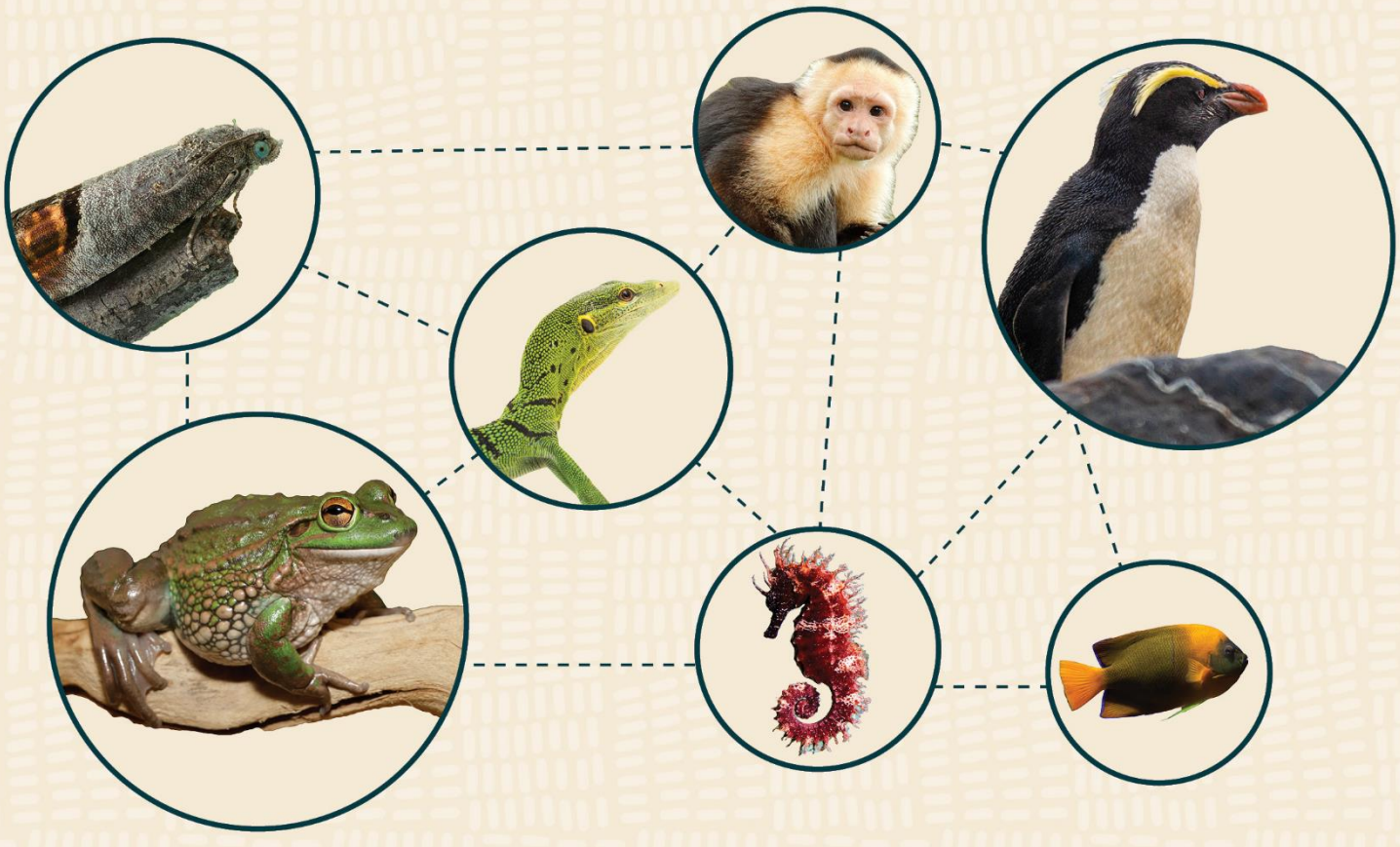
Australian Government
Department of Climate Change, Energy, the Environment and Water

Assessment of the Potential Impacts of 10 Species from the Genus *Chilatherina* on the Environment

Consideration of an application under the Environment Protection and Biodiversity Conservation Act 1999 to amend the List of Specimens Taken to be Suitable for Live Import

May 2023



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Acknowledgement of Country

We acknowledge the Traditional Custodians of Australia and their continuing connection to land and sea, waters, environment and community. We pay our respects to the Traditional Custodians of the lands we live and work on, their culture, and their Elders past and present.

Executive summary

In 2021, an application was submitted to the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) to amend the *List of Specimens Taken to be Suitable for Live Import* (Live Import List) to include 10 species from the genus *Chilatherina.* The application was prepared in accordance with s 303EE of the EPBC Act. The applicant proposes to use these species for the ornamental freshwater fish trade in Australia (for pets).

The species were:

- *Chilatherina alleni*
- *Chilatherina axelrodi*
- *Chilatherina bleheri*
- *Chilatherina bulolo*
- *Chilatherina campsi*
- *Chilatherina fasciata*
- *Chilatherina lorentzii*
- *Chilatherina pagweinsis*
- *Chilatherina pricei*
- *Chilatherina sentaniensis*

A risk assessment was undertaken to evaluate the likelihood of establishment and spread in Australia, and the potential consequences of this on the Australian environment. Several factors were considered during the assessment, including, but not limited to, available scientific evidence, biological and ecological traits of the species, environmental conditions for establishment (current and potential distribution of the species), conservation status, and potential impacts in the event of the establishment or spread of the species.

Chilatherina is a genus of rainbowfishes endemic to freshwater bodies in New Guinea (Indonesia and Papua New Guinea).

Under ss 391(1) of the EPBC Act, the Minister must take account of the precautionary principle in making decisions. The precautionary principle is triggered by two threshold conditions: 1) a threat of serious or irreversible environmental damage (direct or indirect); and 2) scientific uncertainty as to the environmental damage. With a low risk of establishment, and a very, very low climate match, the risk assessments show that 9 of the *Chilatherina* spp would have minor-moderate potential impacts on the environment if they were to establish, and do not pose a threat of serious or irreversible damage. *C. fasciata* has a moderate establishment risk and minor-moderate potential impacts.

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serious or irreversible environmental damage (direct or indirect); and 2) scientific uncertainty as to the environmental damage. With a low risk of establishment, and a very, very low climate match, the risk assessments show that 9 of the *Chilatherina* spp. would have minor-moderate potential impacts on the environment if they were to establish, and do not pose a threat of serious or irreversible damage. *C. fasciata* has a moderate establishment risk and minor-moderate potential impacts.

However, 6 species are listed as Critically Endangered, Endangered or Vulnerable on the IUCN Red List. Subsection 303EN(3) of the EPBC Act states that the Minister must not issue a permit unless the Minister is satisfied that the proposed import would not be likely to threaten the conservation status of a species or ecological community; or likely to threaten biodiversity. As a signatory to the Convention on Biological Diversity, Australia has the responsibility to ensure that activities within its jurisdiction do not cause damage to the environment of other states or areas. It is important that listing of threatened species on the Live Import List does not place pressure on wild stocks, and while the applicant has proposed to source specimens from accredited sources, this mitigation measure is unenforceable through the Live Import List process.

Recommendation: After critically examining and reviewing all available information, the department recommends listing *Chilatherina bulolo, Chilatherina campsi* and *Chilatherina lorentzii* in Part 1 of the Live Import List with the import condition:

- of minimum length 4 cm SL

In consideration of their conservation status, the department recommends listing *Chilatherina alleni*, *Chilatherina axelrodi, Chilatherina bleheri, Chilatherina pagweinsis, Chilatherina pricei* and *Chilatherina sentaniensis* in Part 2 of the Live Import List with the condition:

- Captive-bred specimens only, of minimum length 4 cm SL

Due to its moderate establishment risk, the department **does not recommend** listing *Chilatherina fasciata.*

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1 Introduction

1.1 Purpose of the proposed import

An application was submitted to amend the *List of Specimens taken to be Suitable for Live Import* (Live Import List) to include 10 species from the genus *Chilatherina*. The species are *Chilatherina alleni, C. axelrodi, C. bleheri, C. bulolo, C. campsi, C. fasciata, C. lorentzii, C. pagweinsis, C. pricei* and *C. sentaniensis*. The applicant proposes to use these species for the ornamental freshwater fish trade in Australia (for pets).

1.2 Background on the Act

Under section 303EC of the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act), the responsible Minister may amend the Live Import List by, relevantly, including a specimen on the list. Section 303EB of the EPBC Act dictates two parts to the Live Import List:

- Part 1 comprises specimens that can be imported without a permit under the EPBC Act. Part 1 must not include any organism listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and
- Part 2 comprises specimens that require a permit under the EPBC Act to be imported. For each specimen included in Part 2 of the list there is to be a notation regarding whether the inclusion is subject to restrictions or conditions. Restrictions or conditions may relate to a quantitative limit, the circumstances of import, the source of the specimen or the circumstances in which it was taken. Additional conditions may also be applied when the permit for import is issued.

Before amending the Live Import List, the Minister must consult with appropriate state, territory and Commonwealth ministers and other persons, and consider a report assessing the potential environmental impacts of the proposed amendment (s 303EC of the EPBC Act). When submitting an application to the department to amend the Live Import List, all applicants are required to provide an accompanying draft assessment report that addresses specific terms of reference published on the department's website.

The department undertakes an assessment of the potential environmental impacts of the proposed amendment using the information in the applicant's draft report and any other sources of relevant information. The department also considers comments and information received through the public consultation process (including states and territories). The application and accompanying draft report for the proposed import of 10 *Chilatherina* species was released for public comment between 12 January and 10 March 2022. This assessment report on the potential environmental impacts of listing the species was prepared in accordance with s 303EE of the EPBC Act. Under para 303EC(5)(a) the Minister must consider this report before amending the list.

Under ss 391(1) of the EPBC Act, the Minister must take account of the precautionary principle in making decisions. The precautionary principle is triggered by two threshold conditions: (1) a threat of serious or irreversible environmental damage (direct or indirect); and (2) scientific uncertainty as to the environmental damage.

2 Biology and Ecology

2.1 Taxonomy

Rainbowfishes (Melanotaeniidae) are a diverse (ca. 112 species) and monophyletic group endemic to Australia and New Guinea (Unmack et al. 2013; Eschmeyer & Fong 2017; Majtánová et al. 2020). *Chilatherina* is a genus of rainbowfishes that is endemic to New Guinea. There are 11 species in the genus, 10 of which are assessed herein.

Kingdom: Animalia

Phylum: Chordata

Superclass: Osteichthyes

Class: Actinopterygii

Infraclass: Teleostei

Order: Atheriniformes

Family: Melanotaeniidae

Genus: *Chilatherina* (Regan 1914)

Genetic evidence suggests *C. lorentzii* should be placed in the genus *Melanotaenia* rather than *Chilatherina* (Tappin 2011).

Table 1 Scientific and common names of the 10 species of *Chilatherina*

Scientific name	Common name	Synonyms
Chilatherina alleni (Price 1997)	Allen's rainbowfish	
Chilatherina axelrodi (Allen 1980)	Axelrod's rainbowfish	
Chilatherina bleheri (Allen 1985)	Bleher's rainbowfish	
Chilatherina bulobo (Whitley 1938)	Bulolo rainbowfish	*Centratherina bulolo*
Chilatherina campsi (Whitley 1956)	highland rainbowfish	*Anisocentrus campsi* *Centratherina tenuis*
Chilatherina fasciata (Weber 1913)	barred rainbowfish	*Rhombatractus fasciatus*
Chilatherina lorentzii (Weber 1907)	Lorentz's rainbowfish	
Chilatherina pagweinsis (Allen & Unmack 2012)	Pagwi rainbowfish	
Chilatherina pricei	Price's rainbowfish	

Scientific name	Common name	Synonyms
(Allen & Renyaan 1996)		
Chilatherina sentaniensis (Weber 1907)	Sentani rainbowfish	*Rhombatractus sentaniensis*

Taxonomic reference: Fricke, Eschmeyer & Van der Laan 2020

2.2 Description

Rainbowfishes are small (<12 cm), sexually dimorphic freshwater fish. Species of the genus *Chilatherina* exhibit either a straight or curved lateral portion of the premaxilla. The medial upper lip appears swollen and the profusely covered with teeth. In addition, the head tends to be slenderer, and the snout relatively pointed compared with *Melanotaenia*. The latter genus by contrast, has an abrupt downward bend in the lateral portion of the premaxillary with less swelling of the medial upper lip and fewer teeth on its surface. Moreover, the jaws are usually about even or the upper jaw is slightly inferior. The external jaw features of *Chilatherina* and *Melanotaenia* were illustrated by Allen (1980).

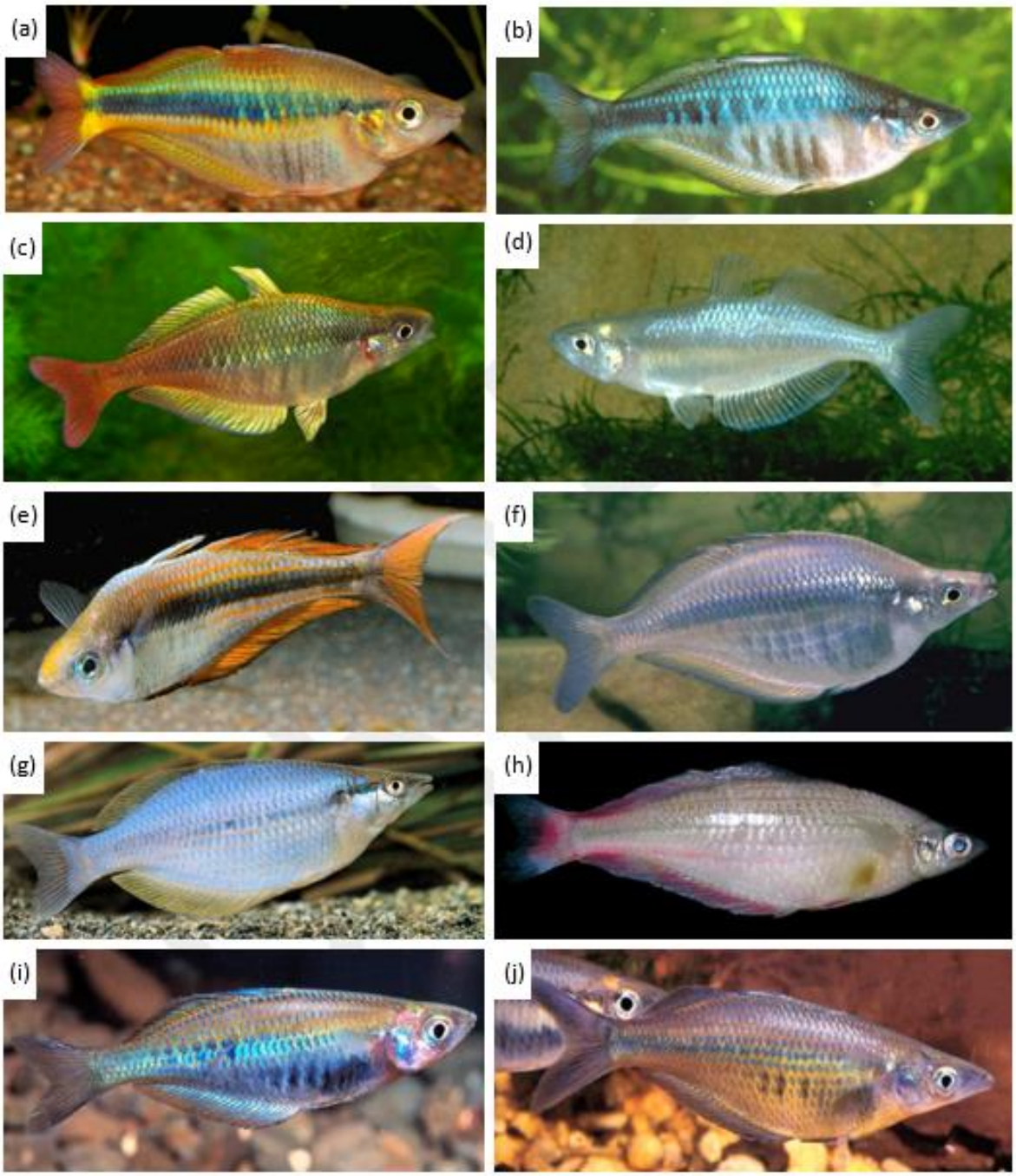
Table 2 Maximum length and description of 10 species of *Chilatherina*

Scientific name	Maximum Length (cm)	Description
Chilatherina alleni	7-10	**General**: upper half of the body brownish anteriorly becoming turquoise posteriorly, each horizontal scale row is separated by narrow brown or dull orange stripe. Mid-lateral band dark blue, occupying about two horizontal scales rows, from upper rear corner of eye to base of caudal fin, interrupted on its lower edge by about five, white indentations in area just behind pectoral fin. Lower half of body mainly dark silver, except for intense white stripe with lower margin of dull orange occupying scale row immediately below mid-lateral band. 4-5 diffused charcoal-coloured bars on lower side between level of pelvic fin base and fin origin. The first dorsal fin is light blue; second dorsal and anal fins translucent bluish becoming reddish on margins. Caudal fin translucent reddish. Pectoral and pelvic fins mainly translucent. There is a wide variation in colouration of this species depending on habitat. One variety has a reddish back, red fins and bright yellow stripe in the middle of the body. They exhibit an amazing range of colour variation; specimens from the rainforest creek near Siewa sometimes exhibit a spectacular pattern involving a bright red back and yellow fins. **Females**: slightly less intense colouration with median fins mainly translucent to bluish without any red. Besides the colour differences noted above. The second dorsal and anal fins short and blunt in females. **Males**: generally larger and deeper bodied than females. and somewhat elongated. The second dorsal and anal fins are pointed. Usually much larger and deeper bodied than females.
Chilatherina axelrodi	8-10	**General**: bluish grey above a blackish mid lateral line and silver grey below. The mid lateral band is broken into a series of large blotches and there are several dark vertical bars on the lower side of the body. The dorsal, anal and pelvis fins are yellowish, other fins translucent. **Females**: overall silvery colour rather plain compared to males. **Males**: brightly coloured, larger and much deeper bodied than females.
Chilatherina bleheri	10-12	**General**: silvery or greenish body colour on the upper back fading posteriorly to pastel shades of yellow to red. The scales on the front half of body, particularly on the dorsal region, have broad yellow-green margins; the first dorsal fin charcoal grey; second dorsal fin grey suffused

