

## *Engaeus sericatus* Hairy Burrowing Crayfish

### Taxonomy

*Engaeus sericatus* Clark, 1936

### Current conservation status

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

### Proposed conservation status

Vulnerable in Australia

Criteria B1ab(v)+2ab(v); D2

### Species Information

#### Description and Life History

The Hairy Burrowing Crayfish is a small terrestrial burrowing crayfish belonging to the southern hemisphere crayfish family Parastacidae. The species is separated from all other taxa in the genus by the combination of: sternum with pores on LP 3rd P, exopodite of third maxilliped multiarticulate and as long as or longer than ischium, ischium of third maxilliped with at least thin patch of plumose setae over ventrolateral surface, propodus without patch of plumose setae, ventral surface of merus asetose or only sparsely and thinly setose (Horwitz 1990). Maximum recorded length (occipital carapace length) is about 40 mm, all specimens are intersexed, reproductive females were carrying larvae in early December and remnant egg cases in late July (Horwitz 1990). Very little else is known about its life history.

Burrowing crayfish spend most of their time underground and freshly excavated soil at burrow entrances is the most obvious sign of their presence. Surface activity is suspected to be nocturnal (Richardson and Swain 1980) and is linked to dispersal and foraging (Shaw 1996) and breeding (Van Praagh and Hinkley 1999). Activity is commonly related to seasonal rainfall (Morey and Hollis 1997, Van Praagh and Hinkley 1999). The cryptic behaviour of burrowing crayfish means little is known about their life history and ecology, including the Hairy Burrowing Crayfish. Poor dispersal, slow maturation and confinement to discontinuous habitats are common to short-range endemics (Harvey 2002) such as the Hairy Burrowing Crayfish. The diet of burrowing crayfish is predominantly plant-based and consists of roots, decomposing leaves and occasionally, small invertebrates (Lake and Newcombe 1975, Suter and Richardson 1977, Grown and Richardson 1988). Males surface during late spring and early summer to search for mates and then enter the burrows of females (Van Praagh and Hinkley 1999). Females incubate egg clusters under the abdomen and the juveniles hatch in late summer (Van Praagh and Hinkley 1999).

#### Generation Length

The generation length of the Hairy Burrowing Crayfish is inferred to be 3 to 4 years. Life history and larval development studies on two Tasmanian species (*E. cisternarius* and *E. fossor*) suggest the life span may be 3 - 4 years for these species (Suter 1977). The Tasmanian species share some similarities with *E. sericatus* so the generation length has been suggested as the same.



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## Distribution

The 35 known species of the genus *Engaeus* are endemic to south-east Australia, with most occurring in Victoria and Tasmania (Horwitz 1994). The Hairy Burrowing Crayfish is found in western Victoria, in creeks south or south-east of the Otway Ranges, more abundantly between the Otway Ranges and Warrnambool, in some creeks south and south-west of Ballarat (north of Lake Corangamite) and between Port Fairy and Portland. The sites west and east of Warrnambool appear to be disjunct. The region around Lake Corangamite was searched extensively without finding evidence of freshwater crayfish, and the gap in the distribution around this lake therefore appears to be a real absence rather than an artefact of lack of collections (Horwitz 1990).

## Habitat

This taxon is found in borrow systems along the flood-plain of creeks and larger streams, and individuals can sometimes be collected from the water (Horwitz 1990). Almost its entire range is in areas impacted by agricultural development.

## Threats

The major threat to taxa of burrowing crayfish is the decline in quality and quantity of habitat, both underground and at the surface. This can be caused by a range of threats, many of which are predicted to be exacerbated by climate change. These include decline in quantity and quality of groundwater, or surface run-off from drought, water abstraction, or alteration to stream flows; decline or loss of vegetation due to removal or disturbance (e.g. urban or agricultural development, forest management operations, fire); soil disturbance (e.g. mechanical disturbance from agriculture, forest management operations or fire suppression activities, and erosion during floods); sedimentation/smothering from overland debris flow during high rainfall events following soil disturbance; impact of chemicals from agriculture, or during fire suppression activities; loss of areas of suitable soil profile in which to construct burrows; and loss of food resources due to soil disturbance or loss of vegetation leading to various ecological changes. Changes to river discharge patterns can reduce the preferred adult macrohabitats, and siltation from catchment erosion can smother the preferred spawning habitat (rocks).

Spatial analysis of likely habitat for the Hairy Burrowing Crayfish indicates that at least part occurs within the Comprehensive, Adequate and Representative (CAR) reserve system, including parks and reserves and special protection zones. The Victorian Code of Practice for Timber Production 2014 (the Code) applies to timber harvesting in native forests and plantations on public and private land. There are no species-specific protections for the taxon in the Code, however other more general prescriptions such as protection and buffering of waterways provide protection from timber harvesting.

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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"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>			

## Evidence:

### Ineligible under Criterion A

There is insufficient evidence to determine whether there has been a reduction in population (criterion A2). 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 <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
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 Vulnerable

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 17,510 km<sup>2</sup>, based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA), and on the available records from field work.

It is estimated to have one location. Climate change impacts and agricultural development will likely be causing the decline of this taxon in future years through impacts on habitat and population numbers.

#### Eligible under Criterion B2 as Vulnerable

The Area of Occupancy (AoO) across the taxon's range is estimated to be 540 km<sup>2</sup>, based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA and on field records. As above, it has 1 location and has a continuing decline in (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 as Data Deficient

There is insufficient evidence to determine the number of mature individuals.

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 <sup>2</sup> or number of locations ≤ 5

## Evidence:

### Eligible under Criterion D2 as Vulnerable

The taxon is estimated to be very restricted, with one location, and it is projected to be subject to threats which could drive it to become Critically Endangered or Extinct in a time frame of one or two generations in response to the identified threats, notably decline in quality and quantity of habitat, both underground and at the surface.

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

## References

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