

**Disclaimer:** The applicant's report addressing the Terms of Reference is circulated for public comment in compliance with section 303EF (2b) of the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The views and opinions expressed in this report are those of the applicant and do not necessarily reflect those of the Australian Government or the Minister for the Environment and Water.

**A draft report to address the potential environmental impacts associated with the importation of a *Melanotaenia papuae*, Papuan rainbowfish for use as an ornamental fish species within Australia.**



*Melanotaenia papuae* - Papuan Rainbowfish



*Melanotaenia papuae*. Photo © Gunther Schmida. Permission granted for use of image.

**Etymology:**

The species is named *papuae*, with reference to the type locality, Papua, which is the name for the southern portion of Papua New Guinea, where type locality (rainforest stream at Mt. Diamond) is situated.

**Introduction**

The keeping of tropical fish species in aquaria is growing in popularity and gained in popularity during the lock down period attributed to the Covid19 Pandemic. Studies into mental health have proven that an aquarium can produce a soothing effect on the human mind that tends toward anxiety. This trend to worry about the future seems to be increasing in recent times. Studies have demonstrated stress reduction from viewing aquatic life in an aquarium, lower heart rates and decrease in blood pressure. (Clements 2019 and Cracknell 2016)

The ornamental aquatic life, fish, invertebrates, and aquatic plants industry is not like industries that produce food and shelter it is more like the Fashion Industry that relies on new products to excite customers to buy the latest trend. The rise of social media and other instant news forums has produced an intense interest in owning possessing the latest trend. This has happened recently with the smuggling of the small Mexican red crayfish and the Indonesian Assassin Snail. Neither of those are on the allowable import list. There is also a large Australia wide trade in red cherry shrimps and other small colourful crustaceans, all of which are smuggled except the native species from tropical NT and Qld.

The Authors of this report will determine that the Rainbowfish, of the genus *Melanotaenia* do not possess any of the aspects of an organism that will cause problems should it escape effective human control. The undesirable aspects of an introduced pest are reproduced from a statement prepared for a Court Case in the NT when an aquarium shop bought unassessed imported aquatic life to a Darwin Aquarium Shop. The statement was to be presented in the witness box by the author 2 of this report, however the accused offender pleaded guilty.

**Disease**

Introduced unassessed aquatic life entering Australia without appropriate quarantine or a risk assessment of the exporting country can carry exotic parasites and disease that may negatively impact on native species and aquaculture enterprises.

**Competition with native species**

Introduced unassessed aquatic life that escapes human control may breed into very large numbers out competing native species for food and space possibly causing local extinctions of native species.

**Destruction of aquatic habitat**

Introduced unassessed aquatic life that escapes human control may damage waterways by digging and moving substrate causing water to be clouded with silt, smothering plants, and contributing to erosion.

**Dangerous species**

Introduced unassessed aquatic life that escapes human control may have features that are a danger to humans, large venomous spines, very sharp teeth, even high voltage electrical discharge and could pose a danger to recreational and commercial activities in natural waterways.

**Impacts associated with Genetic Changes**

Introduced unassessed aquatic life that escapes human control may be closely related to native aquatic life and be able to hybridise causing the loss of genetic diversity.

**References:**

**Clements, Valentin, Rankin, Baker, Gee, Snellgrove, Sloman** (2019) "*The effects of interacting with fish in aquariums on human health and well-being: A systematic review*" published by Institute of Biomedical and Environmental Health Research, School of Health and Life Sciences, University of the West of Scotland, Paisley, United Kingdom.

**Cracknell, White, Pahl, Nichols & Depledge.** 2016 "*Marine Biota and Psychological Well-Being: A Preliminary Examination of Dose-Response Effects in an Aquarium Setting*" published by Environment and Behavior 2016, Vol. 48(10) 1242 –1269 © 2015 SAGE Publications



*Melanotaenia papuae* - female Photo © Gunther Schmida. Permission to use photo granted.

## 1. Taxonomy

*Provide information on the taxonomy of the species including Family, genus, species and subspecies, as well as any synonyms.*

**Kingdom:** Animalia

**Phylum:** Chordata

**Class:** Actinopterygii (ray-finned Fishes)

**Order:** Atheriniformes (Silversides)

**Family:** Melanotaeniidae (Rainbowfishes)

**Genus:** *Melanotaenia* (origin - Greek word *melanos* meaning black and the Latin word *taenia* meaning stripe.)

**Species:** *Melanotaenia papuae*, Allen, 1981. Papuan rainbowfish

### Etymology:

The species is named *papuae*, with reference to the type locality, Papua, which is the name for the southern portion of Papua New Guinea, where type locality (rainforest stream at Mt. Diamond) is situated.

### Holotype:

WAM P26393-002, male, 60.0mm SL, small rainforest stream at Mount Diamond, about 23km east of Port Moresby, Papua New Guinea (approximately 9.27°S, 147.17°E), shrimp seine, G. Allen on 29 September 1978.

### Paratypes:

AMS I.21387-001, 94 specimens, 31.055.3mm SL. Sogeri Plateau, about 32km northeast of Port Moresby, Papua New Guinea (approximately 9°28'S, 147°28'E), gill net, PNG Fisheries Department on 8 June 1973: PNG unregistered, 22 specimens, 25.0-55.0mm SL, same data as AMS paratypes, WAM P26393-001, 34 specimens, 18.0-53.8mm SL, collected with holotype: WAM P26394-001, 8 specimens, 37.0-47.0mm SL, small stream about 12km north of Port Moresby, Papua New Guinea (approximately 9°25'S, 147°14'E) seine G. Allen and D. Crossfield on 30 September 1978: WAM P26395-001, 116 specimens, 19.0-42.0 mm SL: Dasiama creek, about 20km northeast of Port Moresby, Papua New Guinea (approximately 9°18'S, 147°13'E) seine G. Allen on 30 September 1978: WAM P26393-001, 43 specimens, 22.0-57.0mm SL, small stream about 10km northwest of Brown River in forestry reserve, Papua New Guinea (approximately 9°16'S, 147°15'E), seine, G. Allen and D. Crossfield on 30 September 1978: WAM P26399-001, 20 specimens, 22.0-39.0mm SL, small stream about 10km northwest of Brown River crossing on Port Moresby Road, Papua New Guinea (approximately 9°01'S, 147°02'E), seine, G. Allen on 30 September 1978; WAM P26400-001, 21 specimens, 16.0-42.0mm SL; small stream about 15km east of Port Moresby Airport (Jackson Aerodrome) on Rigo Road, Papua New Guinea (approximately 9°35'S, 147°22'E), seine, G. Allen on 1 October, 1978; WAM P26403-001, 13 specimens, 31.0-59.0mm SL, Goldie River near junction with Hiwick River Papua New Guinea (approximately 9°21'S, 147°16'E), seine, G. Allen and B. Parkinson, on 2 October, 1978; WAM P26404-001, 1 specimen, 36.0MM SL; Brown River at bridge crossing, about 32km north of Port Moresby, Papua New Guinea (approximately 9°12'S, 147°14'E) dipnet, G. Allen on 2 October 1978; WAM P26405-001, 21 specimens, 30.0-44.0mm SL, small stream about 15km south of Brown River in forestry reserve, Papua New Guinea (approximately 9°16'S, 147°15'E), dipnets and torches at night, G. Allen and F. Parker, on 2 October, 1978; WAM P26406.001, 2 specimens, 44.0 and 48.0mm SL; Eilogo Creek at Eilogo Rubber Plantation, Sogen Plateau about 32km northeast of Port Moresby, Papua New Guinea (approximately 9°.28'S, 147°28'E), seine, G. Allen and B. Parkinson, on 3 October, 1978;

## 2. Identification

Discuss the identification of the individuals in this species, including if the sexes of the species are readily distinguishable, and if the species is difficult to distinguish from other species. Provide representative photographs of female and male specimens at all life stages. Ensure you have appropriate copyright permission as the report will be published on the department's website.

*Melanotaenia papuae* - Papuan Rainbowfish



Photo, © Gerd Bartz

### Species Summary

The overall body colouration of *Melanotaenia papuae* is generally olive-green above the mid-lateral line and silvery white below. A prominent red spot is frequently present on the upper part of operculum. A pair of prominent black lines is present at the upper and lower edge of the lateral line and they continue down the lower half of the body. On the posterior half of the body the colours of these lines become reddish and/or purplish in males and yellow to pale orange in females. The colours and markings of the females are generally less brilliant than those of the males. Named *Melanotaenia papuae* after its type locality, Papua, the southern portion of Papua New Guinea. May reach a maximum size of 8 cm, but usually less than 6 cm SL.

### Distribution & Habitat

The full extent of *Melanotaenia papuae* geographic range remains undetermined. Most collections have been within a 35 km radius of Port Moresby, Papua New Guinea. They are generally found in rainforest and coastal freshwater streams where they are often found together with *Melanotaenia goldiei*. Temperature and pH reported from these habitats were 25-33°C and 7.3-7.8. From the collections around the Port Moresby District, Gerry Allen found that *Melanotaenia goldiei* prefers more inland streams which are faster flowing, less turbid, and slightly cooler whereas *M. papuae* is more often found closer to the coast in quieter conditions. However, in some locations such as the Sogeri Plateau, they are found together, although at this locality *M. goldiei* was far more abundant.

### Remarks

*Melanotaenia papuae* were one of the earlier New Guinea Rainbowfishes to be maintained in the aquarium hobby and were available in Australia as early as 1961. In 1964, Ian Munro catalogued some specimens from Port Moresby as paratypes of *Melanotaenia sexlineata* in "Additions to the fish fauna of New Guinea". However, there was some confusion regarding their correct identification as among Munro's paratypes were some specimens later identified as *Melanotaenia papuae* by Gerry Allen in 1981. *Melanotaenia papuae* were collected from tributaries of the Laloki, Brown and Goldie Rivers in 1970 and 1971. Gerald Allen and Brian Parkinson collected about 30 live specimens in 1978 from a small creek at Mount Diamond, about 15 miles west of Port Moresby. Specimens were also collected from the tributaries of the Laloki River in 1981. Some of these specimens were brought back to Australia and small numbers were distributed in the hobby. They were a very popular species but these days they seem to have been forgotten and are rarely seen.

### Early Stages

The eggs and larvae of most species of *Melanotaenia* are very similar, mostly clear or light amber in colour, usually 0.5 mm to 1.5 mm diameter but mostly about 1.0 mm with a few sticky filaments coming from the egg. The larvae are generally 4 to 5 mm long on hatching. A request was sent to Johannes Graf of Germany and he sent back two photos, eggs and small fry of *Melanotaenia* with permission to publish in this report.



Photo : Johannes Graf – permission to use photo obtained 28/01/2023



Photo: Johannes Graf – permission to use photo obtained 28/01/2023

The visual identification of the species from eggs or larvae would not be possible. To correctly identify species from such a small sample would require the use of a molecular biologist to identify samples to DNA level..

The larvae of *Melanotaenia* are approx. 4 mm similar to all other newly hatched rainbowfish. Most rainbowfish species are hard to identify until 2cm in length or larger. Lange's Rainbowfish I easily distinguished from the closest looking relative.

Sexual maturity is reached at a size of approx. 25 mm SL and 6 months of age, based on aquarium observations. Males develop a deeper body than females, and have moderately elongated and pointed unpaired fins, compared with short and rounded in females. Colour of the unpaired fins in males red, fading to yellowish orange towards the body, those of females translucent with faint dark margin. In males, the tip of the first dorsal fin is coloured whitish blue and extends posteriorly past the origin of the second dorsal fin, which is not the case in females. Depth of the body in adult males (over 50 mm SL) ranges from 32–37% of SL, and for females from 30–33% of SL. Males below 50 mm SL show the same proportions as females. Males develop elongated dorsal and anal fins from approx. 25 mm SL, based on aquarium observations.

**Reference:**

Tappin A.R. (2018) "Rainbowfish", URL - <https://rainbowfish.angfaqlid.org.au/Papuae.htm>

**3. Conservation Status**

Provide information on the status of the species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the IUCN. For example, is the species listed on CITES Appendix I, II or III, and if so, are there any specific restrictions on the movement of this species? Is the species included in the IUCN Red List of Threatened Species? Include information on the conservation value of the species.

