The Minister approved this Conservation Advice and included this species in the Critically Endangered category, effective from 05 May 2016

Conservation Advice

Galaxias rostratus

flathead galaxias

Taxonomy

Conventionally accepted as *Galaxias rostratus* Klunzinger, 1872.

Summary of assessment

Conservation status

Critically Endangered: Criterion 1 A2(a).

The highest category for which *Galaxias rostratus* is eligible to be listed is Critically Endangered.

Galaxias rostratus has been found to be eligible for listing under the following listing categories:
Criterion 1 A2(a): Critically Endangered.
Criterion 2 B2(a),(b)(ii),(iv): Endangered.

Species can be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Reason for conservation assessment by the Threatened Species Scientific Committee

This advice follows assessment of information provided by New South Wales as part of the process to systematically reviewing species that are inconsistently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and relevant state and territory legislation/lists.

Public Consultation

Notice of the proposed amendment and a consultation document was made available for public comment for 33 business days between 28 July 2015 and 11 September 2015. Any comments received that were relevant to the survival of the species were considered by the Committee as part of the assessment process.

Species Information

Description

Galaxias rostratus (flathead galaxias) is sometimes historically referred to as *Galaxias planiceps*, which is a synonym. The flathead galaxias is a small freshwater fish that belongs to the family Galaxiidae, the species of which are commonly referred to as 'galaxiids'. The galaxiid group of fish species is the most specious group of southern freshwater fishes in Australia. Galaxiids are characterised by a streamlined, elongate, almost cylindrical, scaleless body with a single dorsal fin and pelvic fins which are positioned centrally along the length of the body (Allen et al., 2002). Galaxiids are found in cool latitudes on all major landmasses in the southern hemisphere, including Australia, New Caledonia, New Zealand, Southern Africa and South America (Allen et al., 2002). Some galaxiid species migrate between freshwater, where they are born, to marine environments, and back again to freshwater to grow as adults and spawn (Allen et al., 2002).

The flathead galaxias grows to a maximum total length of 150 mm, but rarely exceeds 100 mm, and a maximum weight of 22.5 g (Lintermans 2007; NSW FSC 2008). The species is olive-green in colour on the back and sides with a silvery belly and transparent fins (Allen et al., 2002; Lintermans 2007). The flathead galaxias is similar in appearance to *G. maculatus* (common galaxias), but is distinguished by its flattened top of the head and the lower jaw which can slightly protrude, which are not diagnostic characteristics of the common galaxias (Allen et al., 2002; Lintermans 2007).

A recent taxonomic revision of the *G. olidus* (mountain galaxias) complex recognised 12 new species of galaxias (Raadik 2014). One of those species in particular, *G. oliros* (obscure galaxias), shares a similar range to the flathead galaxias and occurs across the same Murray-Darling Basin catchments (Raadik 2014). The flathead galaxias is distinguished from the obscure galaxias by its anal fin origin directly below the dorsal fin origin, whereas in the obscure galaxias, the anal fin origin is distinctly posterior to the dorsal fin origin (Raadik 2014).

Distribution

The flathead galaxias is only known from the southern half of the Murray-Darling Basin system. The species once occurred in the middle reaches, usually below 150 m in altitude, of the Lachlan, Murrumbidgee and Murray river catchments in New South Wales, and the Mitta Mitta, Kiewa, Ovens, Loddon, Goulburn and Murray river catchments in Victoria (Allen et al., 2002; Llewellyn 2005; Lintermans 2007; Museum Victoria 2015). There have been isolated records from a lagoon near Bathurst in New South Wales (in the Macquarie River catchment) and from the Lower Murray River in South Australia (Lintermans 2007).

The flathead galaxias inhabits a variety of habitats including billabongs, lakes, swamps and rivers, with a preference for still or slow flowing waters. The species has a preference for schooling in midwater (Allen et al., 2002; Lintermans 2007).

Relevant Biology/Ecology

As an adaption to living in still or slow flowing waters, the flathead galaxias ventilate their gills within the thin oxygenated layer near the water surface (McNeil & Closs 2007). The flathead galaxias spawns in spring, in August and September, when water temperatures rise above 10.5°C (Llewellyn 2005). Fecundity increases with fish length, with a fish of 86 mm having 2300 eggs and a 136 mm fish having 7000 eggs (Llewellyn 2005). Eggs are demersal, round and slightly adhesive (Llewellyn 2005). Eggs are spawned randomly, and can be at multiple sites to reduce risk of all being lost by impact at one location, and settle on the bottom of the water habitat where adults are inhabiting (Llewellyn 1971; Llewellyn 2005).