Scientific name	Maximum Length (cm)	Description
		with red, caudal and anal fins red; pelvic fins reddish anteriorly with reminder white or translucent; pectoral fins translucent. The lower side of the body is white with a series of faint vertical dark markings. **Females**: lack vivid red hues and are mainly silvery or bluish grading to grey or greenish brown. **Males**: brilliant yellow-orange stripe on the middle of the forehead during spawning.
Chilatherina bulolo	8-10	**General**: silver body colour with a black streak on the upper and lower edges of the caudal fin. Wide, blunt head, large eyes and short first dorsal fin. **Males**: larger and deeper bodied than females.
Chilatherina campsi	8-10	**General**: pale blue, white with silvery sheen; pale yellow to whitish longitudinal stripes frequently bordering scale rows and a broad blue mid-lateral stripe (most prominent on posterior part of body); fins white, sometimes with yellow suffusion. 13-15 soft dorsal rays. 21-26 (most frequently 22-23) soft anal rays.
Chilatherina fasciata	10-12	**General**: brown to blue green on the upper half, white to yellowish on the lower half with a diffuse dark mid-lateral stripe. Males usually have several diffuse blackish bars on the lower sides, above the front half of the anal fin base, fins dusky grey to yellowish. Mature males are more colourful than females and often exhibit reddish or yellowish dorsal and anal fins. Deep laterally compressed body that increases with age, particularly in males. Dorsal spines: 5-8; Dorsal soft rays: 11-16; Anal spines: 1; Anal soft rays: 21-28. 19-21 scales in front of dorsal. 13-16 soft dorsal rays (Weber, 1922).
Chilatherina lorentzii	10-12	**General**: blueish body colour grading to silvery-blue ventrally and a broad darker blue midlateral band, with clear to yellowish fins.
Chilatherina pagweinsis	10	**General**: pale grey on upper back grading to white over most of body; diffuse greyish stripe on each scale row of back; fins generally reddish, except pectorals semi-translucent whitish. 10-12 soft dorsal rays. 20-21 soft anal rays.
Chilatherina pricei	8.5	**General**: silvery-grey to blueish; scales on back sometimes with golden or yellow margins, wider on upper and lower edge of scale and forming a longitudinal yellow stripe between each scale row. Scales on caudal peduncle sometimes entirely yellow. **Males**: lack a prominent midlateral stripe and reddish fins.
Chilatherina sentaniensis	8-12	**General**: silvery-blue or greenish on the upper back fading laterally to silverly orange. They have a diffuse blue or green mid-lateral band and narrow silver or light blue stripes between each horizontal scale row. Dorsal spines: 5-7; Dorsal soft rays: 9-12; Anal spines: 1; Anal soft rays: 21-26. 22-27 scales in front of dorsal. 10-12 soft dorsal rays (Weber, 1922). **Males**: 6–8 reddish-brown bars on the lower sides of the body between the pectoral fin base and the level of the middle anal rays. However, colour can be variable depending on captive conditions. **Females**: less brightly coloured and smaller than males.

Source: IUCN (2022) / Tappin (2011)

Figure 1 *Chilatherina* species assessed herein including (a) *C. alleni*, (b) *C. axelrodi*, (c) *C. bleheri*, (d) *C. bulolo*, (e) *C. campsi*, (f) *C. fasciata*, (g) *C. lorentzii*, (h) *C. pagweinsis*, (i) *C. pricei* and (j) *C. sentaniensis*



Source: (a), (e) Gary Lange; (b), (c), (d), (f) Neil Armstrong; (g), (i), (j) Gerald Allan; (h) Peter Unmack

2.3 Geographic distribution

Chilatherina spp. are distributed in freshwater bodies throughout the island of New Guinea (Indonesia and Papua New Guinea; Table 3; Figure 2). New Guinea and Australia were connected by a land bridge in the region that is now the Torres Strait and Arafura Sea for much of their geological past. Because of this, nearly all families, most genera, and approximately 34 species are shared across these two areas. The distribution of freshwater fishes is strongly correlated with the island's geology and divided into two main faunal regions by the Central Cordillera Mountain range of northern and southern New Guinea (Beehler & Marshall 2007). The southern province is by far the most speciose, reflecting its long and relatively stable history, and exhibits the strongest affinity with Australia.

Table 3 Geographic range of 10 species of *Chilatherina*

Scientific name	Geographic distribution
Chilatherina alleni	Siriwo (Aiborei River) and Wapoga river systems of north-western Papua Province, Indonesia. Both systems flow into the eastern edge of Cenderawasih Bay.
Chilatherina axelrodi	Yungkiri Stream near Bewani in north-west Papua New Guinea, although it may occur in other similar streams in the Pual (Nemayer) river system.
Chilatherina bleheri	Danau Biru (Lake Holmes) in the Mamberamo river system of Papua Province, Indonesia. It has recently been found in hilly terrain (elevation approximately 300 m) south of the Mamberamo plains, approximately 100 km due south of Danau Biru.
Chilatherina bulolo	Ramu and Markham river systems of north-eastern Papua New Guinea. It has been reported from the Erap, Snake, and Bulolo rivers in the Markham system and from the Whege River in the Ramu system.
Chilatherina campsi	Markham, Ramu, and Sepik river systems of northern Papua New Guinea. It is also known from headwater tributaries of the southerly-flowing Purari River. It is the only member of the genus to be found on both sides of the Central Cordillera range in New Guinea.
Chilatherina fasciata	Widespread in northern New Guinea including the Markham, Gogol, Ramu and Sepik river systems in Papua New Guinea and the Mamberamo river system in Indonesia.
Chilatherina lorentzii	A few streams flowing to the central north coast of New Guinea centred around Jayapura. It has been collected at Puive Creek, a tributary of the Pual River near Vanimo, Papua New Guinea, and from the Tawarin and Upper Sermowai rivers of Papua Province, Indonesia.
Chilatherina pagweinsis	A creek north of Pagwi Village, which is situated on the banks of the Sepik River, Papua New Guinea (G.R. Allen pers. comm. 2019). There has been sampling in the surrounding area, which has not found this species, but it could easily be confused with other species.
Chilatherina pricei	A stream near Warironi Village on south-eastern Yapen Island, Papua Province, Indonesia. It probably occurs in other streams on the southern side of Yapen, which extends for about 165 km.
Chilatherina sentaniensis	Lake Sentani and small tributaries in the Jayapura Regency (2°33'–2°41'S, 140°23'–140°3 8'E), Papua, Indonesia. It is approximately 70–90 m above sea level. It is approximately 9,360 ha in size, 2–24 km wide with its greatest recorded depth being 51.8 m in the western part of the lake. It is considered extant only at the eastern end of the lake.

Source: IUCN (2022) / Tappin (2011)

2.4 Habitat

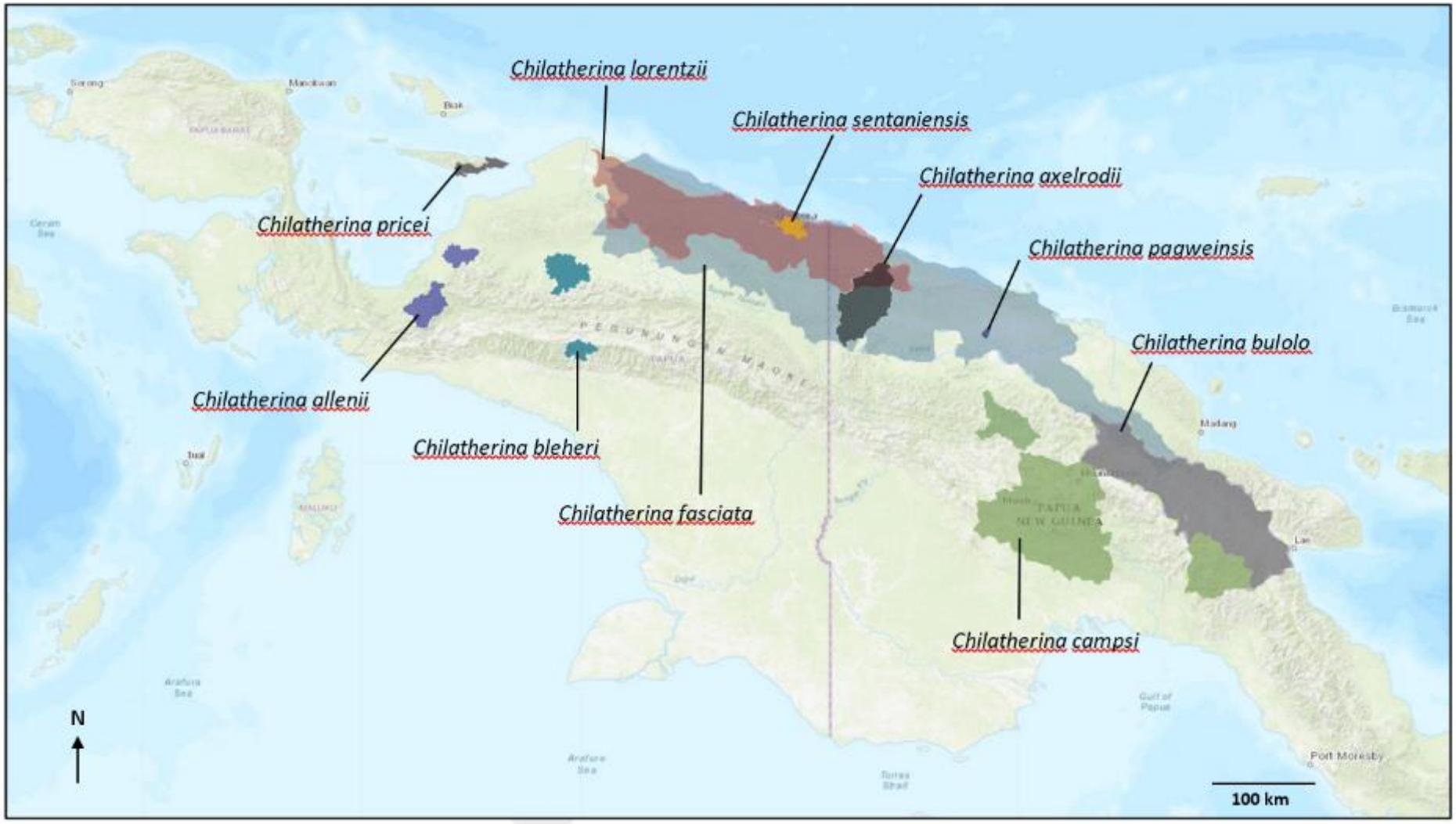
Habitat preferences are detailed in Table 4

Table 4 Habitat preferences of 10 species of *Chilatherina*

Scientific name	Habitat preferences
Chilatherina axelrodi	A small stream bordering the Bewani-Vanimo road.
Chilatherina bleheri	Danau Biru consists of three interconnected lakes lying within a radius of 6-7 kilometres, the largest measuring about 4.5 km long and 2 km wide. The lakes are situated in hilly rainforest terrain, lying at an elevation of about 360 m. It is abundant along the heavily vegetated shoreline and occurs in small, rocky tributary streams.
Chilatherina bulolo	Rapid-flowing streams in foothill terrain, often in "white water" rapids.
Chilatherina campsi	Hilly or mountainous terrain between about 200-1,525 m elevation but has been collected from at least one site in lowlands at 80 m in rainforest in the Ramu valley. It is usually found in clear, moderately fast to swift-flowing streams with rock and gravel or sand bottoms.
Chilatherina fasciata	This species usually occurs in clear rainforest streams, but it is also found in lakes such as Lake Wanam near Lae, Papua New Guinea. Its habitat includes both lowland tributaries of major rivers and mountain tributaries to an elevation of about 500 m. It congregates in deeper pools, often around log debris or among aquatic vegetation.
Chilatherina lorentzii	Clear rainforest streams between about 100-400 m elevation. It prefers deeper shaded pools with leaf litter and gravel bottoms, and fish generally congregate among the branches of fallen trees.
Chilatherina pagweinsis	Quiet pool in a small creek, flowing through secondary forest to a depth of 1.8 m. Rock and mud bottom in a slow-flowing stream in closed-canopy forest. The latter site is situated approximately 400 km upstream from the sea at an elevation of about 30 m above sea level.
Chilatherina pricei	Coastal streams in southern Yapen Island, which typically rise in the steep interior mountains and plunge to the narrow (3-5 km) coastal plain, which is the home of *Chilatherina* pricei. The species is abundant over rock or boulder bottoms of the main stream channels, usually in exposed sections that receive abundant sunlight.
Chilatherina sentaniensis	Lake Sentani, which is approximately 30 km long and 2-5 km wide, and its small tributaries (Allen et al. 2020).

Source: IUCN (2022) / Tappin (2011)

Figure 2 Geographic distribution of 10 species of *Chilatherina*



Source: Modified IUCN (2022) / DCCEEW

2.5 Diet

All species of the *Chilatherina* genus are opportunistic omnivores and feed on organic detritus, microscopic and filamentous algae, diatoms, bottom rooted or floating plants, macrophytes and planktonic animals, especially crustaceans (Beehler & Marshall 2007). They also feed on aquatic insects and their larvae, and a range of terrestrial insects and other small animals that live near the water's edge (Beehler & Marshall 2007). Food resources fluctuate greatly according to the seasons (Beehler & Marshall 2007).

2.6 Reproductive biology

Sexual maturity occurs in most species of *Chilatherina* at approximately 3.5-4.0 cm SL in females and 4.5-5.5 cm SL in males (by the end of their first year; Allen 1981). In female *Melanotaenia australis,* rapid and flexible changes occur in their reproductive investment according to male sexual attractiveness (Evans et al. 2010). Males compete for access to females and spawning substrate (usually aquatic vegetation) while actively courting females. Male–male competition and female mate choice favour relatively large males (Young et al. 2010).

Rainbowfishes are egg scatterers; males will court (chase) females until she releases her eggs, when the male simultaneously releases sperm (Yanong 1996, Allen 1981). Eggs adhere on submerged aquatic and riparian vegetation for 5-15 days before hatching into fry (Tappin 2011, Allen 1981). Rainbowfishes maximise their use of food resources to coincide spawning peaks during the wet season peak (Beehler & Marshall 2007). This strategy offers young fish an improved chance of survival, as flood conditions provide shelter in the form of inundated stream side vegetation; increased water turbidity also offers further protection from predators, such as birds and other fish (Beehler & Marshall 2007). Species of the genus *Chilatherina* produce approximately 40-150 viable eggs for several consecutive days in a 2-week period (Allen & Cross 1982). Rainbowfishes live to approximately 4 years of age in the wild and up to 8 years in captivity (Allen & Cross 1982).

2.7 Environmental tolerances

Chilatherina have little tolerance for salt and are highly unlikely to move into other drainages via estuary migration. Many rainbowfishes appear to be restricted to an isolated lake or small part of a single river system. These species are highly vulnerable to environmental disturbances such as clear-cut logging, mining and dam construction. Rainbowfishes will not survive in barren environments and require cover to protect them from predators and to provide refuge from flow, which can include rocks, logs, fallen branches and vegetation (Tappin 2011).

Of most importance is dissolved oxygen, pH and temperature, while alkalinity, hardness and clarity are not of significance (Tappin 2011). In their natural environment, rainbowfishes are exposed to highly variable temperatures depending on the size and depth of the water body, with an overall range reported from 5-38°C, although survival rates declines sharply when temperatures rise above 36°C (Tappin 2011). The preferred and tolerable ranges differ considerably; the tolerable range is where the fish can survive without associated problems and the preferred range is where physiological processes are optimised (Table 5Table 5, Tappin 2011).

Rainbowfishes can perform aquatic surface respiration to survive low oxygen concentrations for short periods (Tappin 2011).

Table 5 Preferred and tolerable ranges of environmental parameters for rainbowfish

Water quality factor	Preferred ranges	Tolerable ranges
Temperature	22 – 28°C	5 – 36°C
pH	6.5 – 8	4 – 10
Hardness	50 – 250 ppm	
Alkalinity	50 – 200 ppm	< 50 ppm
Carbon dioxide	< 10 ppm	Up to 20 ppm
Dissolved oxygen	> 5 ppm	Minimum level depends on species and temperature

Source: Tappin 2011

2.8 Hybridisation

Hybridisation occurs when two individuals from separate species reproduce to form offspring (hybrids). Rainbowfishes are known to readily hybridise in captivity and to a lesser extent, in the wild (Caughey et al. 1990, Unmack et al. 2013). Allen & Cross (1992) report on natural hybrids between the genera *Melanotaenia* and *Chilatherina*. Unmack (2016) and Unmack et al. (2016) also report on hybrids in the genus *Melanotaenia*. Two species of rainbowfish are found in Australia: *Cairnsichthys bitaeniatus* and *Cairnsichthys rhombosomoides* (Martin & Barclay 2013, Hammer et al. 2018). It is unknown whether *Chilatherina* spp. can hybridise with native Australian rainbowfishes. Research suggest it would be unlikely, but not impossible, especially if one or both species showed no preference for or against con-specific mates (Unmack 2016, Unmack et al. 2016, Moy et al. 2018).

Rainbowfish hybrids may be bred in the aquaculture industry for desirable traits, such as phenotypic expression, increased growth rate and environmental tolerances (Bartley et al. 2000). However, there is a trend to conserve wild 'pure' species in captivity. Hobby groups, such as the Rainbowfish Study Group (United States of America), the International Rainbowfishes Group (Europe) and Australia and New Guinea Rainbowfishes Association (Australia) advise against buying or breeding hybrids (Tappin 2011).

3 Species status and conservation

3.1 National status

Some *Chilatherina* spp. are present in the aquarium hobby and trade in Australia. The applicant has kept several *Chilatherina* spp. since 1983, including *C. axelrodi, C. bleheri, C. bulolo, C. campsi, C. fasciata* and *C. sentaniensis*. The applicant states that specimens were imported from New Guinea (Indonesia or Papua New Guinea) into Australia until 1986. The applicants state that no *Chilatherina* spp. have naturally occurring populations (i.e., no established exotic populations) in Australia despite being kept by private hobbyists for several decades. Tappin (2011) reports similar statements for the 10 *Chilatherina* spp.

3.2 Related Live Import List listings

No *Chilatherina* spp. are listed on the Live Import List, however, 2 closely related species of rainbowfish from the genus *Glossolepis* are listed on Part 1 (Table 6).

Table 6 Non-endemic *Glossolepis* species on the Live Import List.

Scientific name	Common name	Import conditions
Glossolepis incisus	red rainbowfish	Minimum length of 3.5 cm standard length
Glossolepis leggetti	Leggett's rainbowfish	Minimum length 4 cm standard length

3.3 Related threat category listings

No *Chilatherina* spp. are considered invasive or pests.