A search of Convention for International Trade in Endangered Species (CITES) checklist with the search terms "Rainbowfish" and "*Melanotaenia*" revealed no results for those entities. Found at: [https://cites.org/eng/search?search\\_api\\_fulltext=rainbowfish](https://cites.org/eng/search?search_api_fulltext=rainbowfish) and [https://cites.org/eng/search?search\\_api\\_fulltext=melanotaenia+](https://cites.org/eng/search?search_api_fulltext=melanotaenia+) respectively.

*Melanotaenia papuae* has most recently been assessed for *The IUCN Red List of Threatened Species* in 2019, as vulnerable. This fish has been kept and bred here since the early to mid 1960's and is still here. *Melanotaenia papuae* is listed as Vulnerable. Assessment shows:

Allen, G.R., Unmack, P. & Hammer, M. 2020. *Melanotaenia papuae*. The IUCN Red List of Threatened Species 2020: e.T13071A147682647. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13071A147682647.en>

**Red List Category & Criteria:** Vulnerable B1ab(iii) ver 3.1

**Year Published:** 2020

**Date Assessed:** December 6, 2019

**Justification:**

This species is assessed as Vulnerable. It has an extent of occurrence (EOO) of 1,700 km<sup>2</sup>. There are between 6-10 locations based on the threat of introduction of non-native species. Urbanisation in the area is leading to a continuing decline in habitat.

**Previously Published Red List Assessments**

1996 Lower Risk/least concern (LR/LC)

1994 – Rare (R)

The authors believe that if a small colourful fish such as a rainbowfish from Papua or Irian Jaya was listed, it should be cultured and kept in captive populations bred from a limited collection of wild specimens taken at a time of plenty, usually at the end of the wet season populations are at their most abundant. The species that we are applying for are all available as captive bred. There is no need to harvest from the wild.

The NT Government employed a world-renowned environmentalist to formulate its "Sustainable Use of Wildlife as a Conservation Tool" policy. [REDACTED] helped Author 2 formulate a method to use vulnerable small fish as an aquarium subject and sell it with a care sheet and information about its status, then share profits from sales with the land owner. This gives the fish or other wildlife value and the species and its habitat will be more likely considered during any further development of the land.

**References.**

**CITES.** Convention on International Trade in Endangered Species of Wild Fauna and Flora. <https://cites.org/eng> accessed on 25/03/2023

IUCN. 2022. The IUCN Red List of Threatened Species. Version 2022-2. Available at: <https://www.iucnredlist.org>

IUCN. 2022. The IUCN Red List of Threatened Species. Version 2022-2. Available at: <https://www.iucnredlist.org/species/13071/147682647>

**Lawson, David** (1997) The Northern Territory Government policy "*Strategy for Conservation through Sustainable Use of Wildlife*" located at : [https://www.aquagreen.com.au/files/strategy\\_for\\_conservation\\_through\\_sustainable\\_utilisation\\_of\\_wild\\_life.pdf](https://www.aquagreen.com.au/files/strategy_for_conservation_through_sustainable_utilisation_of_wild_life.pdf)

#### 4. Purpose and source of import

*Provide a summary of the types of activities that the specimen may be used for if imported into Australia (e.g., research, education, exhibition, conservation breeding, household pet or travelling exhibition, or for commercial purposes) and from where the animals will be obtained. Please include information on the rationale for this species, the numbers you want to import and standards for importation.*

If approved, farmed specimens of *Melanotaenia* will be sourced from Licensed overseas exporters with product approved for import under Australian Biosecurity regulations. There are approved farms producing this species in Indonesia, Germany and the United States of America.

The species is to be used as an ornamental species and will be farmed by Author 2 [REDACTED] or sale to aquarium fish distributors, aquarium shops and aquarium hobbyists within Australia. It is also likely to be imported by larger ornamental fish importers such as Aquarium Industries and Bay Tropical Fish for sale through Australian retail aquarium outlets.

Studies into mental health have proven that an aquarium can produce a soothing effect on the human mind that tends toward anxiety. This trend to worry about the future seems to be increasing in recent times. Studies have demonstrated stress reduction from viewing aquatic life in an aquarium, lower heart rates and decrease in blood pressure. (Clements 2019 and Cracknell 2016)

The Aquarium Industry is not like industries that produce food and shelter it is more like the Fashion Industry that relies on new products to excite customers to buy the latest trend. The rise of social media and other instant news forums has produced an intense interest in owning possessing the latest trend. This has happened recently with the smuggling of the small Mexican red crayfish and the Indonesian Assassin Snail. Neither of those are on the allowable import list. There is also a large Australia wide trade in red cherry shrimps and other small colourful crustaceans, all of which are smuggled except the native species from tropical NT and Qld. Author 2 had a couple of conversations with Mary Bomford about 2005, she said that enthusiasts will go to great lengths to obtain the latest fish discovery by-passing disease controls and environmental risk assessment. However, she said that if they can obtain the animals legally the enthusiasts are more likely to report on the smugglers.

#### References:

**Bomford, M. and Glover, J.** (June 2004) "Risk assessment model for the import and keeping of exotic freshwater and estuarine finfish"

**Clements, Valentin, Rankin, Baker, Gee, Snellgrove, Sloman** (2019) "The effects of interacting with fish in aquariums on human health and well-being: A systematic review" published by Institute of Biomedical and Environmental Health Research, School of Health and Life Sciences, University of the West of Scotland, Paisley, United Kingdom.

**Cracknell, White, Pahl, Nichols & Depledge.** ( 2016 ) "Marine Biota and Psychological Well-Being: A Preliminary Examination of Dose–Response Effects in an Aquarium Setting" published by Environment and Behavior 2016, Vol. 48(10) 1242 –1269 © 2015 SAGE Publications

#### 5. Legislative controls

*Provide information on all other Commonwealth, state and territory legislative controls on the species, including the species' current quarantine status, or pest or noxious status, or whether it is prohibited or controlled by permit or licence in any state or territory.*

In the book by Robert Francis (2012) *A Handbook of Global Freshwater Invasive Species* , there are no references or instances of *Melanotaenia* being an invasive or noxious species, anywhere in the world.

#### The Commonwealth Government



Regulation of fish imports is in two parts, biosecurity and possible risk to the environment. Environmental risk is controlled and assessed under provisions the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). The list of allowable species of fishes for importation into Australia and shows that *Melanotaenia species* are not included on the current list. The current list of fishes allowed for importation occurs in section 303 EB of the Environment Protection and Biodiversity Conservation Act 1999. Information about importation of fishes is available on Department of The Environment and Energy web site accessed on 25/03/2023 at <https://www.legislation.gov.au/Series/F2006B01053>

The disease risk assessment used to be controlled by the provisions of the Quarantine Act 1908. The current legislation is the Biosecurity Act 2015 as in force 9th April 2020 available at <https://www.legislation.gov.au/Details/C2020C00127> and accessed 25/03/2023. The Australian Government Department of Climate Change, Energy, the Environment and Water is responsible for the administration of these acts.

### **The Northern Territory Government**

The Northern Territory Fisheries Division Department of Industry, Tourism and Trade will not allow *Melanotaenia species* across its border unless they has passed the Commonwealth guidelines for acceptance into Australia. The list of species of fishes allowed into the Northern Territory for ornamental fishes is the same as Commonwealth list under the provisions of the EPBC Act 1999 or native to Australia but with the possibility of having the native species rejected if it is deemed unsuitable by the NT. Minister for Fisheries as outlined in section 26 of the Northern Territory Fisheries Regulations 2017.

The most current version of the Northern Territory Fisheries Regulations accessed at [Aquatic pests: marine and freshwater](#) on 25/03/2023 shows that no *Melanotaenia species* are listed on this schedule as a noxious fish

### **The Queensland Government**

The Queensland legislation to control possession of noxious fish called "Restricted Matter" comes under the provisions of the Biosecurity Act 2014, Schedule 2 lists Noxious Fish in the Restricted matter schedule. Part 6 of the Act lists further Noxious Fish. No *Melanotaenia species* are listed on this schedule as noxious fish or listed in the restricted matter schedule. In Queensland, invasive fish are listed under the Biosecurity Act 2014 and the Biosecurity Regulation 2016 The most current version of Queensland Biosecurity Act 2014 accessed on 25/03/2023 at: [Invasive fish of Queensland \(06/20\)](#)

### **The Western Australian Government**

Under Regulation 176 of the Fish Resources Management Regulations 1994, a person must not bring into the State a species of fish not endemic to the State without the written approval, or written authority, of the Executive Director of the Department of Fisheries. Species listed as noxious under Schedule 5 of the Fish Resources Management Regulations 1995 and prohibited to be imported into the State. There are no *Melanotaenia species* listed as noxious or restricted in Western Australia. West Australian Government Fish Resources Management Regulations 1995 current at April 2021, and accessed 25/03/2023 at, [http://www.fish.wa.gov.au/Documents/biosecurity/noxious\\_fish\\_list.pdf](http://www.fish.wa.gov.au/Documents/biosecurity/noxious_fish_list.pdf), and shows no *Melanotaenia* on that list.

### **The South Australian Government**

Section 49 of the Fisheries Act 1982 makes it an offence to import or sell exotic fish. The South Australian Fisheries regulations relating to exotic aquarium fish are the Fisheries (Exotic Fish, Fish Farming and Fish Diseases) Regulations 2000, Regulations under The Fisheries Act 1982. Part 6 of the regulations creates schedule 3 that lists the fishes exempt from Section 49 of the fisheries Act. The ACT can be found at: [Fisheries ACT 1982](#). The South Australian Government of noxious fish list accessed 25/03/2023, is available at [http://pir.sa.gov.au/biosecurity/aquatics/aquatic\\_pests/noxious\\_fish\\_list#toc1](http://pir.sa.gov.au/biosecurity/aquatics/aquatic_pests/noxious_fish_list#toc1) and shows no *Melanotaenia* on that list.

### **The New South Wales Government**

On 1 July 2017, the way government, industry and the community manage biosecurity in NSW changed. The [Biosecurity Act 2015](#) (the Act, No. 24) came into effect on 1 July 2017. The regulations, instruments, policies and procedures that underpin the Act were developed in consultation with industry, community and government partners. Under the *Biosecurity Act 2015* there is a general obligation on people to be aware of their surroundings and take action to prevent the introduction and spread of pests, diseases, weeds and contaminants. Read about the [general biosecurity duty](#).

The New South Wales noxious fish list accessed on 25/03/2023, is available at <https://www.dpi.nsw.gov.au/fishing/aquatic-biosecurity/pests-diseases/freshwater-pests/freshwater-finfish>, and shows no *Melanotaenia* on that list

### **The Victorian Government**

Section 75 of the Victorian Fisheries Act 1995, allows the declaration of certain species as "Noxious Aquatic Species". The Victorian Government publishes the Noxious Aquatic Species List on their web site. No *Melanotaenia* species appear on this list. The list of Victorian Government declared noxious species is available.

The Victorian Fisheries Act accessed 25/03/2023 is available at <https://vfa.vic.gov.au/operational-policy/pests-and-diseases/noxious-aquatic-species-in-victoria/noxious-aquatic-species-in-victoria> and shows no *Melanotaenia* on that list.

### **Tasmania**

To import freshwater aquarium or pond fish into Tasmania the Inland Fisheries Service requires registration as a Fish Dealer. Certain species may be imported under permit with written consent of the Director of the Inland Fisheries Service. Species listed as Controlled under the *Inland Fisheries Act 1995* cannot be imported into Tasmania. These species include European carp (*Cyprinus carpio*) mosquito fish (*Gambusia* spp.) Didymo a freshwater algae (*Didymosphenia geminata*) and freshwater turtles. The Tasmanian noxious list accessed on 25/03/2023 can be found at: <http://dpiwwe.tas.gov.au/invasive-species/invasive-animals/invasive-freshwater-species> there are no *Melanotaenia* listed on the page.

Under the *Biosecurity Act 2019* there is a general obligation on people to be aware of their surroundings and take action to prevent the introduction and spread of pests, diseases, weeds and contaminants. Read about the [Biosecurity Act 2019](#).

### **Australian Capital Territory**

Under s. 155 of the Nature Conservation Act 2014, held under a nature conservation licence, or listed on Part 1 of the Live Import List, established under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999. Part 1 of the Live Import List identifies non-native animals that can be brought into Australia without a permit.

