



## *Phreatoicopsis terricola* freshwater isopod

### Taxonomy

*Phreatoicopsis terricola* Spencer & Hall, 1897

There is some dispute over the family for this genus; however phylogenetic studies indicate the *Phreatoicopsis* and *Synamphiopsus* spp. 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 Victoria

Criterion D2

### 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.

Wilson and Keable (2002) note that male and female character states do not appear correlated with body size and thus suggest hermaphroditism in *Phreatoicopsis terricola*. There are no other data relating to the life history of this species. The information given below relates to general characteristics of phreatoicidean species.

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 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 highly restricted distributions and patterns of high endemism (Brusca, 1997).

*P. terricola* 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 Temnocephalids (flatworms) crawling around on their sternites and pleopods, similar to many Australian crayfish. *P. terricola* has also been recorded hosting lagenophryid peritrichs, which are ciliates epibionts. All but one of the species of peritrich ciliates in the family Lagenophryidae are specialized ectocommensals of crustaceans, and are different to most other peritrich in that they are grossly flattened and laterally distorted, with a discoid, bilaterally symmetrical shape that fits closely against the host's surface. They are also different to others peritrichs as they don't attach to their hosts using a stalk, rather they cement themselves to the host's exoskeleton with the rim of their protective lorica (Clamp and Kane 2003). The species found on *P. terricola* is *Operculigera inorta* which has also been recorded on *Colubotelson chiltoni*. Clamp and Kane (2003) state that all Australian species of *Operculigera* appear to be

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restricted to phreatoicid hosts, which is unusual a range of other lagenophryids occur on parastacid crayfish in Australia. 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 *Phreatoicopsis terricola* is suspected to be 1 to 3 years, based on suggestion that as large species, *Phreatoicopsis* could be long lived (Buz Wilson pers. comm. 2019).

## Distribution

The taxon occurs in the Otway Range, including Gellibrand Gorge and Cobden, Victoria.

## Habitat

The taxon has been recorded from wetlands in the Otway range. 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. The 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, drought and water pollution are all threats to the conservation of this taxon. There are no specific data relating to threats.

## 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"> <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>			

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## Evidence:

### Ineligible under Criterion A

There is insufficient evidence to determine whether there has been or will be a reduction in population sufficient to meet any threshold for Criterion A.

There have been no targeted surveys since the work done by Wilson & Keable (2002). There is no evidence to indicate that there has been a decline in population size or any other demographic parameter. A decline in habitat is suspected which may imply population decline, but this cannot be confirmed. However, recent extensive surveys have not been conducted.

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:

### Ineligible under Criterion B

The Extent of Occurrence across the taxon's range is estimated to be 49 km<sup>2</sup> and the Area of Occupancy (AoO) is estimated to be 12 km<sup>2</sup>, but other thresholds under this criterion have not been met.

It is possible that the range is under-estimated, because of limited surveys.

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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

No reliable estimate of the total population size of the species is available. However, records exist from 1897 with the most recent collections made in 1999. The Atlas of Living Australia (ALA) also lists a "human observation" of one specimen in 2003. There is a total of 48 occurrence records on ALA related to preserved specimens. Nineteen of these records noted the number of specimens collected: 140 specimens taken in total, with an average of 7.4 specimens per collection event. Based on the number of average number of specimens per collection event, it is estimated that the total number of specimens collected during the past 120 years is approximately 215, suggesting that this species is rare, elusive, and/or infrequently studied.

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 an AoO of 12 km<sup>2</sup>. This restriction makes it possible that the taxon could become Critically endangered or Extinct within a time period of one or two generations, in response to the identified threats, mainly environmental degradation of rivers, streams and other water bodies.

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

## References

- Boyko, C.B; Bruce, N.L.; Hadfield, K.A.; Merrin, K.L.; Ota, Y.; Poore, G.C.B.; Taiti, S.; Schotte, M. and Wilson, G.D.F. (Eds) (2008 onwards). World Marine, Freshwater and Terrestrial Isopod Crustaceans database. *Phreatoicopsis raffae* Wilson and Keable, 2002. Accessed through: World Register of Marine Species at: <http://marinespecies.org/aphia.php?p=taxdetails&id=262112> on 2018-05-02
- Brusca, R. (1997). Isopoda. Version 06 August 1997. <http://tolweb.org/Isopoda/6320/1997.08.06> in The Tree of Life Web Project, <http://tolweb.org/>
- Clamp, J.C. and Kane, J.R. (2003). Redescription of four species of lagenophryid peritrichs (Ciliophora) from Australia and New Guinea, with descriptions of two new species. *Records of the Australian Museum* 55(2): 153-168.
- DSE (2009) *Advisory List of Threatened Invertebrate Fauna in Victoria - 2009*. Department of Sustainability and Environment, East Melbourne, Victoria. Retrieved from: [https://www.environment.vic.gov.au/\\_\\_data/assets/pdf\\_file/0016/50452/Advisory\\_List\\_of\\_Threatened\\_Invertebrate\\_Fauna\\_2009\\_FINAL\\_Sept\\_2009.pdf](https://www.environment.vic.gov.au/__data/assets/pdf_file/0016/50452/Advisory_List_of_Threatened_Invertebrate_Fauna_2009_FINAL_Sept_2009.pdf)
- Wellborn, G.A., Witt, J.D.S. and Cothran, R.D. (2015). Chapter 31 - Class Malacostraca, Superorders Peracarida and Syncarida, In J.H. Thorp and D.C. Rogers, *Thorp and Covich's Freshwater Invertebrates* (Fourth Edition), (pp781-796), Academic Press.
- Wilson, G.D.F. (2008). Gondwanan groundwater: subterranean connections of Australian phreatoicidean isopods (Crustacea) to India and New Zealand. *Invertebrate Systematics*, 22, 301-310
- Wilson, G.D.F. and Ho, EL. (1996). *Crenoicus* Nicholls, 1944, (Crustacea, Isopoda, Phreatoicidea): Systematics and biology of a new species from New South Wales. *Records of the Australian Museum* 48: 7-32.
- Wilson, G.D.F and Fenwick, GD. (1999). Taxonomy and ecology of *Phreatoicus typicus* Chilton, 1883 (Crustacea, Isopoda, Phreatoicidae). *Journal of the Royal Society of New Zealand* 29(1):41-64.
- Wilson, G. D. F. and Keable, S. J. (2002). New Phreatoicidea (Crustacea: Isopoda) from Grampians National Park, with revisions of *Synamphisopus* and *Phreatoicopsis*. *Memoirs of Museum Victoria* 59(2): 457-529.
- Wilson, G. D. F., and Johnson, R. T. (1999). Ancient endemism among freshwater isopods (Crustacea, Phreatoicidea). In W. F. Ponder and D. Lunney (eds) 'The Other 99%. *The Conservation and Biodiversity of Invertebrates*' pp. 264-268. (Royal Zoological Society of New South Wales: Mosman, Australia.)