3.4 Conservation status

3.4.1 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between governments to which Australia is a party. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten the survival of the species.

No *Chilatherina* spp. are CITES-listed.

It should be noted that wild *Chilatherina* spp. are collected for the aquarium trade from New Guinea (Tappin 2011). *C. alleni* specimens were collected from the type location near Siriwo Village and introduced into the aquarium hobby in 2008. Additional live specimens were collected in 2012 from the Wapoga River. *C. lorentzii* specimens were collected from the Sokoata River, which is a tributary of the Sermowai River. Ensuring better traceability for both wild-caught and tank reared fish, as outlined in the Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their utilisation (CBD 2010) will be key to achieving a sustainable industry in the long-term (Evers et al. 2019).

3.4.2 IUCN Red List of Threatened Species

Established in 1964, the International Union for Conservation of Nature (IUCN)'s Red List of Threatened Species is the world's most comprehensive information source on the global extinction risk status of animal, fungus and plant species.

Some *Chilatherina* spp. are detrimentally impacted by threats, as listed in Table 7.

Table 7 IUCN Red List status, population trend and threats of 10 species of *Chilatherina*. All species were last assessed in 2019.

Scientific name	IUCN status	Population trend	Threats
Chilatherina alleni	Vulnerable B1ab(iii)	Unknown	Decline in habitat due to mining and human settlements (Allen & Hammer 2020).
Chilatherina axelrodi	Endangered B2ab(iii)	Unknown	Invasive species and decline in habitat due to oil palm plantations, logging, human settlements (Allen 2020a)
Chilatherina bleheri	Endangered B1ab(v)	Unknown	Invasive species and use of gill netting fisheries (Allen 2020b).
Chilatherina bulolo	Least Concern	Unknown	No major threats (Hammer & Allen 2020).
Chilatherina campsi	Least Concern	Unknown	No major threats (Allen & Unmack 2020)
Chilatherina fasciata	Least Concern	Stable	No major threats (Allen, Kadarusman & Unmack 2020)
Chilatherina lorentzii	Near Threatened B1b(iii)	Stable	Invasive species and decline in habitat due to oil palm plantations, logging, human settlements (Allen & Kadarusman 2020).
Chilatherina pagweinsis	Endangered B1ab(iii)	Stable	Decline in habitat and invasive species (Unmack & Allen 2020).
Chilatherina pricei	Vulnerable D2	Unknown	No major threats, however, rising sea levels could be a future potential threat.
Chilatheria sentaniensis	Critically Endangered B1ab(iii)	Stable	Invasive species, such as carp, tilapia, walking catfish, barbs, snakehead, red devil cichlids and gouramis, and associated diseases. Decline in habitat due to resultant pollution from domestic waste entering the lake from nearby human settlements and traditional gold mining (Allen et al. 2020).

3.4.3 Conservation of Migratory Species of Wild Animals (CMS)

The Convention on the Conservation of Migratory Species of Wild Animals is an environmental treaty of the United Nations to which Australia is a party. It provides a global platform for the conservation and sustainable use of migratory animals and their habitats.

No *Chilatherina* spp. are listed on the Convention on the Conservation of Migratory Species of Wild Animals.

4 Risk Assessment

4.1 Bomford Risk Assessment Model

The likelihood of establishment for 10 spp. of *Chilatherina* in Australia was assessed using the Bomford Risk Assessment Model (Bomford 2008 – Chapter 4. Freshwater Fish) in accordance with the five key risk factors:

- climate match
- overseas range score
- establishment overseas
- introduction success
- taxa risk

Using information compiled from research into these factors, the potential impacts of the establishment of feral populations can be estimated.

4.1.1 Climate match

Climatch v2.0 (ABARES 2020) was used to identify suitable habitat in Australia that these 10 species may inhabit if released. Climatch v2.0 implements the CLIMATE algorithm to predict a species' distribution using climatic variables from the species' current distribution (source) to other regions in Australia (target; see ABARES 2020). This generates a map of the area with a climate that closely matches that of *Chilatherina* spp. original range.

Distribution data from IUCN (2022) was used to generate a Climatch map for 10 spp. of *Chilatherina* (Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, Figure 9, Figure 10). Climatch could not be generated for *C. sentaniensis, C. pagweinsis* or *C. pricei*, as no meteorological stations are present in their restricted range. In the absence of a climate match and given the ranges for these 3 species sit within the range for other rainbowfishes being assessed, the climate score for the latter species was used as a conservative estimate for their assessment. The climate match score (CMS) is increased by one increment as recommended by Bomford (2008) for species whose distribution contains 12 or fewer meteorological stations (in the source area). This resulted in a CMS of 2, **very very low.**

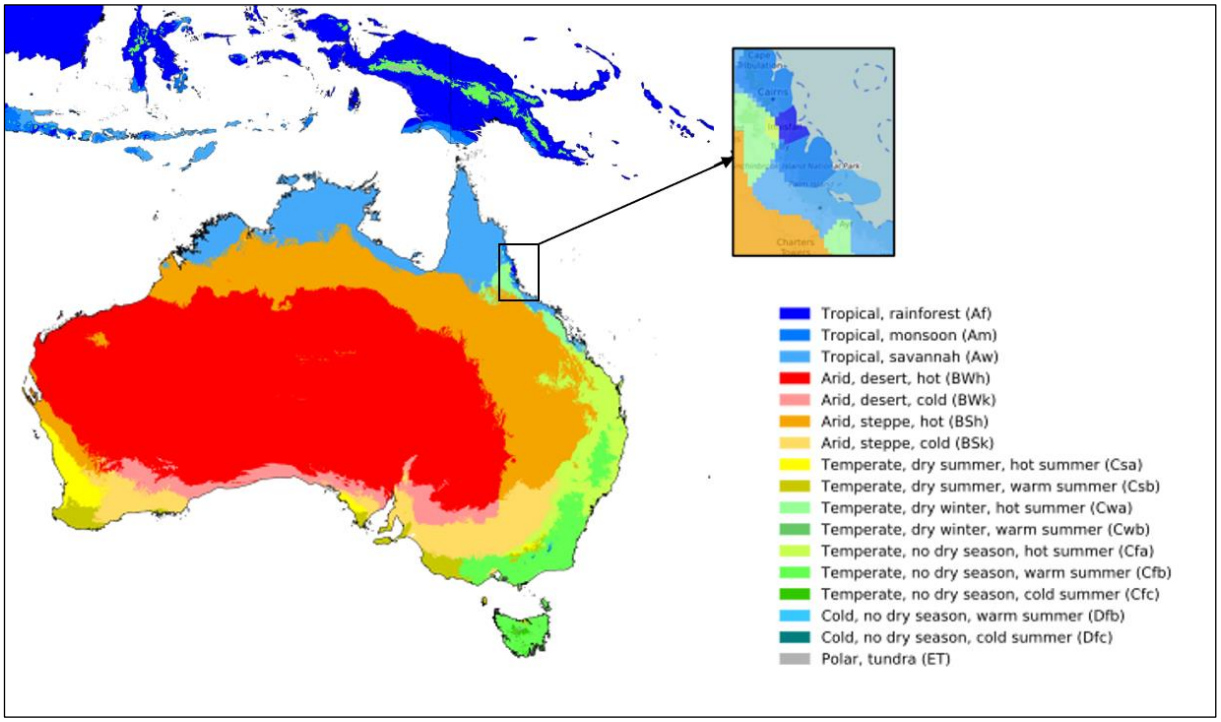
Climatch is based on terrestrial climate data and the target species are freshwater fish, therefore the generated maps are not a completely accurate indicator of possible suitable habitat. In Australia, rainbowfish (Melanotaeniidae) occur throughout northern Australia and in eastern coastal drainages south to the Hastings River and in much of the extensive Murray–Darling Basin (McGuigan et al. 2000). Within this range rainbowfish are locally abundant and occupy the full spectrum of freshwater habitats ranging from arid-zone waterholes to rainforest streams (McGuigan et al. 2000). The rivers in tropical northern Australia have average surface water temperatures of 30°C but may range from 25-38°C (Tappin 2011).

The Köppen-Geiger system classifies climate into five main classes and 30 sub-types and is based on threshold values and seasonality of monthly air temperature and precipitation (Beck et al. 2018). In

species distribution models, climate variables are considered the primary driver to explain species ranges at larger spatial extents (Guisan & Zimmermann 2000).

The 10 *Chilatherina* spp. are found within 2 climatic zones of the Köppen-Geiger in New Guinea: Af and Cfb (Figure 3). The Af zone is only found in a very restricted area of coastal northern Queensland in Australia from approximately Mission Beach in the south to Fishery Falls in the north. The Cfb zone is present in Australia on the north-eastern coast of Queensland (Figure 3).

Figure 3 Köppen-Geiger climate system of Oceania



Source: Beck et al. (2018)

Arthington et al. (1999) considers temperature as the most limiting environmental factor in Australia's freshwater that affects exotic finfish establishment. Rainbowfish are exposed to highly fluctuating temperatures, often between 8-12°C daily (Tappin 2011). Rivers in far northern Australia have average surface water temperatures of 30°C but may range between 25-38°C (Tappin 2011). Surface temperatures of the lower Sepik River in New Guinea are recorded between 28-31°C (Chambers 1987). It is highly probably, therefore, that waterbodies of northern Australia would provide suitable habitat for *Chilatherina* species.

Figure 4 Climatch map for *C. alleni*



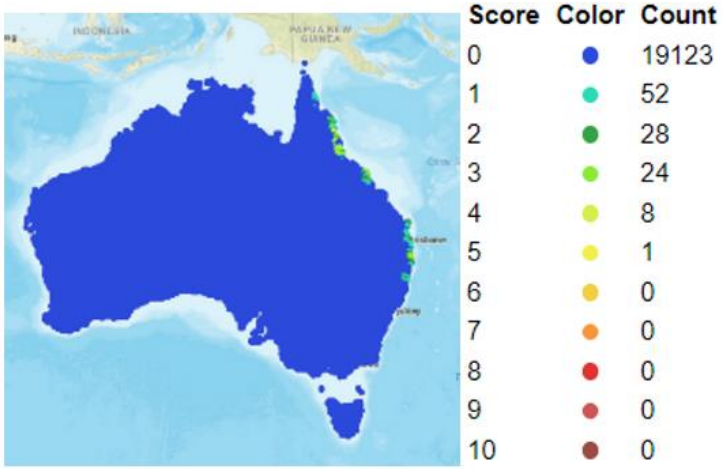
Source: Climatch

Figure 5 Climatch map for *C. axelrodi*



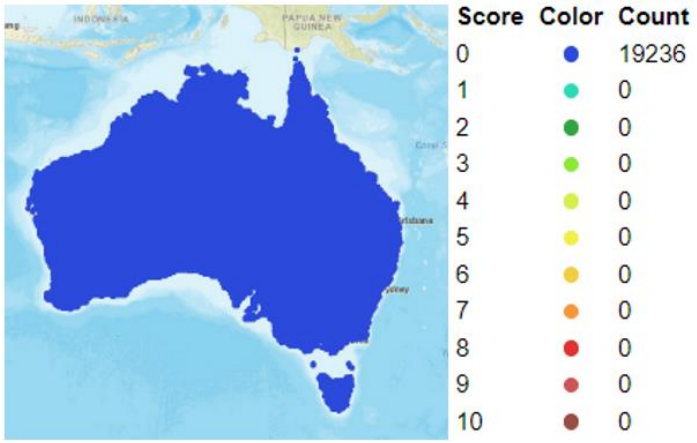
Source: Climatch

Figure 6 Climatch map for *C. bulolo*



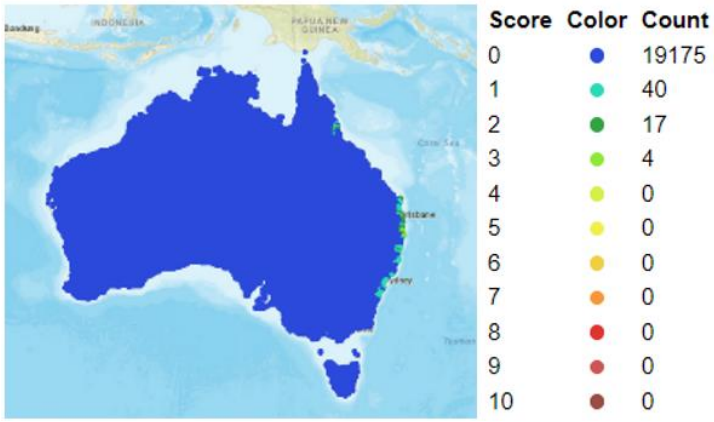
Source: Climatch

Figure 7 Climatch map for *C. bleheri*



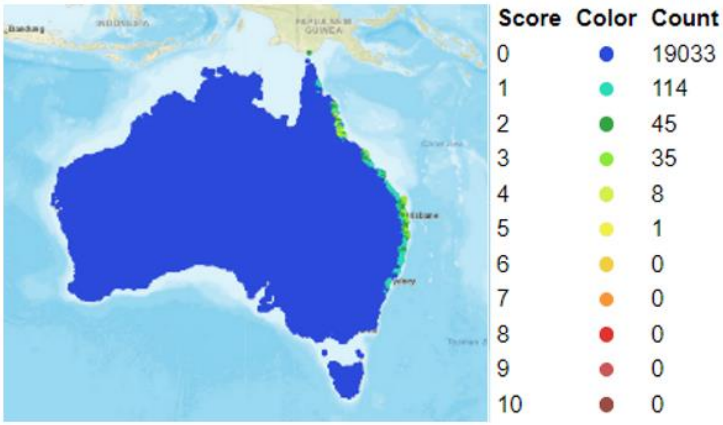
Source: Climatch

Figure 8 Climatch map for *C. campsi*



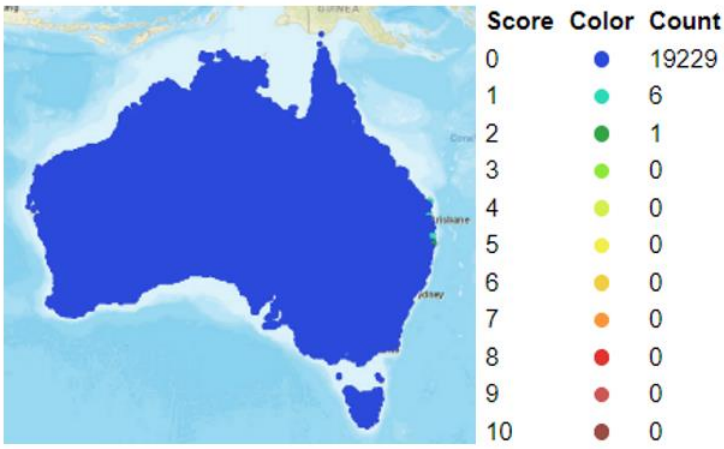
Source: Climatch

Figure 9 Climatch map for *C. fasciata*



Source: Climatch

Figure 10 Climatch map for *C. lorentzii*



Source: Climatch

4.1.2 Overseas Range

The overseas range score is calculated by counting the number of grid squares (1° latitude x 1° longitude) in which an occurrence of the species is recorded in Fishbase (Froese & Pauly 2022), excluding Australia. For each *Chilatherina* spp., their distribution map was overlaid onto Google Earth to enable a count of the number of grid squares (Table 8).

Table 8 Number of grid squares in species distribution and resultant overseas range score for 10 spp. of *Chilatherina*

Scientific name	Number of 1° grid squares	Overseas range score
Chilatherina alleni	3	0
Chilatherina axelrodi	2	0
Chilatherina bleheri	3	0
Chilatherina bulolo	6	1
Chilatherina campsi	13	2
Chilatherina fasciata	22	3
Chilatherina lorentzii	8	1
Chilatherina pagweinsis	2	0
Chilatherina pricei	1	0
Chilatherina sentaniensi	1	0

4.1.3 History of establishment elsewhere

A proven history of establishing exotic populations may indicate that a species has attributes that increase the risk of it successfully establishing in other areas (Bomford 2008). To date, there are no records in FishBase of previous successful establishments of any *Chilatherina* spp. outside their distribution. A moderate risk rank score of 1 (never introduced) is given as there are no recorded introductions.

4.1.4 Introduction success

The introduction success score is calculated by counting the number of known successful introductions of the species worldwide, excluding Australia. This number is expressed as a proportion of the total number of introductions. A moderate introduction success score of 2 is given where there are no recorded introductions, although a precautionary approach could warrant a higher Introduction Success Score.

No *Chilatherina* spp. have been introduced outside of their range and thus warrant an introduction success score of 2 (never introduced).

4.1.5 Taxonomic group history of invasiveness

The taxa risk score is either a species' genus risk score, if there are greater than or equal to 4 introduction events for the species' genus, or a species' family risk score, if there are less than 4 introduction events (Bomford 2008). As there have been no recorded introductions for spp. from the genus *Chilatherina*, a moderate (or more moderate) family risk score of 0 (never introduced) was given, although a precautionary approach could warrant a higher score.

Genus *Chilatherina*

C. crassispinosa is the only other species currently within the genus not being assessed herein. Like other members of *Chilatherina,* it has not been introduced anywhere outside of its range.

Family Melanotaeniidae

There are 7 genera and 96 species in the Family Melanotaeniidae, all freshwater species originating from northern and eastern Australia and New Guinea. Four species have been introduced outside of their natural range with no known establishments (Table 9). This gives a family success rate of 0% with more than 3 introductions, resulting in a Family Risk Score of 0.

Table 9 Introductions of species from the Family Melanotaeniidae

Scientific name	Country of introduction	Year	Establishment	Reference
Iriatherina *werneri*	Philippines	1996	Unknown	Torres (2022a)
Melanotaenia boesemani	Philippines	1993	Unknown	Palomares (2022a)
Melanotaenia lacustris	Philippines	Unknown	Unknown	Palomares (2022b)
Melanotaenia nigrans	Philippines	1992	Unknown	Torres (2022b)
Melanotaenia nigrans	USA	1930	Unknown	Torres (2022b)

4.2 Results

Results from the Bomford Model (2008) for 10 spp. of *Chilatherina* assessed herein are presented in Table 10.

All species have a low establishment risk, except for *C. fasciata* which has a moderate establishment risk. This risk assessment and its results should be evaluated with additional information and data when it becomes available.