Under s. 22 of the Act, it is an offence for a person to keep a prohibited pest animal if the person is 'reckless' about whether the animal is a prohibited animal and is also 'reckless' about whether keeping the animal would result, or would be likely to result, in the spread of prohibited animals of that kind. For example, a person who keeps a fish that is declared as a prohibited pest animal is unlikely to be committing an offence if they keep that fish isolated in a tank and do not allow it to spread into public waters. However, if the species is also declared as notifiable, that person will now be required to notify the ACT Government that the species is being kept.

Proposed Amendments to the Pest Plants and Animals (Pest Animals) declaration discussion paper (May 2019) was to be published in 2020. It was accessed on 25/03/2023. It can be found at: [Proposed amendments to the pest plants and animals \(pest animals\) declaration](#). There are no *Melanotaenia* species listed.

## **6. Is the species highly domesticated or captive bred for commercial, angling or ornamental purposes?**

*Melanotaenia papuae* are being made more widely available from commercial fish exporters overseas. Some have been commercially available for 40 years. The main purpose of the collection of various species was to use the species as an ornamental species. The species have been successfully introduced to many countries. Specimens have made their way to an Indonesian Commercial breeder and Commercial breeders in Europe and North America, which most of the fish would be obtained from. Fishbase notes that the majority of the *Melanotaenia* family are used commercially as an aquarium fish.

### **Reference:**

**Froese, R. and D. Pauly.** Editors. 2023. FishBase. World Wide Web electronic publication.

www.fishbase.org, (02/2023) available at:

[https://www.fishbase.se/NoRecord.php?Type=Summary&typesearch=simple&crit1\\_operator=EQUAL&crit1\\_value=Melanotaenia&crit2\\_operator=EQUAL&crit2\\_value=&group=summary&computeall=false](https://www.fishbase.se/NoRecord.php?Type=Summary&typesearch=simple&crit1_operator=EQUAL&crit1_value=Melanotaenia&crit2_operator=EQUAL&crit2_value=&group=summary&computeall=false)

**IUCN.** 2022. The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>.

Accessed on 25/03/2023 available at:

<https://www.iucnredlist.org/search?query=melanotaenia&searchType=species>

**7. Has the species established one or more self-sustaining populations beyond its native range?**

Provide information on the locations this species has been introduced and/or established populations outside its range, and if so, where those populations are.

No records of *Melanotaenia papuae*, were found as being introduced in any waterways in the world.

**Reference:**

**Froese, R. and D. Pauly.** Editors. 2023. FishBase. World Wide Web electronic publication. www.fishbase.org, 02/2023 available at: [https://www.fishbase.se/country/CountryChecklist.php?showAll=yes&what=list&trpp=50&c\\_code=608&cpresence=Reported&sortby=alpha2&ext\\_CL=on&ext\\_pic=on&vhabitat=fresh](https://www.fishbase.se/country/CountryChecklist.php?showAll=yes&what=list&trpp=50&c_code=608&cpresence=Reported&sortby=alpha2&ext_CL=on&ext_pic=on&vhabitat=fresh)

**8. Are any subspecies or varieties referenced on FishBase (<https://www.fishbase.se/search.php>)?**

A search of the IUCN RedList Accessed on 25/03/2023 available at: <https://www.iucnredlist.org/search?query=melanotaenia&searchType=species> Shows there are no subspecies or varieties listed.

**Reference:**

**IUCN.** 2022. The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>. Accessed on 25/03/2023 available at: <https://www.iucnredlist.org/search?query=melanotaenia&searchType=species>

**9. What is the country of origin and the natural distribution of this species?**

**Range Description:**

M, papuae occurs in numerous streams within about a 35 km radius of Port Moresby in south-eastern Papua New Guinea (Allen 1981, [REDACTED]).



**Country Occurrence:** Native, Extant (resident): Papua New Guinea (Papua New Guinea (main island group))

**Population**

There is no information on the population size or trend of this species.

**Current Population Trend:** Unknown

**Habitat and Ecology** This species occurs in slow-flowing small creeks flowing through second-growth and primary forest in lowland areas. It forms aggregations around log snags in deeper pools and can grow to a maximum size of about 6.5 cm SL (Allen 1981, [REDACTED]).

**Systems:** Freshwater (=Inland waters)

#### Use and Trade

This species is found in the aquarium trade, but individuals are from captive bred populations [REDACTED]

#### Threats

This species is threatened by invasive fish species, which are likely to be threatening the species through competition, predation and habitat degradation. Land use change, resulting from increasing settlements surrounding Port Moresby, is another major threat to this species [REDACTED]

Conservation Actions There are no conservation actions in place for this species. Research into the population and distribution is recommended.

Recently, (2022) A project, funded by the Environmental Biosecurity Project Fund through the Commonwealth Department of Agriculture, Water, and the Environment, to assess whether 447 species of fish on the "greylist" (fish claimed to be in Australia before the EPBC Act came into effect. The publication by Millington et al. using the South Australian Research Development Institute (SARDI) risk assessment tool (Deveney 2018), capable of identifying the invasive potential of grey-listed non-indigenous ornamental species traded within Australia. This tool uses queries to score three categories: 1) estimation of the likelihood of release, 2) likelihood of invasion, and 3) an assessment of consequences. Through the use of a series of scores based on the presence or absence of specific parameters that encompass different contributions to risk posed by each parameter, species are categorised as:

1. "high risk" (>150)
2. "moderate risk" (51 – 149)
3. "low risk" (<50)

Eleven species of rainbowfish from the *Melanotaenia* family, were fast assessed. They were all assessed as having a "low" chance of: 1) estimation of the likelihood of release, 2) likelihood of invasion, and 3) an assessment of consequences.

The authors of these reports will be applying for 9 of these 11 species. Each of these species will have an individual report prepared.

<i>Melanotaenia boesemani</i>	Boeseman's rainbowfish	HT	LV	Yes	None	L	32		
<i>Melanotaenia herbertaxelrodi</i>	Lake Tebera rainbowfish	HT	LV	Yes	None	L	16		
<i>Melanotaenia kamaka</i>	Kamaka rainbowfish	HT	LV	No	No	L	7	DD	DD
<i>Melanotaenia lacustris</i>	Lake Kutubu rainbowfish	HT	LV	Yes	None	L	32		
<i>Melanotaenia papuae</i>	Papuan rainbowfish	MT	LV	No	No	L	6	DD	DD
<i>Melanotaenia parkinsoni</i>	Parkinson's rainbowfish	MT	LV	No	No	L	6	DD	DD
<i>Melanotaenia parva</i>	Lake Kuromai rainbowfish	MT	LV	No	No	L	7		
<i>Melanotaenia praecox</i>	Dwarf rainbowfish	HT	LV	No	No	L	14		
<i>Melanotaenia sexlineata</i>	Fly River rainbowfish	MT	LV	No	No	L	18	DD	

As acknowledged in the Millington et al. (2022) report, the SARDI tool is not appropriate for an Australian-wide risk assessment. It overlooks key information, includes features that resulted in underscoring, and data deficiencies were a continuing theme. The authors noted that precautionary principles were not applied in the SARDI tool, and the prevalent data deficiencies may have resulted in underscoring of invasive potential, marring true invasion risk. Consequently, the authors note that the

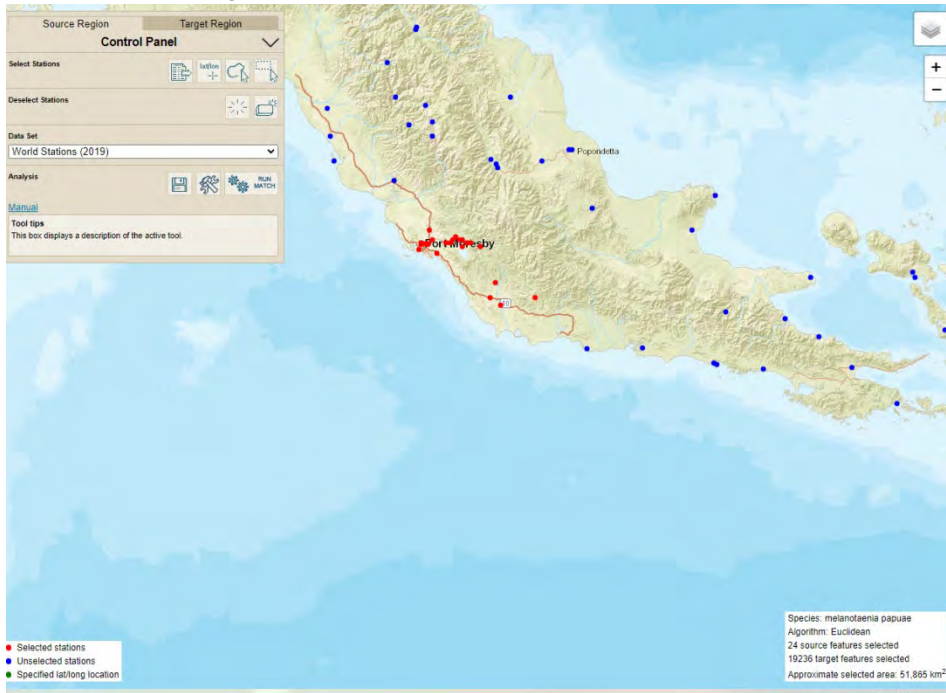
department does not take into consideration the outcomes of the Millington et al. (2022) study when assessing species for the Live Import List.

**Reference:**

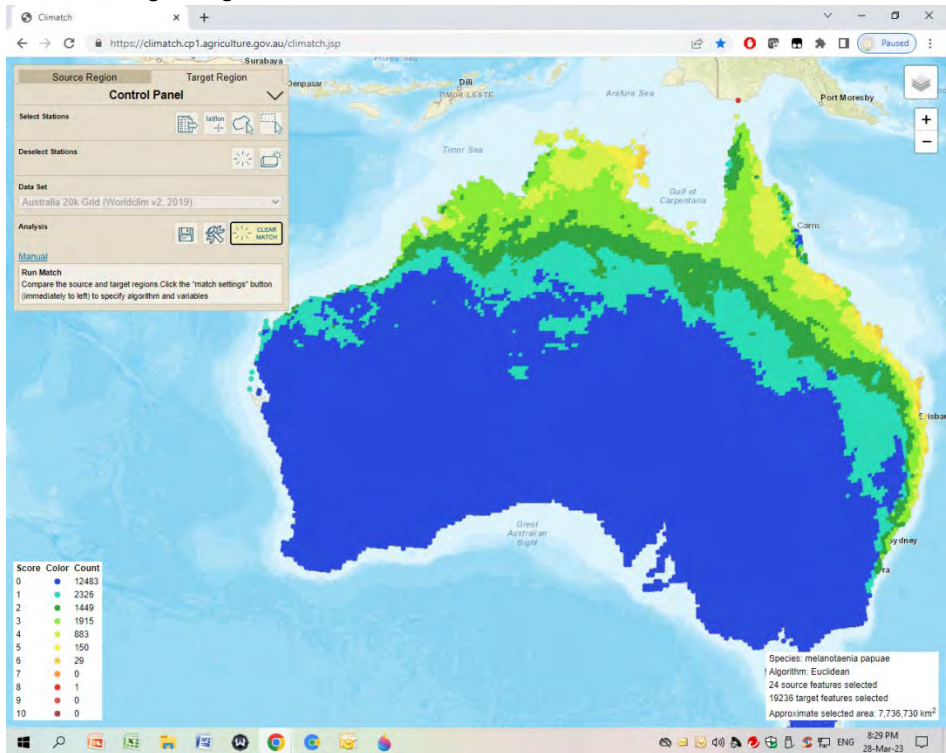
**Millington M, Sierp M, Gaylard S** (2022) Assessing the Invasiveness Risk of Non-Indigenous Fish in the Australian Ornamental Trade. Department of Agriculture and Fisheries, Brisbane. 62pp.

10. Are there areas in Australia that are climatically similar to the species' native range?

Climatch Source Region



Climatch Target Region



Using the copy of Climex for PC, the process indicates the species has a low to moderate chance of survival in Australian water ways.

