Nomination No. 899
Taxon ID 622

FLORA & FAUNA GUARANTEE

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE

PRELIMINARY RECOMMENDATION ON A NOMINATION FOR LISTING

Hyridella narracanensis Narracan Corrugated Mussel

DOCID107-417469679-742

Dates of Consideration: 29 April, 8 June, 5 Aug, 5 Oct, 18 Nov 2021, 21 Jan 2022

Validity: The nomination is for a valid item.

Prescribed Information: The prescribed information was provided

Name of the Nominator is adequately provided

Name of the Item is adequately provided

The nominated taxon is accepted by the Scientific Advisory Committee (SAC) as a valid taxon because it has been formally described and is accepted as a valid taxon by Museum Victoria and is accepted as valid by DAWE/ABRS on the Australian Faunal Directory.

Current conservation status

The nominated taxon is not currently listed as threatened in Victoria.

The nominated taxon was listed as 'Near Threatened' in Australia by the International Union for Conservation of Nature (IUCN) in 2015 (Klunzinger et. al. 2014).

Eligibility for listing as a taxon under the Flora and Fauna Guarantee Act 1988

The SAC has assessed the eligibility of this nomination based on its extinction risk within Victoria in accordance with Section 16C(4)(c) of the *Flora and Fauna Guarantee Act 1988* (the FFG Act) and the criteria for determining eligibility for listing prescribed in the Flora and Fauna Guarantee Regulations 2020. In its application of the relevant eligibility criteria, the SAC has, as required by the nationally adopted Common Assessment Method, had regard to the *IUCN Red List Categories and Criteria (Version 3.1)* and the *Guidelines for Using the IUCN Red List Categories and Criteria (version14, 2019).*

Species information

Description and Life History

H. narracanensis is a small bivalve (maximum length about 60 mm) with an almond shape and a very strong hinge. It is not markedly winged posteriorly, but the posterior end is pointed and ridged. The strong beak sculpture does not extend onto the adult shell (Ponder et. al. 2020). The larvae (glochidia) of *H. narracanensis* are likely to be obligate ectoparasites of freshwater fish (attaching to their gills and fins). The life cycle of this species is therefore dependent on host availability, however the host species for *H. narracanensis* is presently unknown. The juvenile parasitic life-stage is the primary means for dispersal, as the adults are sessile and have very little capacity for long-distance movement other than via extreme hydrological flow events (Klunzinger et. al. 2014).

Generation Length
Within the class Bivalvia, mussel taxa from the Hyriidae family are considered long-lived, with some species known to survive 7-33 years (Walker et. al. 2001). Various mussel researchers have noted the absence of data in determining basic population and age information for Australian mussel species, Klunzinger (2013) notes: 'Defining species distributional boundaries and the declines in the extent of occurrence is also difficult where data is lacking. Without accurate age data, we can't determine generation length, and this also hinders conservation assessment'. The generation length for H. *narracanensi*s has been estimated as 3 years (Klunzinger et. al. 2014), however other expert opinion suggests a much longer generation time of 8-10 years (H. Jones pers. comm. to nominator). The generation length used for this assessment was 5-6 years based on expert estimates for the Glenelg Freshwater Mussel (*H. glenelgensis*) (DELWP unpublished 2018).

Distribution
Relatively few occurrence records for the species are reported in the Atlas of Living Australia and Victorian Biodiversity Atlas. However, these records indicate the general distribution of *H. narracanensis* is restricted to certain rivers and streams in Victoria, north-eastern Tasmania and the southeast corner of South Australia. This species was first recorded and described from the Narracan River in Gippsland, Victoria. *H. narracanensis* occurs in a small number of streams in the Yarra, Bunyip, La Trobe and South Gippsland river basins and may still be present in streams of the Otway Ranges (T. Raadik pers. comm.). There is evidence that the western Victorian records are a new species that has not yet been formally described and accepted (T. Raadik pers. comm.).

Based on Victorian Biodiversity Atlas records of *H. narracanensis* (including the western Victorian records), the current Extent of Occurrence is 28 487 km^2 and the Area of Occupancy is 156 km^2.

Habitat
This species is found in areas well-shaded by overhanging vegetation, in shallow water with moderate currents over sandy, compacted substrata with low organic content (Klunzinger et. al. 2014). It requires clean, clear water that is permanently flowing and where there is a water current flowing steadily over a sandy bed (H. Jones pers. comm. to nominator).

