

THREATENED SPECIES SCIENTIFIC COMMITTEE

Established under the *Environment Protection and Biodiversity Conservation Act 1999*

The Minister's delegate approved this Conservation Advice on 16/12/2016

Conservation Advice

Galaxias fontanus

Swan galaxias

Conservation Status

Galaxias fontanus (Swan galaxias) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from 16 July 2000. The species was eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Endangered under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

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

The main factors that make the species eligible for listing in the Endangered category are that the Swan galaxias had experienced past decline, it had a limited distribution that was severely fragmented and continuing decline was inferred given the presence of introduced fish species in areas where some of the populations occur (TSS 2006).

Description

The Swan galaxias, family Galaxiidae, is a small, stout freshwater fish, reaching a maximum length of approximately 135 mm (Allen et al., 2002; TSS 2006). Adults are light olive-green in colour with light brown bars or blotches on the back and sides, tending to silvery-white on the underside (Allen et al., 2002; TSS 2006). The head is relatively broad and flattened (TSS 2006). Superficially, the Swan galaxias looks similar to a number of other galaxiid species, but is distinguished by the position of the dorsal fin origin which is directly above the vent (TSS 2006).

Distribution

The Swan galaxias is endemic to eastern Tasmania, and occurs naturally only in the headwaters of the eastern-flowing Swan River above Hardings Falls (approximately 15 km due west of Bicheno) and tributaries of the northern-flowing Macquarie River (starting approximately 25 km west of Cranbrook and waters to the south) (TSS 2006). The species may once have been more widespread, but given the presence of alien fish species in stream locations nearby and in downstream locations, they no longer exist (Davies 2005; TSS 2006). There may be as many as nine known natural populations occupying 11 km of stream length (TSS 2006). As of 2006, three of the nine natural populations (at Parramores Creek, Snaky Creek and Brodribb Creek) were considered to be at high risk of extinction given only small populations in these areas remained and brown trout (*Salmo trutta*) or redfin (*Perca fluviatilis*) had recently invaded these areas (TSS 2006). In the absence of information since, the fate of these populations is unknown. Other naturally occurring populations are known from: a tributary of the Swan River; Blue Tier Creek; Tater Garden Creek east and west; Macquarie Tier Creek, and; Dairy Creek (TSS 2006).

The Swan galaxias had also been successfully translocated to several fish-free streams, inaccessible to alien fish species (Allen et al., 2002; TSS 2006). These translocations were undertaken between 1989 and 1995 in the Cygnet, Little Swanport, Lost Falls, Macquarie, South Esk and St. Pauls river catchments, which are waterways nearby to where the species occurs naturally (TSS 2006).

The Swan galaxias occurs within the South East, the Tasmanian Northern Midlands and Ben Lomond Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions and the North and South Natural Resource Management Regions.

The distribution of the Swan galaxias is not known to overlap with any EPBC Act-listed threatened ecological community.

The Department of the Environment has prepared survey guidelines for the Swan galaxias. The survey guidelines are intended to provide guidance for stakeholders on the effort and methods considered appropriate when conducting a presence/absence survey for species listed as threatened under the EPBC Act.

<http://www.environment.gov.au/epbc/publications/threatened-fish.html>

Relevant Biology/Ecology

The Swan galaxias is the only Tasmanian galaxias that lives exclusively in freshwater streams, in contrast to those species which spend significant time in lacustrine (lake) environments or those with a marine migratory stage in the life cycle (Allen et al., 2002; TSS 2006). All habitats where the species occurs in healthy populations are free of other fish species except *Anguilla australis* (Australian shortfinned eel) and are protected from brown trout (*Salmo trutta*) invasion or establishment by some sort of barrier (such as a waterfall, marsh or variable flow) (McDowall 2006; TSS 2006). Streams are generally in forested country, of low gradient and range in size from extremely small, spring-fed streams to larger rivers (TSS 2006). Many of the streams do not flow all year but contain permanent water (TSS 2006). It is considered to be tolerant of elevated temperatures and low oxygen levels, and survives when flows decline and streams become a series of isolated pools, with no or minimal flows (McDowall 2006).

The Swan galaxias is an opportunistic carnivore and feeds on terrestrial insects, aquatic insects and crustaceans (Crook & Sanger 1998). The species is an active mid-water swimmer and both adults and juveniles can be observed swimming mid-water in pools (TSS 2006).

The spawning habitat of the Swan galaxias is currently unknown, as eggs have not been found in the wild (TSS 2006). An egg mass was deposited on the side of a pond during captive breeding trials (Jackson 2002, cited in TSS 2006), thus indicating that spawning sites may be on vertical structures or substrates rather than under rocks (TSS 2006). Individuals mature at two years of age and spawning takes place in spring (Allen et al., 2002; Davies 2005), between the months of August and October and a small number (150 - 550) of relatively large eggs for galaxiids (2.2 - 2.5 mm) are produced (Crook & Sanger 1998). Newly hatched larvae are approximately 7 - 8 mm long (Crook & Sanger 1998; TSS 2006). Populations typically include 3 - 4 age classes (TSS 2006).