Reference:

ABARES 2020, Climatch v2.0 (Australian Bureau of Agriculture and Resource Economics and Sciences) November 2020'

**11. In the species' introduced range, are there impacts to:  
wild stocks of angling or commercial species  
aquacultural, aquarium or ornamental species  
rivers, lakes, threatened species or ecological communities?**

*If any boxes are ticked, please provide additional information.*

*Melanotaenia papuae* has not been introduced as an angling species, too small, no use to anglers. There are only 3 records of *Melanotaenia* being introduced outside their natural range, and the introductions were not successful. There are no threat to any threatened species or ecological communities. (Fishbase)

**Reference:**

**Froese, R. and D. Pauly.** Editors. 2023. FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), 02/2023 available at: [https://www.fishbase.se/country/CountryChecklist.php?showAll=yes&what=list&trpp=50&c\\_code=608&cpresence=Reported&sortBy=alpha2&ext\\_CL=on&ext\\_pic=on&vhabitat=fresh](https://www.fishbase.se/country/CountryChecklist.php?showAll=yes&what=list&trpp=50&c_code=608&cpresence=Reported&sortBy=alpha2&ext_CL=on&ext_pic=on&vhabitat=fresh)

**12. Are other members of the genus known to be invasive?**

The authors could find no references or records of rainbowfish being invasive. The three major genera of Rainbowfishes, *Melanotaenia*, *Chilatherina* were searched on Fishbase, there are a couple of records of Rainbowfishes being introduced into natural waters of the Philippines. There is no information to suggest any of them have established. There is no record of *Melanotaenia species* being introduced into any waterways. A Search of *Melanotaenia*, *Chilatherina* and *Glossolepis* on Fishbase. <https://www.fishbase.se/search.php> showed no results.

**Reference:**

**Froese, R. and D. Pauly.** Editors. 2023. FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), (02/2023) accessed on 25/03/2023 at: <https://www.fishbase.se/search.php>

**13. Does the species have any harmful characteristics (poisonous/venomous/spines/aggression), or pose any risks to human health?**

Fishbase, report that *Melanotaenia papuae* is harmless to humans.

**Reference:**

**Froese, R. and D. Pauly.** Editors. 2023. FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), (02/2023) *Melanotaenia* <https://www.fishbase.se/Nomenclature/ScientificNameSearchList.php?>

**14. Is the species known to be aggressive towards other species? Does the species out-compete native species?**

Males with close areas will sometime circle each other flaring their fins. This rarely causes any damage and as it is mostly stylised display to establish male dominance. Rainbowfishes are peaceful towards each other and other species except for the male displays mentioned earlier. Keepers of aggressive species such as some cichlids use rainbowfishes as "dither fish" to diffuse aggressive behaviour because they are able to keep out of the way and distract the aggressive species from hurting each other.

**References:**

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson.

**Tappin, A.R., (2015)** "Home of the Rainbowfish", <https://rainbowfish.angfaql.org.au>

**15. Is the species parasitic of other species?**

The authors could find no references or records of *M. papuae* being parasitic.

**References:**

**Tappin, A.R., (2011)** "*Rainbowfishes, their care and keeping in captivity*" available at: <http://www.mediafire.com/download/g7qzn85uqde8v8o/Rainbowfishes.2011.pdf>

**16. Is the species unpalatable to, or lacking, natural predators?**

Although the fishes swim in the open, shelter in the form of aquatic vegetation and submerged forest debris is never far away. Fry and young fish are strongly reliant on cover, not only to escape normal predators, but also cannibalism by larger individuals of their own species. Young are often present in large numbers among submerged grasses and other shoreline vegetation. Predators of adult rainbows include large fishes such as **grunters** (family Terapontidae), **cardinalfishes** (genus *Glossamia*), **Barramundi** (*Lates calcarifer*), and freshwater **snappers** (*Lutjanus*). They are also preyed on by a variety of waterfowl, especially during drought periods when water levels are greatly reduced. Last, but not least, humans occasionally hunt rainbows for food. Neat piles of freshly caught Red Rainbows are sold at the market next to Lake Sentani. Allen 1995, "I've only resorted to eating rainbows on one occasion - during a jungle trek in New Guinea when there was nothing else to eat. They were terrible - the flesh was full of bones and laced with a strong formic-acid flavour".

**Reference:**

**Allen, G.R., (1995)** Rainbows in Nature and in the Aquarium, Their identification, care and breeding. Tetra-Verlag Germany. ISBN 1-56465-149-5 (pp.20)

**17. What native species would the species likely feed upon? Are natural predators of these native prey species also present?**

The diet of *Melanotaenia* species has been recorded. The diet of other members of the *Melanotaenia* genus are well recorded. All rainbowfishes of the family Melanotaeniidae are reasonably similar in their dietary preferences. They are omnivores, eating a variety of small aquatic and terrestrial creatures and plant matter. Rainbowfishes have villiform teeth that extend outside their mouth around their lips to enable them to scrape algae from submerged hard surfaces. The diet includes algae, ants, aquatic insect larvae and small crustaceans. (Allen 1991)

**References:**

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson.

**Tappin, A.R., (2011)** "*Rainbowfishes, their care and keeping in captivity*" available at: <http://www.mediafire.com/download/g7qzn85uqde8v8o/Rainbowfishes.2011.pdf>

**18. Does the species host, and/or is it a vector, for one or more recognised non-native infectious diseases/parasites (see Australia's National List of Reportable Diseases of Aquatic Animals)?**

No, none of the diseases recorded on the Australia's National List of Reportable Diseases of Aquatic Animals are applicable. Rainbows and blue-eyes are remarkably free of disease in normal circumstances. I have sometimes gone for several years at a time without any disease problems. Often, when obvious diseases do occur, they tend to be isolated incidents affecting only a few fish in one particular tank. It may seem cruel, but I prefer to destroy diseased fish, lest they contaminate others. New fish should be quarantined for 1 -2 weeks in order to be absolutely certain that no diseases are evident. Also it is advisable to avoid routinely moving fish from one tank to another, particularly if the water chemistry varies in your fish room. The chance of disease is greatly reduced if your fishes are given plenty of space. This is easier said than done. especially if you are breeding.

A very manageable situation, with lots of fry being held in small containers, quickly turns to chaos when the fish begin to grow. Two of the most common crowd-induced diseases are white spot (*Ichthyophthirius multifiliis*) and velvet disease (*Oodinium*). Both are caused by parasitic protozoans. They can be treated with standard remedies sold by aquarium dealers. There is a large range of so-called "cures", but they vary greatly in quality and effectiveness. Body and fin fungus (*Saprolegnia*) occasionally attacks rainbows, particularly if they have wounds resulting from fighting or scraping against sharp objects. Chances are the infection will spread to other fishes in the same tank so it is best to treat the entire tank. Increased temperature (up to 5° C if fish are being held at temperatures below 25° C), stronger



aeration, bottom cleaning with a siphon, and partial water changes (20 percent) every 2-3 days should help to overcome the problem, If it does not completely disappear, use also a special medication.

**Reference:**

**Allen, G.R., (1995)** *Rainbowfishes In Nature and in the Aquarium, Their identification, care and breeding.* Tetra-Verlag Germany. ISBN 1-56465-149-5 (pp.39-40)

**19. What is the species' common and maximum body size?**

*Melanotaenia papuae* can grow to a maximum size of about 6.5 cm SL

**Reference:**

**IUCN.** 2022. The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>. Accessed on 25/03/2023 available at: <https://www.iucnredlist.org/species/13071/147682647>

**20. Does the species have a wide salinity tolerance at any stage of its life cycle?**

According to the IUCN Redlist: This species occurs in slow-flowing small creeks flowing through second-growth and primary forest in lowland areas. It forms aggregations around log snags in deeper pools

**Reference:**

**IUCN.** 2022. The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>. Accessed on 25/03/2023 available at: <https://www.iucnredlist.org/species/13071/147682647>

**21. Is the species (at any life stage) able to withstand being out of water for extended periods (e.g. minimum of one or more hours)?**

The only reference that Author 1 found was: The eggs are tough and can withstand short periods (10-15 minutes) out of water as long as they are kept moist. Author 2 breeds many species of Rainbowfishes [REDACTED] and can attest that they die quite quickly when removed from the water. It is not conceivable that any *Melanotaenia* species would be much different.

**Reference:**

**Allen, G.R., (1995)** *"Rainbowfishes In Nature and in the Aquarium, Their identification, care and breeding"*. Tetra-Verlag Germany. ISBN 1-56465-149-5 (p.35)

**22. Is the species tolerant of a range of water velocity conditions?**

There is no information available on the ability of *Melanotaenia species* to negotiate white water rapids, however there is general information about how most species of fish travel. Tappin 2011 states smaller rainbowfishes prefer slow or no current, adults congregate in areas of slow and moderate flow near obstacles and aquatic vegetation. The tendency for Australians to make dams and weirs over all flowing waters has reduced the distribution of many freshwater species by restricting travel and lowering water temperatures. Author 2 collected rainbowfishes in the billabongs adjacent the Murrumbidgee River near Wagga Wagga NSW in the 1970's, but now no one has been able to locate that species in the same places from the 1990's onward.

Rainbowfishes and Blue-eyes can be located in floodwaters at the margins of creeks and rivers outside their banks among riparian grasses and other vegetation, both authors have collected rainbowfishes while avoiding crocodiles in floodwaters of the Howard River in the grassland adjacent the river in the early 2000's wet season. There are larger barriers such as waterfalls in Kakadu National Park where there are different species above the waterfalls to what is found below the waterfalls. During wet season migrations of forage fishes professional ornamental fish collectors in the NT, catch fishes that accumulate at restrictions to upstream movement of fishes. The NT A12 Licensed collectors at Scotts Creek on the old Woolner Station access road put a trap above the small restriction of the road in the latter stages of the wet season. The trap was designed to catch fishes that had negotiated the fast water, not white water but a fast riffle and a rise of 30 to 40 cm from the creek level below the bridge obstruction. The trap caught grunters and Plotosidae catfish but not rainbowfishes. That is an observation of Author 2, who assisted Albert Costa the NT Fisheries A12 licensed collector. That area is

now a National Park and the fishes are not used by humans any longer but die in their thousands from the man made structure and make the water birds gorging on dying fish so fat they can hardly fly.

In general from observations of Australian Rainbowfishes they do not negotiate fast water but travel along the margins in times of flood when the obstacles are under many more meters of water. They cannot travel from one river system to the next via the sea as they are not tolerant of seawater.

### **23. Does feeding or other behaviours of the species reduce habitat quality for native species?**

*For example, benthic foraging or burrow construction that leads to an increase in suspended solids, reducing water clarity?*

Rainbowfishes are nearly all mid water to surface ranging and a species forming loose aggregations that do not disturb any substrate or any other underwater structures that would lead to any form of silting or increase in suspended solids.

#### **Reference:**

**Tappin, A. R.** (1996-2019) "Home of the Rainbowfish" <https://rainbowfish.angfaqlld.org.au>

### **24. What is the diet and feeding behaviour of the species?**

Analysis of stomach contents reveal they feed on a variety of tiny insects that fall onto the surface, ants, are a favourite item. Aquatic insects and various larval forms are also consumed with lesser amounts of small micro-crustaceans and filamentous green algae.

#### **Reference:**

**Allen, G.R., (1995)** Rainbowfishes In Nature and in the Aquarium, Their identification, care and breeding. Tetra-Verlag Germany. ISBN 1-56465-149-5 (p.20)

### **25. Does the species exhibit parental care?**

*For example, is it a mouth-brooder, does it bear live young, does it nest guard?*

There are no known observations of spawning fish exhibiting any form of parental care. All rainbowfishes of three genera known to the Authors breed in a similar fashion. There is no evidence to suggest that any *Melanotaenia* species will breed in any manner different to the other *Melanotaenia*. The male elects an area that is near an object or some aquatic plants. It displays by flaring fins and trying to herd the female to the selected place. Once the pair come together and spawn there is no further interest in the eggs.

#### **Reference:**

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

### **26. Does the species hybridise under natural conditions? Is the species likely to hybridize with native species in Australia?**

Reports of naturally occurring rainbowfish hybrids in the wild are extremely rare. A report of naturally occurring hybrids between the genera *Melanotaenia* and *Chilatherina* can be found in Allen & Cross (1992) but there are no known naturally occurring hybrids between *Glossolepis* sp. and *Melanotaenia* spp.

Based on Allen (1989) and other works, the species in this genus have evolved in isolation from each other and almost certainly differences in courtship and spawning behaviour would have evolved at the same time (indeed, such isolating mechanisms must be available in this one habitat for two or more taxa to have evolved to the level of genus!). Distinct species as we know them have evolved as separate breeding units because of physicochemical, behavioural and recognition cues. These are complex and species-specific and effectively restrict hybridization. That many species of rainbowfish are being raised in ponds adjacent to each other by breeders in Asia and elsewhere (and it is so unlikely that the tanks would always be uncontaminated), negates the likelihood of easy hybridisation between this and other rainbowfish taxa. There are reports, both published and anecdotal, of hybridisation between the various species of *Melanotaenia*, *Glossolepis*, *Chilatherina* and *Rhadinocentrus* as well as between genera. Virtually all of these have taken place either accidentally or on purpose under the artificial conditions

within captivity. The hobby groups that keep Rainbowfishes discourage attempts at hybridisation, see two codes of conduct referred.

