



Engaeus fultoni Otway Burrowing Crayfish

Taxonomy

Engaeus fultoni Smith & Schuster, 1913

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

Criterion D2

Species Information

Description and Life History

The Otway Burrowing Crayfish is a small terrestrial burrowing crayfish belonging to the southern hemisphere crayfish family Parastacidae. The taxon is separated from all other taxa in the genus by the combination of moderately long rostrum, exopodite lacking flagellum, pores on all lateral processes and pores opening ventro-laterally and postero-laterally on LP 3rd P and 4th P respectively (Horwitz 1990). It builds burrow systems, into the soil on the floodplain. Males and females have been found together in the same burrow system in early June to mid-August (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 Otway Burrowing Crayfish. Poor dispersal, slow maturation and confinement to discontinuous habitats are common to short-range endemics (Harvey 2002) such as the Otway 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 are berried in winter, incubating egg clusters under the abdomen. Juveniles hatch in late summer (Van Praagh and Hinkley 1999).

Generation Length

The generation length of the Otway Burrowing Crayfish is inferred to be 3 to 4 years. Life history and larval development studies on two Tasmanian taxa (*E. cisternarius* and *E. fossor*) suggest the life span may be 3 - 4 years for these taxa (Suter 1977). The Tasmanian taxa share some similarities with *E. fultoni* 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 Otway Burrowing Crayfish is only found in the Otway region of western Victoria, usually over 100 m in elevation, although it can be rarely found at sea level (e.g. Johanna River Reserve).

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Habitat

The Otway Burrowing Crayfish typically occurs in wet sclerophyll forest dominated by *Eucalyptus obliqua*, *E. regnans*, *Acacia melanoxylon* and the occasional *Nothofagus cunninghamii* in the Otway Ranges (Horwitz 1990). It constructs either type 3 burrows in yellow-brown soils with a high clay component, or more usually type 2 burrows adjacent to water-courses. However, it has also been found in burrows in tea-tree swamps, or next to creeks in scrubby vegetation or in burrows along the banks of larger river systems (such as the Aire, Cumberland or Gellibrand Rivers). It tends to be found at higher elevations where it is the only burrowing crayfish species present.

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 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, timber harvesting, fire); soil disturbance (e.g. mechanical disturbance from agriculture, timber harvesting 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; loss of food resources due to soil disturbance or loss of vegetation leading to various ecological changes; and trout predation. Changes to river discharge patterns can reduce the preferred adult macrohabitats, and siltation from catchment erosion can smother the preferred spawning habitat (rocks).

It should be noted that native forest timber harvesting on public land has been phased out in the Otways since 2008, although some small scale commercial firewood harvesting is ongoing. Timber harvesting on private land and in plantations continues in parts of its range. Private land timber harvesting must follow the prescriptions in the Code of Practice for Timber Production which include protections for waterway and riparian zones.

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

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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.

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 (EEO)	< 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:

Ineligible under Criterion B

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 918 km² and the Area of Occupancy (AoO) is estimated to be 156 km², but other thresholds under this criterion have not been met.

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 as Data Deficient

There is insufficient evidence to determine the number of mature individuals. There is insufficient evidence to support an estimate of total population size.

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 estimated to be very restricted. It has a restricted distribution, with one location, such that this restriction makes it possible that the taxon could 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.

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