

Galaxias mungadhan Dargo Galaxias

Taxonomy

Galaxias mungadhan 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 A2bce+3ce+4ce; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)

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 4.2-6.4 fish/m² and is the only native fish species so far recorded from within its range. Spawning period is unknown and possibly annually variable, depending on conditions. Adult fish sampled in mid-November (2010) and mid-December (1963) were full of fat deposits and their gonads were in an early stage of development, whereas those collected in mid-April (2008) were at an advanced stage of development, with many females ripe to nearly ripe and with large eggs which were beginning to separate. The smallest presumed 0+ age fish recorded in mid-November (1974) was 27 mm LCF, and 38 mm LCF in mid-December 1963, with approximately 30% of fish collected in late March (2002) less than 50 mm LCF (smallest 27 mm LCF) and in mid-April (2008) 75% of 100 fish collected less than 40 mm LCF, with 94 % < 50 mm LCF, all considered of 0+ age. This suggests an extended spawning period possibly from late winter to spring, though a 0+ age fish of 18.1 mm LCF, still possessing a midventral larval keel, was collected in early May (1962), suggesting a late March to April (autumn) spawning. The taxon is able to survive in very cold water (< 5 degrees C) during winter.

Generation Length

The generation length of the Dargo Galaxias is estimated to be 3 to 4 years. This is based on data for *Galaxias olidus*, a closely related species (Raadik 2011).

Distribution

The taxon is endemic to Victoria. It has so far only been confirmed from a short section of creek extending from 700 m downstream of the type locality to the top of the catchment, in the headwaters of Lightbound Creek, a tributary of the Dargo River, Mitchell River system in the coastal Gippsland region of Victoria, from an elevation of 1550 m ASL. The population is known to extend over approximately 2 km (river distance) from the source, which is at 1620 m ASL, in a catchment of approximately 4 km². The downstream distribution is unknown, though waterfalls are present 2 km farther downstream at Devils Hollow, which are located 2 km upstream from the junction with the Dargo River.

Habitat

The taxon was recorded from a small (0.5-1.3 m average width and 0.05-0.40 m in average depth), cool, clear, alpine creek, flowing through a grassy plain, consisting predominantly of riffles and pools, and with very little shading except that provided by grasses. During winter the catchment is often covered by snow for varying periods of time. The substrate consisted predominantly of bedrock with some loose boulders, with smaller amounts of pebble, gravel, sand and clay, overlain in backwaters by silt. Instream cover was provided by rock and by bank and vegetation (alpine grasses) overhang, and pools averaged 0.5 m in depth (Raadik 2014).

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 taxon is threatened by trout predation and extreme events (fire, flood and drought), fire suppression impacts (e.g. fire retardant, increased sedimentation), and other land management operations that are likely to increase sedimentation.

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.

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.

Forestry operations continue in parts of the range of this taxon. Spatial analysis of catchments occupied by the Dargo Galaxias across all land tenures indicates that 83% occurs within the Comprehensive, Adequate and Representative (CAR) reserve system, including parks and reserves and special protection zones in State forest. Further areas are excluded from harvesting by prescription under the Victorian Code of Practice for Timber Production 2014 (the Code). No species-specific protections for the Dargo Galaxias are included in the Code. However, other more general prescriptions such as protection and buffering of waterways provide protection from forestry operations. In recent years, modified harvesting and forest regeneration practices have been implemented in native forest that are designed to further mitigate the potential threat from forestry operations to threatened species and their habitats.

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;"><i>based on any of the following:</i></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 83 to 99% (midpoint 93%), based on (b), (c) and (e) above.

The reduction is based on coarse survey data and reduction in water level and fish abundance.

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 100%, based on (c) and (e) above.

A future population decline to possible extinction is based on coarse survey data and reduction in water level, limited recruitment, low genetic variability, the continuing threat of trout invasion, and continuing impacts from fire and drought on the extremely small remaining population.

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 90 to 100%, based on (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

This estimate is based on the past decline of more than 90% and a potential future decline to extinction.

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 9VBA) and also on intensive field sampling.

It is estimated to have one location. The taxon is considered to occur in one location as all key identified threats, notably trout predation, apply and can rapidly affect all individuals of the taxon present.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above. There is likely to be a decline in numbers, range and habitat quality, caused by alien predators, climate change and reduced stream flow, increased wildfire and instream sedimentation.

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. As above, it is estimated to have one location and a continuing decline in (i), (ii), (iii), (iv) and (v) above.

Galaxias aequipinnis

East Gippsland Galaxias

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 C as Endangered

It is estimated that there are 400 to 800 (midpoint 600) mature individuals. This is based on extrapolation from annual monitoring point data.

There is estimated to be a continuing decline of 100% within two generations.

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 Vulnerable

It is estimated that there are 400 to 800 (midpoint 600) individuals, and 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.

References

DSE (2013) *Advisory List of Threatened Vertebrate Fauna in Victoria 2013*. Department of Sustainability and Environment, East Melbourne. (Retrieved from



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https://www.environment.vic.gov.au/__data/assets/pdf_file/0014/50450/Advisory-List-of-Threatened-Vertebrate-Fauna_FINAL-2013.pdf)

Raadik, T.A. (2011). Systematic revision of the Mountain Galaxias *Galaxias olidus* Günther, 1866 species complex (Teleostei: Galaxiidae) in eastern Australia. PhD Thesis, University of Canberra, Canberra.

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.

SAC (2014). Flora and Fauna Guarantee Scientific Advisory Committee Final recommendation on a nomination for listing. Nomination No. 833 Dargo Galaxias - *Galaxias mungadhan*.