the exact role of native vegetation in the survival of the taxon is not known, it is likely to be important (DSE 2003). A substantial amount of land within the range of the taxon's distribution is used for plantations. Plantation activities may pose direct and indirect threats to this taxon from construction, use and maintenance of logging roads, snig tracks, and removal of vegetation. This taxon's burrows can be located in headwater regions which are particularly susceptible to degradation by forestry practices. They are also often found in smaller seepages that may not have protection or afforded only a small buffer during forestry operations (DSE 2003). It should be noted that prescriptions in the *Code of Practice for Timber Production 2014* (Code) are applicable to plantation forestry on public land and private land. Relevant restrictions in local planning scheme are also applicable. Native forest harvesting on private land timber harvesting must also follow the relevant prescriptions in the Code.

Broad scale habitat changes and changes in weather, water and drainage patterns due to climate change could become a major issue in the future (N. Doran pers. comm. 2008). Given the taxon's occurrence at relatively high altitudes climate change will pose a significant threat to this taxon in the future (P. Horwitz pers. comm. 2009).

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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 style="text-align: center;"><i>based on any of the following:</i></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:

Ineligible under Criterion A

The past population reduction does not meet the threshold for eligibility under criterion A2, and the future population reduction does not meet the threshold for eligibility under criterion A3.

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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 B1 as Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 434 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

It is inferred to have two locations. The taxon occurs in two major areas in the eastern Strzelecki Ranges, the La Trobe and South Gippsland drainages. Each of these could be considered to be a single location, as the known threats have a non-reversible impact on the individuals of the taxon and have the potential over time to threaten the majority of individuals in each area.

It has a continuing decline in (i), (ii) and (v) above. The known threats are still operating in the Strzelecki Ranges, so there is likely to be a continued reduction in habitat extent and quality, and therefore the numbers of mature individuals.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 72 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it has two locations and a continuing decline in (i), (ii) and (v).

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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 15,000 to 150,000 mature individuals, which exceeds the thresholds for criterion C.

Criterion D. Very small or restricted populations		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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