FLORA & FAUNA GUARANTEE

NOMINATION NO. 893
TAXON ID 619

FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE

PRELIMINARY RECOMMENDATION ON A NOMINATION FOR LISTING

***Hyridella depressa* Depressed Freshwater Mussel**

DOCID107-417469679-742

Dates of consideration: 7 Oct, 25 Nov 2020, 17 Feb, 1 April, 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 species has not been formally assessed for conservation status in any state and no Australian jurisdiction has so far listed *Hyridella depressa* as threatened. However, *H. depressa* is a species identified as part of a threatened aquatic community in NSW (NSW Fisheries Committee 2011).

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

The Scientific Advisory Committee has assessed the eligibility of this nomination based on its extinction risk within Victoria in accordance with Section 16C 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

Hyridella depressa is a freshwater bivalve mollusc that is endemic to eastern Australian coastal rivers and streams. It has an elongated, dark brown shell with fine beak sculpture with v-shaped ridges (usually visible only in young shells) and attains a maximum shell length of approximately 70 mm. The species has a lower profile (maximum height relative to maximum length about 50%) than other species of Hyridella (hence the species name), the postero-dorsal margin is angled, and the beaks (umbo) project beyond the line of the dorsal margin (Ponder et al. 2020).

Hyridella depressa is a shallow burrower in silty sand/mud in streams and rivers, including small mountain streams in flowing water. Like other freshwater bivalves, this species is a suspension feeder. As is the case with most freshwater bivalves the taxon's glochidia larvae are brooded in the marsupia of the gills of females. However, freshwater mussels are unique in producing larvae that are parasitic mostly on fish. The reproductive cycle of *H. depressa* is seasonal and extends throughout

most of the warmer months of the year. Females release glochidia promptly as they mature and may produce several broods per year (Byrne 1998). It is likely that this species releases batches of glochidia multiple times per year (Jones et al. 1986; Byrne 1998). Freshwater mussels play a key role in stream ecosystems (Vaughn & Hakenkamp 2001, Strayer 2014).

Generation Length

Within the class Bivalvia, mussel taxa from the Hyriidae family are considered long-lived, with some New Zealand species known to survive 7-33 years (Walker et. al 2001). Based on other freshwater mussel species, the Depressed Freshwater Mussel is likely to reach sexual maturity between 2-4 years of age (Byrne 1998; Jones et al. 1986). 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'. For *H. depressa,* H. Jones (pers. comm. to nominator) estimates the average generation length is more likely to be around 8-10 years, assuming a max age of around 15-20 years and sexual maturity at 2-3 years of age. The generation length used for this *H. depressa* assessment was 5-6 years based on expert estimates for the Glenelg Freshwater Mussel *H. glenelgensis* (DELWP unpublished 2018).

Distribution

The conservation of freshwater mussels is neglected in Australia, and poor historical data could mask trends in species' range and abundance. The general distribution of *H. depressa* is coastal rivers and streams of southeast Queensland, New South Wales and into Victoria where the Mitchell River at Bairnsdale seems to be the southern range limit (Ponder et al. 2020). Recent extensive sampling across coastal Victoria including tributaries of the Latrobe, Thomson and further east of the Mitchell River have not found this mussel extending further westward than the Mitchell River basin in Victoria (T. Raadik, pers. comm.). The mussels' patchy distribution combined with difficult to access localities and the labour-intensive survey methods required make population estimates, defining distributional boundaries and extent of occurrence difficult to obtain.

Habitat

Throughout much of its natural range, in coastal rivers and streams, this species is often the most commonly encountered freshwater mussel. Its microhabitat is in slow-moderate currents in sand or gravel of glides and pools. *Hyridella depressa* occurs from the upper reaches of streams to the lowlands and seems to occupy a range of flow regimes (all flowing streams that are well oxygenated). It is often on fairly mobile sand-bed streams but usually on the steep sides of the stream where there is some protection (H. Jones, pers. comm. to nominator).