There are indications that the flathead galaxias has a preference for moving upstream in November and December, however, little else is currently known about their ecology (Lintermans 2007).

Threats

While it is difficult to identify with certainty any particular threat or group of threats that are negatively impacting on the flathead galaxias, it is likely that a combination of river regulation and its associated effects of diminishing lateral connectivity, habitat degradation, competition with and predation by alien fish species and water pollution are negatively impacting on the species (NSW FSC 2008).

River regulation throughout the Murray-Darling Basin has involved the construction of approximately 4000 barriers to fish movement in the form of dams, weirs and other structures and the vast majority do not have fishways (Lintermans 2007). These structures can severely limit or completely prevent migration and recolonisation of areas which have been depleted. “Barriers” or impediments to fish passage, resulting from the construction and operation of dams, weirs, levees, culverts and also “non-physical barriers” such as increased velocities, reduced habitats, water quality and thermal pollution, was identified as one of eight key threats to native fish populations by the *Native Fish Strategy for the Murray-Darling Basin 2003–2013* (MDBC 2003).

Water resource development within the Murray-Darling Basin has profoundly changed seasonal and inter-annual flow regimes, including reducing floodplain inundation (Kingsford et al., 2015). Infrastructure constructed in catchments and along the waterways, resulting in loss or altered connectivity between rivers and floodplains could potentially be negatively impacting upon the species (NSW FSC 2008; NSW DPI 2014). Indications are that lateral connectivity is important for the small-bodied fish community (Lyon et al., 2010). While recent fishway construction programmes have focussed towards restoring longitudinal connectivity in the temperate south-eastern rivers of Australia, up until 2008 no regulators controlling flow into lateral areas had had fishways installed (Jones and Stuart, 2008). The trial of several potential management and engineering solutions has been recommended to improve river floodplain connectivity in lowland rivers (Jones & Stuart 2008). Recent environmental water priorities are focussed on floodplain inundation to provide lateral connectivity (MDBA 2015).

Habitat degradation caused by the agricultural practices removing riparian vegetation, and the resulting siltation of waterways are potentially threatening to the flathead galaxias. These changes have likely led to the loss of aquatic vegetation like ribbon weed (*Vallisneria* spp.) (NSW FSC 2008; NSW DPI 2014), which the flathead galaxias is considered to have an association with (Allen et al., 2002).

Competition with and predation by alien fish species, including carp (*Cyprinus carpio*), redfin perch (*Perca fluviatilis*), gambusia (*Gambusia holbrooki*) and possibly trout and other Salmonids (Family Salmonidae), is potentially threatening the flathead galaxias (Allen et al., 2002; McDowall 2006; Lintermans 2007; NSW FSC 2008; NSW DPI 2014).

Early records indicate that carp were first introduced into Australia as early as the 1860s, but these strains showed no signs of spreading (Shearer & Mulley 1978). The ‘Boolara strain’ was imported illegally from Germany in the 1950s, and in the 1960s was illegally introduced into watercourses in the Murray-Darling Basin (Rhodes 1999; Koehn et al., 2000). There is now a ubiquitous and dominating presence of carp across the Murray-Darling Basin, and it has become the most abundant large freshwater fish in southeastern Australia (Koehn 2004; Davies et al., 2012). Carp disturb native fish habitats by raising turbidity and destroying submergent macrophytes (Roberts et al., 1995; Roberts & Sainty 1996; Villizi et al., 2014) in areas which may be important nursery and feeding habitats for flathead galaxias.

Redfin perch are a fast-breeding, voracious predatory fish introduced to mainland Australia in 1860s (Weatherley 1977; Cadwallader & Backhouse 1983; Lintermans 2007). The species is widely distributed through the lower Murray-Darling Basin, being restricted to water temperatures less than 31°C (Weatherley 1963a; 1963b; 1977). The species does not occur in Queensland waterways of the Murray-Darling Basin (Lintermans 2007). Redfin perch are noted as being the main host of Epizootic Haematopoietic Necrosis Virus (EHNV) (Langdon et al., 1986; Langdon & Humphrey 1987; Langdon 1989), to which several galaxiid species are susceptible (Langdon 1989). It is currently unconfirmed whether the flathead galaxias is also susceptible to EHNV.

