

Gariwerdeus ingletonensis freshwater isopod

Taxonomy

Gariwerdeus ingletonensis Wilson & Keable, 2002

The family level taxonomy adopted follows that of Boyko et al. (2008).

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

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 is one of three from the genus *Gariwerdeus* found only from the Grampians National Park, all of which are blind. "Gariwerd" is the indigenous Jardwadjali and Djab Wurrung peoples name for this area (Wilson and Keable 2002).


This taxon belongs to the Suborder Phreatoicoidea, Family Phreatoicidae all of which are freshwater species. Phreatoicoidean 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 phreatoicoideans have significant endemism at the generic and higher levels.

G. ingletonensis is named after the spring in which it was discovered, Ingleton Spring. Specific ecological and biological information is lacking for this species with the following text relating to peracarid isopods in general, and related species. All three genera of phreatoicoideans found in the Grampians region support substantial numbers of *Temnocephala* flatworms on their limbs and somites, similar to many Australian crayfish. It's not known if the flatworms have any impact on their isopod hosts (Wilson and Keable 2002). Note that further research is required to confirm the life history of *G. ingletonensis*.

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 small replicas of adults but lack the last pair of thoracic legs. There is no pelagic larval stage among the isopods. There is a large amount of data which indicates that peracarids are very poor overland dispersers, and is potentially limited to the crawling ability of the species, resulting in most species having highly restricted distributions and patterns of high endemism (Brusca, 1997, Wellborn et al. 2015).

Phreatoicidae typically reproduce multiple times over a lifetime (iteroparous life cycle). The New Zealand species *Phreatoicus typicus* has an iteroparous life cycle that may span more than a year, with synchronous reproduction with large numbers of individuals recruited into the adult population in winter (Wilson and Fenwick, 1999).

P. typicus breeding appears to be annual, starting in late winter, early spring and continuing through summer. Phreatoicids brood their young and young are probably released in late spring (Oct-Nov) and possibly also in later



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summer. *P. typicus* reaches maturity and becomes reproductive around one year of age and females may breed for up to three times before disappearing from the population (Wilson and Fenwick, 1999). This lifecycle pattern is similar to that seen in another Australian phreatoicid *Crenoicus buntiae* (Wilson and Ho, 1996) and is potentially indicative of *G. ingletonensis* although further research would be required to confirm this.

Generation Length

The generation length of *G. ingletonensis* is inferred to be 1 year, based on the lifestyle of a similar species (Wilson and Fenwick, 1999), as there is insufficient field observation to support an estimate of generation length with any confidence.

Distribution

The taxon is known from Ingleton Spring, Grampians National Park, Victoria

Habitat

The taxon is found within freshwater springs and oases, on white sand where spring flows from under a rock, (Wilson and Keable 2002).

Threats

Environmental degradation of rivers, streams and other water bodies via land clearing, development, increased sedimentation post fires, drought, water pollution, altered water regimes and temperature due to climate change are all assumed to be threats to the conservation of this species.

It may be more difficult to affirmatively assess risks to the taxon, because the animals are in a spring aquifer (found only where the spring comes out of the ground) and probably live underground. Mapping the limits of the underground aquifer where the animals might live is difficult (Buz Wilson, pers. comm. 2019).

Very little is known about the taxon and no targeted surveys have been conducted since 2002, however the habitat is highly threatened and similar species of isopods have been recorded as going extinct elsewhere in Victoria and in Western Australia.

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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 style="text-align: center;"><i>based on any of the following:</i></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:

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.

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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 and the Area of Occupancy (AoO) across the taxon's range are estimated to be 4 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>	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)
<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 as Data Deficient

No reliable estimate of the total population size of the species is available. The taxon has only been recorded from Ingleton Spring, Grampians National Park and only 34 specimens were collected (Wilson and Keable, 2002). No recent surveys have been undertaken.

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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 D2 as Vulnerable

The taxon is suspected to be very restricted. It has a restricted distribution, with an AoO of 4 km² and one location, such that this restriction make it possible that the taxon could become Critically Endangered or Extinct within a time frame of one or two generations in response to the identified threats, namely hydrological changes and damage to the aquifer.

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

References

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