

Galaxias gunaikurnai Shaw Galaxias

Taxonomy

Galaxias gunaikurnai Raadik, 2014

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2014).

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

Proposed conservation status

Critically Endangered in Australia

Criteria A2abce+3ce+4abce; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C1+2a(i,ii); D

Species Information

Description and Life History

The taxon is confined to freshwater and considered not to undertake diadromous migrations. It has been recorded at densities of 0.05-0.18 fish/m² and is the only native fish species so far recorded from within its range. The spawning period is unknown, though possibly from winter to early spring: fish collected in late February were at an early stage of gonad development, with the majority of the body cavity full of fat deposits (though one female was significantly advanced in development), those collected in mid-April (NMV A.26403-1) and had gonads filling 50-60% of the body cavity and males collected in early May 2013 were running ripe and females were at a ripe stage. The smallest presumed 0+ age fish recorded in April 1960 and May 2012 was 32 mm Length to Caudal Fork (LCF) with the smallest fish collected in mid-April 2008 measuring 40 mm LCF and 70% of 95 individuals ranging in length from 40-60 mm LCF. The taxon is able to survive in very cold water (< 5 degrees C) during winter.

Generation Length

The generation length of the Shaw Galaxias is estimated to be 3 to 4 years. This is based on data for *Galaxias olidus*, a closely related species.

Distribution

The Shaw Galaxias is a Victorian endemic, known only from the headwaters of Shaw Creek, a tributary of the Caledonia River (Macalister River Catchment) in the coastal Gippsland region. It persists as a single, small population in the uppermost four kilometre section of a headwater tributary, upstream of a waterfall with trout below.

Habitat

The taxon has been recorded from a small (0.6-1.4 m average width and 0.15-0.20 m in average depth), cool, clear, alpine creek, flowing through a grassy plain, consisting of pools, glides and riffles, with smaller amounts of small cascades, and with very little shading except that provided by grasses. During winter the catchment is usually covered by snow for varying periods of time. The substrate consisted of bedrock, boulder and cobble, with smaller amounts of pebble, gravel and coarse sand. Instream cover was provided predominantly by rock and from bank and vegetation (alpine grasses) overhang, and pools averaged 0.5 m in depth.

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Threats

This taxon is one of a group of endemic galaxiids occurring in Victoria's eastern foothills and mountains. These taxa share ecological and habitat similarities that lead to a common suite of actual or potential threats. These taxa occur typically in small, isolated populations with limited geneflow. This may limit their adaptability to changing conditions associated with climate change.

The main threat to this taxon is invasion by Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*). Trout predation and competition are extreme risks and are likely to rapidly extirpate the entire population.

Brown Trout and Rainbow Trout invaded upstream above the waterfall in about 2010 and eliminated approximately 99% of the galaxiid population. Since then, an instream barrier has been placed into the system and over five years the trout have been removed. However, the population of galaxiids has not recovered as of 2018.

Artificial barriers restrict movement of trout into the stream but the risk of re-invasion is high. Mechanisms for potential invasion include transfer by humans and drown-out of trout barriers during high flows.

Other threats include fire (sedimentation, post-fire debris flow during high intensity rainfall events), severe weather events (droughts, floods), fire suppression impacts such as the use of fire retardant and increased sedimentation following disturbance from machinery, climate change and reduced water flows, and other forest management operations including road and firebreak construction and maintenance, especially at stream crossings.

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;">} 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:

Eligible under Criterion A2 as Critically Endangered

The population reduction over the past 10 to 12 years is estimated to be greater than 95%, based on (a), (b), (c) and (e) above.

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There has been an observed and measured reduction, based on extensive fieldwork over the entire range of the species. The causes of the reduction may not have ceased, be understood or be reversible.

Eligible under Criterion A3 as Critically Endangered

The population reduction over the next 10 to 12 years is projected to be greater than 95%, based on (c) and (e) above.

The taxon is highly likely to become extinct, based on the assumption that the known threats, principally trout predation, will continue to impact the taxon, and that the remaining population is now very small.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 10 to 12 year period, including both past and future is estimated to be greater than 95%, based on (a), (b), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

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:

Eligible under Criterion B1 as Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 8 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA), and also based on intensive field sampling across the entire known range.

It is estimated to have one location. The main threats to the taxon (i.e. trout predation, extreme events such as fire, flood and drought, increased sedimentation) have a non-reversible impact on the individuals of the taxon and have the potential over time to threaten most individuals. Both subpopulations are geographically very close and the main threats are expected to impact both.

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 current ten year period, and may intensify in the longer term. The remaining population is extremely small and therefore highly prone to inbreeding.

Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 8 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA and intensive field sampling. As above, it is estimated to have one location and has a continuing decline in (i), (ii), (iii), (iv) and (v) above.

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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:

Eligible under Criterion C1 as Critically Endangered

It is estimated that there are 30 to 100 (midpoint 65) mature individuals. This is based on intensive monitoring data across the remaining range of the taxon.

A continuing decline of 100% is estimated to occur within one generation.

Eligible under Criterion C2 as Critically Endangered

The number of mature individuals is projected to continue to decline, the number of mature individuals in each subpopulation is 50 or fewer and the percentage of mature individuals in one subpopulation is 90-100%.

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 D as Critically Endangered

The taxon is estimated to have 30 to 100 (midpoint 65) mature individuals.



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

References

- DSE (2013) *Advisory List of Threatened Vertebrate Fauna in Victoria 2013*. Department of Sustainability and Environment, East Melbourne. (Retrieved from https://www.environment.vic.gov.au/__data/assets/pdf_file/0014/50450/Advisory-List-of-Threatened-Vertebrate-Fauna_FINAL-2013.pdf)
- Raadik, T.A. (2014). Fifteen from one: a revision of the *Galaxias olidus* Günther, 1866 complex (Teleostei, Galaxiidae) in south-eastern Australia recognises three previously described taxa and describes 12 new species. *Zootaxa* 3898 (1), 1-198.
- Raadik, T.A. Unpublished survey data from 2002-2018.
- SAC (2014). Flora and Fauna Guarantee Scientific Advisory Committee Final recommendation on a nomination for listing. Nomination No. 834 Shaw Galaxias - *Galaxias gunaikurnai*.