Gambusia, native to the Gulf of Mexico, were introduced to Australia in the mid-1920s to control mosquito larvae (Cadwallader and Backhouse 1983; Lloyd & Tomasov 1985; Arthington 1991). The species was distributed widely around Australia during the Second World War to military camps and is now found widely across the Murray-Darling Basin (Lintermans 2007). Mosquito larvae have subsequently been found not to be a prominent part of the species' diet (Lintermans 2007) and native fish species have long been considered to be a more effective control than gambusia (Lake 1978). Gambusia are a vector for Asian fish tapeworm (Dove & Fletcher 2000), and are known to harass and impact small native fish through fin-nipping and physical displacement (Warburton & Madden 2003; Tonkin et al., 2011). Modelling of the impacts of gambusia on fish species diversity has predicted that small-bodied, wetland specialist species sharing dietary and habitat preferences, such as the flathead galaxias, would be the most severely impacted fish species of gambusia invasion in wetland systems in southeastern Australia (MacDonald et al., 2012).

A range of Salmonid species (family Salmonidae) originating from the northern hemisphere have been introduced to the Murray-Darling Basin, including Atlantic salmon (*Salmo salar*), brown trout (*S. trutta*), brook char (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*). Of these, brown and rainbow trout have been the most successful of the species. These trout species are widely distributed in the upland regions of the Murray-Darling Basin in the Australian Capital Territory, New South Wales and Victoria, but are rarely recorded in lowland waters (Lintermans 2007). However, there are locations such as Lake Hume and further upstream along the Murray River which support both brown and rainbow trout (Hunt et al., 2011), hence Salmonid species overlap in distribution with the flathead galaxias. Given the threat Salmonid species pose to other galaxiid species (McDowall 2006), Salmonid populations may also represent a serious threat to flathead galaxias in areas where the species co-occur.

Water pollution caused by domestic, agricultural and industrial sources could also be impacting negatively on the species (NSW FSC, 2008).

How judged by the Committee in relation to the EPBC Act Criteria and Regulations

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.

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 1 A2(a) for listing as Critically Endangered

The flathead galaxias is reported in older literature sources and records as being abundant, with a widespread but patchy distribution throughout the southern Murray-Darling Basin in the Lachlan, Murrumbidgee and Murray river catchments in New South Wales, usually below 150 m in altitude, and the Mitta Mitta, Kiewa, Ovens, Loddon, Goulburn and Murray river catchments in Victoria (Lake 1967; 1978; Cadwallader 1979; Merrick & Schmida 1984; King et al., 2003; Llewellyn 2005; Lintermans 2007; McNeil & Closs 2007; Beesley et al., 2014; Museum Victoria 2015). Additionally, Lintermans (2007) reports that there are interesting, unusual outlying records of the species from before 1980 from the Lower Murray in South Australia and near Mildura, a lagoon near Bathurst in the Macquarie River catchment (noting that the Macquarie River flows into the Darling River).

Probably the most comprehensive fish presence/absence study of recent times, the Sustainable Rivers Audit (see reports 1 and 2), which sampled fish assemblages across each of the 23 major river valleys in the Murray-Darling Basin, failed to sample a single individual of flathead galaxias in samples collected between 2004 and 2010; while noting that it considered the species mainly a wetland species, and that the sampling program did not occur in wetlands within the river valleys (Davies et al., 2008; Davies et al., 2012). Another study, undertaken at about the same time, that sampled in the lower Murray River from the Murrumbidgee confluence to the South Australian border, and included sampling of floodplain wetlands within 2.5 km of the riverine sampling sites, did not detect any individuals of flathead galaxias (Gilligan 2005a).
The study's author concluded that the species is likely to be locally extinct in the Lower Murray-Darling catchment (Gilligan 2005a) and referred to observations made by J.O. Langtry in his

1949 and 1950 surveys that the flathead galaxias[1] "have been taken through the system (Murray)" (Cadwallader 1977).

The species is absent from South Australia (Harris et al., 2013). There was an old record before 1980 from the lower Murray in South Australia, but no individuals have been recorded in the past 30 years (Lintermans 2007).