Table 10 Bomford Model results for 10 spp. of *Chilatherina*

Scientific name	Climate match	Overseas range	History of establishment elsewhere	Introduction success	Taxa risk	Total	Establishment risk
Chilatherina alleni	2	0	1	2	0	5	Low
Chilatherina axelrodi	2	0	1	2	0	5	Low
Chilatherina bleheri	2	0	1	2	0	5	Low
Chilatherina bulolo	2	1	1	2	0	6	Low
Chilatherina campsi	2	2	1	2	0	7	Low
Chilatherina fasciata	2	3	1	2	0	8	Moderate
Chilatherina lorentzii	2	1	1	2	0	6	Low
Chilatherina pagweinsis	2	0	1	2	0	5	Low
Chilatherina pricei	2	0	1	2	0	5	Low
Chilatherina sentaniensi	2	0	1	2	0	5	Low

4.3 Consequences for the environment

The magnitude and type of impacts by alien taxa vary greatly among ecosystems, and many of these impacts only become obvious or influential after the onset of invasion (IUCN 2020). Moreover, many impacts remain or are difficult to redress even if the alien taxa of concern are removed or controlled (IUCN 2020, Havel et al. 2015).

The freshwater ornamental fish industry is a primary route of introduction for aquatic animal diseases and non-native species (Wood 2022). Escapes and deliberate releases of ornamental fish into habitats outside their native range have contributed to invasive species (Keller & Lodge 2007, Gertzen et al. 2008, Brosse et al. 2021), impacting native species and freshwater ecosystems. Factors and their impacts are considered for *Chilatherina* spp. in Table 11.

Eleven impact categories were assessed (Appendix A). In each of the 11 impact categories, the magnitude of impact is quantified with levels ranging from Minimal to Critical (Minimal, Minor, Moderate, Major and Critical). The impact results are based on published evidence as detailed throughout this report (Table 11).

Note that for most of these impacts, the scientific knowledge is sparse and for freshwater fish in general currently inadequate to allow reliable predictions.

Table 11 Potential impacts from the establishment of 10 species of *Chilatherina* in Australia

Type of impact	Assessment	Rating
Herbivory e.g., grazing, bark stripping, antler rubbing, feeding on algae, uprooting of aquatic macrophytes, restrictions in establishment, pollination, or seed dispersal of native species.	*No impact known or detectable; or very low level of herbivory*. No major damage documented	Minimal
Competition e.g., competition for nutrients, food, water, space or other resources. May outcompete native species due to higher reproduction, resistance, longevity. In the beginning, might be slow change in species abundance but might lead to the local/global disappearance of a native species. Includes behavioural changes in outcompeted species and ranges from population decline to population loss.	*Causes declines in populations densities, but no changes in community composition.* *Chilatherina* spp. may compete with native fish spp. for food and habitat. *Chilatherina* spp. are omnivorous and would likely prey on insects, crustaceans and plant matter, such as algae. They would likely complete for habitat and refuge sites as they occupy a similar areas as Australian native rainbowfish present in the Northern Territory and Queensland, such as the Eastern rainbowfish (*Melanotaenia splendida* complex). There are 16 native Melanotaeniidae species in Australia – 6 spp. are threatened and 3 of these would share niche sites with the *Chilatherina* spp. being assessed. They exhibit little aggression toward other fish except from conspecific breeding males, this aggression is non-physical stylised display.	Moderate
Predation e.g., predation, parasitism, or intoxication, measurable as	*Predators directly or indirectly resulting in a decline of populations size of at least one native species but no changes in community composition.*	Moderate

Type of impact	Assessment	Rating
reductions in reproduction, survival, growth, or abundance. These impacts range from population decline to population loss, including minor changes in the food web.	Introduced omnivores generally negatively influence the abundance of aquatic community (Gallardo et al. 2015), particularly macrophytes, invertebrates and fish. For example, introduced fish reduce population densities of invertebrates and outcompete native fishes (e.g., *Gambusia* spp.; Simon & Townsend 2003; Pyke 2008).	
Habitat and ecological community impacts Changes in nutrient pools, increased water turbidity, modification of soil or water body properties, changes in hydrology, erosion, ecosystem functions, or other physical or structural changes. Includes modification of successional processes that may lead to reduced suitability (e.g., shelter) for native species, thus causing their disappearance.	*Change in chemical, physical and/or structural characteristics detectable, with no reduction of fitness of native individuals.* The conspicuous colouration of these spp. increases their risk of predation by fish, water birds and aquatic reptiles (e.g., barramundi, grunters, file snakes), thereby providing an additional food source for these species. Gallardo et al. (2015) suggests there is no general evidence for a decrease in species diversity in invaded habitats, but also states there is a time lag between rapid abundance changes and local extinctions. *Chilatherina* are very similar to native rainbowfishes and would likely occupy a similar (or the same) niche, therefore they are unlikely to cause great impact or upset the ecological balance. They are also not ecological engineers (i.e., they do not modify habitat) and again would have no impact in habitat function. Invaded habitats generally show as increase in water turbidity, nitrogen and organic matter concentration, which are related to the capacity of invasive spp. to transform habitats and increase eutrophication (Gallardo et al. 2015). However, the 10 spp. of *Chilatherina* are mid water to surface swimmers (Tappin 2011) and would likely cause little to no disturbance to the substrate during feeding so would not contribute to declines in water quality. They breed by laying eggs on aquatic vegetation or debris and do not damage the habitat doing so.	Minimal
Hybridisation Hybridisation with native species, leading to a reduced or lost opportunity for reproduction, sterile or fertile hybrid offspring, gradual loss of the genetic identity of a species, and/or disappearance of a native species, i.e., extinction.	*No hybridisation between alien species and native species observed in the wild, may be possible in captivity.* Allen & Cross (1982) recorded hybrids between *Chilatherina campsi* and *Melanotaenia affinis*. There are no native *Chilatherina* spp. in Australia. Tappin (2011) states that hybridisation between wild rainbowfishes occurs more commonly than originally thought.	Minimal
Disease transmission Host or alternate host for native or alien diseases (viruses, fungi, protozoans or other pathogens) or parasites, impacts by transmission of diseases or parasites to native species.	*Parasites or pathogens directly or indirectly affecting fitness of native individuals without declines of their populations.* Live aquarium fish are the greatest risk group for introducing aquatic animal diseases in Australia (Corfield et al. 2008). Aquarium fish led to the spread of the goldfish ulcer disease that was introduced into Australia via infected goldfish, and which subsequently spread to native fish such as *Bidyanus bidyanus* (silver perch) (Corfield et al. 2008). Introduced fish are also the source of the Asian fish tapeworm *(Bothriocephalus acheilognathi*), which has caused substantial mortalities in *Hypseleotris klunzingeri* (Western carp gudgeon) in the Canberra region (Dove et al. 1997). This parasite has the potential to be a significant source of mortality for native fish species. Several pathogens and parasites infect rainbowfishes, including *Ichthyophthirius multifilis* (causes white spot disease), *Psicinoodinium pillulare* (causes velvet disease) and *Trichodina* (causes trichodiniasis); Tappin (2011). Langdon et al. (1985) reports that the decline of the desert rainbowfish (*Melanotaenia splendida tatei*) in the Finke River	Minor

Type of impact	Assessment	Rating
	(Australia) was due to the protozoan *Chilpodonella hexasticha*. Leeches are occasionally seen on wild rainbowfishes and can cause chronic anaemia and secondary infections (Tappin 2011). Monogenean flatworms, cestodes, nematodes and coccidia are also common in rainbowfishes (Tappin 2011). The bacteria *Aeromonas, Pseudomonas* and *Flavobacterium* can cause fin and tail rot. *Flavobactrium columnare* (causes columnaris disease) is ubiquitous on the skin of healthy fish worldwide and is a significant problem in warm water species (Bernardet & Grimont 1996). Hypoxia and death can occur in acute cases and the disease is transmitted by direct contact with infected fish or contaminated water (Tappin 2011). Tappin (2011) reports that *Achlya* fungus and epizootic ulcerative syndrome ('red spot') has been reported from wild rainbowfish in Australia. A review of diseases associated with rainbowfish did not identify any pests or diseases associated with the family Melanotaeniidae that were not already identified in Australia (Hardy-Smith et al. 2007). There are no known diseases or strains specific to Melanotaeniids, and therefore the introduction of disease from exotic *Chilatherina* spp. is unlikely to pose risk to native spp.	
Agriculture and forestry Damage to crops, pastures or plantations, horticultural and stored products, forests or forest products. Include direct feeding damage, seed dispersal, browsing on young trees, bark gnawing or stripping and antler rubbing, felling trees, defoliating them for nesting material.	*None, or only occasional damage or yield loss to crops or plantations (e.g., orchards), damage similar to native species, no change to forest structure or regeneration.* No adverse impacts on crops, plantations or forestry would be expected.	Minimal
Animal production Competition with livestock, transmission of diseases or parasites, predation, affecting livestock health, weakening or injuring livestock, pollution by droppings on farmland which domestic stock are then reluctant to graze, reduction of livestock accessibility to grazing land.	*None, or occasional competition with, or loss of yield in livestock or animal production.* If it became established in Australia, it is unlikely to have any negative impacts on animal production or aquaculture etc.	Minimal
Infrastructure Damage to human infrastructure, roads, buildings, dams, docks, fences, electricity cables (e.g., by gnawing or nesting on them) or through pollution (e.g., by droppings), digging activities.	*None or biological traits and lifestyle suggest potential damage to infrastructure (e.g., potential to increase soil erosion and decrease road stability, physical damage to property and infrastructure, disruption to transport and communications) but not yet reported.* No damage to infrastructure would be expected.	Minimal
Human health Injuries (e.g., bites, stings, scratches, rashes, accidents), transmission of diseases and parasites to humans. Impacts	*None, or host of one or more harmless diseases with the possibility of infecting humans, not yet reported.* Not toxic nor harmful to humans.	Minimal

Type of impact	Assessment	Rating
might affect human safety and cause traffic accidents. Via health costs, impacts usually lead to economic costs due to medication and treatments costs, as well as the consequences in productive losses from these impacts on workforce.	*Chilatherina* are non-venomous or toxic and harmless to humans (Froese & Pauly 2022). They are highly unlikely to cause injury to non-prey species outside of normal feeding behaviour.	
Social impacts Impact on human wellbeing. Noise disturbance, pollution of recreational areas, damage by trampling and overgrazing, restrictions in accessibility to habitats or landscapes of recreational value. Restrictions or loss of recreational activities, aesthetic attraction, touristic value, or employment possibilities, aesthetic values and natural or cultural heritage.	*Occasional small disturbance, only small percentage of human population affected.* If *Chilatherina* spp. were to establish in the wild in Australia, there may be impacts to fishing activities (whether directly through changes to fish structures through competition, or indirectly e.g., closures due to eradication or management activities).	Minor

Source: Adapted from Kumschick et al. (2012) and Nentwig et al. (2016)

The consequences for the environment may be predominantly from competition for resources, and predation.

The ratings are estimates as the impacts are mostly unknown but, using the Precautionary Principle and considering the information above, a risk rating of **minor-moderate** for the environmental consequences is appropriate.

4.4 Risk Rating

Establishment risk is the probability that establishment will occur (Bomford 2008). Results from this risk assessment show that, with the exception of *C. fasciata*, the likelihood of 9 spp. of *Chilatherina* establishing viable wild populations in Australia is low**.** The environmental impact and consequences of these spp., should they become established, is minor to moderate (Table 11).

4.5 Concerns raised during consultation

The first consultation round seeking comment from state and territory government jurisdictions and the public on the applicants' response to the terms of reference was undertaken from 12 January to 10 March 2022. Responses provided by various stakeholders and members of the public are presented in Appendix B. The main concerns raised and the applicants' responses to these concerns are outlined in Table 12.

The department's reports were circulated with relevant state and territory government agencies for comment between 21 September and 24 October 2022. The New South Wales and Western Australian Governments responded with comments supporting the amendment. The South Australian Government responded with no comments (Appendix B).

Table 12 Summary of main concerns raised and the applicant's responses

Concern	Response
Conservation status and sustainability Many species are listed as threatened, but trade in listed species can be counterproductive to protection and compromise conservation efforts due to increased harvesting. As a signatory to the Convention on Biological Diversity Australia has the responsibility to ensure that activities within our jurisdiction do not cause damage to the environment of other states or areas. If the species being considered are already under threat, adding the species to Australia's approved list, may further compound this issue by creating an incentive to harvest from the wild.	All species are being sustainably farmed and available from various fish farms in USA, Europe, and Maju aquarium in Indonesia. Being widely available overseas suggests that there should not be any wild harvesting. All stocks would come initially from German breeders and then from commercial facilities to which these captive-bred stocks are distributed to ensure no pressure is placed upon wild populations. Vets and Government licensing Authorities should be able to provide certification as to the source of the imported specimens. Wild specimens may be sought if there are none in captivity.
Identification issues The minimum size limit suggested by the proponent of 4cm should be applied to the importation of these species to reduce the chance of mistaken identity of juveniles with other similar looking fish species at the border.	There is no objection to the 4cm minimum size limit for the importation of rainbowfishes. This is already in place for the *Glossolepis* spp. on the allowable list 303EB EPBC Act.
Risk of introduction of pathogens to native population Appropriate certification of health status (i.e., free from disease, viral agents) of the originating facility prior to importation of this species, and adherence to all other Australian import conditions including post arrival quarantine.	Any fish imported into Australia for ornamental purposes are subject to being listed on the EPBC Act as an allowable import species and must have appropriate health certification then be subject to quarantine protocols in place at the time. They will come through licensed premises with appropriate quarantine processes.

4.6 Risk Mitigation

In response to the comments received during the consultation, the applicant provided the following risk mitigation measures and remarks:

1. Specimens should be a minimum length of 4 cm for ease of identification.
2. Specimens are sourced from captive-bred populations held by private keepers/breeders and commercial retailers in Germany (to ensure no pressure is placed on wild populations). However, there may be limitations on the restrictions that can imposed through the Live Import List process.
3. Imported specimens are subject to health certification requirements for freshwater ornamental (aquarium) fish, including inspection by a competent authority within 7 days prior to export and post-import quarantine.
4. Retailers or other traders should provide relevant information on best practice for buyers of *Chilatherina* species in Australia.
5. The unique colouration, likely popularity and expectant high prices (rarity confers value) of *Chilatherina* species in Australia may reduce the likelihood of establishing wild populations through accidental disposal/escape.

The department acknowledges the applicant's suggestions and agrees with measures 1 and 2. Due to the already low risk most of these species pose to the Australian environment, the first proposed mitigation point above can be imposed as an import condition to further reduce the risk to an acceptable level. Measure 4 is not considered viable under the EPBC Act. Measure 5 may be an inhibitor in some cases but is not considered by the department to be a viable mitigation measure.

5 Discussion

The global aquarium trade is arguably the greatest biosecurity threat to freshwater ecosystems (Ebner et al. 2020). Ornamental fish present a significant risk to aquatic systems in Australia and have the potential to trigger or contribute to a future major aquatic animal pest or disease incursion, particularly in freshwater habitats (Moore et al. 2010). Ebner et al. (2020) highlighted the numerous existing and potential pathways for incursions from the aquarium trade into freshwater ecosystems in tropical Australia, encompassing the lands and waterways north of the Tropic of Capricorn. The lack of consolidated information relevant to tropical Australia in terms of biotic incursion of even the better documented taxa (e.g., freshwater fishes) and a lack of information on most taxa in the aquarium trade (e.g., diseases in the wild) creates a major biosecurity risk (Ebner et al. 2020).

One of the factors affecting establishment success is propagule pressure – successful species are introduced more times than unsuccessful species. The number of fish that escape or are released is likely to increase if more species are kept, in higher numbers, and in more locations. As a result, propagule pressure can be minimised by limiting the species that are kept in Australia, the number of collections that hold a species, the number of individuals held in each collection, and the security circumstances in which species are kept (Bomford 2008).

There is also no evidence of *Chilatherina* spp. successfully establishing elsewhere, nor is there evidence for any of the 96 species in the family Melanotaeniidae. Arthington et al. (1999) considered that there is a low or residual probability that New Guinea rainbowfishes would establish feral populations in Australia. The Climatch map for these species indicated a very very low climate match. However, Climatch is based on terrestrial climate data and therefore is unlikely to be a true indicator of the potential range of non-endemic aquatic species.

In the absence any history of invasiveness and establishment, and a very very low climate match, results from the Bomford Model show that 9 of the 10 *Chilatherina* spp. have a low establishment risk, and moderate potential impacts on the environment if they were to establish. *C. fasciata* has a moderate establishment risk.

In addition to the factors assessed under the Bomford Model, several other characters that are most frequently cited as being associated with successful fish invasions include exhibiting high physiological tolerance (Moyle & Marchetti 2006), r-selected life history strategies (high fecundity, rapid growth, early maturity) (Moyle & Marchetti 2006, Bomford 2008, Corfield et al. 2008, Chan et al. 2021), aggressive behaviour (Corfield et al. 2008), moderate size (Moyle & Marchetti 2006, Bomford 2008, Corfield et al. 2008), and dietary preferences (Moyle & Marchetti 2006).

Subsection 303EN(3) of the EPBC Act states that the Minister must not issue a permit unless the Minister is satisfied that the proposed import would not be likely to threaten the conservation status of a species or ecological community; or likely to threaten biodiversity. Australia also has the responsibility under the Convention on Biological Diversity to ensure that activities within its jurisdiction do not cause damage to the environment of other states or areas. Adding species already under threat to Australia's approved list may further compound their conservation status by

creating an incentive to harvest from the wild. With 1 species listed as Critically Endangered and 3 further species listed as Endangered, it is important that listing of these species on the Live Import List does not place pressure on wild stocks.

Under ss 391(1) of the EPBC Act, the Minister must take account of the precautionary principle in making decisions. The precautionary principle is triggered by two threshold conditions: 1) a threat of serious or irreversible environmental damage (direct or indirect); and 2) scientific uncertainty as to the environmental damage. With a low risk of establishment, and a very, very low climate match, the risk assessments show that 9 of the *Chilatherina* spp would have minor-moderate potential impacts on the environment if they were to establish, and do not pose a threat of serious or irreversible damage. *C. fasciata* has a moderate establishment risk and minor-moderate potential impacts.

6 Conclusion

The department has reviewed the application to amend the Live Import List to include 10 species of *Chilatherina* and undertaken a risk assessment. During this process, the department has independently reviewed all available information on the 10 species of *Chilatherina* and has consulted Commonwealth, state and territory agencies, the public and other experts, as is required under the *Environment Protection and Biodiversity Conservation Act 1999.* Results from the Bomford Risk Assessment Model (2009) show that 9 species of *Chilatherina* pose a low risk of becoming established in Australia and 1 species poses a moderate risk.

Juveniles of these species would be difficult to distinguish from other species. Due to this characteristic, a minimum length of 4 cm SL is proposed to allow for positive identification of these species at the border.

