Threatened Species Assessment

Neochanna cleaveri
Australian Mudfish

Taxonomy

Neochanna cleaveri (Scott, 1934)

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1991).

Categorised as Critically endangered in the 2013 Advisory list of threatened vertebrate fauna in Victoria (DSE 2013).

Proposed conservation status

Endangered in Victoria

Criterion B2ab(i,ii,iii,iv,v)

Species Information

Description and Life History

The taxon is a migratory species (facultative diadromy), undertaking spawning in freshwater and larvae washed downstream to estuarine/marine environments (Fulton 1986), with juveniles migrating upstream into freshwater adult habitat. Adults appear to have a high temperature tolerance (Andrews 1991), and are tolerant to low salinities (Jackson and Davies 1982, Andrews 1991). Adults usually forage nocturnally, though, as opportunists, they can become accustomed to feeding during the day in captivity (O'Brien and Dunn 2007). Adults 'browse' in open areas or burrow through sediments searching for food (Andrews 1991, Koehn and Raadik (1991). Maturity is reached at about 2 years of age, and sexes can be differentiated during the spawning period by the shape of the spawning papillae, and the colour of the gonads (O'Brien and Dunn 2007, Raadik unpubl. data). Unspawned oocytes are 1.3-1.5 mm in diameter. Once spawned, eggs are very adhesive and are thought to be scattered over submerged aquatic vegetation. Spawning occurs in the winter months, usually when floods inundate portions of the floodplain: the local movement of sexually mature adults increases dramatically at this time (Raadik unpubl. data). Larvae migrate back into freshwater during spring to early summer. During drought periods when streams and wetlands dry, adults burrow into moist mud on the substrate (e.g. under banks, logs, stones etc.) and aestivate underground until water returns (Scott 1934, Koehn and Raadik 1991, O'Brien and Dunn 2007). The taxon is also able to tolerate water which contains low levels of dissolved oxygen. Adults can jump out of the water up to 60 mm (Andrews 1991), potentially as a predator avoidance behaviour. This appears to be the only native Australian fish that can also survive periods without water, and has a migratory phase to its life cycle (Raadik 2006b).

Generation Length

The generation length of the Australian Mudfish is estimated to be 3 to 5 years. No age data exists for Australian Mudfish, so the estimate is based on age at maturity and maximum age of New Zealand species of mudfish in the same genus (and genetic lineage) summarised in O'Brien and Dunn (2007).

Distribution

The Australian Mudfish has a patchy distribution in coastal of northern, southern and western Tasmania, including Flinders Island (Allen et al. 2002). In Victoria it has been recorded from the south east side of Wilsons Promontory (Jackson and Savies 1982), the Aire and Ford rivers in the Otway Ranges (Koehn and Raadik 1991, Raadik and

Hartwell 2011), the Barwon River near Geelong, the Wye and Barham rivers near Apollo Bay, the Maribyrnong and Yarra rivers in Melbourne (Raadik 2006a), Cardinia Creek, Bunyip River and Lang Lang River in Westernport, and the Tarwin River in South Gippsland (Raadik (unpubl. data). All records are from freshwaters but close to the coast, and all below about 30 m in elevation (Raadik unpubl. data).

Habitat

Adults are mainly found in freshwater reaches of still, heavily vegetated water with a substrate of mud, including swamps, shallow wetlands, drains, ditches and tributary streams (Raadik 2006b). Juveniles move upstream from estuarine/marine environments via larger coastal rivers to access adult habitat (McDowall and Fulton 1996, Raadik unpubl. data). They are also able to utilise man-made habitats such as constructed wetlands, channels or altered waterways (e.g. drains, ditches etc.) and withstand stagnant conditions (Andrews 1991, Koehn and Raadik 1991, O'Brien and Dunn 2007). Adults and juvenile fish are often found within dense stands of vegetation, often lying in a horizontal position just below the water surface. During drought periods when streams and wetlands dry, adults burrow into moist mud on the substrate (e.g. under banks, logs, stones etc.) and aestivate underground until water returns (Scott 1934, Koehn and Raadik 1991, O'Brien and Dunn 2007). In summary, the fish is a cryptic taxon which is rather difficult to locate due to the habitat which it occupies.

Threats

The major threats to this taxon were collated from Koehn and Raadik (1991), Skene *et al*. (2003), Raadik (2006b), and DEE (2018). Major threats are:

- the loss of low-lying wetlands on private and public land near the coast. Large areas of suitable wetland habitat have been lost due to drainage and development. For example, wetlands of the type suitable for mudfish habitat have declined by 99% in South Gippsland (Koehn and Raadik 1991);
- the continuing degradation of remaining wetlands by urban and agricultural development (e.g. loss of inflow, degradation of riparian and instream habitat, input of herbicides, pesticides, fertilisers and other pollutants, and stock trampling of floodplain wetland habitat);
- instream barriers on lowland coastal streams which prevent the upstream migration of juveniles from the estuary into low elevation freshwater adult habitats;
- predation by alien fish species of upstream migrating juveniles in coastal streams, and adults and juveniles in wetland habitats; and,
- ongoing impacts from climate change, leading to a reduction in water availability, loss of suitable habitats, increased frequency and periods of drought, potential loss of lowland coastal wetlands and alteration to estuaries from sea level rise.

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%

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

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.

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*]

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, 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:

Eligible under Criterion A3 as Vulnerable

The population reduction over the next 9 to 15 years is projected to be 40%, based on (c) and (e) above.

This is based on the previous estimated decline in habitat (loss of suitable habitat as a result of drainage and development, and the impacts of the Millennium Drought) and inferred continuation and intensification of some threats.

Eligible under Criterion A4 as Vulnerable

The population reduction over any 9 to 15 year period, including both past and future, is estimated to be 30%, based on (c) and (e) above.

This is based on the previous estimated decline in habitat (loss of suitable habitat as a result of drainage and development, and the impacts of the Millennium Drought) and inferred continuation and intensification of some threats.

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 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			

Evidence:

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 48 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas, and on data from other opportunistic field sampling and a degree of intensive field sampling for the taxon.

The taxon occurs in three locations: Otways/Barwon, Port Phillip/ Westernport and South Gippsland. These localities differ in many aspects, such as degree of forest cover, urbanisation of degree of agriculture and therefore the degree of impact of particular threats.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the assumption that the known threats will continue to impact the taxon over the next ten to fifteen years and will intensify in the longer term.

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

No reliable estimate of the total population size is available due to a lack of monitoring of this taxon, poor knowledge on distributions at known locations, no abundance estimate, and detection probability issues with this cryptic taxon.

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 km2 or number of locations ≤ 5

Evidence:

Eligible under criterion D2 as Vulnerable

The taxon is estimated to be very restricted.

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

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