Threatened Species Assessment

Engaeus urostrictus
Dandenong Burrowing Crayfish

Taxonomy

Engaeus urostrictus Riek, 1969

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2005).

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

Proposed conservation status

Critically Endangered in Australia

Criterion B1ab(ii,iii,v)

Species Information

Description and Life History

The Dandenong Burrowing Crayfish is a small terrestrial burrowing crayfish belonging to the southern hemisphere crayfish family Parastacidae. The species has a laterally flattened body and a small, bristly abdomen (Horwitz 1990). The Dandenong Burrowing Crayfish has a maximum recorded carapace length of approximately 20 mm, a short broad rostrum and an almost spineless triangular tail fan (Horwitz 1990).

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 Dandenong Burrowing Crayfish. Poor dispersal, slow maturation and confinement to discontinuous habitats are common to short-range endemics (Harvey 2002) such as the Dandenong 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, Growns and Richardson 1988). The diet of the Dandenong Burrowing Crayfish is not specifically known but is suspected to be similar. Breeding in most burrowing crayfish is likely to occur over spring and summer. 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). Berried (gravid) females of the Dandenong Burrowing Crayfish have been found in late November and early December with small, ovoid and undeveloped eggs (Horwitz et al. 1985, Horwitz 1990) and juveniles have been found in chambers of burrow systems in June and September (Horwitz et al. 1985). Males and females of the species have been found in approximately equal ratios with intersexed specimens occasionally found (Horwitz 1990).

The Dandenong Burrowing Crayfish builds extensive burrow systems with many lateral branches amongst buried, rotting plants and roots of ferns, shrubs and trees (Horwitz et al. 1985). The riparian burrow systems of the species have tunnels which descend to the water table, allowing the crayfish to follow the rise and fall of the water table (Horwitz et al. 1985). The species can form chimneys of excavated soil pellets up to 13 cm high.

Generation Length

The generation length of the Dandenong 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 1977b). The Tasmanian species share some similarities with *E. urostrictus* in occupying wet forest habitats (Horwitz, 1990) so the generation length has been suggested as the same.

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 Dandenong Burrowing Crayfish is restricted to the Dandenong Ranges east of Melbourne. This species has only been recorded from a few small sub-catchments around Mount Dandenong, Sherbrooke, Sassafras and Kallista areas. All known locations of the species are near the headwaters of small streams that flow through predominantly forest in the Dandenong Ranges National Park and the Sassafras Creek Nature Conservation Reserve (Lumsden et al. 2011, DSE 2013). The species is not likely to be found west of Mount Dandenong (Horwitz 1990).

Habitat

The Dandenong Burrowing Crayfish occurs in riparian zones characterised by sandy soil flats adjacent to small, slow flowing headwater streams with high organic content. The organic content in the stream and adjacent flats originates from leaf and bark fall (Horwitz et al. 1985). These streams are predominantly located within the Wet Forest Ecological Vegetation Class (EVC) which occurs on well-drained loamy soils in protected gullies and on southern aspects of hills and mountains in high rainfall areas. In the Dandenong Ranges, the Wet Forest EVC is comprised of tree ferns (*Dicksonia antarctica*) and Sassafras (*Atherosperma moschatum*) with a tall forest of Mountain Ash (*Eucalyptus regnans*) dominating nearby slopes and a moist, shaded, fern-rich ground layer. The species is known from altitudes of approximately 250 - 440 m (Horwitz 1990, DEPI 2013).

Threats

The major threat to this taxon 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 declines in quantity and quality of groundwater and surface run-off as a result of drought, water extraction or alteration to stream flows; decline or loss of vegetation due to removal or disturbance (e.g. urban or agricultural development, bushfire); soil disturbance (e.g. mechanical disturbance from agriculture, fire suppression activities or 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).

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:

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.

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 Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 24 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas. The EoO has been made equal to the AoO to ensure consistency with the definition of AoO as an area within EoO.

The taxon is inferred to be severely fragmented. Individual occurrences are considered severely fragmented based on the taxon's limited dispersal ability, the barriers to dispersal and/or the lack of habitat separating them. Such fragmentation precludes the possibility of recolonisation in the event of local extinction.

It is inferred to have a continuing decline in (ii), (iii) and (v) above. Introduced taxa and declines in water quality may be issues in reduction of the taxon. Declines are based on likely reduction in flow and impairment to habitat.

Eligible under Criterion B1 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 24 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is severely fragmented and has a continuing decline in (i), (ii), (iii) 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 as Data Deficient

As the taxon lives underground and is relatively difficult to survey, the number of mature individuals in the population is unknown. The cryptic nature of the taxon may mean the numbers of mature individuals will never be known but further research may allow estimations of numbers within the population(s).

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:

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.

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