Threats
The limited habitat and restricted extent of the *H. narracanensis* population in Victoria make the species vulnerable to a variety of threats (including natural processes). Changes in water quality coupled with declines of instream habitat and riparian vegetation are threatening the survival of freshwater mussel populations. The main threats are identified as:

Hydrological alteration: Water diversions and regulated flows cause water-level fluctuations to which mussels are highly vulnerable as they occupy shallow marginal habitats (Klunzinger et. al. 2014, Walker et. al 2014). Low water flows may increase salinity and water temperatures and lower oxygen levels, all of which threatens the survival of freshwater mussels. The shallower regions of streams, that are the preferred habitat of the species, are prone to drying out during low flows. Cessations in flow can threaten the refuge habitats used by mussels in drier periods (DELWP unpublished 2018).

Catchment clearing and removal of riparian vegetation: Clearing of riparian areas, urban build-up close to streams, and intensive farming have all been implicated in the loss of freshwater mussel species within Australia and Northern America (Brainwood et al. 2006, DELWP unpublished 2018). Loss of vegetation in catchments and riparian areas due to agricultural and urban development is causing increased sediment loads and adding to in-stream erosion (Klunzinger et. al. 2014, Jones & Byrne 2013). Freshwater mussels favour reaches where there is dense overhanging vegetation that provides shelter from intense sunlight and high air temperatures and acts as a source of in-stream woody debris that provides in-stream refuges. Loss of riparian vegetation may occur through deliberate clearing or unrestricted stock access (Klunzinger et. al. 2014).

In-stream erosion and siltation: Bank erosion and mobilised sediments ('sand slugs') degrade in-stream habitats, causing shells to be dislodged and smothered (Klunzinger et. al. 2014). Plantation forestry has been implicated in the decline and loss of mussel habitat and mussel species overseas, mainly as a result of sedimentation and channel destabilisation from altered hydrology (Staton et al. 2000; Jensen 2007; Österling & Högberg 2014). Unsealed roads are a major sediment source in forested catchments, and Motha et. al. 2003 suggest that unsealed roads contribute 20 to 60 times more sediment than the undisturbed forest and about 10 times more sediment than the harvested areas on a per unit area basis. Harvested areas contribute 1 to 5 times greater sediment than the undisturbed forest. Currently there is a lack of research and no monitoring

of the effects of plantation forestry on freshwater mussels in Australia, so it is unknown if forestry has similar impacts on mussels in Australia.

Stock access: Unrestricted access by cattle causes destruction of riparian vegetation, erosion of stream banks and trampling of sediments and mussels in shallow water (Klunzinger et. al. 2014). Loss of vegetation increases soft silts in stream beds that can then clog feeding, respiratory and reproductive organs of the mussels, or bury them totally (DELWP unpublished 2018, Playford & Walker 2008).

Changes in fish communities and availability of hosts: Any environmental changes that affect fish communities (e.g., hydrological and geomorphological changes, in-stream barriers, alien species) can affect mussels through predation pressure or the availability of hosts for glochidia (Klunzinger et. al. 2014).

Decision by the Scientific Advisory Committee

The eligibility of the nominated taxon (including the extinction risk and the category of threat that applies to the taxon) to be specified in the Threatened List must be determined in accordance with the eligibility criteria prescribed for the purposes of Division 2 of Part 3 of the FFG Act.

The relevant eligibility criteria are prescribed in Schedule 1 of the Flora and Fauna Guarantee Regulations 2020, which provides that a taxon is at risk of extinction in a particular category of threat if a primary criterion is met, and is therefore eligible to be specified in the Threatened List.

As required under the Intergovernmental Memorandum of Understanding - Agreement on a Common Assessment Method for Listing of Threatened Species (to which Victoria is a signatory), eligibility has also been assessed in accordance with the *IUCN Red List Categories and Criteria (Version 3.1)* and *Guidelines for Using the IUCN Red List Categories and Criteria*.

For details of the IUCN criteria see Appendix 1.

Criterion A – Population Size Reduction

Not assessed - there are currently no population estimates available to provide evidence for this criterion.