After critically examining and reviewing all available information, the department recommends listing, *Chilatherina bulolo, Chilatherina campsi.* and *Chilatherina lorentzii* on Part 1 of the Live Import List with the import condition:

- of minimum length 4 cm SL

In consideration of their conservation status, the department recommends listing *Chilatherina alleni, Chilatherina axelrodi, Chilatherina bleheri, Chilatherina pagweinsis, Chilatherina pricei* and *Chilatherina sentaniensi* on Part 2 of the Live Import List with the condition:

- Captive-bred specimens only, of minimum length 4 cm SL

Due to its moderate establishment risk, the department **does not recommend** listing *Chilatherina fasciata.*

Appendix A: Impacts assessment scoring criteria

Table 13 Impacts assessment scoring criteria

Impact	Description	Minimal	Minor	Moderate	Major	Critical
Herbivory	Can cause changes in reproduction, survival, growth, and abundance of plants in the invaded community, e.g., herbivory, grazing, bark stripping, antler rubbing, feeding on algae, or uprooting of aquatic macrophytes. Result in restrictions in establishment, pollination, or seed dispersal of native species. Range from population decline to population loss and include minor changes in the food web.	No impact known or detectable; or very low level of herbivory, no major damage reported.	Herbivory affecting several native species, without significant impact on affected species or decline of their populations.	Herbivory affecting several native species, at least one native species declining.	Herbivory affecting many native species, several declining in population size, recorded community change is reversible.	Herbivory or toxicity affecting native threatened species, decline of these species, replacement or even extinction of species, recorded community change is irreversible.
Competition	Concern at least one native species, e.g., by competition for nutrients, food, water, space or other resources. May outcompete native species due to higher reproduction, resistance, longevity. In the beginning, might be slow change in species abundance but might lead to the local/global disappearance of a native species. Includes behavioural changes in outcompeted species and ranges from population decline to population loss.	No effect on fitness of native species.	Causes reductions in individual fitness but no declines in native populations densities.	Causes declines in populations densities, but no changes in community composition.	Causes changes in community composition – reversible if alien species is removed.	Causes at least local extinction of species and irreversible changes in community composition.

Impact	Description	Minimal	Minor	Moderate	Major	Critical
Predation	May concern single animal species or a guild, e.g., through predation, parasitism, or intoxication, measurable as reductions in reproduction, survival, growth, or abundance. These impacts range from population decline to population loss, including minor changes in the food web. . These impacts concern only free-living animals in the wild.	Negligible level of predation.	Predation on several abundant species, without significant impact on affected species or decline of their populations.	Predators directly or indirectly resulting in a decline of populations size of at least one native species but no changes in community composition.	Predators directly or indirectly resulting in local or population extinction of at least one native species, leading to changes in community composition, but changes are reversible when introduced species removed.	Predators directly or indirectly resulting in extinction of one or more native species (i.e. species vanish from communities at sites where they occurred before alien arrival), changes in community composition are irreversible.
Habitat and ecological community impacts	Impacts on characteristics of an ecosystem, its nutritional status (e.g. changes in nutrient pools, increased water turbidity, faecal droppings), modification of soil or water body properties, and disturbance regimes (changes in hydrology, erosion or soil compacting), changes in ecosystem functions (e.g. pollination or decomposition rates), or other physical or structural changes. Includes modification of successional processes that may lead to reduced suitability (e.g. shelter) for native species, thus causing their disappearance. The application of pesticides to control impacts might have side effects on non-target organisms.	Change in chemical (e.g. eutrophication, nutrient-cycling), physical (e.g. soil compaction, structure, hydrology) and/or structural (e.g. felled trees, burrows, disturbance dynamics) characteristics detectable, with no reduction of fitness of native individuals.	Moderate change in chemical, physical and/or structural characteristics, affecting fitness of native individuals without decline of their populations.	Major change in chemical, physical and/or structural characteristics, change in fauna and flora and/or successional processes, reversible.	Severe changes in chemical, physical and/or structural characteristics, decline of species and/or change in species composition, resulting in local extinction of at least one native species, leading to changes in community composition, but change are reversible when introduced species is removed.	Massive changes in chemical, physical and/or structural characteristics, endemic species and/or threatened species affected, decline of species and/or change in species composition, loss of habitat characteristics, damage of sites of conservation importance, irreversible.

Impact	Description	Minimal	Minor	Moderate	Major	Critical
Hybridisation	Impacts are through hybridization with native species, usually closely related to the alien taxon, leading to a reduced or lost opportunity for reproduction, sterile or fertile hybrid offspring, gradual loss of the genetic identity of a species, and/or disappearance of a native species, i.e., extinction.	No hybridisation between alien species and native species observed in the wild, may be possible in captivity.	Hybridisation is observed in the wild but rare; hybrids weak, do not reach maturity, no decline of native populations.	Hybridisation is regularly observed in the wild; hybrids are vigorous but sterile, local decline of pure native populations but pure native species persists.	Hybridisation is common in the wild; F1 hybrids are vigorous and fertile, however offspring of F1 hybrids are weak and sterile; individuals of introduced species and hybrids discernible from pre natives, pure native populations can be recovered by removing the introduced species and hybrids.	Hybridisation is common in the wild; hybrids are vigorous and fertile, pure native populations cannot be recovered by removing the introduced species and hybrids resulting in local extinction of native species.
Disease transmission	Host or alternate host for native or alien diseases (viruses, fungi, protozoans or other pathogens) or parasites, impacts by transmission of diseases or parasites to native species.	Not a host of diseases transmissible to native species, or very low level of transmission; reduction of fitness of native individuals is not detectable.	Parasites or pathogens directly or indirectly affecting fitness of native individuals without declines of their populations.	Parasites or pathogens directly or indirectly resulting in a decline of populations size of at least one native species but no changes in community composition.	Parasites or pathogens directly or indirectly resulting in local or population extinction of at least one native species leading to changes in community composition, but changes are reversible when introduced species is removed.	Parasites or pathogens directly or indirectly resulting in local or population extinction of at least one native species, community changes are irreversible.

Impact	Description	Minimal	Minor	Moderate	Major	Critical
Agriculture and forestry	Damage to crops, pastures or plantations, horticultural and stored products, forests or forest products. Include competition with crops by weeds, direct feeding damage, seed dispersal, reduced accessibility, usability or marketability through contamination and cosmetic changes. Impacts might affect forest regeneration through browsing on young trees, bark gnawing or stripping and antler rubbing. Damage includes felling trees, defoliating them for nesting material. Includes the need for applying pesticides which involve additional costs, reducing market quality. Impacts usually lead to an economic loss.	None, or only occasional damage or yield loss to crops or plantations (e.g., orchards), damage similar to native species, no change to forest structure or regeneration.	Damage or yield loss to crops common, damage or yield loss similar to native species, minor effect on forest growth, impact on seed dispersal. Some trade disruptions.	Regular damage or yield loss similar to native species through feeding on crops or through competition, occasional threat to stored food, constrains forest regeneration through browsing on young trees, damage to plantations, gnawing of bark, losses exceed impact of the native fauna, sometimes reaching high levels. Moderate trade disruptions.	Regular high damage or yield loss in fields or to stored food, fruit consumption; moderate to strong damage to mature forest through seed consumption, bark stripping or antler rubbing, death of trees by felling or flooding. Killing trees by defoliating them for nesting material. High trade disruptions.	Complete loss of yield or destruction of fields or plantations (e.g. orchards), or of stored food by consumption and contamination; very strong damage to mature forest through seed consumption, bark stripping. Massive trade disruptions.
Animal production	Competition with livestock, transmission of diseases or parasites, predation, affecting livestock health, weakening or injuring livestock, e.g., by stinging or biting, pollution by droppings on farmland which domestic stock are then reluctant to graze, reduction of livestock accessibility to grazing land, the need for applying pesticides which involve additional costs, reducing market quality. Impacts usually lead to an economic loss. This category refers to livestock, poultry, game animals, fisheries and aquaculture.	None, or occasional competition with, or loss of yield in livestock or animal production.	Competition with, or loss of yield in livestock or animal production, transmission of diseases to livestock or production animals in the native area, but not yet reported from the area of introduction. Little operational obstruction or removal/control cost. Some trade disruptions.	Competition more frequent with several livestock or production animal species, transmission of diseases reported, but infection rates low. Pollution by droppings on farmland which domestic stock are then reluctant to graze. Moderate trade disruptions.	Transmission of economically important diseases or hybridization with economically important game animals, fatalities uncommon. Large trade disruptions.	For animals, transmission of harmful diseases to or hybridization with livestock or production animals, fatalities reported. Massive trade disruptions.

Impact	Description	Minimal	Minor	Moderate	Major	Critical
Infrastructure	Damage to human infrastructure, roads, buildings, dams, docks, fences, electricity cables (e.g., by gnawing or nesting on them) or through pollution (e.g., by droppings), digging activities on watersides, roadside embankments and buildings which may affect flood defence systems, traffic infrastructure or stability of buildings. Includes the need for applying pesticides and performing management and eradication programmes, their development and further administration costs, as well as costs for research and control. Impacts usually lead to an economic loss.	None or biological traits and lifestyle suggest potential damage to infrastructure (e.g., potential to increase soil erosion and decrease road stability, physical damage to property and infrastructure, disruption to transport and communications) but not yet reported.	Occasional damage with minor economic losses, e.g., damage to fences, impact through pollution, accumulations of droppings, minor increases in soil erosion.	Damage to fences and/or plantations, gnawing electricity cables, causing road accidents, nesting on current conductions. Moderate increase in soil erosion, moderate damage to property, buildings and infrastructure, frequent obstruction of waterways.	Considerable damage to property and infrastructure, with considerable economic costs, damage through burrowing or nesting in buildings. Major obstruction of waterway.	Considerable damage to flood defence systems or other critical infrastructure, major soil erosion, danger to human safety, threat to transport safety.
Human health	Injuries (e.g., bites, stings, scratches, rashes, accidents), transmission of diseases and parasites to humans, bioaccumulation of noxious substances, health hazard due to contamination with pathogens or parasites (e.g., through contaminated water, soil, food, or by faeces or droppings). Impacts might affect human safety and cause traffic accidents. Includes the need for applying pesticides which due to their low selectivity and/or residues might have side-effects on humans. Via health costs, impacts usually lead to economic costs due to medication and treatments costs, as well as the consequences in productive losses from these impacts on workforce.	None, or host of one or more harmless diseases with the possibility of infecting humans, not yet reported.	Host of several harmless diseases, indirect transmission or possibility of direct transmission, but only a small percentage of the human population at risk, health hazard from soil and water contamination caused by droppings, few cases reported.	Direct infection with one or more harmless diseases, occasional health threat through bites or other attacks, moderate number of cases reported.	Direct transmission of several diseases. Health threat through bites or other injuries happen more often, rarely fatal.	Vector of harmful diseases to humans and/or many diseases frequently transmitted. Health threat through bites or other injuries happen frequently, more often fatal.

Impact	Description	Minimal	Minor	Moderate	Major	Critical
Social impacts	Impact on human wellbeing. Noise disturbance, pollution of recreational areas (water bodies, rural parks, golf courses or city parks), fouling, eutrophication, damage by trampling and overgrazing, restrictions in accessibility to habitats or landscapes of recreational value. Restrictions or loss of recreational activities, aesthetic attraction, touristic value, or employment possibilities, aesthetic values and natural or cultural heritage.	None, or biological traits and lifestyle suggest potential for disturbance in recreational or residence areas (e.g., by noise, pollution).	Occasional small disturbance, only small percentage of human population affected.	Regular small disturbance, or occasional larger disturbance.	Regular larger disturbance. Recreational value of a habitat or a landscape strongly affected.	Massive disturbance; complete loss of recreational value of a habitat or a landscape.

Appendix B: Summary of comments received on the proposal to include 10 species of *Chilatherina* on the Live Import List

Round 1

Consultation with the general public, stakeholders and state and territory government agencies on the applicants' report was undertaken from 12 January to 10 March 2022. Submissions containing comments to be addressed were received from Western Australia (WA), New South Wales (NSW), and Federation University (Table 14). Ten email responses supporting the proposal were received from members of the public and the aquarium industry. These raised no issues requiring additional information.

Table 14 Comments received during public consultation and response from applicant

Respondent	Major comments	Further information requested	Applicant response
NSW Department of Primary Industries (DPI)	NSW DPI supports the amendment to add these species to the Live Import List provided the following conditions are met: The minimum size limit suggested by the proponent of 4cm should be applied to the importation of these species to reduce the chance of mistaken identity of juveniles with other similar looking fish species at the border. Appropriate certification of health status (i.e., free from disease, viral agents) of the originating facility prior to importation of this species, and adherence to all other Australian import conditions including post arrival quarantine. NSW DPI further notes that all other identified biosecurity risks are acceptable, and these 17 species of Rainbowfish pose very low risks to the Australian and NSW aquatic environment.	No further information required	There is no objection to the 4cm minimum size limit for the importation of rainbowfishes. This is already in place for the *Glossolepis* spp. on the allowable list 303EB EPBC Act. Only certain countries are approved to export freshwater aquarium fish to Australia. They are China, French Polynesia, Germany, Hong Kong, Indonesia, Malaysia, New Zealand, Singapore, Sri Lanka, Thailand, and the USA. They are listed by BICON Australian Biosecurity Import Conditions - available at: https://bicon.agriculture.gov.au/BiconWeb4.0/ViewElement/Element/Index?elementPk=1659368&caseElementPk=1752962 Importers of the species requested will only import from these countries. Model Health Certificate, Appendix 6: Health certification for freshwater ornamental finfish exported to Australia states that: Only finfish listed in the List of Permitted Live Freshwater Fish Suitable for Import are included in this consignment and are documented on the attached invoice. The fish in the consignment have been inspected within seven (7) days prior to export and show no clinical signs of infectious disease or pests. The Export Premises are approved for export to Australia, meeting standards of the Department of Agriculture and Water Resources.

	It is noted that in Section 12.f in providing information on NSW legislative controls on the species the proponent has incorrectly referenced the Fisheries Management Act 1994 in a number of these applications. Control of aquatic species was transferred in 2017 to the Biosecurity Act 2015 which declares some fish, aquatic invertebrates and plants as prohibited matter under Schedule 2; and the Biosecurity Regulation 2017 which declares notifiable aquatic species under Schedule 1 Part 2.	All fish being held at the Export Premises exhibit no clinical signs of significant infectious disease or pests and are sourced from populations not associated with any significant disease or pests within the six (6) months prior to certification. All fish in the consignment have been in approved Export Premises for fourteen (14) days prior to export. The fish have not been kept in water in common with farmed food fish (fish farmed for human consumption including recreational fishing) or koi carp. Adequate quarantine safeguards are in place to maintain the health status of the certified fish until export. The fish are effectively isolated in holding systems that prevent infection by direct contact with other fish or indirect contact via water, equipment or any other means. Any fish imported into Australia for ornamental purposes are subject to being listed on the EPBC Act as an allowable import species and must have appropriate health certification then be subject to quarantine protocols in place at the time. They will come through licensed premises with appropriate quarantine process to allow fish in good health at the other end of the process. Anyone importing allowable species to NSW will also have to comply with any state legislation in place at the time of importation.
WA Department of Primary Industries and Regional Development (DPIRD)	In general, the Department of Primary Industries and Regional Development (DPIRD) considers the suite of 17 rainbow fish (in *Chilatherina* and *Glossolepis* families) applications being considered for addition to the Federal permitted import list, "the White List", to be relatively low risk to the Western Australian environment. However, DPIRD WA does not support the addition of most of these fish due to sustainability concerns in their native environment. Lyer (2016) outlines how trade in listed species can be counterproductive to protection and compromise conservation efforts due to increased harvesting. as outlined below. Certification in developing countries is problematic and poorly managed. As a signatory to the Convention on Biological Diversity Australia has the responsibility to ensure that activities within our jurisdiction do not cause damage to the environment of other states or areas. If the species being considered are already under threat, adding the species to Australia's approved list, may further compound this issue by creating an incentive to harvest from the wild.	Whilst the fish that the WA Department of Primary Industries and Regional Development (DPIRD) have concerns about regarding their IUCN status, it is important to note that in most instances the fish population is stable or data deficient. There is considerable debate about the decline of natural species and what is the best thing that can be done to stop the march to extinction. Just monitoring does not work, it lets us know that they are going. The best way to protect species is to reverse the threatening processes that are causing the decline. The major causes affecting the decline of fishes in West Irian and Papua New Guinea are human activities, Palm Oil plantations, mining and habitat destruction. More up to date research needs to be undertaken, but the exorbitant costs involved to conduct field trip research makes this a very onerous task. Millington, M D, Holmes, B J, and Balcombe S R. (March 2022) Systematic review of the Australian freshwater ornamental fish industry: the need for direct industry monitoring, report the following: Wild-capture fisheries and captive-based aquaculture constitutes an important part of imported stock. Seven of the species we identified as at risk of exploitation originate from continents involved in ornamental trade of wild fish (Asia: E. *bicolor, B. melanopterus, B. splendens, P. titteya, C. carpio;* Africa: *T. duboisi, O. mossambicus*) (Yi 2014), and may have been harvested from wild populations. Capture-based aquaculture continues to remain the only feasible and efficient means of production for a considerable number of top–traded ornamental species (Teletchea 2015). Indeed, an estimated 85% to 90% of the ornamental species produced in India are sourced from captive-based ornamental fisheries (Rani et al. 2013; Silas et al. 2011). Further, more than 70% of fish in the Singapore industry are harvested from wild populations in

India, Asia, South America, and Africa (Yi 2014), and as Singapore is one of the leading exporters of freshwater ornamental fish and a main supplier to the Australian trade (O'Sullivan et al. 2008), these wild-caught fish will undoubtedly become part of the ornamental community in Australia. Demand for such fish remains high, as wild-type stock is championed by hobbyist groups over hybridised, line-bred progeny (M. Millington unpubl. data 2018). However, a ready supply of pure strain individuals is necessary to retain the wild type features that hobbyists' favour, and thus there continues to be a push by industry for further whitelisting of wild-caught species to supplement linebred stock (Toomes et al. 2020).

Captive-based aquaculture must be pursued and prioritised as a replacement for high impact wild-caught fisheries to minimise further exploitation of the freshwater fish species by the Australian ornamental industry. This has been achieved in the past for ornamental species, including Boeseman's rainbowfish – *Melanotaenia boesemani* (Allen & Cross, 1980). Following their intense collection for ornamental purposes in the 1980s that severely threatened population resilience (IUCN 2021c), a switch to captive-bred production removed this threat and the species is no longer considered exploited by ornamental trade (IUCN 2021c).