Threats

Assessing threats is a problem in conservation assessments of invertebrates, many of which are poorly known and for which data on distribution and abundance are lacking (Cardoso et al. 2011). The issue of data deficiency is exacerbated for species that range over large areas. Factors negatively impacting populations in Victoria are the same as those that occur in other states where research shows the impacts of land use is a major contributing factor to declines in *H. depressa* populations (Jones & Byrne 2013). In non-forested or forestry managed catchments, increases in sedimentation and bank erosion caused by forestry management, agricultural development, trampling by stock and loss of aquatic and riparian vegetation have had major impacts on water and riparian habitat quality (Walker et. al. 2014).

Forestry has the potential to degrade mussel habitat through erosion and siltation caused by harvesting, particularly if buffer zones are inadequate (T. Raadik, pers. comm.). Bulk sediment input into streams during high intensity rainfall events following fire delivers magnitudes more silt to the streams than under normal circumstances, and this sediment then persists as bedload, smothering the stream bed for decades following fire. There is also a risk associated with fire (encompassing loss of vegetation, erosion and siltation) in tree plantations.

Freshwater mussels (Unionoida) are among the most imperilled freshwater taxa, as there have been catastrophic losses of species in response to human impacts. Major losses are reported from the northern hemisphere and lesser ones from the southern hemisphere. As freshwater mussels influence nutrient fluxes, productivity and community structure, their decline is a good indicator of decline in the condition of freshwater ecosystems (Jones & Byrne 2013).

Freshwater mussels have declined at many sites in association with agricultural development, a feature of most upland streams and valleys in coastal south-eastern Australia. This development has resulted in increasing nutrient and sediment inputs and accelerating rates of erosion and sedimentation (Prosser et al. 2001; Norris et al. 2007). Changes include gully formation in upper catchments (Prosser and Winchester 1996) and channel widening and straightening, and erosion and deposition, in middle and lower catchments (Brooks and Brierley 1997, Prosser et al. 2001).

Threats are likely to intensify over the next century, as human population increases (The Treasury 2010) and climate change advances, with projected 5–10% reductions in regional annual rainfall and more frequent, more extreme droughts and floods (Hobday and Lough 2011). Freshwater mussels are vulnerable to rapid environmental changes because their sedentary, benthic habit and weak dispersal capability limit their ability to escape adverse conditions. In addition, their glochidia (larvae) are obligate ectoparasites of fish, so their fate is linked to the well-being of fish communities (Kat 1984).

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 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 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 Criteria B1ab (iii) + B2ab (iii) (FFG Primary Criterion 4.1 - Subcriterion 4.1.2 (a), (b) (iii))

Evidence:
The pre-European range of *Hyridella depressa* was believed to have extended further westward in coastal Victoria, however all recent records of the species have only been from the Mitchell River at Bairnsdale and east of this location up the east coast to Queensland (T. Raadik, pers. comm.). Range contractions have been recorded in NSW but there is currently no detailed information for Victoria. Detailed surveys for mussels in Victoria have only just begun, and 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 rate of decline. Based on the limited available information, the Extent of Occurrence and Area of Occupancy used in this assessment were 4175km^2 and 52km^2, both under the IUCN threshold for Endangered.

The geographic distribution of *H. depressa* in Victoria is not only highly restricted, but its habitat is also severely fragmented. Populations appear to be limited to certain rivers in East Gippsland. There has also been a decline in habitat quality across the entire potential range including Victoria following the 2019-2020 fires (Mitchell River to the NSW border near Genoa).

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 poor 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 by 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 Scientific Advisory Committee concludes that on the evidence available, the nominated taxon is eligible for listing as Endangered in Victoria because Primary Criterion 4.1 – Subcriteria 4.1.2 (a), (b) (iii) have been satisfied (IUCN Criteria B1ab (iii) + 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 **21 January 2022**
Convenor

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In person communications

Raadik, T.A – Senior Research Scientist, aquatic fauna/native fish biologist, DELWP – ARI, Heidelberg.

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.