Fisheries Scientific Committee

Proposed Determination

Kosciuszko Galaxias
Galaxias supremus

Assessment outcome CRITICALLY ENDANGERED
Category B1ab(i, ii, iii, iv)

The Fisheries Scientific Committee, established under Part 7A of the *Fisheries Management Act 1994* (the FM Act), has assessed the ***Galaxias supremus*** **(Kosciuszko Galaxias)** under the FM Act and the Common Assessment Method and has determined that it is eligible to be listed as a **CRITICALLY ENDANGERED SPECIES**.

The Fisheries Scientific Committee, with reference to the criteria relevant to this species, prescribed by Part 16 of the Fisheries Management (General) Regulation 2019 (the Regulation) has assessed and determined that:

- The listing of CRITICALLY ENDANGERED is provided for by Part 7A, Division 2 of the FM Act.
- The assessment has been determined in accordance with the national Common Assessment Method (CAM), which provides a nationally consistent approach to the assessing and listing of threatened species in Australia.
- The assessment documentation below indicates the eligibility of the species for listing under both FM Act requirements and IUCN criteria as prescribed by the CAM.
- For more information about the CAM, visit https://www.awe.gov.au/environment/biodiversity/threatened/cam

The FSC is now accepting submissions on this proposed determination.

All submissions must be received by **11.59 pm Monday 5 September 2022**.

Please note that all submissions may be made public unless confidentiality is specifically requested. Only written submissions will be accepted.

Any person may make a written submission which should be forwarded by **email** to fsc@dpi.nsw.gov.au or by **post** to:

Fisheries Scientific Committee
c/- NSW DPI Fisheries
LMB 3020
NOWRA NSW 2541

The proposed determinations can also be viewed at the DPI Fisheries Head Office and District Fisheries Offices in NSW.

This consultation process may coincide with a separate process for listing these species under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) as part of the Common Assessment Method.

For information about this process visit
http://www.environment.gov.au/biodiversity/threatened/nominations/comment

Species information and status

a) Taxonomy

Galaxias supremus Raadik, 2014 – Kosciuszko Galaxias (family Galaxiidae [Galaxiformes]) is a valid recognised taxon and is a species as defined in the Fisheries Management Act 1994.

Galaxias supremus was initially considered part of *Galaxias olidus* Günther, 1866. Genetic analysis found 15 genetically-defined candidate taxa which were then found to be morphologically discernible from each other (Raadik 2011, Adams *et al.* 2014). Consequently *G. olidus* sensu lato (s.l.) were defined as a hyper-cryptic species complex of distinct species, all valid under multiple species concepts (Raadik 2014). This grouping of taxa is herein referred to as the '*Galaxias olidus* complex', or 'upland galaxiids'.

b) Current conservation status

Jurisdiction	State / Territory in which the species is listed	Date listed or assessed (or N/A)	Listing category known
International (IUCN Red List)	IUCN	2019	Critically Endangered [A3bce, B1ab(i,ii,iii,iv,v)+2ab(i,ii, iii,iv,v)]
National (EPBC Act)	Not listed	Not listed	N/A
New South Wales	Not listed	Not listed	N/A

c) Description of species

Galaxias supremus (Figure 1) is morphologically very similar to other members in the *G. olidus* complex. Average recorded length is 80–85 millimetres (length to caudal fork (LCF)) and maximum LCF is 96 mm. The species can be differentiated from other members of the *G. olidus* complex by a combination of: Eight pelvic fin rays, a distinctly shorter lower jaw, relatively shallow body depth, short and shallow caudal peduncle, long snout, small eyes, dorsal and anal fins being short with the anal fin set well back at about 85% from the front of the dorsal fin (the furthest back of all members of the species complex). Body has a distinctive mottled pattern and lacks black, ovoid bars along the side (Raadik 2014). *Galaxias supremus* are known to hybridise with *G. olidus* (Adams et al. 2014).