In New South Wales, historical records show that the species was widespread in the southern Murray-Darling Basin system, and while the species' occurrence was patchy and intermittent, it was often recorded as being locally abundant in suitable habitats (NSW FSC 2008). Surveys between 1966 and 1971 collected high numbers of individuals of flathead galaxias at Willow Dam, approximately 23 km northwest of Griffith, which is a part of the Barren Box Storage and Wetland, which are in turn part of the Murrumbidgee Irrigation Area (Llewellyn 2005). The species was also collected in high numbers at a water regulator near Yanga Lake and a swamp outlet near Balranald, which close to the lower Murrumbidgee River (Llewellyn 2005). The species was also collected from Bartley's Dam, on the floodplain of Poison Water Hole Creek, which is a tributary of the Murrumbidgee River, near Narrandera (Llewellyn 2005). And two individuals were collected from Lake Brewster (sometimes known as Lake Ballyrogan) 45 km east of Hillston, which is just off the Lachlan River (Llewellyn 2005).

The comprehensive 'NSW Rivers Survey' which sampled between 1994 and 1996 across all New South Wales tributaries of the Murray River, including the Murrumbidgee and the Lachlan rivers, failed to detect a single flathead galaxias (Harris & Gehrke 1997).

There are a few rare records of the species from sampling in the Murrumbidgee River in 1995. Individuals were collected from the Murrumbidgee River at: about 1 km downstream of Maude Weir; Meriola Reserve about 20 km east of Hay; Nulabor Reserve about 25 km east of Hay, and; at Long Beach about 15 km south of Leeton (Australian Museum 2015). Sampling since 1996 in the Murrumbidgee catchment, and including sampling of wetlands on the Murrumbidgee in 1998 (Gilligan 2005b), and including at sites near Balranald over 2000 and 2001 (Baumgartner 2004), has failed to detect the species since. A study that sampled many sites across the Murrumbidgee River catchment in 2004 failed to detect any flathead galaxias individuals and notes that the species was formerly common around Narrandera and in Willow Dam; and considers the species to be locally extinct in the Murrumbidgee catchment (Gilligan 2005b). The Committee is unaware of any individuals being recorded in the Murrumbidgee River catchment since 1995 (Gilligan 2005b; Lintermans 2007; ALA 2015).

Studies in the upper Murray River have only detected small numbers of flathead galaxias recently. There are records of small numbers from near Tintaldra between 1992 and 1993 and a record from near Albury in 2003 (NSW FSC 2008). Collections by T.A. Raadik in 2002 and 2003 sampled individuals at Cudgewa Creek (a tributary of the upper Murray River) about 2 km west of Tintaldra and at Normans Lagoon just off the Murray River in Albury (Museum Victoria 2015). The fish was recorded at sites in the mid-Murray River between 2010 and 2012 after floods which occurred during the summer of 2010/11 (Beesley et al., 2014). Only seven individuals were captured: two at Snake Island about 10 km west (and downstream) of Howlong; two at Banyandah about 8 km west of Howlong, and; three at Dairy Lagoon about 5 km south west of Corowa (Beesley pers. comm., 2015).

[1] J.O. Langtry referred to, and likely confused, flathead galaxias as *G. attenuatus* (a synonym of the common galaxias (*Galaxias maculatus*)), which is similar species found in coastal habitats and only extends up to Mannum on the Lower Murray River in South Australia (Lintermans 2007).

Flathead galaxias were recorded in Tahbilk Lagoon in Victoria in the early 1980s and during miscellaneous surveys undertaken by the Australian and New Guinea Fish Association in the 1990s (Clunie et al., 2008). However, surveys of 19 sites in Tahbilk Lagoon in 2008 did not detect a single individual of the species (Clunie et al., 2008). The species was recorded in a survey in the summer months of 1977/78, in the Seven Creeks river system in Victoria (tributaries of the Goulburn River), in stream channels up to 5 m wide and 1 m deep (Cadwallader 1979). The species was collected from billabongs on the Ovens River floodplain between 1996 and 1998 (McNeil & Closs 2007) and in 2000 (King et al., 2003). However, one-off sampling of 93 sites of the middle Murray region of Victoria in 2009 and 2010, which included sites in wetlands in the Goulburn and Lower Ovens river catchments failed to detect a single individual of the species (MacDonald et al., 2012).