Threats

Competition and predation by alien fish species is the primary threat to the Swan galaxias (Sanger & Fulton 1991; McDowall 2006; TSS 2006). Other likely threats include vegetation clearing, fragmentation due to populations being isolated from one another, construction of water storages within the catchments where the species occurs (TSS 2006) and sudden droughts and floods driven by climate change.

Table 1 – Threats impacting the Swan galaxias in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Invasive species		
Competition and predation by alien fish species	known current	The Swan galaxias can only be found in healthy abundance in sections of stream that do not have brown trout (<i>Salmo trutta</i>), and all natural populations are limited by a downstream presence of brown trout. It is highly likely that the Swan galaxias cannot continue to coexist with brown trout and other introduced species (Sanger & Fulton 1991; TSS 2006). Local extinctions have been observed in areas where brown trout or redfin perch (<i>Perca fluviatilis</i>) have invaded habitat (TSS 2006), likely caused by competition and/or predation on juveniles and/or adults. Targeted research should be directed to confirm the exact cause of these extinctions.
Fragmentation		
Isolated populations	suspected current	All natural populations are effectively isolated from one another due a downstream presence of brown trout or redfin perch preventing individuals safely moving between various upper parts of the catchments (TSS 2006). Translocated populations had been successfully established between 1989 and 1995 at a number of locations, but the proportion of natural genetic diversity they contain is not known (TSS 2006). There are concerns for bottleneck effects caused by the reduction of the small, isolated populations and genetic studies are needed (McDowall 2006).

Habitat loss, disturbance and modifications		
Vegetation clearing of areas adjacent to streams with populations	suspected future	Most of the current Swan galaxias populations occur within State Forest area (TSS 2006). The potential hydrological effects from vegetation clearing in areas adjacent to waterways with Swan galaxias (such as more frequent drying, higher or more frequent flood flows) remain a concern due to the lack of data to determine likely water yield responses (TSS 2006). The species is listed as a 'priority species requiring consideration' under the <i>Tasmanian Regional Forest Agreement 1997</i> and is therefore to be protected through the CAR (Comprehensive, Adequate and Representative) reserve system or relevant management prescriptions (TSS 2006).
Sudden stream flow changes caused by flood or drought	suspected future	All the natural populations of Swan galaxias are in small headwater streams which are vulnerable to the extreme fluctuations in stream flow characteristic of the area (Hughes 1987), which are likely to be exacerbated by climate change driven events of heavy rain followed by long periods of dry weather (Tas CCO 2012). Swan galaxias no longer have downstream refuges from floods or droughts affecting the headwaters in all of the catchments the species exists, given the presence of alien fish species, mainly brown trout and/or redfin (TSS 2006). Temporary declines in numbers have been observed at some sites due to the drought which occurred in Tasmania between the late 1990s and early 2009 (McDowall 2006; TSS 2006).
Construction of water storages in or near populations	suspected future	Construction of water storages in or near the species' populations had been identified as likely to threaten the species through inundation of habitat and alteration of flow regimes (TSS 2006). Several dams proposals have been put forward for the catchment, such as the Hardings Falls dam proposal in 1976, but to date no relatively large water storages have been built in the Swan river catchment (TSS 2006; GSB NRM 2013).

Conservation Actions

Conservation and management priorities

Invasive species

- Develop and implement a management plan for alien fish species impacting Swan galaxias, including brown trout and redfin perch.

- Cease stocking alien salmonids in Parramores Creek, Snaky Creek and Brodribb Creek where populations of Swan galaxias are considered to be at high risk of extinction.
- Cease stocking of alien salmonids in catchments which Swan galaxias inhabit, to allow the expansion of populations and to provide refuge areas downstream from where current populations are located.
- Install trout barriers so that alien salmonids cannot access Swan galaxias populations.

Habitat loss disturbance and modifications

- Consideration be given to the effects of forestry operations on catchment water yield and flow patterns required to avoid drying up of streams or increasing the frequency and size of high flows.
- Prohibit future construction of water storages in the areas in or nearby to where populations of the species occur.

Stakeholder Engagement

- Raise awareness of the Swan galaxias within the local community and with visitors, possibly as part of a broader Tasmanian threatened galaxiid communication strategy (TSS 2006), highlighting the importance of not introducing alien or non-native species into areas where there are populations of the species.
- Liaise with Forestry Tasmania with the aim to increase knowledge of the area's hydrological responses to forestry operations.
- Engage with recreational fishers about the importance of not-moving or translocating trout, and other alien fish species, around inland waters.
- Increase compliance effort to ensure that the use of Swan galaxias as live or dead bait for trout is strictly prohibited.
- Engage with private landholders and land managers responsible for areas adjacent to waterways in which remaining populations occur and encourage these key stakeholders to contribute to the implementation of conservation management actions.

Survey and monitoring priorities

- Continue to monitor of the species' population annually in the locations that the species is known to occur, and assess the effectiveness of management actions and the need to adapt them if necessary.
- Survey areas where the species previously occurred to determine whether there is any recovery.

Information and research priorities

- Undertake genetic studies to inform decisions on population protection, translocation and captive breeding, to ensure that genetic structure and diversity is maintained, given that all naturally occurring populations are isolated from each other.

- Research the effects of alien fish species, including but not limited to brown trout and redfin perch, on Swan galaxias, specifically focussing on competition and predation studies.
- Study how the species responds to drought and flood.

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