There was no record or mention from any of the scientist collectors of any other hybrids of *Melanotaenia* in its natural location. Hybridisation in rainbowfishes, although rarely occurring in nature, can be forced in the aquarium by providing only one sex of two different species. A closely related species, *Glossolepis incisus* was hybridized with a *Melanotaenia praecox* by an aquarium fish importer attempted to create appealing aquarium subject for commercial purposes. The resulting offspring were infertile. Overseas ( Europe and USA) some attempts have been made to establish "aquarium" strains of hybrids between various *Melanotaenia* species and none of these have become established in the trade, mainly because of hobby , club and market resistance to such crosses . The hobby groups overseas such as the RSG (Rainbowfish Study Group, in the USA) and the IRG (IRG – International Rainbowfish Association in Europe) and ANGFA ( here in Australia regularly advise hobbyists against buying or perpetuating such hybrids even when they are disguised under "pseudo-scientific" names such as *Melanotaenia marcii* etc. Hobbyists engage in continuous dialogue on various aspects of husbandry and conservation of rainbowfishes (as well as other species) on the Internet, social media and various discussion forums in several languages. The members of the Australia and New Guinea Rainbowfishes Association have a "Code of Conduct" that encourages enthusiasts to stay away from hybrid fish.

There are wild places that have many species of Rainbowfish living together, if hybridisation was common or easy there would only be one species with the features of the original 4 or 6 species at that location. The Mary River NT, at the southern end entry to Kakadu National Park has 4 species of Rainbowfish, *Melanotaenia trifasciata*, *M.exquisita*, *M.nigrans* and *M.splendida inornata*. No hybrids have been found there during many collections by Author 2. However Author 2 did find and photograph a natural hybrid between *Melanotaenia exquisita* and *Melanotaenia australis* in Pine Creek approx. 200 km south of Darwin in the Northern Territory.

The photo shows a natural hybrid, centre fish has features of *Melanotaenia exquisita*, fish pictured at bottom of photo and *Melanotaenia australis*, not in photo.



Photograph by Dave Wilson [REDACTED] taken October 2014, permission to publish 25 Feb 2023

The Jardine River in far North Queensland has six species of Rainbowfish recorded with no record of any hybrids.

Majtánová and all, 2020, concluded that their DNA in the family *Melanotaeniidae* was sufficiently close for them all to hybridise. Author 2 called a scientist, an expert in the field of rainbowfish for clarification and was reminded that Rainbowfishes have been imported into Australia for many decades and none have caused any trouble from introductions to natural waterways, However there has been an hybridisation event in Running River a tributary of Barnett River Qld where a different rainbowfish *Melanotaenia splendida splendida* has been introduced to a different rainbowfish *Melanotaenia splendida* known as Running River Rainbowfish. Researchers for Australian National University (Unmack 2015) have taken steps to preserve that over run species. However these are both in the *Melanotaenia splendida* group, very closely related. There is an extensive program started by Canberra University to

move the affected fish to a safe location and Author 2 has that species cultured and it is sold with its story.

**References:**

**Allen, G.R. and N.J. Cross** (1982). "*Rainbowfishes of Australia and Papua New Guinea*". Angus & Robertson.

**ANGFA** "Code of Conduct"

<https://www.angfa.org.au/about-constitution/206-angfa-code-of-conduct.html>

**IRG (International Rainbowfish Association)**, available at URL - <https://www.irg-online.de/we-about-us/> accessed 11 March 2023.

**Majtánová, Unmack, Prasongmaneerut, Shams, Srikulnath, Ráb and Ezaz** (2020) "*Evidence of Interspecific Chromosomal Diversification in Rainbowfishes (Melanotaeniidae, Teleostei)*" published Genes 2020, 11, 818; doi: 10.3390/genes11070818

**Tappin, A.R.**, (2011) "Rainbowfishes, their care and keeping in captivity" available at: <http://www.mediafire.com/download/g7qzn85uqde8v8o/Rainbowfishes.2011.pdf>

**Tappin A.R.**, (2013) Home of the Rainbowfish <http://rainbowfish.angfaqld.org.au/splendida.htm>

**Wilson, D.N. & Biggs, C** (2004) "Aquarium and Pond Keepers Code of Conduct" available as a download from World Wide Web electronic publication at URL [http://www.aquagreen.com.au/files/Code\\_of\\_Conduct\\_V5.pdf](http://www.aquagreen.com.au/files/Code_of_Conduct_V5.pdf)

**Wilson D.N.** (2017) "*Running River Rainbowfish, Melanotaenia sp. Fact Sheet*" available at URL [https://www.aquagreen.com.au/plant\\_data/Melanotaenia\\_sp.html](https://www.aquagreen.com.au/plant_data/Melanotaenia_sp.html)

**Unmack & Hammer** (2015) "Burdekin River Rainbowfish on the verge of disappearing from Running River" , Fishes of Sahul; V24 NO. 4, page 933

**27. Is the species hermaphroditic, or it is capable of parthenogenesis?**

The authors could find no record in any Rainbowfish books or papers examined of this family being able to store sperm. Rainbow fish are egg scatterers with eggs and sperm ejected simultaneously requiring both sexes for a successful fertile egg laying.

**References:**

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson

**Tappin, A. R.** (1996-2019) "Home of the Rainbowfish" <https://rainbowfish.angfaqld.org.au/>

**28. Is the species dependent on the presence of another species or specific habitat features to complete its life cycle?**

*For example, fast-flowing water, particular species of plant or types of substrata*

Rainbowfishes live in a variety of habitats from clear streams and lakes through large turbid rivers, floodplain habitats, and isolated rocky pools or waterholes in arid regions. Most species form loose aggregations, which swim either in midwater or just below the surface. There is no known dependence on other species to complete their life cycle. Author 2 produces many species of Rainbowfish in ponds that have no other species present. Adult fish spawn on mops made from acrylic yarn and floats. Once mop has eggs adhering to the yarn it is moved to a pond with natural plankton. Apart from small plankton species used as food no other species are required to raise young rainbowfish. This method is used for all species farmed on Author 2 property. The method is described in Tappin 2011

**References:**

**Tappin** (2011) "Rainbow Fishes, their care and keeping in captivity"

**29. What is the fecundity of the species (number of eggs per spawn), and does it produce offspring multiple times in a lifecycle, or have an extended spawning season?**

The authors found numerous record or observation for *Melanotaenia species*, most species will produce about 40 to 100 viable eggs a day for several consecutive days in a two week period. This amount of egg production will continue during times of good water quality and abundant foods which would occur for several months before, during and shortly after the wet season.

**References:**

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson.

**Tappin, A. R.** (1996-2019) "Home of the Rainbowfish" <https://rainbowfish.angfaql.org.au>

### **30. What is the time from hatching to full maturity?**

Generally rainbowfishes start to breed about 6 months of age and are reported to live for about 4 years in their natural habitat and up to 8 years in captivity.

**References:**

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson.

**Tappin, A. R.** (1996-2019) "*Home of the Rainbowfish*" <https://rainbowfish.angfaql.org.au/>

### **31. Are life stages likely to be dispersed unintentionally?**

*For example, bait buckets, live eggs on anglers' gear, accidental release during aquarium maintenance as a food fish or an angling amenity, for ornament or unusual appearance, for cultural reasons, as a contaminant of other commercially sold fish.*

If *Melanotaenia papuae* was approved, it would be unlikely to be used as live bait in the tropics because of its small size. There have been media reports of Tilapia being used as live bait near Atherton in Qld, there was prosecutions mentioned in the same report.

Ponds in tropical areas overflowing in the wet season is another way for feral fish to be introduced to drains. There are small populations of guppies around the drains of Darwin.

Eggs sticking to aquarium plants. The eggs of *Melanotaenia* like the eggs of other rainbowfishes and may attach to aquarium plants. Generally, aquarium plants have a one-way trip from the aquarium shop to an aquarium where they gradually die and then are replaced by more plants from the Aquarium shop. Author 2 produces aquatic plants for the aquarium trade and has local species of Blue-eye, *Pseudomugil tenellus*, in the plant production ponds for mosquito control. Customers occasionally asked what the small fish that hatched from their plants. The eggs of *Pseudomugil* although slightly larger have similar small filaments attached to their eggs like rainbowfish.

Water changes going to garden sewer or septic and should cause no problem transferring eggs.

### **32. Is it likely to be deliberately released from aquariums due to growth rate, social behaviour etc?**

*Melanotaenia papuae* are generally thought of by aquarium hobbyists as peaceful community aquarium subjects that do not grow very big so are not a problem because they get to large nor do they become more aggressive as they grow older. Tappin 2011 pages 4 to 6 outlines the history and reasons Rainbowfishes have become popular.

Frogwatch Northern Territory, [REDACTED] went on local TV and Radio to promote the use of *Pseudomugil tenellus* for "Frog Pond" tadpole friendly mosquito control. This was done to stop the people using Guppies *Poecilia reticulata*, a common belief they were native was dispelled by members of ANGFA and NT Frogwatch. Similar programs were started in other states by ANGFA members. Author 2 was a member of NT Frogwatch Committee along with Ex Lord Mayor of Darwin Graeme Sawyer [REDACTED]

Generally there has been programs directed toward Aquarium and Pond keepers to make their pond and aquariums secure. See "Code of Conduct" from various organisations associated with the aquarium industry.

Arthington et al. (1999) considered that there is a low or residual probability that New Guinea rainbowfishes would establish feral populations in Australia. Indeed, *G. incisus* has been here, and popular, for more than 40 years (and other New Guinea rainbowfishes are cultivated here also) and there are no feral populations of this fish in natural waterways.

**References :**

**ANGFA** "Code of Conduct" available on the world wide web at URL  
[https://angfa.org.au/index.php?option=com\\_attachments&task=download&id=64](https://angfa.org.au/index.php?option=com_attachments&task=download&id=64)

**Arthington, A. H.; Kailola, P. J.; Woodland, D. J.; Zaluki, J. M.** (1999) Baseline environmental data relevant to an evaluation of quarantine risk potentially associated with the importation to Australia of ornamental finfish. Report to the Australian Quarantine and Inspection Service. Canberra, ACT, Department of Agriculture, Fisheries and Forestry.

**Tappin** (2011) "Rainbow Fishes, their care and keeping in captivity" available as a download from URL -  
<https://rainbowfish.angfaqlld.org.au/Book.htm>

**Wilson, D.N. & Biggs, C** (2004) "Aquarium and Pond Keepers Code of Conduct" available as a download from World Wide Web electronic publication at URL  
[http://www.aquagreen.com.au/files/Code\\_of\\_Conduct\\_V5.pdf](http://www.aquagreen.com.au/files/Code_of_Conduct_V5.pdf)

**33. Are eggs or larvae dispersed by water current, or can they move between water bodies via connections?**

*For example, climbing vertical surfaces, through pipes*

Rainbowfishes generally do not climb and in nature congregate at barriers to upstream movement. They also are not salt water tolerant so cannot move into the sea to move between river systems.

**34. Are juveniles or adults of the species known to migrate (spawning, smolting, feeding)?**

Authors were unable to find any record of large upstream migrations of any species of Rainbowfishes. It is generally believed by collectors that rainbowfishes are reduced in numbers during dry season and repopulate areas during wet season flows that give them access to places that are dry during cooler months of the dry season. Personal observations Author 2.

**35. Are eggs of the species known to be dispersed by other animals?**

*For example, accidentally by water fowl when they move from water body to water body?*

There is no proof, but it is possible if highly unlikely, that the eggs of rainbowfish have filaments that are mildly sticky and cause the eggs to catch in aquatic plants. It has been suggested they can attach to the legs of wading birds but this cannot be verified. There are different species below waterfalls in Kakadu National Park to the species of rainbowfishes above the waterfalls.