Figure 1. *Galaxias supremus* (Rudie Kuiter).

d) Distribution of species

Galaxias supremus has only been found at a small number of sites within upper Snowy River near Mount Kosciuszko, and an unnamed drainage line on the upper slopes of Mount Kosciuszko near Rawson's Pass. All sites are within Kosciuszko National Park in New South Wales (Raadik and Kuiter 2002, Raadik 2014) at elevations of 1900 to 2150 m asl.

Records of *G. supremus* were downloaded from the Atlas of Living Australia on 1 July 2021. All records (especially the iNaturalist reports) were scrutinised by Dr Tarmo Raadik (Senior Research Scientist, Applied Aquatic Ecology, Arthur Rylah Institute for Environmental Research, Victorian DELWP) prior to acceptance. Area of Occupancy (AOO) and Extent of Occurrence (EOO) were determined based on these records using the recommended 2 x 2 km grid methodology in GeoCAT (Bachman et al. 2011; IUCN Standards and Petitions Committee 2022). The current (based on records collected since 2011) global AOO for *G. supremus* is 20 km^2 (Figure 2) Current global EOO was measured as 10 km^2 (Figure 1). But as EOO was less than AOO, as per the IUCN Red List guidelines (IUCN 2019), EOO is also considered 20 km^2.

It is assumed that subpopulations in each of the four locations are isolated from one another due to the presence of introduced salmonids (trout). Trout are abundant in the Snowy River immediately below waterfalls on Carruthers Creek and Blue Lake Creek (T.A. Raadik, unpub data), restricting Kosciuszko Galaxias to the upper reaches of each of these waterways. The presence of trout at the sites along the Kosciuszko and Summit walking tracks is unknown, but they are present throughout the upper reaches of the Snowy River.

Individuals characterised as hybrids between *Galaxias supremus* and *Galaxias olidus* were collected from a fifth site (Sawpit Creek) on 15 March 2002 (Adams et al. 2014). This location is a tributary of the Thredbo River and suggests the possibility that *Galaxias supremus* may be more widespread within the Snowy Catchment than available records suggest.

e) Relevant biology/ecology of the species

There has been no detailed scientific study of the biology and ecology of *G. supremus*. For this assessment, key aspects of the biology of *G. supremus* are inferred based on the more extensive understanding of the biology of congeneric species in the *Galaxias olidus* complex.

Galaxias supremus is a freshwater fish and is not considered to undertake migrations as part of its life cycle. The generation length of the species is not well known but is estimated at 3 or 4 years (Raadik 2019). While the spawning period is not known, it probably occurs from very late spring to early summer. The species can withstand very cold water (< 2 °C) in winter (Raadik 2014) with the upper thermal tolerance anticipated to be less than that of the closely related and more broadly distributed *G. olidus* (i.e., < 33 °C) (Cramp et al. 2021; Mulvey 2021). The physiological capacity to tolerate higher temperatures is likely to be impaired by reductions in dissolved oxygen and mild exposure to ash and sediment (Cramp et al. 2021; Mulvey 2021). It is also the only species of fish within its range, and therefore represents 100% of the fish diversity: *G. olidus* have been found further downstream in the Snowy River (Raadik 2014).

f) Indigenous significance of the species

Galaxias supremus occurs on the lands of the Ngarigo people (AIATSIS 2021), but the cultural significance of the species is undocumented.

Given the acknowledged importance to Aboriginal peoples of Connection to Country and the widespread importance of Caring for Country (which includes biodiversity, 'place', custom and totemic elements) it is considered likely that the species has or is associated with some cultural and/or community significance. The significance of the ecological community, particular species, spiritual and other cultural values are diverse and varied for the many Indigenous peoples that live in the area and care for Country. Such knowledge may be only held by Indigenous groups and individuals who are the custodians of this knowledge.

g) Habitat requirements of the species

Galaxias supremus have been collected from permanent, cold and clear water in small flowing creeks (0.6–1.1 m average width, 0.1–0.2 m average depth, 0.5–0.6 m max depth) and from Blue Lake (a 16 hectare, 28 m deep cirque lake) (Raadik 2014). During winter, all sites are covered by snow and ice for an extended period. Creek substrate consists of bedrock, boulder, cobble, gravel and sand, with fish collected from amongst rock, undercut banks and overhanging grasses. In Blue Lake the substrate is cobble, pebble, gravel and silt, with fish collected from amongst small cobbles and from within 2 m of the shoreline; fish location and habitat in deeper

water is unknown. All sites lack emergent or submerged aquatic vegetation or overhead shading (Raadik 2011, Raadik 2014). The specific habitat requirements for different life stages of *G. supremus* are unknown.

