



Phreatoicopsis raffae freshwater isopod

Taxonomy

Phreatoicopsis raffae Wilson & Keable, 2002

There is some dispute over the family for this genus; however phylogenetic studies indicate the *Phreatoicopsis* and *Synamphiopsus* are different to the other genera of Amphisopidae, and are therefore placed in Phreatoicopsidae (Boyko et al. 2008; G.D.F. (Buz) Wilson pers. comm. 2019).

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 A2ce+3ce+4ce; D1+2

All the Grampians isopods are likely to be at high risk of extinction (G.D.F. (Buz) Wilson, pers. comm. 2019), but that without data on distribution and numbers this is difficult to confirm. Similar species of isopods have been recorded as going extinct elsewhere in Victoria and in Western Australia.

Species Information

Description and Life History

Isopods, which are sometimes referred to as aquatic sowbugs, have over 950 species, rivalling the amphipods in terms of diversity, ecological importance and distribution (Wellborn et al. 2015). Isopods have among their number detritivores, carnivores, fish parasites, and scavengers. This species belongs to the Suborder Phreatoicidea, Family Phreatoicopsidae, all of which are freshwater species. Phreatoicidean species tend to be short or small range endemics, a pattern that is also seen in most genera, and in a few cases at the family-level (Wilson and Johnson 1999, Wilson, 2008). The Australian phreatoicideans have significant endemism at the generic and higher levels.

Phreatoicopsis raffae is semi terrestrial and very large for a phreatoicidean so they are probably long lived as adults (Buz Wilson, pers. comm. 2019). Like *Euastacus* crayfish species and the Cape le Grande phreatoicidean genus *Peludo*, *P. raffae* may emerge at certain times of the year and migrate overland; it is certainly capable of walking around out of its burrows (Buz Wilson pers. comm. 2019).

Phreatoicopsis spp. are unusual in their appearance compared to other phreatoicidean isopods, having a light, sometimes pearly cuticle, with bands or patches of bright yellow on some dorsal surfaces, most obviously the head. Also the legs of *Phreatoicopsis* are unusually thin, lacking the typical structural forms of other genera (Wilson and Keable 2002).

The life history of *P. raffae* is unlikely to be similar to other phreatoicidean species found in the Grampians because a large portion of the adults are (apparently) simultaneous hermaphrodites (Buz Wilson, pers. comm. 2019). However, there are no other data relating to the life history of this species, the descriptions noted below are for this group of isopods in general.

As with all the Peracarid crustaceans, isopod embryos undergo direct development within the female brood pouch (marsupium), from which they emerge as juveniles, known as manca. These are essentially replicas of adults but



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lack the last pair of thoracic legs. There is no pelagic larval stage among the isopods. Dispersal appears to be limited to the crawling ability of these forms, and this attribute has resulted in most species having restricted distributions and patterns of high endemism (Brusca, 1997).

P. raffae has been recorded as hosting large numbers of epibionts (animals that live on the surface of the isopods), with all larger individuals of the genus recorded with Temnocephlids (flatworms) crawling around on their sternites and pleopods, similar to many Australian crayfish. It is also likely that *P. raffae* also hosts peritrich (ciliates) epibionts as does *Phreatoicopsis terricola* but there are no records for this. It is unclear if these epibionts have any impact on the isopods, but in most cases epibionts are commensal - they attach to their host without any harm.

Generation Length

The generation length of *P. raffae* is suspected to be 1 to 3 years. This species is one of the largest in the genus and is assumed to be long lived, although further work is required to confirm this (Buz Wilson, pers. comm. 2019).

Distribution

The taxon occurs in central and southern parts of the Grampians National Park, in wetlands or swamps associated with the Glenelg or Wannon Rivers.

Habitat

This species is considered semi-terrestrial and was found in soils among roots of ferns and under sphagnum moss on the side of a seep (Wilson and Keable 2002). Most phreatoicideans are found in surface expressions of ground water, permanent Sphagnum bogs, in springs or in hypogean habitats, none are found in open streams or lagoons of varying salinities (i.e. upper reaches of estuaries) (Wilson 2008). They burrow into moist soil but may also occupy yabby burrows. This taxon may burrow down to the water table in dry periods (Wilson 2008).

Threats

Environmental degradation of rivers, streams and other water bodies via land clearing, development, sedimentation (in special after fires), drought and water pollution are all threats to the conservation of this taxon. The threats listed are generic in nature and not specific to the taxon.

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 A2 as Vulnerable

The population reduction over the past 10 years is suspected to be 30%, based on (c) and (e) above.

The population decline is only suspected as there have been no targeted surveys since the species was first described and the last records are from 2012.

The causes of the reduction may not have ceased, be understood or be reversible.

Eligible under Criterion A3 as Vulnerable

The population reduction over the next 10 years is suspected to be 35%, based on (c) and (e) above.

Due to the operating threats, it is suspected that the population will continue to decline largely due to declines in habitat.

Eligible under Criterion A4 as Vulnerable

The population reduction over any 10 year period, including both past and future, is estimated to be 35%, based on (c) and (e) above.

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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:

Ineligible under Criterion B

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 406 km² and the Area of Occupancy (AoO) is estimated to be 16 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 <u>C1</u> or <u>C2</u>				
<u>C1</u>	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)	
<u>C2</u>	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 estimated that there are 600 mature individuals, but other thresholds under this criterion have not been met.

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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 D as Vulnerable

The taxon is estimated to have 600 mature individuals, based on numbers previously collected. No reliable recent estimate of the total population size of the species is available.

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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