Author 2 collected the eggs of *Melanotaenia trifasciata* within one hour of laying 13 March 2023 and photographed them in a small Petrie dish on top of a metal ruler. You can see the filaments coming from the eggs as small dark lines. The eggs did not stick to authors fingers. All rainbowfish eggs have these filaments (Tappin 2011)



**Reference:**

**Tappin** (2011) "*Rainbow Fishes, their care and keeping in captivity*" available as a download from URL - <https://rainbowfish.angfaql.org.au/Book.htm>

**36. What are the species environmental tolerances, including water quality, oxygen, pH and temperature extremes?**

Water quality measurements for this species taken by the original collectors of *Melanotaenia species* are well recorded. Allen (1995) writes, rainbows and blue-eyes inhabit natural waters that display very characteristic properties of hardness and pH. Some species such as *Iriatherina wernerii* and *Melanotaenia nigra* are invariably found in soft, acidic conditions, whereas others, for example *M. lacustris* and *M. boesemani* are associated with alkaline waters. Fortunately, rainbows and to a lesser extent blue-eyes are very adaptable with regards to water chemistry. Most species will survive comfortably at hardness and pH ranges of 0-100ppm and 6.5-7.5. Hardness does not seem to be a very critical factor. The normal values for tapwater at most locations is acceptable.

I have never bothered to measure the hardness of our tapwater and have never encountered any problems with keeping or breeding rainbows. As far as pH is considered, a good rule of thumb is to keep the reading close to neutral (7.0) when in doubt. It is always advisable to maintain your fish within a pH range that approximates the natural conditions.

Acidic conditions can be created by using a fine layer of peat below the substrate, and furnishing with abundant plant growth.

More alkaline conditions can be achieved by slowly adding a dissolved solution of sodium bicarbonate.

However water quality and environmental preferences for rainbowfishes varies little across their extensive range. They are tolerant of a variety of water hardness, alkalinity, pH but temperature varies from the upper and lower latitudes. Closer to the equator fishes tend to tolerate higher temperatures for longer periods (observations Author 2 attempting to grow temperate rainbowfishes at 12 deg South near Darwin NT) *Melanotaenia* from northern NSW and the Murray Darling do not survive long periods of water over 32 deg C in the NT.

Reference:

**Allen, G.R., (1995)** *Rainbowfishes In Nature and in the Aquarium, Their identification, care and breeding.* Tetra-Verlag Germany. ISBN 1-56465-149-5 (p.28)

**37. Does the species tolerate or benefit from environmental disturbance?**

*For example, floods, spates, desiccation, including both short- and long-term human impacts.*

There is no information available however [REDACTED] for the NT Dept of Fisheries, 2016 and 2017 and noted that the last fish to die in a low dissolved oxygen event were Tarpon and Gudgeon species, the rainbowfishes and other small forage fishes died after the larger species that require more oxygen.

**Reference:**

**Saunders, T., Allsop, Q., Wilson D.** (2017) "*Fish Kills Investigation Manual*" published by NT Dept Primary Industries. (copy available from Author 2)

**38. Are there effective natural enemies of the species present in Australia?**

Rainbowfishes will form the diet of many predatory species of fish, water birds, aquatic reptiles and humans. Some of the predatory fish families that eat rainbowfishes that occur in Australia and West Papua are; Ambassidae, Anguillidae, Apogonidae, Ariidae, Belonidae, Butidae, Carcharhinidae, Dasyatidae, Eleotridae, Gobiidae, Kuhliidae, Latidae, Lutjanidae, Megalopidae, Muraenidae, Osteoglossidae, Plotosidae, Sciaenidae, Synbranchidae, Terapontidae and Toxotidae.

**Reference:**

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson.

**39. Are there similar niche species present in Australia that it would compete with for food and resources? If 'yes', what types of resources could be used: food; water; space; rest or shelter sites; nest sites; other. Include species names, in particular for threatened species.**

It is unlikely that *M. papuae* would establish in Australia (Kailola & Arthington). If it did, it would be an additional small rainbowfish, larger native fishes are natural predators of this fish family. The established populations would not alter the habitat, and a perceived increase in intergeneric competition for resources would be contained.

**References:**

**Kailola, P.J.** (2004) "*Risk assessment of ten species of ornamental fish under the Environment Protection and Biodiversity Conservation Act 1999*"

**Arthington, A. H.; Kailola, P. J.; Woodland, D. J.; Zaluki, J. M.** (1999) Baseline environmental data relevant to an evaluation of quarantine risk potentially associated with the importation to Australia of ornamental finfish. Report to the Australian Quarantine and Inspection Service. Canberra, ACT, Department of Agriculture, Fisheries and Forestry.

**40. What would be the probable prey/food sources in Australia? Include species names, in particular for threatened species.**

Analysis of stomach contents reveal they feed on a variety of tiny insects that fall onto the surface, ants in particular are a favourite item. Aquatic insects and various larval forms are also consumed with lesser amounts of small micro-crustaceans and filamentous green algae.

**Reference:**

**Allen, G.R., (1995)** *Rainbowfishes In Nature and in the Aquarium, Their identification, care and breeding.* Tetra-Verlag Germany. ISBN 1-56465-149-5 (p.20)

**41. Is there the potential for any habitat or ecological community changes resulting from establishment?**

*For example, prey for native predators, habitat alterations, facilitation of the survival of other species, changes to community dynamics*

If *Melanotaenia papuae* was to escape effective control and did establish in a natural or disturbed waterway it is not conceivable that it would cause any changes to natural environment.

It is unlikely that the species would establish in Australia (Kailola & Arthington). If it did, it would be an additional small rainbowfish, larger native fishes are natural predators of this fish family. The established populations would not alter the habitat, and a perceived increase in intergeneric competition for resources would be contained.

**References:**



**Kailola, P.J.** (2004) "*Risk assessment of ten species of ornamental fish under the Environment Protection and Biodiversity Conservation Act 1999*"

**Arthington, A. H.; Kailola, P. J.; Woodland, D. J.; Zaluki, J. M.** (1999) Baseline environmental data relevant to an evaluation of quarantine risk potentially associated with the importation to Australia of ornamental finfish. Report to the Australian Quarantine and Inspection Service. Canberra, ACT, Department of Agriculture, Fisheries and Forestry.

#### **42. In the event of establishment, are there any potential social or cultural impacts?**

*Social or cultural effects may arise as a result of impacts to commercial or recreational values, life support/human health, cultural significance, biodiversity, aesthetics or beneficial uses. When considering social and cultural impacts, effects to human and animal health, indigenous cultural values, quality of life, should be considered, e.g., distress caused by dead/dying fish as a result of disease spread, or at treated infestation sites; reduced access to water bodies due to eradication measures.*

*Melanotaenia papuae* are not known to carry any zoonotic disease. If specimens are imported from licensed aquaculture facilities under disease surveillance It should be detected and eradicated before the border protection phase of any import, should the application be approved.

There is one disease that is zoonotic and ubiquitous in the Aquarium shops of Australia and the fish family *Melanotaenidae* are susceptible and that is Mycobacteriosis. The bacteria can be transferred from an infected fish to a cut on the hand of a keeper and is known as "Fish Fanciers Finger". This is a type of tuberculosis and is difficult to cure. (Tappin 2011)

#### **Reference:**

**Tappin** (2011) "*Rainbow Fishes, their care and keeping in captivity*" available as a download from URL - <https://rainbowfish.angfaqlid.org.au/Book.htm>

#### **43. Are there any potential economic impacts?**

*For example, impacts to trade, livestock or crops, aquaculture. Economic impacts may include loss of earnings due to reduced productivity, costs of mitigation, remediation and eradication, research costs, reduced earnings, impacts to export markets, banning of sale of commercially popular species etc.*

If *Melanotaenia papuae* was to escape effective control and did establish in a natural or disturbed waterway it is not conceivable that it would cause any potential economic impacts.

It is unlikely that the species would establish in Australia (Kailola & Arthington). If it did, it would be an additional small rainbowfish, larger native fishes are natural predators of this fish family. The established populations would not alter the habitat, and a perceived increase in intergeneric competition for resources would be contained.

#### **References:**

**Kailola, P.J.** (2004) "*Risk assessment of ten species of ornamental fish under the Environment Protection and Biodiversity Conservation Act 1999*"

**Arthington, A. H.; Kailola, P. J.; Woodland, D. J.; Zaluki, J. M.** (1999) Baseline environmental data relevant to an evaluation of quarantine risk potentially associated with the importation to Australia of ornamental finfish. Report to the Australian Quarantine and Inspection Service. Canberra, ACT, Department of Agriculture, Fisheries and Forestry.

#### **44. What control/eradication programs could be applied in Australia if the species was released or escaped?**

If *Melanotaenia papuae* was to escape to a place it may survive, suggest from the climate match data that it would be North Qld, WA or NT. NT has a major population area near the coast, Darwin. There are numbers of feral fishes around Darwin, particularly Live Bearing Tooth carps such as Guppies *Poecilia reticulata* where people either allow them to overflow from Garden Ponds during the wet season or in some cases believe they are doing a good thing for mosquito control by introducing them to natural waters. Governments and local Aquarium societies run education programs. And promote native species for mosquito control with NT Fisheries. There are similar programs run by other State Governments

NT Fisheries through 2016 and 2017 where the last known population of *Gambusia holbrooki* was eradicated and guppies from the Botanic Gardens and local

drains have been poisoned with rotenone. The feral Fighting Fish on the Adelaide River floodplain have not been targeted by NT Fisheries because of the size of the area. In smaller waterways the native fish are removed by electrofishing then taken to ponds off site. Rotenone is applied then after it has dissipated the native species reintroduced.

Generally, if the pest fish is in a smaller waterway they are controlled by poison, however if they are over a large area control is not possible.

If *Melanotaenia papuae* was to establish in a northern waterway it would blend in with the other forage species, hardyheads, glassfishes, small gudgeons and most likely be first species selected by predator because of its brighter colours. If it did establish in a smaller closed waterway it would most likely be eradicated with rotenone.

Feral Fish eradication strategies in the Northern Territory are discussed in Hammer et al 2019. The Siamese Fighting Fish, *Betta splendens*, has established on the Adelaide River floodplain from upstream of the Arnhem Highway to downstream of Fogg Dam and observed in wetlands on both sides of the Adelaide River by Author 2.

**Reference :**

**Hammer, Skarlatos Simoes, Needham, Wilson [REDACTED] Barton and Lonza (2019)**

“Establishment of Siamese Fighting Fish on the Adelaide River floodplain: the first serious invasive fish in the Northern Territory, Australia” published Springer Nature Switzerland AG 2019

**45. What conditions or restrictions could be applied to the import of the species to reduce any potential negative environmental impacts?**

*e.g., single sex imports, size restrictions etc. If the outcome of the assessment is that the specimen can be imported subjected to conditions, limiting imports to eligible non-commercial purposes only, excluding household pets, it will be placed on Part 2 of the Live Import List (i.e. the species of animals and plants suitable for live import with an import permit issued under the Environment Protection and Biodiversity Conservation Act.).*

There is no point restricting imports to single sex only as that would take away the Hobby Fish Keepers passion to breed their fish. One of the aspects of the hobby and the fish keeping clubs is to swap their fish among members at meetings and have fish auctions in the States and Territories where it is legal to sell fish, as part of fund-raising activities for those clubs.

The only condition that could be imposed is a size restriction on imports to ensure the correct identification of the specimens.

The Authors are all members of ANGFA, Australia and New Guinea Fishes Association, Authors 1 and 2 are or were members of CDAS, Canberra and District Aquarium Society, both organisations have breeding, information sharing and conservation of native fishes as listed club activities.

**References:**

**Australia New Guinea Fishes Association**, Mission, available on URL <https://www.angfa.org.au/about-constitution.html> Accessed 25 March 2023

**Canberra and District Aquarium Society**, Activities, available at URL, <http://www.cdas.org.au/node/6> Accessed 25 March 2023

## References:

**ABARES 2020, Climatch v2.0 (Australian Bureau of Agriculture and Resource Economics and Sciences)** November 2020

**Agriculture Department** <http://www.agriculture.gov.au/SiteCollectionDocuments/biosecurity/new-legislation/submission/terrestrial-ecosystems.pdf>

**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.

**Allen GR** (1980) A generic classification of the rainbowfishes (Family Melanotaeniidae). *Records of the Western Australian Museum* 8: 449–490.

**Allen, G.R.** 1981. Central highland rainbows from Papua New Guinea, with descriptions of two new species (Melanotaeniidae). *Tropical Fish Hobbyist* 29(5): 20-33, 68-81.