h) Threats and level of risk to the species including assessment of threatening processes (under clause 238 of the Fisheries Management (General) Regulation 2019)

Galaxias supremus faces similar threats to other taxa in the *G. olidus*complex (Raadik 2014, Lintermans and Raadik, 2019). The major and most imminent threat is the introduction and spread of trout into occupied waterways. Deteriorating genetic health resulting from small population size and fragmentation and the impacts of feral horses (*Equus caballus*) on habitat quality are additional established threats. Climate change induced intensification of wildfires, changes to water availability and extreme weather events represent emerging threats.

Threats		
Threat	Extent	Impact
Exotic and invasive species		
Introduced salmonids (trout)	**Status**: Historical, current and future **Confidence**: Known **Consequence**: Severe **Trend**: Increasing **Extent**: Across entire range	The major threat to *G. supremus* is the spread/introduction and establishment of introduced salmonid fishes, particularly Brown Trout (*Salmo trutta*) and Rainbow Trout (*Oncorhynchus mykiss*). The introduction of salmonids commonly results in major declines or extirpation of galaxiid subpopulations (Lintermans 2000, McDowall 2006). For example, Tilzey (1976) reported rapid declines in *G. olidus* subpopulations in the Snowy Mountains following salmonid invasion, with complete extirpation of galaxiids at these locations within 3 years (Tilzey 1976). The fragmented nature of galaxiid subpopulations in the Australian Alps and the role of salmonids in causing this fragmentation is well documented (Green 2008, McDowall 2006, Lintermans 2000; Raadik and Kuiter 2002; Tilzey 1976). Trout are widely distributed and abundant in almost all streams throughout the upper Snowy River

		Catchment. Trout have colonised the entirety of the Snowy River, restricting populations of *G. supremus* to the very upper reaches of tributary streams (Green 2002). Whilst trout are not permitted to be stocked in the habitat of this species (i.e. not permitted in waters above 1500m in Kosciusko National Park) under the NSW Fisheries Management Strategy, unauthorised stocking may present an ongoing threat to the species. Sustained or increased predator pressure increases the extinction risk for *G. supremus.* Specifically, if trout were to pass upstream of the waterfalls currently excluding them from the upper reaches of Carruthers or Blue Lake creeks, it is projected that *G. supremus* would rapidly become extinct in these locations (Raadik 2019). Illegal stocking of salmonids past these waterfall barriers by anglers is a high probability risk.
Feral horses decreasing habitat quality and availability	**Status**: Historical, current and future **Confidence**: Known **Consequence**: Severe **Trend**: Increasing **Extent**: Across entire range	Feral horse abundance has increased significantly in Kosciuszko National Park (KNP) in recent decades with abundance estimated to be ~19,000 prior to the 2019-20 fires, dropping to >14,300 post-fire (Cairns 2020, Fletcher 2021). Horse populations in KNP have increased by an average of 18% per annum since 2001 and can increase by up to 31% in good years (see Garrott et al. 1991, Grange et al. 2009, Fletcher 2021). As 2021 was a good year with abundant foals obvious (M. Lintermans unpublished data), horse abundance at present in KNP is likely to be substantially higher than 14,300 recorded post the 2019-20 fires.