Collections by T.A. Raadik between 2001 and 2002, found small numbers of flathead galaxias locations within central and northeastern Victoria. Small numbers of individuals were found in central Victoria: in the Yea River at Yea (a tributary of the Goulburn River), and; a billabong just off the Goulburn River approximately 4 km south of Alexandra. Small numbers of individuals were also taken in northeastern Victoria at Gap Creek in Kergunyah (a tributary of the Kiewa River) and at Sandy Creek about 4 km north of the town of Sandy Creek (a tributary of the Mitta Mitta River). There is also a record collected by T.A. Raadik in 2013 in upper Wanalta Creek about 10 km southwest of Rushworth (which discharges into the Corop Lakes system) (Museum Victoria 2015).

In summary, the species is now presumed locally extinct from the Lachlan, Murrumbidgee and lower Murray river catchments in New South Wales and the lower Murray River in South Australia. The species may be present still in billabongs, dams, lagoons and other waterways in the upper Murray River catchment, but only a small number of individuals have been collected from this area over the past 15 years. There may also be populations of the species existing in billabongs and lagoons in the Murray-Darling system rivers of Victoria, including (from east to west) the Mitta Mitta, the Kiewa, the Ovens, the Loddon and the Goulburn river catchments, and the Corop Lakes system, but surveys have only detected the species in these areas inconsistently and rarely.

The generation length is unknown for flathead galaxias. However, the lifespan of the closely-related common galaxias (*G. maculatus*) is considered to be approximately than three years, with maturity being reached at the end of its first year (Lintermans 2007). Based on these estimates, generation time for this species would be approximately two years. Therefore, if the three generation time of flathead galaxies is less than 10 years, the appropriate timespan for consideration of declines under this criterion needs to be 10 years.

The data presented above appear to indicate that the flathead galaxias has experienced a very severe reduction in population numbers as a direct observation in numbers sampled over the past 50 years. While sampling has not been comprehensive within the last 10 years relevant to this criterion, the sampling that has been undertaken shows the species to be absent, or present in low numbers, in areas where it was previously common.

In this context, and with most of the putative threats still active, the Committee considers that the species has undergone a very severe reduction in population size, of greater than 80 percent, and that the reduction may not have ceased. Therefore, the Committee considers that the flathead galaxias has been demonstrated to have met the relevant elements of Criterion 1 to make it eligible for listing as Critically Endangered.

Criterion 2. Geographic distribution is precarious for either extent of occurrence AND/OR 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 2 B2(a),(b)(ii),(iv) for listing as Endangered

When records of flathead galaxias are mapped, the extent of occurrence is calculated to be 23 065 km^2 and the area of occupancy is calculated to be 84 km^2 (DotE 2015). Therefore, the area of occupancy is classified as restricted. The geographic distribution is likely to be severely fragmented given that river regulation throughout the Murray-Darling Basin has involved the construction of thousands of barriers to fish movement throughout the system (Lintermans 2007), likely restricting movement between remaining populations. These structures can severely limit or completely prevent migration and recolonisation of areas which have been depleted. There are indications that the flathead galaxias has a preference for moving upstream in November and December (Lintermans 2007). Continuing decline in the area of occupancy and the number of locations or subpopulations is inferred, given that most of the putative threats are still active and may be still negatively impacting on the species into the future.

In this context, the Committee considers that the species' area of occupancy is restricted, and the geographic distribution is precarious for the survival of the species because its occurrence is severely fragmented and continued decline in area of occupancy and number of locations and subpopulations may be inferred. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it eligible for listing as Endangered.

Criterion 3. Small population size and decline				
		Critically Endangered Very low	**Endangered Low**	**Vulnerable Limited**
Estimated number of mature individuals		**< 250**	**< 2,500**	**< 10,000**
AND either (C1) or (C2) is true				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	**Very high rate 25% in 3 years or 1 generation (whichever is longer)**	**High rate 20% in 5 years or 2 generation (whichever is longer)**	**Substantial rate 10% in 10 years or 3 generations (whichever is longer)**
C2	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:			
(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:

Insufficient data to determine eligibility

It is currently impossible to estimate the number of mature individuals existing in wild populations as there has been insufficient intensive sampling of all billabongs, dams, lagoons and waterways across the Murray-Darling Basin to estimate a number with confidence. Therefore, the Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 4. Very small population			
	Critically Endangered Extremely low	**Endangered Very Low**	**Vulnerable Low**
Number of mature individuals	**< 50**	**< 250**	**< 1,000**

Evidence:

Insufficient data to determine eligibility

It is currently impossible to estimate the number of mature individuals of flathead galaxias existing in wild populations as there has been insufficient intensive sampling of all billabongs, dams, lagoons and waterways across the Murray-Darling Basin to estimate a number with confidence. Therefore, the Committee considers that there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

Criterion 5. Quantitative Analysis			
	Critically Endangered Immediate future	**Endangered Near future**	**Vulnerable Medium-term future**
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**

Evidence:

Insufficient data to determine eligibility

Population viability has not been undertaken for flathead galaxias.