**Allen, G.R.** (1981): Sepik magic. *Tropical Fish Hobbyist* 39 (8), 19-33.

**Allen GR** (1981) The "Maccullochi species group" of rainbowfishes (Melanotaeniidae) with the description of *Melanotaenia papuae*, new species. *Revue française d'Aquariologie Herpétologie* 8: 47–56.

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

**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

**Allen G.R.**(1984) Boeseman's Rainbowfish, The Pearl of IrianJaya. *Tropical Fish Hobbyist* 32(6): 22-24.

**Allen, G.R. 1985.** Three new rainbowfishes (Melanotaeniidae) from Irian Jaya and Papua New Guinea. *Revue fr. aquariol.* 12 (2): 53-62.

**Allen, G.R.** (1989). "*Freshwater Fishes of Australia*", TFH Publications, New Jersey.

**Allen, G.R.** (1991) Field Guide to the Freshwater Fishes of New Guinea. Publication No. 9 of the Christensen Research Institute. ISBN 9980-85-304-2

**Allen, G.R., (1995)** Rainbowfishes In Nature and in the Aquarium, Their identification, care and breeding. Tetra-Verlag Germany. ISBN 1-56465-149-5 (p.20)

**Allen GR** (1996) Two new species of rainbowfishes (Melanotaeniidae) from the Kikori River system, Papua New Guinea. *Revue française d'Aquariologie Herpétologie* 23: 9–16.

**Allen GR** (1997) A new species of rainbowfish (Melanotaenia: Melanotaeniidae) from the Lakekamu Basin, Papua New Guinea. *Revue française d'Aquariologie Herpétologie* 24: 37–42.

**Allen G.R. & M. Boeseman** (1982) A collection of freshwater fishes from western New Guinea with descriptions of two new species (Gobiidae and Eleotridae). *Records of the Western Australian Museum* 10(2): 67-103.

**Allen, G.R., and Coates, D.** (1990) An Ichthyological survey of the Sepik River, Papua New Guinea. *Records of the Western Australian Museum Supplement No. 34* (1990) *Studies on Freshwater Fishes of New Guinea and Northern Australia*. Western Australian Museum

**Allen, G.R. and Cross, N.J.** (1980). Descriptions of five new rainbowfishes (Melanotaeniidae) from New Guinea. *Rec. West. Aust. Mus.* 8 (3): 377-396.

**Allen, G.R. & Cross, N.J.** (1982) "*Rainbowfishes of Australia and Papua New Guinea*". Published by Angus and Robertson

**Allen GR & Hadiaty RK** (2011) A new species of rainbowfish (Melanotaeniidae), from western New Guinea (West Papua Province, Indonesia). *Fishes of Sahul* 25: 602–607.

**Allen GR & Hadiaty RK** (2013) *Melanotaenia sneideri*, a new species of rainbowfish (Melanotaeniidae) from West Papua Province, Indonesia. *Aqua, International Journal of Ichthyology* 19: 137–146.

**Allen, G.R. & Hammer, M.** 2020. *Melanotaenia herbertaxelrodi*. The IUCN Red List of Threatened Species 2020: e.T13063A147682235. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13063A147682235.en>

**Allen, G.R., Hortle, Kent G., and Renyaan, Samuel J.** (2000), *Freshwater Fishes of the Timika Region New Guinea*. PT Freeport Indonesian Company, and Tropical Reef Research. ISBN 0-646-40480-6

**Allen, G.R. & Kadarusman.** 2020. *Melanotaenia boesemani*. The IUCN Red List of Threatened Species 2020: e.T13058A147682045. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13058A147682045.en>

**Allen, G.R. & Kadarusman.** 2020. *Melanotaenia kamaka*. The IUCN Red List of Threatened Species 2020: e.T161098680A161098695. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T161098680A161098695.en>

**Allen, G.R. and Kailola, P.J.** (1979). *Glossolepis wanamensis*, a new species of freshwater rainbowfish (Melanotaeniidae) from New Guinea. *Rev. fr. Aquariol.* 6 (2): 39-44

**Allen, G.R., Larson, H., Kolkolo, U., Hoese, D. & Mungkaje, A.** 2020. *Melanotaenia lacustris*. The IUCN Red List of Threatened Species 2020: e.T13065A147682318. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13065A147682318.en>

**Allen, G.R., S.H. Midgley and M. Allen** (2002). *Field Guide to the Freshwater Fishes of Australia*, Western Australian Museum.

**Allen, G. R., Parenti, L. R. & Coates, D.** (1992): *Fishes of the Ramu River, Papua New Guinea*. *Ichthyological Exploration of Freshwaters* 3 (4), 289-304.

**Allen GR & Renyaan SJ** (1998) Three new species of rainbowfishes. *Aqua, Journal of Ichthyology and Aquatic Biology* 3: 69–80.

**Allen, G.R. and Renyaan, S.J.** 1996. Three new species of rainbowfishes (Melanotaeniidae) from the Triton Lakes, Irian Jaya, New Guinea. *aqua, Journal of Ichthyology and Aquatic Biology* 2(2): 13-24

**Allen, G.R. & S. J. Renyaan.** (1996). *Chilatherina pricei*, a new species of rainbowfish (Melanotaeniidae) from Irian Jaya. *Revue française d'Aquariologie Herpétologie* 23(1-2): 5-8

**Allen, G.R., Storey, A.W., and Yarrao, M** (2008). *Freshwater Fishes of the Fly River Papua New Guinea*. PT Freeport Indonesian Company, and Tropical Reef Research. ISBN 978-0-646-49605-4

**Allen GR & Unmack PJ** (2008) A new species of rainbowfish (Melanotaeniidae: *Melanotaenia*) from Batanta Island, western New Guinea. *Aqua, International Journal of Ichthyology* 13: 109–120.

**Allen GR & Unmack PJ** (2012) A new species of rainbowfish (*Chilatherina*: Melanotaeniidae), from the Sepik River System of Papua New Guinea. *Aqua, International Journal of Ichthyology* 18: 227–237.

**Allen GR, Unmack PJ, Hadiaty RK** (2008) Two new species of rainbowfishes (Melanotaenia: Melanotaeniidae) from western New Guinea (Papua Barat Province, Indonesia). *Aqua, International Journal of Ichthyology* 14: 209–224.

**Allen GR, Unmack PJ, Hadiaty RK** (2014) Three new species of rainbowfishes (Melanotaeniidae) from the Birds Head Peninsula, West Province, Indonesia. *Aqua, International Journal of Ichthyology* 20: 139–158.

**Allen GR, Unmack PJ, Hadiaty RK** (2015) *Melanotaenia rubrivittata*, a new species of rainbowfish (Melanotaeniidae) from northwestern Papua Province, Indonesia. *Fishes of Sahul* 29: 846–859

**Allen, G.R., Unmack, P. & Hammer, M.** 2020. *Melanotaenia papuae*. The IUCN Red List of Threatened Species 2020: e.T13071A147682647. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T13071A147682647.en>

**Amendment - List of Specimens Taken to be Suitable for Live Import (11/04/2005)**  
<https://www.legislation.gov.au/Details/F2005L00922/Explanatory%20Statement/Text>

**ANGFA, Australia New Guinea Fishes Association** <https://angfa.org.au/>

**ANGFA**, Australia New Guinea Fishes Association, (05/1990), Submission to 1990 IBM Conservation award review committee - Taronga Zoo. "Project Eachamensis" .. the saving of a species from extinction.

**ANGFA**, Australia New Guinea Fishes Association, (1993), The best of ANGFA Queensland Newsletters..the early years (1985-1992)

**ANGFA**. 2002. Response to the Thorogood report on *Glossolepis incisus*. Australia New Guinea Fishes Association. 15 p.

**ANGFA** Database available on the world wide web at URL <http://db.angfa.org.au>  
If reviewers require further information contact Author 2 for password access.

**ANGFA** "Code of Conduct" available at:  
[https://angfa.org.au/index.php?option=com\\_attachments&task=download&id=64](https://angfa.org.au/index.php?option=com_attachments&task=download&id=64)

**Anon.** (2001) Fish collection database of the National Museum of Natural History (Smithsonian Institution). Smithsonian Institution - Division of Fishes

**Aqua-fish.net** – since 2005 - <https://en.aqua-fish.net/fish>

**Aquagreen Aquarium and Pond Keepers Code of Conduct** – available at URL -  
[https://www.aquagreen.com.au/files/Code\\_of\\_Conduct\\_V5.pdf](https://www.aquagreen.com.au/files/Code_of_Conduct_V5.pdf)

**Arnold, K.E.** (2000). Kin recognition in rainbowfish (*Melanotaenia eachamensis*): sex, sibs and shoaling. PHD thesis, University of QLD.

**Arthington, A. H. Kailola, P. J. Woodland, D. J. Zaluki, J. M.** (1999) Baseline environmental data relevant to an evaluation of quarantine risk potentially associated with the importation to Australia of ornamental finfish. Report to the Australian Quarantine and Inspection Service. Canberra, ACT, Department of Agriculture, Fisheries and Forestry.

**Arthington, A.H., Milton, D.A. and McKay, R.J.** (1983) "*Effects of urban development And habitat alterations on the distribution and abundance of native exotic freshwater fish in the Brisbane region, Queensland*". Australian Journal of Ecology, 8: 87-101.

**Australian Government, Department of Agriculture**, Importing-Live-fish-Aus, Information and advice for importing live fish to Australia, published on the World Wide Web at Uniform Resource Locator <http://www.agriculture.gov.au/import/live-animals/importing-live-fish-aus>

**Australian Government, Quarantine Act 1908**, available at  
[http://www.austlii.edu.au/au/legis/cth/consol\\_act/qa1908131/](http://www.austlii.edu.au/au/legis/cth/consol_act/qa1908131/) Downloaded 17 July 2015

**Australian Quarantine Inspection Service (AQIS)** (July 1999) "Import Risk Analysis on Live Ornamental Finfish", available at:  
<http://www.agriculture.gov.au/SiteCollectionDocuments/ba/animal/horsesubmissions/finalornamental.pdf> downloaded 17 July 2015

**Axelrod, H.R., Burgess, W.E., Pronek, N., and Walls, J.G.** (1985) Dr. Axelrod's Atlas of Freshwater Aquarium Fishes. T.F.H. Publications, Inc. Ltd. ISBN 0-86622-052-6

**Beauforti (1960)** A series of miscellaneous publications zoological museum - Amsterdam No. 87 Volume 7 January 15, 1960 A list of type specimens of fishes in the Zoological Museum, University of Amsterdam. 1. Order Mugiliformes by J.J. Hoedeman (Zoological Museum, Amsterdam)

**Berra T.M., R. Moore and L.F. Reynolds** (1975) The Freshwater Fishes of the Laloki River System of New Guinea. Copeia 2: 316-326.

**Biosecurity Australia.** (2009) "**BIOSECURITY AUSTRALIA ADVICE 2009/30 EXTENSION OF POLICY TO INCLUDE THE IMPORTATION OF RED RAINBOWFISH FOR ORNAMENTAL PURPOSES**". Published by the Australian Government, available at:  
<http://www.daff.gov.au/SiteCollectionDocuments/ba/memos/2009/2009-30.pdf> Downloaded 17 Jul 2015.