		Wild horses are listed as a key threat to native plants and animals under the NSW Biodiversity Conservation Act 2016 with habitat degradation and loss listed as a Key Threatening Process (KTP) in Schedule 4 of the Act. The listing acknowledges the negative impact of wild horses on wetlands, watercourses, and riparian systems; alteration of the structure and composition of vegetation; and reduction in plant biomass (NSW Threatened Species Scientific Committee 2018). Feral horses graze fens (peat accumulating wetland) and other wet areas and can leave a dense network of tracks (Drying 1990, Hope et al. 2012). Wet soils are more susceptible to erosion than dry soils, and hooved animals walking through bogs and fens can trample vegetation, which leads to further loss of soil and changes to the hydrology of bogs and fens, creating channels and potentially leading to draining of the wetland (Drying 1990, Hope et al. 2012). Feral horses also damage high country aquatic environments via stream bank damage, pugging, crossings, sedimentation, alteration of riparian vegetation (Threatened Species Scientific Committee 2018, Tolsma & Shannon 2018, Robertson et al. 2019). Horse distribution in KNP overlaps much of the distribution of *G. supremus* and therefore all of the above impacts from feral horses are likely to affect this species and its habitat.
Genetic health		
Genetic decline due to population/ abundance decline and isolation	**Status**: Historical, current and future **Confidence**: Known **Consequence**: Severe	*Galaxias supremus* persists in four isolated locations with population size believed to be small, making the species susceptible to

	Trend: Increasing **Extent**: Across entire range	deterioration of genetic health through inbreeding, loss of evolutionary potential and adaptability, leading to increased risk of extinction (Frankham et al. 2010). Given the likely current absence of immigration-emigration amongst the existing sub-populations, genetic rescue via captive breeding or direct translocations may be required to ensure the long-term viability of the species.
Climate change		
Increased magnitude, intensity and frequency of bushfires	**Status**: Current and future **Confidence**: Known **Consequence**: Catastrophic **Trend**: Increasing **Extent**: Across entire range	The frequency, magnitude and intensity of bushfires is predicted to increase under climate change scenarios (Di Virgilio et al. 2019). Projection of future climate for the Murray Basin cluster (the regional climate modelling undertaken in this area) region predicts, with high confidence, that climate change will result in a harsher fire-weather climate in the future (Timbal et al. 2015). Bushfires pose potentially devastating consequences for aquatic ecosystems and species (Gomez Isaza et al. 2022; Legge et al. 2022). Aquatic habitats within the fire footprint can alter the physiochemical properties of the water, including causing extreme temperature of the water in the small streams that these fish inhabit, leading to mortality of fish (Raadik et al. 2010). Storm events following fire usually result in significant inputs of ash and sediment to streams which severely impact aquatic habitats (Ward et al. unpublished data.). Post-fire sedimentation can impact waterways 50–80 km downstream of the burnt area (Lyon et al. 2008, Silva et al. 2020) and have severe effects on water quality and aquatic fauna including threatened fish and

		crayfish (Cramp et al. 2021; Gomez Isaza et al. 2022; Legge et al. 2021; Ward et al. unpub data). Ash and sediment inputs smother stream substrates, alter water chemistry, alters riparian shading and organic inputs. Post-fire rainfall impacts on aquatic habitats from high severity fire can significantly alter fish habitat and severely reduce local fish populations within a single generation. The spatial extent of the threat from fires is not fixed for any one fire, and will vary with ignition point, fuel loads, antecedent climatic conditions (e.g. rainfall/drought) and weather variables. Whilst the 2019-20 bushfires did not appear to directly impact *G. supremus* (Legge et al. 2021), a single bushfire has the capacity to impact large sections of the population of this species, potentially leading to a rapid population decline across the species range, or extirpation of the species over a short time frame.
Increased and more severe droughts, elevated temperatures decrease habitat quality and availability	**Status**: Current and future **Confidence**: Suspected **Consequence**: Severe **Trend**: Increasing **Extent**: Across entire range	Increased and more severe droughts will decrease the availability and the quality of surface water. This will result in loss of instream refuge habitats and increased water temperatures (Raadik et al. 2010, Raadik 2019). Physiologically, species of the Galaxias olidus complex are highly susceptible to such changes in water quality, with an upper thermal tolerance of approximately 33 °C (which declines with reductions in dissolved oxygen) (Mulvey 2021). Future climate projections for the region that includes the range of *G. supremus* predicts, with high confidence, average temperatures will continue to rise in all seasons. It is also