Criterion B – Geographic Range (Extent of Occurrence and Area of Occupancy)

Eligible as Endangered under IUCN Criterion B2ab (iii) (FFG Primary Criterion 4.1 - Subcriterion 4.1.2 (a), (b))

Evidence:
Detailed surveys for mussels in Victoria have only just begun, but even so, there is currently no program of monitoring. These are key steps which are required in the conservation of this species, and without them, we will not have an accurate idea of the true distribution or rate of decline. Based on the available information, the Area of Occupancy used in this assessment is 156 km^2, well under the IUCN threshold for Endangered.

The geographic distribution of *H. narracanensis* in Victoria is severely fragmented. Mussels have been detected in discrete patches in some streams with none detected in intervening streams. Populations are isolated in separate river basins with no freshwater connectivity between basins (T. Raadik pers. comm.). A recent survey of Narracan Creek (the type locality), failed to detect Narracan Freshwater Mussel (T. Raadik pers. comm.).

Continued decline of suitable mussel habitat is expected given that many of the threats are ongoing and, in some cases, predicted to increase. Riparian vegetation loss and decrease in river condition due to urban development, agricultural expansion, increasing average temperatures, decreasing average rainfall, and more intense and frequent natural events such as drought, flood and wildfire will continue to impact on mussel habitat extent and quality (Clarke et. al 2019, Jones & Byrne 2013).

Criterion C – Small Population Size and Decline

Not assessed - there are currently no estimates available for the number of mature individuals.

Criterion D – Very Small or restricted population

Not assessed - there are currently no estimates available for the number of mature individuals.

Criterion E – Quantitative Analysis

Population viability analysis has not been undertaken. Therefore, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Documentation

The published information provided to and sourced by the SAC has been assessed. To the best of their knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported.

Preliminary Recommendation of the Scientific Advisory Committee

As outlined above, the nominated taxon satisfies at least one criterion of the set of criteria prepared and maintained under Division 2 of Part 3 of the FFG Act and stated in Schedule 1 of the Flora and Fauna Guarantee Regulations 2020.

The SAC concludes that on the evidence available, the nominated item is eligible for listing as Endangered in Victoria because Primary Criterion 4.1 – Subcriterion 4.1.2 (a), (b) of the FFG Regulations 2020 have been satisfied (IUCN criterion B2ab (iii)).

Endangered, in relation to a taxon of flora or fauna, means that the taxon is not critically endangered but is facing a very high risk of extinction in the wild in the near future.

The Scientific Advisory Committee therefore makes a preliminary recommendation that the nominated taxon be supported for listing as Endangered in Victoria under the Flora and Fauna Guarantee Act 1988.

Endorsement by the Convenor of the Scientific Advisory Committee **Date**

Dr. Michelle T. Casanova **8 March 2022**
Convenor

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Appendix 1: IUCN Red List Categories and Criteria

SUMMARY OF THE FIVE CRITERIA (A-E) USED TO EVALUATE IF A TAXON BELONGS IN AN IUCN RED LIST THREATENED CATEGORY (CRITICALLY ENDANGERED, ENDANGERED OR VULNERABLE).[1]

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%

A1 Population reduction observed, estimated, inferred, or suspected in the past where the causes of the reduction are clearly reversible AND understood AND have ceased.

A2 Population reduction observed, estimated, inferred, or suspected in the past where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction projected, inferred or suspected to be met in the future (up to a maximum of 100 years) *[(a) cannot be used for A3]*.

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.

based on any of the following:

(a) direct observation *[except A3]*
(b) an index of abundance appropriate to the taxon
(c) a decline in area of occupancy (AOO), extent of occurrence (EOO) and/or habitat quality
(d) actual or potential levels of exploitation
(e) effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites.

B. Geographic range in the form of either B1 (extent of occurrence) AND/OR B2 (area of occupancy)

	Critically Endangered	Endangered	Vulnerable
B1. Extent of occurrence (EOO)	< 100 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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			

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 at 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			

D. Very small or restricted population

	Critically Endangered	Endangered	Vulnerable
D. Number of mature individuals	< 50	< 250	**D1.** < 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 taxon to CR or EX in a very short time.	-	-	**D2.** typically: AOO < 20 km² or number of locations ≤ 5

E. Quantitative Analysis

	Critically Endangered	Endangered	Vulnerable
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

1 Use of this summary sheet requires full understanding of the *IUCN Red List Categories and Criteria* and *Guidelines for Using the IUCN Red List Categories and Criteria*. Please refer to both documents for explanations of terms and concepts used here.