

Threatened Species Assessment

Synamphisopus doegi freshwater isopod

Taxonomy

Synamphisopus doegi Wilson & Keable, 2002

There is some dispute over the family for this group of isopods. The family 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

Most of the Phreatoicdean isopods are likely to be small range endemics and subject to considerable risk. All the Grampians isopods are likely to be at high risk of extinction according to Buz Wilson (G.D.F. Wilson pers. comm. 2019), but without data on distribution and numbers this is difficult to confirm.

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 Phreatoicidae all of which are freshwater species. Phreatoicdean 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 phreatoicdeans have significant endemism at the generic and higher levels. *Synamphisopus doegi* is particularly unusual as it is one of only two species of freshwater isopods that have been observed to aestivate (Chester and Robinson 2011, Mackie et al. 2013, Strachan et al. 2015).

Specific ecological and biological information is limited for this species with most of the following text relating to peracarid isopods in general. All three genera of Phreatoicdean found in the Grampians region support substantial numbers of *Temnocephala* spp. on their limbs and somites, as with many Australian crayfish. It's not known if the flatworms have any impact on their isopod hosts (Wilson and Keable 2002).

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). Further detailed studies on the distribution and life history of this species are required.

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Generation Length

The generation length of *Synamphisopus doegi* is inferred to be 1 to 3 years. There are no data on the life history of this taxon, so the generation length is based on a similar phreatoicdean isopods that are also thought to be long lived, although further work is required to confirm this (Buz Wilson, pers. comm. 2019).

Distribution

The taxon is endemic to Victoria and is found in the Grampians National Park.

Habitat

The taxon is found in permanent and intermittent streams and creeks, under rocks, submerged wood and leaf litter (Mackie et al. 2013).

Threats

There are no data on specific threats to the taxon, but generic threats include environmental degradation of rivers, streams and other water bodies via land clearing and development, reduced flows caused by water abstraction or drought, increased sedimentation leading to habitat change, and water pollution from increased run-off associated with land clearing.

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> | <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> |
|--|---------------------------------------|---|

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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There is no evidence to indicate whether the taxon has suffered significant past decline in population size or any other demographic parameter.

It is not known if the population has declined as there have been no targeted surveys since the species was first described. However due to the operating threats, it is suspected that the population is susceptible to declines in the future.

| 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 across the taxon's range is estimated to be 24 km² and the Area of Occupancy (AoO) is estimated to be 12 km², but other thresholds under this criterion have not been met.

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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 as Data Deficient

There is insufficient evidence to determine the number of mature individuals. This taxon has been collected in surveys in 2002 and also in 2009 (Chester and Robson 2011, Mackie et al. 2012). Sampling effort has been insufficient to estimate of the total population size.

| 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 ² or number of locations ≤ 5 |

Evidence:

Eligible under Criterion D2 as Vulnerable

The taxon is suspected to be very restricted, with an AoO of 12 km² and one location. 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. *Synamphisopus doegi* Wilson and Keable, 2002. Accessed through: World Register of Marine Species at: <http://marinespecies.org/aphia.php?p=taxdetails&id=263381> 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/>
- Chester, E.T. and Robson, B.J. (2011). Drought refuges, spatial scale and the recolonization of invertebrates in non-perennial streams. *Freshwater Biology*, 56:2094-2104.
- DSE (2009) *Advisory list of threatened invertebrate fauna in Victoria - 2009*. Department of Sustainability and Environment, Melbourne. 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
- Mackie, J.K., Chester, E.T., Matthews, T.G., and Robson, B.J. (2013). Macroinvertebrate response to environmental flows in headwater streams in western Victoria, Australia. *Ecological Engineering*, 53:100-105.
- Strachan, S.R., Chester, E.T. and Robson, B.J. (2015) Freshwater invertebrate life history strategies for surviving desiccation. *Springer Science Reviews*, 3 (1). pp. 57-75.
- 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), (pp 781-796), 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 Fenwick, G.D. (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 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.)
- Wilson, G. D. F. and Keable, S. J. (2002). New Phreatoicideans (Isopoda; Crustacea) from Grampians National Park. *Memoirs of Museum Victoria* 59(2): 457-529.