		projected with very high confidence that there will be more hot days and warms spells and there will be fewer frosts (Timbal et al. 2015). It is anticipated that this will impose thermal stress on the species as well as impacting key life history processes, particularly when other threats are impacting (such as bushfires).
Severe storms and flooding decrease habitat availability	**Status**: Future **Confidence**: Suspected **Consequence**: Severe **Trend**: Increasing **Extent**: Across entire range	Increased severity of storms and flooding associated with climate change are likely to increase erosion and sedimentation of the streams inhabited by *G. supremus*. Increased high flows may also enhance opportunities for predator invasion through barrier drown-out or damage, leading to new, temporary pathways (Raadik et al. 2010, Raadik 2019). The climate projections for the region suggest, with high confidence, that while mean annual rainfall is projected to decline, heavy rainfall intensity is projected to increase (Timbal et al. 2015).

i) Eligibility against criteria

Assessment of the species reduction in abundance, geographic distribution or genetic diversity (under clause 271 of the Fisheries Management (General) Regulation 2019)

In 2015 the NSW Government signed an Intergovernmental Memorandum of Understanding on the Agreement on a Common Assessment Method for listing of threatened species and threatened ecological communities (the CAM). The CAM provides a nationally consistent approach to assessing and listing threatened species in Australia, using the IUCN Redlist Categories and Criteria (Version 3.1). To ensure that this Proposed Determination meets the requirements under the CAM, an assessment against the IUCN Redlist Categories and Criteria (Version 3.1) has been included. This assessment also reflects the requirements for listing species provided under clause 271 of the Fisheries Management (General) Regulation 2019. For more information on the CAM please visit
http://www.environment.gov.au/biodiversity/threatened/cam

FSC assessment of eligibility against the criteria:

A. Population size reduction

Criterion 1. Population size reduction (reduction in total numbers)
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered Very severe reduction	Endangered Severe reduction	Vulnerable Substantial reduction
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.

base

(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

Category and criteria (or Data Deficient): Insufficient data.

Eligibility against the criteria: There is insufficient data to determine eligibility of *G. supremus* for listing under Criterion A.

The species is thought ot have been more widely distributed and is likely to have experienced a decline in the population, however this is likely to have occurred outside the assessment timeframe (10 years) and there is no data available. In terms of subcriterion A3, it is projected that there will be a population reduction in the future due to the threats imposed on the species. Namely, a decline in AOO, EOO and quality of habitat is anticipated due to climate change as increasing temperatures and reduced moisture availability as well as increased frequency and intensity of bushfires (NSW OEH 2014). Invasive trout

		species remain a threat, particularly as they continue to be stocked in the vicinity of localities that support *G. supremus* (NSW DPI Fisheries, stocking database).
B.	Geographic range	

Criterion 2. Geographic distribution as indicators for either extent of occurrence AND/OR 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 indicating distribution is precarious for survival:			
(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			

Category and criteria (or Data Deficient): Critically Endangered B1ab(i, ii, iii, iv).

Eligibility against the criteria: Based on records available from the Atlas of Living Australia, the Extent of Occurrence (EOO) was estimated at 20 km² (actual EOO of 10 km²) and the Area of Occupancy (AOO) at 20km² estimated using the recommended 2 x 2 km grid methodology in GeoCAT (Bachman et al. 2011; IUCN Standards and Petitions Committee 2022). The EOO meets the threshold for listing as Critically Endangered under Criterion B1 and the AOO meets the threshold for listing as Endangered under Criterion B2.

In addition to the distribution threshold, at least two of three other conditions must be met. These conditions are:

a) Severely fragmented OR number of locations

There are four, small subpopulations of *G. supremus*. All four are isolated from one another by the presence of predatory trout in inter-connecting streams.While there are 4 subpopulations, their limited range and the pervasiveness of threats (e.g. fire) suggests that 1 location is the best estimate to use for assessment. Each subpopulation is vulnerable to invasions by trout from downstream, either through upstream expansion past existing fish passage barriers, or through deliberate translocations. Whilst there is a high probability that individual subpopulations could become extinct, and there is limited probability of recolonisation, there is no information on the viability of subpopulations to determine if the severely fragmented subcriterion is applicable.