While these trade protections may not substantially reduce within-native-range impact for all imperilled species, given the sizeable ornamental industries internationally (Yi 2014; Hensen et al. 2010), Australia should set a global example to encourage other countries to also remove exploited species from import. A united front on exploitation and investment in advancing captive breeding techniques has the potential to remove capture-based ornamental fisheries from the industry and reduce the industry's environmental impact.

There are also many instances of species becoming endangered in Australia, such as:

Gouldian finch decline.

The main threats potentially affecting seed resource availability for Gouldian Finches are grazing pressure exerted by stock and feral herbivores, and unfavourable fire regimes. Grazing intensity has been shown to be the factor most strongly correlated with historical granivorous bird species decline across the northern savannas, and data suggest that the negative impacts of grazing may be worse where pastoral settlement and grazing intensification occurred earlier, as in Queensland (Franklin et al. 2005).

Plains wanderer - *Pedionomus torquatus*

The major threat to the survival of the Plains-wanderer is the loss of sparse native grasslands and the condition of the grassland habitat that remains. They like it just right. If the grass cover becomes too thick or too sparse, they abandon the site. Zoos Victoria is part of an Australian National Recovery Team, formed in an emergency effort to save the species from extinction

Red finned blue eye - *Scaturiginichthys vermeilipinnis*

The introduced and highly invasive fish Eastern Gambusia (*Gambusia holbrooki*) – also known as the mosquitofish – is the biggest threat to the Red-finned Blue-eye's survival. Eastern Gambusia compete with the Red-finned Blue-eye for food and habitat, display aggressive behaviour such

as fin-nipping, and probably eat the eggs and newborn, Red-finned Blue-eye (and other native fish). Gambusia are implicated in the extinction of Red-finned Blue-eye from seven springs since 1991. Added to this, Red-finned Blue-eye have most likely also been affected by habitat degradation caused by cattle and feral pigs that trample plants, increase turbidity, and degrade water quality to an intolerable level for Red-finned Blue-eye.

Bilby - *(Macrotis lagotis)*

Main threats to bilbies, Predation by foxes, feral cat and wild dogs, Competition with, and habitat degradation by, introduced herbivores (rabbits, cattle, camel), Inappropriate fire regimes, Climate change leading to a drier climate, Habitat loss and degradation due to mining and other developments, and Road mortality.

We are extremely lucky that there are recovery plans and efforts to save these species including captive breeding programs, where there may be no plans to do the same in New Guinea, and West Papua.

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		Yi Y (2014) Developing Monitoring Tools for Tomorrow's Invasive Species Lists, DNA Barcodes, and Images for Ornamental Fish. PhD Thesis, National University of Singapore, Singapore, 172 pp
	How is source stock from the suppliers collected?	Hans-Georg Evers, a German aquarist, author, fish collector, who, from 2005 until 2018 was editor-in-chief of the aquarium magazine "AMAZONAS". Evers mainly travels to South America and Asia to discover new fish and import them for breeding. He has caught about 350 species of fish so far, many of them for the first time. The species *Oryzias evers*i, a ricefish from Sulawesi, and *Corydoras eversi*, a short -snouted mailed catfish from the Rio Araguaia area, Brazil, were named after their discoverers. Evers has authored and co-authored hundreds of professional articles and ten books, mostly on South American catfish. He has also written more than 1000 articles published in hobbyist magazines and scientific papers. Today, he works for the American issue of AMAZONAS as an editor. Along with Jeffrey Christian, the owner of Maju Aquarium in Java, started a project in 2011, that saw them collect a once only collection of brood stock from Western Papua and breed rainbowfish sustainably. In his article: Evers, H.G., Pinnegar, J.K., and Taylor, M.I (2019), Where are they all from? – sources and sustainability in the ornamental freshwater fish trade available at: https://onlinelibrary.wiley.com/doi/full/10.1111/jfb.13930 He writes a relevant case study, Case Study: WILD COLLECTING OF RAINBOWFISHES IN WEST PAPUA, FOR BREEDING IN CAPTIVITY, The rainbowfishes (Melanotaeniidae) are a family of small, colourful, freshwater fish found in northern and eastern Australia, New Guinea and several islands of Indonesia. Some melanotaeniids are now critically endangered as a result of over-collecting and hence trade is carefully restricted. Notably, Boeseman's rainbowfish Melanotaenia boesemani Allen & Cross 1980 is one of the most popular melanotaeniid species in the aquarium hobby. When fully matured, males display a very distinct pattern of half-and-half coloration marked by a brilliant blue anterior and bright yellow to orange-red posterior. Allen and Cross (1980) discovered the species whilst studying material originally collected in 1954–1955 by Marinus Boeseman and stored at the National Museum of Natural History in Leiden (Netherlands). The species is known only from the Ayamaru Lakes and tributaries and from Uter-Aitinyo Lake in West Papua; two locations that are 30 km apart and are separated by rugged karsts. After the first publication describing M. boesemani (Allen & Cross 1980), great interest arose in the potential commercial value of this species. It was introduced to the aquarist trade in 1983 and has steadily increased in popularity since then (Polhemus & Allen, 2007). In the mid-1980s, more than 60,000 males were caught and exported monthly from Ayamaru (Allen, 2007). Such over-exploitation quickly brought this species to the verge of extinction in its natural habitat. Consequently, this species was included on the IUCN Red List of endangered species (Allen, 1996) and only farmed animals are now permitted to be exported (Nugraha et al., 2015). Melanotaenia boesemani has however, been domesticated and produced in Indonesian fish farms since 1983 (Nugraha et al., 2015). Visits in 2013 suggest that the population in Lake Uter is stable and apparently healthy,

		but the Ayamaru lakes have been devastated through the introduction non-native fish species and by pollution, hence fish populations are severely threatened (Evers, 2014). There are currently 86 recognized species in the genus Melanotaenia Gill 1862 and several more in the genera *Glossolepis* Weber 1907 and *Chilatherina* Regan 1914. There is a great appetite to introduce more of these rainbowfishes into the freshwater aquarium trade. Melanotaeniids thrive in captivity and thanks to their often-brilliant colours, small size and ease of breeding, are highly prized by aquarists. However, in order to avoid some of the same over-exploitation problems associated *M. boesemani*, and because many species have highly restricted home ranges, collectors are now working with taxonomists and breeding facilities, to secure new broodstock. They are then developing sustainable aquaculture practices; such that wild populations are not put at risk in the future. A particular focus in recent years has been the Birds Head Peninsula, West Papua Province, Indonesia where a multitude of novel species have been discovered (Allen et al., 2014, 2016; Kadarusman et al., 2012). Once in captivity it is relatively straightforward to maintain and breed most species of rainbowfish. If rainbowfishes are kept in a species tank with floating plants or a synthetic spawning mop, sooner or later fry will appear. Most rainbowfish species spawn every day, usually in the morning, with the males attracting the females and the pairs spawning in the plants. The tiny, crystal-clear eggs adhere to the plants with their sticky filament for about 10 days until the fry hatch. In Indonesia, large well-equipped breeding facilities have emerged, offering many different species and varieties. The Maju Aquarium is now regularly reproducing more than 40 different species of Indonesian rainbow fish under sustainable conditions (social and environmental aspects). Maju Aquarium has previously exported fish on the Allowable Import List to Western Australia, with no problems. They complied with all regulations, and there are aware of Australia's biosecurity and quarantine procedures. Each of the 7 species listed may have an expedition story attached. Some are well documented in Aquarium Fish journals. The Authors of the reports to add the 7 species are well known within the Rainbowfish aquarium hobby. Author 1 has a fish named in his honour by the Ichthyologists at NT Museum and Canberra University, Melanotaenia wilsoni for David Wilson for his work with native fishes and finding new species and increasing distribution information. Where possible we will put a reference to the expeditions to collect these species.
	Is the applicant able to detail how often wild caught specimens are used from the	Evers, Personal communications (2022) advises that it is generally very expensive to arrange an expedition to remote parts of Papua New Guinea or West Irian to collect wild rainbowfishes. indicate that from Germany, prior to covid lockdowns, that a typical 10-day expedition cost approximately $14,000 Australian dollars (9000 Euros) each, and that a minimum of 3 people travelled on most trips. This is a considerable expense to acquire fish species. Broodstock was only collected one time and deposited at Maju Aquarium in Java.

	source supplier?	Author 1 arranges expeditions into remote parts of the NT to collect different forms of native fish brood stock. The distances involved and logistics to get live fishes to captivity make wild caught specimens very expensive and makes no business sense to use wild specimens when rainbowfishes are more easily bred in captivity. This is also a protection mechanism when captive bred healthy fish are much less expensive than wild caught fish as well as less likely to suffer from any of the parasites and other disease-causing organisms from natural locations. Many of the collections are a once only expedition so wild specimens would only be sought if there are none in captivity.
	How can you provide evidence that the fish are sustainably sourced?	There is no question that when the fish are sourced from the USA, Asia or Germany that they will come from a well-managed fish farm. Vets and Government licensing Authorities should be able to provide certification as to the source of the imported specimens. It is just not good business practise to supply wild fish when farm raised are so much cheaper. An example is a report showing that one of Indonesia's easternmost regions is taking an unprecedented step toward sustainability Last week, the government of the province of West Papua, on the island of New Guinea, announced legislation establishing it as Indonesia's first "conservation province." What this means is that the government will ensure that all future economic activity and development will be sustainable. Overseas fish farms are concerned about Conservation and Sustainability, and it is easy to find comments such as below on Seagrest Farms web pages. We love fish. And we know you do too. Part of our mission at is to promote conservation and sustainability efforts so that everyone can continue to have these experiences both in their home aquariums and in the wild. We support both aquaculture and sustainable wild collection and hope to help guide you to make the best decisions possible. They also have a poster available on conservation and sustainability. Seagrest Farms: http://segrestfarms.com/index.cfm?fuseaction=content.posters Millington, M D, Holmes, B J, and, Balcombe S R. (March 2022) Systematic review of the Australian freshwater ornamental fish industry: the need for direct industry monitoring, report the following: Captive-based aquaculture must be pursued and prioritised as a replacement for high impact wild-caught fisheries to minimise further exploitation of the freshwater fish species by the Australian ornamental industry. This has been achieved in the past for ornamental species, including Boeseman's rainbowfish – *Melanotaenia boesemani* (Allen & Cross, 1980). Following their intense collection for ornamental purposes in the 1980s that severely threatened population resilience (IUCN 2021c), a switch to captive-bred production removed this threat and the species is no longer considered exploited by ornamental trade (IUCN 2021c). Evers, et al. state: However, in order to avoid some of the same over-exploitation problems associated *M. boesemani*, and because many species have highly-restricted home ranges, collectors are now working with taxonomists and breeding facilities, to secure new broodstock. They are then developing sustainable aquaculture practices; such that wild populations are not

		put at risk in the future. A particular focus in recent years has been the Birds Head Peninsula, West Papua Province, Indonesia where a multitude of novel species have been discovered (Allen et al., 2014, 2016; Kadarusman et al., 2012). Once in captivity it is relatively straightforward to maintain and breed most species of rainbowfish. If rainbowfishes are kept in a species tank with floating plants or a synthetic spawning mop, sooner or later fry will appear. Most rainbowfish species spawn every day, usually in the morning, with the males attracting the females and the pairs spawning in the plants. The tiny, crystal-clear eggs adhere to the plants with their sticky filament for about 10 days until the fry hatch. In Indonesia, large well-equipped breeding facilities have emerged, offering many different species and varieties. The Maju Aquarium is now regularly reproducing more than 40 different species of Indonesian rainbow fish under sustainable conditions (social and environmental aspects).
	How can you prove all the fish sourced are captive bred?	There is no question that when the fish are sourced from the USA or Germany that they will come from a well-managed fish farm. Vets and Government licensing Authorities should be able to provide certification as to the source of the imported specimens. It is just not good business practise to supply wild fish when farm raised are so much cheaper. There is considerable debate about the decline of natural species and what is the best thing that can be done to stop the march to extinction. Just monitoring does not work, it lets us know that they are going. The best way to protect species is to reverse the threatening processes that are causing the decline. The major invasive species causing the decline of fishes in West Irian and Papua New Guinea is humans' activities. Large scale land clearing to produce oil palms by the straight hairs, a description from West Irian natives describing the new immigrants from Indonesia. (Personal communication with Dan Dority, the person who discovered *Glossolepis dorityi*, also the person who raised the alarm regarding the decline of the species). Wilson, co-author of reports has toured ornamental fish and aquatic plant production farms in Malaysia and seen the impact of large oil palm plantations. Local Malaysian ornamental aquatic plant producers spoke of the disappearance of the small fishes of the streams within and surrounding the oil palm plantations adjacent their properties. The IUCN states, the tropical areas suitable for oil palm plantations are particularly rich in biodiversity. Oil palm development, therefore, has significant negative impacts on global biodiversity, as it often replaces tropical forests and other species-rich habitats. Globally palm oil production is affecting at least 193 threatened species, according to The IUCN Red List of Threatened Species. It has been estimated that oil palm expansion could affect 54% of all threatened mammals and 64% of all threatened birds globally. It also reduces the diversity and abundance of most native species. For example, it has played a major role in the decline in species such as orang-utans and tigers.

Some 10,000 of the estimated 75,000–100,000 Critically Endangered Bornean orang-utans are currently found in areas allocated to oil palm. Every year around 750 to 1,250 of the species are killed during human-orang-utan conflicts, which are often linked to expanding agriculture. A small number of species can benefit from the presence of oil palm plantations, including species of wild pig, rodents and some snakes.

Evers, et al. state: However, in order to avoid some of the same over-exploitation problems associated *M. boesemani*, and because many species have highly-restricted home ranges, collectors are now working with taxonomists and breeding facilities, to secure new broodstock. They are then developing sustainable aquaculture practices; such that wild populations are not put at risk in the future. A particular focus in recent years has been the Birds Head Peninsula, West Papua Province, Indonesia where a multitude of novel species have been discovered (Allen et al., 2014, 2016; Kadarusman et al., 2012).

Once in captivity it is relatively straightforward to maintain and breed most species of rainbowfish. If rainbowfishes are kept in a species tank with floating plants or a synthetic spawning mop, sooner or later fry will appear. Most rainbowfish species spawn every day, usually in the morning, with the males attracting the females and the pairs spawning in the plants. The tiny, crystal-clear eggs adhere to the plants with their sticky filament for about 10 days until the fry hatch. In Indonesia, large well-equipped breeding facilities have emerged, offering many different species and varieties. The Maju Aquarium is now regularly reproducing more than 40 different species of Indonesian rainbow fish under sustainable conditions (social and environmental aspects).

The total island wide, Papua New Guinea and West Irian, introduction of larger South American, Asian and African species of fishes to increase food production and for mosquito control.

Species introduced to the Island of New Guinea (WI & PNG)

Family	Species	Common name
ANABANTIDAE	*Anabas testudineus*	Climbing Perch
BELONTIIDAE	*Trichogaster pectoralis*	Snakeskin Gourami
BELONTIIDAE	*Trichogaster trichopterus*	Threespot Gourami
CHANNIDAE	*Channa stricta*	Striped Snakehead
CICHLIDAE	*Oreochromis mossambica*	Tilapia
CICHLIDAE	*Coptodon rendalli*	Redbreast Tilapia
CLARIIDAE	*Clarias batrachus*	Walking Catfish
CYPRINIDAE	*Crassius auratus*	Goldfish
CYPRINIDAE	*Cyprinus carpio*	Common Carp
OSPHRONEMIDAE	*Osphronemus goramy*	Giant Gourami

POECILIIDAE	*Gambusia affinis*	Mosquito Fish
POECILIIDAE	*Poecilia reticulata*	Guppy
POECILIIDAE	*Xiphophorus helleri*	Swordtail
SALMONIDAE	*Oncorhynchus mykiss*	Rainbow Trout
SALMONIDAE	*Salmo trutta*	Brown Trout
SALMONIDAE	*Salvelinus fontinalis*	Brook Trout
SERRASALMIDAE	*Piaractus brachypomus*	Red Bellied Pacu

The island wide introduction of larger predatory species and Gambusia spp. (Mosquito Fish) combines with land clearing is the most likely cause of native fish decline. Collecting numbers of fishes in remote locations for commercial sale of wild collected fish is not viable as a business. Collections do occur in areas where there are large numbers of colourful rainbowfishes such as Boeseman's Rainbowfish Melanotaenia boesmani and this is concerning but will not end the species as quickly as invasive species or pollution from large scale industrial agriculture.

References:

Allen, Gerald R (1991) "Freshwater Fishes of New Guinea", published by Christian Research Institute.

De Smit, Olivia (2019) Conservation International https://www.conservation.org/blog/indonesian-province-leaps-ahead-in-conservation

Evers, H.G., Pinnegar, J.K., and Taylor, M.I (2019), Where are they all from? – sources and sustainability in the ornamental freshwater fish trade available at: https://onlinelibrary.wiley.com/doi/full/10.1111/jfb.13930

Froese, R. and D. Pauly. Editors. 2022. FishBase. World Wide Web electronic publication. www.fishbase.org, version (02/2022).

https://www.fishbase.de/Country/CountrySpeciesSummary.php?c_code=598&id=5808

International Union for Conservation of Nature (IUCN) https://www.iucn.org/resources/issues-briefs/palm-oil-and-biodiversity

Millington, M D, Holmes, B J, and Balcombe S R. (March 2022) Systematic review of the Australian freshwater ornamental fish industry: the need for direct industry monitoring.

Chilatherina spp.	***Chilatherina alleni (Allen's Rainbowfish)***
Whilst the 10 *Chilatherina* species listed in the proponent's various applications are not CITES listed; all are IUCN listed ranging from least concern to critically	The IUCN reports, This species is assessed as vulnerable. It has an extent of occurrence (EOO) of 780 km2. The primary threat to this species is mining and there are a best estimate of six locations based on this threat, which effects the two river systems and the main river and

endangered (Table 1). Many of the *Chilatherina* species have a limited distribution and supply for the aquarium trade is therefore likely to include wild harvest. Additionally, breeders require source stock, likely to come from the wild. Whilst the proponent is proposing fish are sourced from breeders, once approved for the White List there are no processes in place to ensure that is the only source. DPIRD WA is not satisfied there are robust checks and balances in place to ensure the ongoing sustainable import into Australia once added to the White List. DPIRD WA do not support the addition to the White List of the seven IUCN listed species rated above least concern (Table 1). Of the remaining three species rated as of "least concern" there is little information on the status of *Chilatherina bulolo* and *C. campsi* populations available. Therefore, using the precautionary principle, DPIRD WA does not support their addition to the white list. The remaining species (*Chilatherina fasciata*) could be considered for addition to the White List following a robust risk assessment assessing likelihood and consequence. However, once added there is no guarantee that all fish imported to Australia will come from commercial breeders.