Therefore, the Committee considers that there are insufficient data to demonstrate if the species is eligible for listing in any category under this criterion.

Conservation Actions

Recovery Plan

Many of the threats to the flathead galaxias are threats to other EPBC Act-listed threatened fish species that occur within the Murray-Darling Basin. Actions and mechanisms that are being implemented through a variety of other existing programs (including in other species recovery plans, water management plans, actions being undertaken by relevant catchment management authorities) are likely to be of benefit to this species. In particular, with regard to the threat posed by river regulation and its associated negative impact on lateral connectivity, an objective of the *Basin Plan 2012* (paragraph 8.06(3)(b)) is “to protect and restore connectivity within and between water-dependent ecosystems, including by ensuring that ecological processes dependent on hydrologic connectivity laterally between watercourses and their floodplains (and associated wetlands)”.

This approved Conservation Advice provides sufficient direction, especially for the immediate term under ‘*Information and research priorities*’ (below), and it is unlikely sufficient extra direction would be provided to necessitate a recovery plan for the species. Given that the threats to the species are poorly understood, prioritisation of recovery actions under a recovery plan to address these threats may be a little premature until there is a greater understanding of the species, which can be gained from targeted research that can be undertaken outside the confines of species-specific recovery plan.

Primary Conservation Objectives

Halt decline and stabilise populations in the immediate term, then recover the range of the flathead galaxias to historical extent and rebuild populations.

Conservation and Management Actions

- Implement management and engineering solutions to physical barriers, such as dams, weirs, levees, culverts, to improve river-floodplain connectivity, targeting areas of the Murray-Darling Basin where flathead galaxias are found, or have been known to occur.

- Explore the use of larger environmental flow events, particularly the use of environmental water to "top-up" natural flood events, so that off-stream billabongs, lagoons and wetlands receive sufficient watering at appropriate times to encourage breeding, spawning, movement and recruitment.
- Implement, or supplement existing programs to include a targeted control program for alien fish species, especially carp (*Cyprinus carpio*) but also other species such as redfin (*Perca fluviatilis*), Salmonids (Family Salmonidae) and gambusia (*Gambusia holbrooki*), in the billabongs, lagoons, wetlands and dams known to contain the species.
- Implement, or supplement existing programs to include a seeding program of native aquatic plants (such as native *Vallisneria* spp.) in the billabongs, lagoons, wetlands and dams known to contain flathead galaxias (as identified by the action under '*Information and research priorities'* below).

Monitoring priorities

- Implement a targeted, and if possible non-lethal, monitoring program to establish the current extent of occurrence, area of occupancy and population abundance.
- Implement a monitoring program to determine the effectiveness of the management actions being implemented to recover the species.
- Consider the potential to identify waterways the species is occurring within using eDNA techniques. The low abundance and difficulty in collecting the species may mean that eDNA provides the best opportunity to detect the species and document the species' range.

Information and research priorities

- Identify refuge habitats (river reaches and wetlands) that are strongholds for the species (i.e. consistently support the species) through investigative research, rather than just monitoring, which incorporates genetic sampling from the outset to establish baseline genetic information.
- Given that flathead galaxias were bred in earthen ponds in the late-1960s (Llewellyn 2005), urgently assess the likelihood of successful captive breeding programs at hatcheries, and then based on those results implement a collection program to source broodstock and initiate a breeding program to stock waterways with the species.
- Investigate the suitability of undertaking translocations of genetic sub-stocks, of both wild and/or captive-bred fish, to protected mesocosms (ponds and wetlands) to create a repository population.Increase understanding of the species' life history characteristics, including seasonal migration patterns and habitat preference, longevity, age-at-maturity, fecundity and growth rates.
- Increase understanding of the level and type of habitat degradation that is specifically impacting upon this species (i.e. the current availability of permanent billabongs, lagoons, wetlands and dams and regularity of flood-enabling movement events).

Recommendations

(i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the Critically Endangered category:

Galaxias rostratus

(ii) The Committee recommends that there not be a recovery plan for this species.

Threatened Species Scientific Committee

10/11/2015

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