The species' highly restricted distribution, at one location, leaves it highly vulnerable to extinction from a single stochastic event or disturbance, accident, or other threat. Yet, at this stage,

<table>
<tr><td></td><td></td><td>it is concluded that insufficient data exists to assess changes in population size.

b) Continuing decline projected in (i) extent of occurrence (ii) area of occupancy and (iii) quality of habitat.

Based on observations of the rapid decline of and local extinction of galaxiids following the invasion/introduction of trout (Tilzey 1976, Lintermans 2000, McDowall 2006), it is projected that the geographic distribution of the species will continue to decline in the future. Invasion of any of the four locations occupied by G. supremus by trout, either through upstream expansion past existing fish passage barriers or through deliberate translocations, would result in rapid declines in each of EOO and AOO. The risk of this occurring within a period of three generations (10 years) is considered high.

Increasing intensity and/or frequency of fire, droughts and floods as well as feral horses is projected to result in the reduction of habitat quality.</td></tr>
<tr><td>C.</td><td>Small population size and decline</td><td>
<table>
<tr><th colspan="5">Criterion 3. Population size and decline</th></tr>
<tr><td colspan="2"></td><td>Critically Endangered
Very low</td><td>Endangered
Low</td><td>Vulnerable
Limited</td></tr>
<tr><td colspan="2">Estimated number of mature individuals</td><td>< 250</td><td>< 2,500</td><td>< 10,000</td></tr>
<tr><td colspan="5">AND either (C1) or (C2) is true</td></tr>
<tr><td>C1</td><td>An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)</td><td>Very high rate
25% in 3 years or 1 generation
(whichever is longer)</td><td>High rate
20% in 5 years or 2 generation
(whichever is longer)</td><td>Substantial rate
10% in 10 years or 3 generations
(whichever is longer)</td></tr>
<tr><td>C2</td><td>An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">(a)</td><td>(i) Number of mature individuals in each subpopulation</td><td>≤ 50</td><td>≤ 250</td><td>≤ 1,000</td></tr>
<tr><td>(ii) % of mature individuals in one subpopulation =</td><td>90 – 100%</td><td>95 – 100%</td><td>100%</td></tr>
<tr><td>(b)</td><td>Extreme fluctuations in the number of mature individuals</td><td></td><td></td><td></td></tr>
</table>
Category and criteria (or Data Deficient): Insufficient data.

Eligibility against the criteria: There are no estimates of numbers of mature individuals, population-size, or any population-decline data that will allow assessment of G. supremus for eligibility for listing under Criterion C.</td></tr>
<tr><td>D.</td><td>Very small or restricted population</td><td>
<table>
<tr><th colspan="4">D. Very small or restricted population</th></tr>
<tr><td></td><td>Critically Endangered</td><td>Endangered</td><td>Vulnerable</td></tr>
<tr><td>D. Number of mature individuals</td><td>< 50</td><td>< 250</td><td>D1. < 1,000</td></tr>
<tr><td>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.</td><td>-</td><td>-</td><td>D2. typically:
AOO < 20 km^2 or
number of locations ≤ 5</td></tr>
</table>
Category and criteria (or Data Deficient): Insufficient data.</td></tr>
</table>

<table>
<tr><td></td><td></td><td>Eligibility against the criteria: The number of mature individuals of G. supremus is presently unknown, making assessment against Criterion D1 not possible.

The restricted AOO of 20 km^2, only four known locations, and plausible future threats that could drive the species to Critically Endangered or Extinct in a very short time satisfy the elements of Criterion D2 to make it eligible for listing as D2 Vulnerable.</td></tr>
<tr><td>E.</td><td>Quantitative analysis</td><td>
<table>
<tr><th colspan="4">Criterion 5. Quantitative Analysis</th></tr>
<tr><td></td><td>Critically Endangered
Immediate future</td><td>Endangered
Near future</td><td>Vulnerable
Medium-term future</td></tr>
<tr><td>Indicating the probability of extinction in the wild to be:</td><td>≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)</td><td>≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)</td><td>≥ 10% in 100 years</td></tr>
</table>

Category and criteria (or Data Deficient): Insufficient data.