DPIRD WA assessment of *Chilatherina fasciata* (Barred Rainbowfish)

DPIRD WA finds the environmental risk to WA of *Chilatherina* fasciata to be acceptable for the reasons outlined below. *Chilatherina fasciata* as a tropical species there is a moderate risk to be able to establish populations in the Kimberley region of WA. There is some risk that it could establish in suitable waters of the Pilbara as there is no comprehensive temperature tolerance information. Fishes' temperature tolerances are often greater than the native or preferred temperatures quoted. The Kimberley and Pilbara regions are sparsely populated, so the risk of release is low and correspondingly the propagule pressure from multiple releases is also low. It should be noted that over time human population densities in some areas are likely to increase and that it must be assumed that all fish in the tributaries separately. There is continuing decline in habitat based on this threat. Current Population Trend: Unknown. There is no detailed information available on the population size or trends in this species, but it is thought to be common in both river systems in which it occurs (G.R. Allen pers. comm. 2019). There are mining concessions in part of the distribution area of this species (Siriwo River) and associated human settlements also represent a threat (Kadarusman pers. comm. 2019). An excerpt from David Price's article *Chilatherina* alleni: The melanotaeniid genus *Chilatherina* contains small (up to 100 mm SL) freshwater fishes that inhabit rivers, creeks and lakes and are restricted to the lowlands of northern New Guinea and adjacent Yapen Island in the Geelvink Bay. Allen (1981) reviewed the genus, recognising six species including C. axelrodi Allen, C. campsi (Whitley), C. crassispinosa (Weber), C. fasciata (Weber), C. lorentzi (Weber), and C. sentaniensis (Weber). Since that review, three other species have been added; C. bulolo (Whitley, see Allen 1983), C. bleheri Allen, 1985 and C. pricei Allen, 1996. This paper describes a new member of the genus from Siriwo, north Irian Jaya. C. alleni was collected from a tributary of the Aiborei (=Aboge) River which is part of the Siriwo drainage. The river is approximately five meters wide, with a maximum depth on about one meter, although most pools which C. alleni tend to favour are no more than 70 cm in depth. The substrate consists of gravel and rocks. The water is cold and clear and swiftly descends from the mountains through the village adjacent to the airstrip. In November 1994 water pH was 7.0. Named alleni in honour of Gerald R. Allen, in recognition of his outstanding contribution to ichthyology and his deep commitment to the study and preservation of the aquatic fauna of New Guinea. Full article: Price, David S. (1997) *Chilatherina alleni*, a new species of Rainbowfish (Melanotaeniidae) from Irian Jaya. Revuefr. Aquariol., 24 (1997),3-4, 19 December 1997. This is a very colourful fish and is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina axelrodi (Axelrod's Rainbowfish)

The IUCN reports this species is assessed as endangered. It has an area of occupancy (AOO) of 40-60 km2 and occurs in a single location based on the threats of invasive species and developments (e.g., logging and oil palm). These are also causing continuing decline in habitat. However, there is no information on the population size or trend of this species. An excerpt from Dr Allen's article *Chilatherina axelrodi*, a new species of rainbowfish: Of the five known members of the genus, *Chilatherina axelrodi* is most closely related to *C. lorentzi*, which is widely distributed in northern New Guinea, and *C. sentaniensis* in Lake Sentani, Irian Jaya (West New Guinea). These species share a similar body shape, dentition, and general colouration. However, they are separable on the basis of head and snout length, dorsal ray counts, and to a certain extent on the basis of colour pattern. The type specimens were collected from a small

aquarium trade will eventually escape or be released into suitable waters at some time. Additionally, climate change may increase the geographic area suitable for establishment. Whilst it has been known to occur, there is a very low risk of natural hybridisation with native rainbowfish stocks (Melanotaenia), however, hybrids between the family groups that have been produced appear to be sterile. In captivity, the genera Melanotaenia, *Chilatherina* and *Glossolepis* are known to hybridise. A female rainbowfish deposits eggs in vegetation which is then fertilised by the male. In a tank containing more than one species of rainbowfish it is possible that cross fertilisation may occur, resulting in hybrid fish. In the wild only two individual F1 hybrids have ever been identified (*Melanotaenia affinis* x *Chilatherina campsi*) out of the 36 species belonging to the Northern linage or Clade IV (Unmack et al., 2013). If *Chilatherina fasciata* were released and able to establish, as a small omnivorous fish they are unlikely to have significant impact upon other fish species. There is likely to be some niche overlap resulting in competition for space and resources with related or similar species. It is unlikely to result in any significant impact. The combination of the low likelihood of release and establishment in suitable waters, low environmental impact and the extremely low risk of hybridisation results in a negligible risk to the WA environment.

Table 1 *Chilatherina* spp. proposed for addition to the White List

References for all *Chilatherina* species:

Allen G.R. (1981) A Revision of the Rainbowfish Genus *Chilatherina* (Melanotaeniidae). Records of the Western Australian Museum 9(3): 279-299.

Tappin, Adrian (2005) "Rainbowfishes ~ Their Care & Keeping in Captivity 2nd Edition - 2011" at: http://www.mediafire.com/download/g7qzn85uqde8v8o/Rainbowfishes.2011.pdf

flowing stream in rainforest habitat about 37 km inland from the coastal town of Vanimo and approximately 14 km due east of the Indonesian border. Most of the types were taken from two relatively large, slow flowing pools measuring about 3 x 10 meters with a maximum depth of 1.5 meters. Although situated in rainforest the stream bed was relatively open and exposed to sunlight, which is typical of *Chilatherina* streams. The water was slightly turbid and a temperature of 25.8°C and pH of 7.8 were recorded. The gut contents of many of the paratypes indicates a diet consisting primarily of filamentous algae. *Chilatherina* axelrodi was by far the most common fish in the stream which was also inhabited by two other rainbow-fishes, C. crassispinosa and Melanotaenia affinis. The species is named in honour of Dr. Herbert R. Axelrod who generously provided collecting assistance and financial aid during the 1979 expedition to Papua New Guinea. full article: Allen, G.R. 1979. *Chilatherina* axelrodi, a new species of rainbowfish (Melanotaeniidae) from Papua New Guinea. Tropical Fish Hobbyist 28(5): 48-49, 52-55. An excerpt from Barry Crockford's article *Chilatherina* axelrodi: In late May 1983, armed with all the necessary paper work I decided if I had the time and more importantly if the money held out, I would return to this remote region for old times' sake, and see if I could collect some specimens of my own. I could see at once that it contained Melanotaenia affinis and schools of fishes could be seen swimming in the flow near the deep banks. I ran out the seine and in the first sweep I had netted about 50 fishes. I was elated, immediately I could see the majority of fishes were *Chilatherina* axelrodi. I'm sure my friend thought me quite mad and when I asked if this was the place Gerry had collected, he couldn't remember but "it sure was a good spot for a swim to cool off anyway". Later we collected about 50 specimens and headed back to Vanimo where I had previously set up a makeshift pond. Next morning, I had to move quickly as the aircraft I had come on was due to make the return trip to Wewak. I selected 10 young healthy pairs, packed them and before I knew it was saying my goodbye's. Full article: Crockford, B. 2001. *Chilatherina* axelrodi. Fishes of Sahul 15(4), 790–795. Both above authors indicate that this species was the most common fish. The stock currently in Australia originated from the 10 pairs that Barry Crockford collected. This fish is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina bleheri (Bleher's Rainbowfish)

The IUCN reports this species is assessed as Endangered. It has an extent of occurrence (EOO) of 1,350 km2 and occurs in two locations based on the threats of invasive species and fishing. These are leading to continuing declines in the number of mature individuals. However, there is no information on the population size or trend. The main threats to this species are the presence of introduced species and the increasingly common gill netting fisheries on the lakes.

Wagner, Michael (2015) Husbandry & Breeding: Charmed by *Chilatherina*, AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. Jul/Aug 2015

Wagner, Michael (2015b) Husbandry & Breeding Part Two, The *Chilatherina* Eleven, AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. Nov/Dec 2015 Species

IUCN Listing DPIRD WA response *Chilatherina* alleni (Allen's Rainbowfish) https://www.iucnredlist.org/species/169522/147680522 vulnerable No Response The IUCN reports, This species is assessed as vulnerable. It has an extent of occurrence (EOO) of 780 km2. The primary threat to this species is mining and there are a best estimate of six locations based on this threat, which effects the two river systems and the main river and tributaries separately. There is continuing decline in habitat based on this threat. Current Population Trend: Unknown There is no detailed information available on the population size or trends in this species, but it is thought to be common in both river systems in which it occurs (G.R. Allen pers. comm. 2019). There are mining concessions in part of the distribution area of this species (Siriwo River) and associated human settlements also represent a threat (Kadarusman pers. comm. 2019). An excerpt from David Price's article *Chilatherina* alleni: The melanotaeniid genus *Chilatherina* contains small (up to 100 mm SL) freshwater fishes that inhabit rivers, creeks and lakes and are restricted to the lowlands of northern New Guinea and adjacent Yapen Island in the Geelvink Bay. Allen (1981) reviewed the genus, recognising six species including C. axelrodi Allen, C. campsi (Whitley), C. crassispinosa (Weber), C. fasciata (Weber), C. lorentzi (Weber), and C. sentaniensis (Weber). Since that review, three other species have been added; C. bulolo (Whitley, see Allen 1983), C. bleheri Allen, 1985 and C. pricei Allen, 1996. This paper describes a new member of the genus from Siriwo, north Irian Jaya. C. alleni was collected from a tributary of the Aiborei (=Aboge) River which is part of the Siriwo drainage. The river is approximately five

An excerpt from his article, Dr Gerald Allen Three New Rainbowfishes (Melanotaeniidae) from Irian Jaya and Papua New Guinea: Finally in 1982 1 had on opportunity to make collections - Irian Jaya. Although the expedition was of only two weeks duration and the number of collecting days considerably less, nearly every stream yielded new fishes, especially in the jungles of the remote Vogelkop Peninsula. The present paper describes two species of rainbowfishes taken on this expedition and a third species collected from Papua New Guinea in 1983. The new taxa belong to the genera *Chilatherina*, *Glossolepis*, and Melanotaenia. The first two groups are represented by eight and six species respectively and are distributed in northern New Guinea. Melanotaenia, the largest genus in the family, contains about 30 species from Australia and New Guinea. Allen and Cross (1982) reviewed these genera in their monograph of the family, although a number of additional species have been described since this work appeared. The type locality of Danau Biru or Lake Holmes is a complex of three interconnected lakes lying at an altitude of about 430 metres above sea level and set in mountainous jungle terrain, approximately 290 kilometres west of Jayapura, the capital city of Irian Jaya. The lakes lie within a radius of 6-7 kilometres with the main lake having a length of approximately 4.5 kilometres and maximum width of about two kilometres. The depth appears to be relatively shallow (perhaps averaging less than 5-10 metres) and one of the dominant features is a profusion of dead "iron-wood" tree stumps which protrude above the surface. Their presence indicates that the present shoreline or perhaps the entire lake system was formed in relatively recent times by a catastrophic event which blocked the feeder stream. The lakes are drained by a small stream which flows into the Mamberamo River at a point approximately 15 kilometres directly to the north. The type specimens were collected along the heavily vegetated shoreline of the main lakes and from small, rocky bottom, tributary streams. The lake and surrounding creeks are inhabited by 11 fish species, including one other rainbowfish, *Melanotaenia maylandi* in addition to the differences in colour pattern and fin lengths between the sexes of C. bleheri which were mentioned in the description, there is also a significant difference in the maximum body depth. Mature males are much deeper bodied than females. The maximum depth of 17 males, 74-95 mm SL, averaged 36.6 percent of the standard length compared with 27.6 percent for 13 females, 40-85 mm SL. The species is named bleheri in honour of Mr. Heiko Bleher of Frankfurt, Germany who helped to collect the type specimens and generously provided financial assistance for the 1982 visit to Irian Jaya. Full article: Allen. G.R. Three New Rainbowfishes (Melanotaeniidae) from Irian Jaya and Papua New Guinea. Rev. fr. Aquariol., 12 (1985), 2, 15 December 1985 This fish is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list.

meters wide, with a maximum depth on about one meter, although most pools which C. alleni tend to favour are no more than 70 cm in depth. The substrate consists of gravel and rocks. The water is cold and clear and swiftly descends from the mountains through the village adjacent to the airstrip. In November 1994 water pH was 7.0. Named alleni in honour of Gerald R. Allen, in recognition of his outstanding contribution to ichthyology and his deep commitment to the study and preservation of the aquatic fauna of New Guinea. Full article: Price, David S. (1997) Chilatherina alleni, a new species of Rainbowfish (Melanotaeniidae) from Irian Jaya. Revuefr. Aquariol., 24 (1997),3-4, 19 Decembre 1997 This is a very colourful fish and is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list. *Chilatherina* axelrodi (Axelrod's Rainbowfish) https://www.iucnredlist.org/species/4628/147680647 endangered No

Chilatherina bulolo

The IUCN reports this species is assessed as least concern. We believe that due to its status, this species should be changed to yes. This species occurs in the Ramu and Markham river systems of north-eastern Papua New Guinea. It has a relatively restricted extent of occurrence (EOO) of 5,000 km2. Conversion to oil palm has resulted in the population becoming fragmented, but more information is required on other effects of oil palm on the population. The hillsides, where this species occurs, are relatively untouched by threats at present. There is no information on the population size or trend. However, it is still considered common in some sub-catchments (R. Smith pers. comm. 2020). An excerpt from his article, Dr Gerald Allen, *Chilatherina* bulolo, a valid species of rainbowfish (Melanotaeniidae) from northern New Guinea. Fishes of Sahul, records Subsequently this species was questionably considered to be a junior synonym of *Centratherina crassispinosus* (Weber, 1913) by Ian Munro in his lengthy checklist of the fishes of the New Guinea region published in 1958 (`P.N.G. Agricul. Joum'., vol. 10, no, 4). My own studies on rainbowfishes were initiated in 1974 and resulted in several publications dealing with the New Guinea species. The generic classification within the Melanotaeniidae was treated in a 1980 paper (`Rec. West. Aust. Mus.', vol. 8, no. 3). In this work I considered the genus Centratherina Regan (1914) to be invalid and synonymous with *Chilatherina*, also described by Regan. The latter genus was revised in 1981 'Rec. West. Aust. Mus', vol. 9, no. 3), however I erroneously neglected to 4 include any mention of Whitley's Bulolo rainbow. This mistake was rectified in Rainbowfishes of Australia and Papua New Guinea' by Allen and Cross (T.F.H. Publications, 1982), where the species was listed as a synonym of *Chilatherina crassispinosa*. Since the book appeared in print, I have had an opportunity to make two additional visits to northern New Guinea and obtained numerous specimens of *C. crassispinosa*. I first made collections between Lae and Wau, including the Bulolo Valley, which as mentioned previously, is the type locality of Whitley's species. Later I travelled west to the foothill streams of the Torricelli Range, part of the Sepik River system and to the Bewani Range near the Irian Jaya border. The specimens of "crassispinosa" I had collected earlier from Lae-Wau seemed somehow different from those obtained farther to the west. One obvious difference was colour pattern. Those from the Torricelli-Bewani region were more colourful, particularly males, with narrow orange stripes on the sides and pale yellow dorsal and anal fins. Specimens from the Lae, Wau district were overall silvery with whitish or transparent fins. I also noted major differences in habitat between these two forms. The Lae-Wau fish was mainly collected in very fast flowing streams, frequently amongst rapids or "white water." Full article: Allen, G.R. 1983. *Chilatherina* bulolo, a valid species of rainbowfish (Melanotaeniidae) from northern New Guinea. Fishes of Sahul, Journal of the Australia New Guinea Fishes Association 1(2): 13-17 The catchments in which this species occurs have historically been areas of deforestation, although the area may have naturally been largely grassland. More recently, there has been conversion to oil palm plantations in the valley floor, but the hillsides, where this species occurs, are relatively untouched (U. Kolkolo pers. comm. 2019). However, this would still have negatively

affected the species by fragmentation of the population. The IUCN reports this species is assessed as least concern. We believe that due to its status, this species should be changed to yes. This species occurs in the Ramu and Markham river systems of north-eastern Papua New Guinea. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina campsi (highlands Rainbowfish)

The IUCN reports this species is assessed as least concern. We believe that due to its status, this species should be changed to yes. This species occurs in the Markham, Ramu, and Sepik river systems of northern Papua New Guinea and has an extent of occurrence (EOO) of over 40,000 km2. There are localised threats but no major threats to the overall population. However, there is no information on the population size or trend. Local threats: the Ramu and Markham catchments in which this species occurs have historically been areas of deforestation, although the area may have naturally been largely grassland. More recently, there has been conversion to oil palm plantations in the valley floor, but the hillsides, where this species occurs, are relatively untouched (U. Kolkolo pers. comm. 2019). However, this would still have negatively affected the species by fragmentation of the population. Additionally, logging is still a threat in the Sepik and Purari catchments. An excerpt from his article, Dr Gerald Allen, (1981) A Revision of the Rainbowfish Genus *Chilatherina* (Melanotaeniidae; reports, *Chilatherina* campsi was formerly known only from the Central Highlands of Papua New Guinea in the Jimmi River (Sepik system) and Wahgi River (Purari system) at an elevation of approximately 1,525 m. It is the only melanotaeniid known to occur on both sides of the central dividing range. 289 REVISION OF *CHILATHERINA* Recent collections by the author have expanded the range considerably. It is now known from the Pima River at the junction of the Tua River, approximately 190 km downstream from the previous collection sites on the Wahgi River, and from two sites in the Markham River drainage near Lae, some 240 km east of the highland collection sites. Full article: Allen G.R. (1981) A Revision of the Rainbowfish Genus *Chilatherina* (Melanotaeniidae). Records of the Western Australian Museum 9(3): 279-299. An excerpt from Barry Crockford's article: *Chilatherina campsi*. reports, I have collected *Chilatherina campsi* over much of its range and think it fair to say that it could be classified into two readily identifiable forms. The highlands specimens tend to be slenderer in the body and their colour subdued when compared with specimens taken from the Markham River region. Specimens taken from the Omsis River, about 27 km. from Lae for example appear more robust and have a deeper, more distinct body colouration. Unknown to me at the time, my first specimens were taken from the Or Isis River near Lake Wanam. Within an hour I was on my way back to the Omsis to make a thorough collection of the same site. I was amazed that I had not noticed these fish on the previous day, for they were reasonably common; perhaps it was the excitement at the time or the fact that when in fright pattern the species loses almost all its colour, but this species was also later identified by Dr Allen as *Chilatherina campsi*. It was almost a year later before I had the opportunity to collect *Chilatherina campsi* in the highlands. I sampled many rivers and streams

in the Mt Hagen region finding them to be very common in most places and the only rainbow to be found; although Allen has found them co-habiting with *Melanotaenia pimaensis* in the upper reaches of the Lima River, a tributary of the Purari. *Chilatherina campsi* is a truly beautiful fish which is easily bred using the typical "rainbow" method. Full article: Crockford, B. 1985. *Chilatherina campsi*. Fishes of Sahul 3(2), 116–118. This fish is being commercially farmed sustainably and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. This species is assessed as least concern. We believe that due to its status, this species should be changed to yes.