Eligibility against the criteria: Presently, quantitative analysis has not been undertaken for G. supremus.</td></tr>
</table>

j) **Fisheries Scientific Committee conclusion pursuant to Section 220F of the NSW Fisheries Management Act 1994**:

It is the opinion of the NSW Fisheries Scientific Committee that *Galaxias supremus* is facing an extremely high extinction risk in New South Wales in the immediate future, as determined in accordance with criteria prescribed by the regulations.

237 Criteria—reduction in abundance, geographic distribution or genetic diversity

(1) It is observed, estimated, inferred or reasonably suspected that the species has undergone, or is likely to undergo, within a time frame appropriate to the life cycle and habitat characteristics of the taxon—

(a) for critically endangered species—an extremely large reduction in 1 or more of the following—

(i) an index of abundance appropriate to the taxon,

(ii) geographic distribution,

(iii) genetic diversity

The species is eligible to be listed as a CRITICALLY ENDANGERED SPECIES

k) Additional information

i Fisheries Scientific Committee Management Recommendations for *G. supremus*

Recommended management and research actions that will benefit the conservation of the species:

- Following fires, implement management responses where possible to prevent/reduce ash and sediment deposition into streams with post-fire rainfall
- Consider physiological tolerances to post-fire changes in water temperature and water oxygen saturation as triggers for emergency extraction/relocation of fire-affected subpopulations.
- Carry out surveys to identify new populations of the species (to determine contemporary geographic range), to identify sites suitable for future translocations (predator-free or suitable if predators removed), and potential sites for trout barrier installation.
- Monitor to track the trajectory of known populations
- Extract a portion of each remaining population into ex situ captive management as an insurance against the extinction of the species in the wild.
- Population genetic analysis of current and new populations, to inform genetic management of populations and guide captive breeding and translocation plans.
- Undertake predator (trout) removal, if present, from potential translocation sites.
- Assessment of all populations for security from trout incursion: implement annual predator detection and removal for less secure sites, and every 5 years (or following 1: 50 yr rainfall events) at other locations.
- Development of a detailed captive breeding plan and undertake breeding.
- Development of a detailed translocation plan and undertake translocations to establish additional, viable populations to spread extinction risk (reintroduction or assisted colonisation) or to bolster populations (reinforcement).
- Management measures to reduce the abundance of feral horses within the distribution of *G. supremus*.
- Study into the species' ecology (reproduction, growth, longevity, habitat use and requirements, age, movement).

ii Priorities Action Statement

The NSW Department of Primary Industries Priorities Action Statement (PAS) is a statutory, non-regulatory document addressing each threatened species, population, ecological community and key threatening process (KTP) listed on the schedules of the *Fisheries Management Act 1994*. The PAS provides an agreed list of strategies and actions that will assist to down-grade or de-list species, populations and ecological communities from the threatened species schedules of the *Fisheries Management Act 1994*, as well as actions that will assist to abate or eliminate the impacts of KTPs.

The draft Priorities Action Statement for the *Galaxias supremus* is being drafted as part of the NSW listing process and will be available on the NSW DPI Website when finalised at www.dpi.nsw.gov.au/fishing/threatened-species/priorities-action-statement

l) Statement on the standard of scientific evidence and adequacy of survey:

This assessment has been prepared by the Fisheries Scientific Committee in good faith using the highest possible standard of scientific evidence and adequacy of survey.

As prescribed under Section 4 of the Intergovernmental MOU on the CAM, in preparing this documentation the Committee gave consideration to:
(i) the nature of the data, including adequacy of survey (occurrences) and monitoring (to detect change), including factors such as sampling design, effort applied, number of variables considered, proportion of a species' range covered, time period covered etc.;
(ii) the number of data sets relevant to the conclusion;
(iii) the range of uncertainty in the data and degree of consistency between different data sets;
(iv) the source of the data and its credibility; and
(v) the relevance of the data to the particular assessment criterion.

References

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