Chilatherina fasciata (barred rainbowfish)

The IUCN reports this species is assessed as least concern. This species is widespread across northern New Guinea. There are no major threats. The population of this species is typically abundant throughout much of its range and the population trend is likely to be stable. There are localised threats within the range of this species, but no major threats to the population overall. An excerpt from Barry Crockford's article: Lake Wanam fasciata *Chilatherina fasciata*, in trouble. Because of concern for the future of Glossolepis wanamensis in the wild, a special team consisting of ANGFA, the Melbourne Zoo and the Rainforest Habitat in the University of Lae, PNG, was formed in June 1999, to conduct a survey of the Wanam Lake rainbowfish population (see Lake Wanam revisited, Fishes of Sahul V13-3, p. 621). The team collected specimens of *Glossolepis wanamensis*, which formed the basis for a successful captive breeding program in Lae, PNG. Unfortunately, this survey also brought to light that a second melanotaeniid species *Chilatherina fasciata*, which in previous years was quite common in the lake, could not be found during the 4 days specifically searching for it. Although until now not recognised as being different taxonomically from *Chilatherina fasciata*, the lake population is a unique form, popularly known as the Lake Wanam Fasciata. It differs considerably from the true *C. fasciata* in appearance and from a biological point of view, it appears to represent a valid species (and in my opinion should be treated as at least a subspecies of *C. fasciata*). The drastic decline or possible demise of the population caused me much concern. Full article: Crockford, B. 2001. Lake Wanam fasciata *Chilatherina fasciata*, in trouble. Fishes of Sahul 15(3), 776–779. An excerpt from Alan Powell's article: *Chilatherina fasciata* populations are quite common and widespread throughout the river systems of northern Papua from the Markham River in the east into Irian Jaya's Mamberamo system, but according to Barry Crockford, the Lake Wanam population is a unique form that differs considerably from the true C. fasciata, and "appears to represent a true species in its own right". Two photographs are published in Fishes of Sahul V15-3, pp 776 & 777 showing Lake Wanam and Clearwater Creek forms in profile, with both fish approx. 14 cm in length. The Clearwater Creek variant appears more streamlined, while the Lake Wanam variant displays the typical rainbow hump. Colours and markings appear like each

other, though my experience with these fish is that they are like any other rainbow species — that is, their colour changes minute by minute, and one is hard put to ever describe their colour, other than to say `rainbow like' humped body profile. Full article, Powell, A. 2009. *Chilatherina fasciata*, Lake Wanam. Fishes of Sahul 23(3), 536–537 An excerpt from Neil Travis's article: The barred rainbowfish, *Chilatherina fasciata*, reports: In February 1981 I went with Barry Crockford to Papua New Guinea to collect various native fishes in the Port Moresby, Lae regions. One species collected was *C. fasciata*. We found this fish in Lake Wanam, approximately 40 km east of Lae and Clearwater Creek, approximately 60 km east of Lae. The only fish we collected were in Clearwater Creek, a tributary of the Markham River system. On arrival at Clearwater Village, through which the creek flows, we were confronted with a stream of crystal-clear water, approximately 50 cm. deep, 7.5 pH, 90 ppm hardness., 75°F (24°C). The creek was slow flowing, with a very muddy bottom. When stirred up the creek was far from clear. Vegetation lined the banks. The fish were rather plentiful and in a period of 20 minutes, approximately 40 were collected. The largest 100 mm for males, females being slightly smaller. Full article, Travis, N. 1984. The barred rainbowfish, *Chilatherina fasciata*. fishes of sahul 2(1), 55–56. This fish is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina lorentzi (Lorentzi's Rainbowfish)

The IUCN reports this species is assessed as near threatened. It has an extent of occurrence (EOO) of 17,000 km^2 and is undergoing continuing decline in habitat due to multiple threats including oil palm plantations, logging, settlements and invasive species. However, there are more than 10 threat-based locations, meaning it does not qualify for a threatened category. The population is thought to be stable (G.R. Allen pers. comm. 2019). Threats to this species include invasive species (P. Unmack pers. comm. 2019), logging, oil palm plantations (G.R. Allen pers. comm. 2019) and settlements in Papua (Kadarusman pers. comm. 2019). In an excerpt from his article, Dr Gerald Allen, (1981) A Revision of the Rainbowfish Genus *Chilatherina* (Melanotaeniidae). *Chilatherina lorentzi* is thus far known from only two localities on the central north coast of New Guinea. The types were collected in the Tawarin River, Irian Jaya which is situated approximately 100 km west of Jayapura. A recent collection of 13 female specimens was made by the author at Puive Creek, a tributary of the Nemayer or Pual River system, in mountainous terrain near Vanimo, Papua New Guinea. This site is situated about 160 km east of the type locality and the species can be expected to occur in the intermediate area. The male and female *C. lorentzi* illustrated by Allen (1980a and b) from Lake Wanam near Lae represents a misidentification of *C. fasciata*. Habitat Specimens were collected by the author in 1979 from a relatively small (5-10 m width) clear, moderately flowing stream. The stream was enveloped

by dense rainforest canopy with little direct sunlight reaching the surface. The fishes were concentrated in the deeper (1-2 m) sections in the vicinity of aquatic plants and log debris. The elevation at this site is approximately 300 m above sea level. Full Article: Allen G.R. (1981) A Revision of the Rainbowfish Genus *Chilatherina* (Melanotaeniidae). Records of the Western Australian Museum 9(3): 279-299. It is uncertain if this fish is being commercially bred at this stage. However, we are hopeful that it is. or that expeditions are planned to acquire this species. *C. lorentzi*, which is widely distributed in northern New Guinea, and in the same vicinity of *C. axelrodi*. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina pagwiensis (Pagwi Rainbowfish)

The IUCN reports this species is assessed as endangered. It has an extent of occurrence (EOO) of 150 km2, occurs in one location (a single creek) based on the threat of invasive species, and there is continuing decline in habitat. The population is presumed to be stable (P. Unmack pers. comm. 2019). This species is threatened by at least four exotic species (P. Unmack pers. comm. 2019) In an excerpt from their article, Allen, and Unmack (2012) A new species of Rainbowfish (*Chilatherina*: Melanotaeniidae), from the Sepik River System of Papua New Guinea, report, A new species of rainbowfish, *Chilatherina pagwiensis*, is described on the basis of 31 specimens, 20.5-76.1 mm SL, collected from a tributary of the Sepik River near Pagwi village, East Sepik Province, Papua New Guinea. Morphologically it is closely allied to C. campsi, an inhabitant of mainly hilly or mountainous terrain in the Markham, Ramu, and Sepik river systems of northern Papua New Guinea and the Purari system, south of the Central Dividing Range. The new species was found in the same habitat with *C. fasciata* (Weber, 1913), which is widely distributed in northern New Guinea. There is also an apparent difference in maximum SL with *C. fasciata* attaining 105 mm versus less than 80 mm SL for C. pagwiensis. The species is known only from a single creek in the vicinity of Pagwi village, Sepik River system, Papua New Guinea. Full article: Allen, G. R. and Unmack, P.J. A new species of Rainbowfish (*Chilatherina*: Melanotaeniidae), from the Sepik River System of Papua New Guinea. aqua vol. 18 no. 4 - 15 October 2012 It is uncertain if this fish is being commercially bred at this stage. However, we are hopeful that it is, or that expeditions are planned to acquire this species. And that the authors believe the population to be stable. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina pricei (Price's Rainbowfish)

The IUCN reports this species is assessed as vulnerable. It is restricted to a single stream near Waironi Village on southeastern Yapen Island but may be more widespread in the lowlands of the island. Sea level rise is a plausible threat that could push the species to Critically Endangered or Extinct in a very short time period. There is no information on the population size or trend. There are no major threats to this species at present. However, sea level rise could be a future

potential threat to this species. An excerpt from their article, Dr Gerald Allen, and Samuel Renyaan, reports: A new species of melanotaeniid, *Chilatherina* pricei, is described on the basis of 23 specimens, 42.5-88.7 mm SL, collected between 1991 and 1995 in the Reifafeif River, near 'Toni Village, Yapen Island, Irian Jaya. It is similar to C. fasciata of the northern New Guinea mainland,). It is also similar to an undescribed species from Siriwo region of Irian Jaya *Chilatherina* pricei is most similar to C. fasciata, which is broadly distributed in northern New Guinea between the Markham and Mamberamo River systems and an undescribed *Chilatherina* from the vicinity of Siriwo, Irian Jaya (3°38'S. 136°05'E). Named pricei after David Price, in recognition of his keen interest in the natural history of New Guinea. He has lived periodically on Yapen Island with his family over the past decade, making valuable collections of fishes and frogs, including type specimens of the new *Chilatherina*. We are very grateful for the support of our respective institutions, the Western Australian Museum and Universitas Cenderawasih. Special thanks are due the Indonesian Institute of Sciences (LIPI), for sponsoring our studies of the freshwater fishes of Irian Jaya. The National Geographic Society, Washington, D.C., generously provided grant funds for field. Full article: Allen, G.R,.and. RENYAAN, S.J *Chilatherina pricei*, a new species of Rainbowfish :(Melanotaeniidae) from Irian Jaya Revue fr. Aquariol., 23 (1996), 1-2, 30 jun 1996 This fish is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list.

Chilatherina sentaniensis (Lake Sentani Rainbowfish)

The IUCN reports this species is assessed as critically endangered. The species is considered extant only at the eastern end of Lake Sentani and based on this it has an extent of occurrence (EOO) of 90 km^2. There is a single location based on the threat of predatory and competitive invasive species. There is also a continuing decline in habitat due to pollution from the nearby settlement. The species was reported as being common in the 1950s. However, repeated attempts to collect the fish between 1980 and 2000 yielded only around ten specimens taken from a single creek in 1991 (G.R. Allen pers. comm. 2019). In 2015, under 30 individuals were collected in the east of Lake Sentani (Kadarusman pers. comm. 2019). The population size is low, but the trend is thought to be stable (Kadarusman pers. comm. 2019). However, this could potentially change due to the several invasive species present. An excerpt from their article, Johannes Graf on *Chilatherina sentaniensis*, how to recognize the real species? reports, it is a positive aspect that we have “real” *C. sentaniensis* in the hobby. Those fishes comply with all criteria for the identification of this species. The red body colour of the males is somewhat surprising, because it is not mentioned in any literature. Full article: Graf, Johannes, *Chilatherina sentaniensis*, how to recognize the real species? Original written in German in “Regenbogenfisch”, magazine of the International Rainbowfish Association (IRG), No 4 – 2007.

			The human population living along the shore of Lake Sentani is rapidly increasing and was estimated at 25,000 in 1996. The population has continued to grow since the 1990's and was estimated at 137,000 in 2014. The resultant pollution from domestic waste entering the lake is a threat to the species living there. A further threat to this fish comes from the introduction of exotic species, and associated disease, into its habitat, including carp, tilapia, walking catfish, barbs, snakehead, red devil cichlids and gouramis. There is also traditional gold mining to the west of the lake (G.R. Allen and Kadarusman pers. comm. 2019). This fish is being commercially and sustainably farmed and available from various fish farms in USA, Europe, and by Maju Aquarium in Indonesia. Author 2 accessed various sites on the internet on 14/4/2022. Being widely available overseas suggests that there should not be any wild harvesting of this fish, as collecting this fish would be very expensive. Therefore, we ask that this species be accepted onto the allowable fish import list.
Federation University	A separate application was submitted for each of the seventeen species. Because of time constraints, I am unable to comment on more than one, that of *Glossolepis dorityi.* I assume as there are only two genera involved, that the applications for the other species are similar. The map (Fig 1) for the species in one of the genera, *Glossolepis*, indicates that all species targeted are short range endemics living in mountain lakes in Papua New Guinea. The species has diversified, and I assume that each species is adapted to slightly different environmental conditions. As allegedly the fish for import will be sourced from existing aquarium stock overseas, I can only assume that they are flexible in their ecological and feeding requirements and should they be accidentally or deliberates introduced to the wild they could survive in Australia if the climate was suitable. The application I read is relatively complete, but species and genus names should be in italics, and they are not always formatted correctly in the application. The aim of the application, as far as I can gather but it is not stated, is to provide stock for the aquarium trade i.e., for commercial gain. The main risk is that of escape or discarding the fish to the wild followed by establishment. Details are not given of temperature requirements. It is hard to see how this action can be prevented or guarded against. Risk of hybridisation with	No further information required – out of the scope of this assessment.	1. To suggest that all traders be licensed if they are not already, and that a condition of the permit 2. is that fish are not dumped live in the wild and that all buyers and keepers of these fish also be licensed with the same condition, would be an impossible system to maintain. With well over 1 million people keeping fish, the resources required to administer such a program would be enormous. Imagine if every fishkeeper in Australia needed a license to own any fish, the record keeping and administration tasks would be onerous. Only certain countries are approved to export freshwater aquarium fish to Australia. they are: China, French Polynesia, Germany, Hong Kong, Indonesia, Malaysia, New Zealand, Singapore, Sri Lanka, Thailand, and the USA. They are listed by BICON Australian Biosecurity Import Conditions - available at: https://bicon.agriculture.gov.au/BiconWeb4.0/ViewElement/Element/Index?elementPk=1659368&caseElementPk=1752962 02-2016 - Updated model health certificates for imported ornamental (aquarium) finfish – Valid from 1 March 2016 - available at: https://www.awe.gov.au/biosecurity-trade/import/industry-advice/2016/02-2016 states that: 1.Only finfish listed in the List of Permitted Live Freshwater Fish Suitable for Import are included in this consignment and are documented on the attached invoice. 2.The fish in the consignment have been inspected within seven (7) days prior to export and show no clinical signs of infectious disease or pests. 3.The Export Premises are approved for export to Australia, meeting standards of the Department of Agriculture and Water Resources. 4.All fish being held at the Export Premises exhibit no clinical signs of significant infectious disease or pests and are sourced from populations not associated with any significant disease or pests within the six (6) months prior to certification.

native species if accidentally released by an extreme weather event or by human error seems negligible.

I make the following addition recommendations.

Recommendations

I suggest all traders be licenced if they are not already, and that a condition of the permit 2. is that fish are not dumped live in the wild and that all buyers and keepers of these fish also be licenced with the same condition.

Each species of Rainbow Fish must be bar coded and bar codes be deposited in GenBank.

Several examples of each life stage of each species be deposited in the permanent collections of at least two Australian Museums.

5.All fish in the consignment have been in approved Export Premises for fourteen (14) days prior to export.

6.The fish have not been kept in water in common with farmed foodfish (fish farmed for human consumption including recreational fishing) or koi carp.

7.Adequate quarantine safeguards are in place to maintain the health status of the certified fish until export. The fish are effectively isolated in holding systems that prevent infection by direct contact with other fish or indirect contact via water, equipment or any other means.

Any fish imported into Australia for ornamental purposes are subject to being listed on the EPBC Act as an allowable import species and must have appropriate health certification then be subject to quarantine protocols in place at the time. They will come through licensed premises with appropriate quarantine process to allow fish in good health at the other end of the process. Anyone importing allowable species to NSW will also have to comply with any state legislation in place at the time of importation. If Commonwealth Legislation allows a species to be imported then any attempt by the state to make those species noxious will be in contravention to the Constitution.

Most Aquarium Fish traders have some form of Business License. Author 1 has a NT Government supervised Aquaculture License, license number C1/533 and leases an Aquarium Fish Collecting License number A12/1914. The NT Government supervises fish species and fish health on Author 1's fish farm, Aquagreen at Howard Springs. The Aquarium fish traders in the NT are all licensed.

2. Most rainbowfishes have already been barcoded and listed in GenBank.

Kadarusman et al (2012). Cryptic Diversity in Indo-Australian Rainbowfishes Revealed by DNA Barcoding: Implications for Conservation in a Biodiversity Hotspot Candidate 2012 available at:

https://www.semanticscholar.org/paper/Cryptic-Diversity-in-Indo-Australian-Rainbowfishes-Kadarusman-Hubert/0378c97cef3f39c5ab89982dfc35c84a4044a7b3

and

Unmack, Peter J. et al (2013). Phylogeny and biogeography of rainbowfishes (Melanotaeniidae) from Australia and New Guinea available at:

https://www.researchgate.net/publication/234122621_Phylogeny_and_biogeography_of_rainbowfishes_Melanotaeniidae_from_Australia_and_New_Guinea

Author 2 has 2 other documents (spreadsheets) that can be supplied if required, that show the GenBank reference number for these fish.

3. Most rainbowfish species are already present in Australian Museums due to the work of Dr Gerald R Allen

Round 2

The department's reports were circulated with relevant state and territory government agencies for comment between 21 September 2022 and 24 October 2022. The New South Wales and Western Australian Governments responded with comments supporting the amendment. The South Australian Government responded with no comments.

Table 14 Comments received during Round 2 of consultation

Respondent	Major comments	Department's response
NSW Government	The NSW government supported the amendment to add these species to the Live Import List and was pleased that the condition of a minimum length of 4cm has been included. They also agreed with the decision to not list some species in Part 1 due to conservation concerns.	Noting their conservation status and concerns from the NSW and WA governments, 11 species are recommended for listing on Part 2 of the Live Import List with conditions.
Western Australian Government	The WA Government advised they were comfortable with the outcome and recommendations from these reviews.	Noting their conservation status and concerns from the NSW and WA governments, 11 species are recommended for listing on Part 2 of the Live Import List with conditions.
South Australian Government	No comment from the South Australian Government on the proposal to amend the Live Import List	

Glossary

Term	Definition
CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species
DCCEEW	Department of Climate Change, Energy, the Environment and Water
EPBC	Environment Protection and Biodiversity Conservation Act 1999
GISD	Global Invasive Species Database
IUCN	International Union for Conservation of Nature
mm	Millimetres
ppm	Parts per million
SL	Standard length
spp	Species
TL	Total length

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