**Biosecurity Act 2015** as in force 25 march 2020, Accessed 24 march 2021, available at:  
<https://www.legislation.gov.au/Details/C2020C00127>

- Bleher, H** (2015). Reportage Etna Bay: A Primordial Paradise. AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. May/June 2015
- Boeseman M.** (1956) The Lake Resources of Netherlands New Guinea. South Pacific Commission Quarterly Bulletin 6(1): 23-25.
- Boeseman M.** (1956) Fresh-water sawfishes and sharks in Netherlands New Guinea. Science 123: 222-223.
- Boeseman, M. (1963)** Notes on the fishes of western New Guinea 1. Zool. Mededelingen, 38(14); 221-242.
- Bomford, Mary** (2006) "Risk assessment for the establishment of exotic vertebrates in Australia: recalibration and refinement of models" A report produced for the Department of the Environment and Heritage, Commonwealth of Australia
- Bomford, M. and Glover, J.** (June 2004) "Risk assessment model for the import and keeping of exotic freshwater and estuarine finfish"
- Bowman, R.** 1984. *Chilatherina fasciata* (Clearwater Creek) – some colour observations. *Fishes of Sahul* **2(1)**, 57
- Brock (1998)** "Top End Native Plants" published by John Brock.
- Burnett J.B., M. Davies and G. Taylor** (2003) Flora and Fauna Survey of the Tangguh LNG Site Papua Province, Indonesia. P.T. Hatfindo Prima, Bogor.
- Caughy, A. and Armstrong, N. (1993).** A code of ethics for ANGFA fishkeepers. *Fishes of Sahul* **7(4)**, 332–334.
- Clements, Valentin, Rankin, Baker, Gee, Snellgrove, Sloman** (2019) "The effects of interacting with fish in aquariums on human health and well-being: A systematic review" published by Institute of Biomedical and Environmental Health Research, School of Health and Life Sciences, University of the West of Scotland, Paisley, United Kingdom.
- Corfield J, Diggles B, Jubb C, McDowall RM, Moore A, Richards A and Rowe DK** (2008). Review of the impacts of introduced ornamental fish species that have established wild populations in Australia'. Prepared for the Australian Government Department of the Environment, Water, Heritage and the Arts. Available at: <https://www.environment.gov.au/system/files/resources/fb1584f5-1d57-4b3c-9a0f-b1d5beff76a4/files/ornamental-fish.pdf> [Downloaded 17 April 2021]
- Cowie, Short, Osterkamp-Madsen** (2000) "Floodplain Flora" published by Environment Australia and NT Parks and Wildlife
- Cracknell, White, Pahl, Nichols & Depledge.** 2016 "Marine Biota and Psychological Well-Being: A Preliminary Examination of Dose–Response Effects in an Aquarium Setting" published by Environment and Behavior 2016, Vol. 48(10) 1242–1269 © 2015 SAGE Publications
- Crockford, B.** 1985. *Chilatherina campsi*. *Fishes of Sahul* **3(2)**, 116–118.
- Crockford, B.** 2001. Lake Wanam fasciata *Chilatherina fasciata, wanamensis*, a subspecies in trouble. *Fishes of Sahul* **15(3)**, 776–779.
- Crockford, B.** 2001. *Chilatherina axelrodi*. *Fishes of Sahul* **15(4)**, 790–795.
- D'Cruz R.** (2008) Lake Kutubu Catchment Management Plan, Aonyx Environmental, Malaysia.
- Davis, MA, Grime, P and K Thompson** (2000) Fluctuating resources in plant communities: a general theory of invisibility. *Journal of Ecology*, 88: 528-534.
- DAWE** (2020b) "Import conditions for freshwater aquarium fish: Effective 18 July 2020. Department of Agriculture, Water and the Environment" [online] Available at: <https://bicon.agriculture.gov.au/BiconWeb4.0/ImportConditions/Conditions?EvaluableElementId=482052&Path=UNDEFINED&UserContext=External&EvaluationStateId=7f1ea5c5-8bef-4b34-a789-2987549620ff&CaseElementPk=1354044&EvaluationPhase=ImportDefinition&HasAlerts=False&HasChangeNotices=False&IsAEP=False> [Accessed 12 October 2020]

**Department of Agriculture and Water Resources** 2016, Biosecurity Import Risk Analysis Guidelines 2016: managing biosecurity risks for imports into Australia, Department of Agriculture and Water Resources, Canberra. ISBN 978-1-7600-3118-3 (online) This publication is available at [agriculture.gov.au](http://agriculture.gov.au).

**de Vries J.** (1962) Review of Inland Fisheries in Netherlands New Guinea. South Pacific Commission Fisheries Technical Meeting (Noumea, 5 - 13 February 1962).

**DOA** (2014) Importation of freshwater ornamental fish: review of biosecurity risks associated with gourami iridovirus and related viruses—Final import risk analysis report, Department of Agriculture, Canberra. Available online: [https://www.agriculture.gov.au/sites/default/files/style%20library/images/daff/\\_data/assets/pdf/file/0004/2404309/gourami-ira.pdf](https://www.agriculture.gov.au/sites/default/files/style%20library/images/daff/_data/assets/pdf/file/0004/2404309/gourami-ira.pdf)

**EASystems** 2006 – Import Risk Assessment- Analysis of 10 species of fish. Report number 21397.9724. Department of the Environment and Heritage

**Esso Highlands Limited** (2005) PNG Gas Project Environmental Impact Statement.

**Evers H.** (2014) Boeseman's Rainbowfish and its rare new cousin. *AMAZONAS* 3(5): 42-51 [English edition].

**Evers, Hans-Georg** (2018) *Kasonaweja, Ho!*, AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. May/June 2018

**Flannery, Tim** (1994) "*The Future Eaters: An Ecological History of the Australasian Lands and People*", ISBN 0-8021-3943-4 ISBN 0-7301-0422-2

**Francis, Robert A.** (2012) *A Handbook of Global Freshwater Invasive Species* ISBN 978-1-84971-228-6. [https://www.fishbase.de/summary/Chilatherina\\_axelrodi.html](https://www.fishbase.de/summary/Chilatherina_axelrodi.html)

**Fricke, R., Eschmeyer, W.N. and Van der Laan, R.** (eds). 2019. *Eschmeyer's Catalog of Fishes: genera, species, references*. Updated 07 October 2019. Available at: <http://researcharchive.calacademy.org/research/ichthyology/catalog/fishcatmain.asp>

**Froese, R. and D. Pauly. Editors.** 2023. FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), (02/2023) <https://www.fishbase.se>

**Froese, R. and D. Pauly. Editors.** 2023. FishBase. World Wide Web electronic publication. [www.fishbase.org](http://www.fishbase.org), (002/2023) accessed on 25/03/2023. Available at: <https://www.fishbase.se/summary/Melanotaenia-papuae.html>

**Graf, Johannes** (2018) Reportage, Searching West Papua for new Rainbowfishes, AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. May/June 2018 Nov/Dec 2018

**Graf, J.A., Herder, F. & Hadiaty, R.A.** 2015. A new species of rainbowfish (Melanotaeniidae), *Melanotaenia garylangei*, from western New Guinea (Papua Province, Indonesia). *Fishes of Sahul* 29(2): 870-881.

**Groombridge, B.** (ed.). 1994. *1994 IUCN Red List of Threatened Animals*. IUCN, Gland, Switzerland and Cambridge, UK.

**Hammer, Skarlatos Simoes, Needham, Wilson [REDACTED] Barton and Lonza (2019)** "Establishment of Siamese Fighting Fish on the Adelaide River floodplain: the first serious invasive fish in the Northern Territory, Australia" published Springer Nature Switzerland AG 2019

**Hammer, MP et al** (2018). Revision of the Australian Wet Tropics endemic rainbowfish genus *Cairnsichthys* (Atheriniformes: Melanotaeniidae), with description of a new species. *Zootaxa*, 4413 (2): 271–294.

**Hardy-Smith P., Jones R. and Kailola P.** (2007) "*Scientific review of the biosecurity risks associated with the importation of rainbowfish for ornamental purposes*"

**Herbert, B. and J. Peters** (1995). *Freshwater Fishes of Far North Queensland* Department of Primary Industries, Queensland.

**Herre A.W.** (1936) Fishes of the Crane Pacific Expedition. Field Museum of Natural History. Zoological Series, 21: 1-472.

**Hieronimus, Harro.** Aqualog (2002), Regenbogenfische und verwandte familien, all Rainbows and related families. ISBN 3-931702-80-4

**Hieronimus, Harro.** Aqualog Special (1999), Breathtaking Rainbows. ISBN 3-931702-51-0

**Holthuis L.B.** (1956) Native fisheries of freshwater Crustacea in Netherlands New Guinea. Contributions to New Guinea Carcinology. I. - Nova Guinea (n. ser.) 7(2): 123-137.

**Howeth, J.G, Gantz, CA, Angermeier, PL, Frimpong, EA, Hoff, MH, Keller, RP, Mandrak, NE, Marchetti, MP, Olden, JD, Romagosa, CM and DM Lodge** (2016). Predicting invasiveness of species in trade: Climate match, trophic guild and fecundity influence establishment and impact of non- native freshwater fishes. Diversity and Distributions, 22: 148–160.

**Imbun, B.Y. and Smith, P.T.** 2018. Recent Developments at Lake Kutubu: impacts on the fish and the Foe. Fishes of Sahul 32(1): 1224-1238.

**Imbun, B.Y., Duarte, F.P. and Smith, P.T.** 2015. "You are not our only child": Neoliberalism, food security issues and CSR discourse in the Kutubu oilfields of Papua New Guinea. Resour. Policy 43: 40-49.

**IRG (International Rainbowfish Association,** available at URL - <https://www.irg-online.de/we-about-us/> accessed 11 March 2023.

**IUCN.** 2022. The IUCN Red List of Threatened Species. Version 2022-2. Available at: <https://www.iucnredlist.org/species/13071/147682647>

**IUCN.** 2022. The IUCN Red List of Threatened Species. Version 2022-2. <https://www.iucnredlist.org>. Accessed on 25/03/2023 available at: <https://www.iucnredlist.org/search?query=melanotaenia&searchType=species>

**IUCN . Soorae, Pritpal S.,** Editor. IUCN SSC Conservation Translocation Specialist Group (CTSG) . Global conservation translocation perspectives: 2021 Case studies from around the globe. Available at: [Global conservation translocation perspectives: 2021 | IUCN SSC Conservation Translocation Specialist Group \(iucn-ctsg.org\)](https://www.iucn-ctsg.org/global-conservation-translocation-perspectives-2021)

**Jenkins A. & P. Buston** (1997) Distribution and abundance of the fishes of Lake Kutubu. Consultancy report to the WWF Kikori ICDP.

**Kadariusman & Allen, G.R.** 2020. *Melanotaenia irianjaya*. The IUCN Red List of Threatened Species 2020: e.T161098535A161098579. <https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T161098535A161098579.en>

**Kadariusman, Sudaro and Laurent Pouyaud** (2007) Laporan Expedisi Ilmiah Rainbowfish Papua 2007 10 Mei - 14 Juni. IRD Indonesia.

**Kadariusman, Sudarto, Paradis E, Pouyaud L** (2010) Description of *Melanotaenia fasinensis*, a new species of rainbowfish (Melanotaeniidae) from West Papua, Indonesia with comments on the rediscovery of *M. ajamaruensis* and the endangered status of *M. parva*. Cybium 34: 207–215.

**Kadariusman, Sudarto, Slembrouck J, Pouyaud L** (2011) Description of *Melanotaenia salawati*, a new species of rainbowfish (Melanotaeniidae) from Salawati Island, West Papua, Indonesia. Cybium 35: 223–230.

**Kadariusman, Hubert N, Hadiaty RK, Sudarto, Paradis E, Pouyaud L.** (2012a) Cryptic diversity in Indo-Australian rainbowfishes revealed by DNA barcoding: implications for conservation in a biodiversity hotspot candidate. Plos One 7: 1–8.

**Kadariusman, Hadiaty RK, Segura G, Setiawibawa G, Caruso D, Pouyaud L** (2012b) Four new species of rainbowfishes (Melanotaeniidae) from Arguni Bay, West Papua, Indonesia. Cybium 36: 362–382.

**Kahn, S.A., Wilson, P.W., Pereira, R.P., Hayder, H. and Gerrity, S.E.** 1999. *Import Risk analysis on live ornamental finfish*. Canberra: Australian Quarantine and Inspection



Service. 172 p.

**Kailola P.J.** (1987) The fishes of Papua New Guinea. A revised and annotated checklist. Vol. 1. Myxinidae to Synbranchidae. Research Bulletin No. 41. Department of Fisheries and Marine Resources, Port Moresby, Papua New Guinea.

**Kailola, P.J.** (2004) "*Risk assessment of ten species of ornamental fish under the Environment Protection and Biodiversity Conservation Act 1999*"

**Lake J.S.,** (1978). Australian Freshwater Fishes – an Illustrated Field Guide. Nelson, Australia.

**Lange, Gary** (2014) Raise and Shine. AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. Nov/Dec 2014

**Larson, H.K. and K.C. Martin** (1990). Freshwater Fishes of the Northern Territory. Northern Territory Museum, Darwin.

**Lawson, David** (1997) The Northern Territory Government policy "*Strategy for Conservation through Sustainable Use of Wildlife*" located at : [https://www.aquagreen.com.au/files/strategy\\_for\\_conservation\\_through\\_sustainable\\_utilisation\\_of\\_wild\\_life.pdf](https://www.aquagreen.com.au/files/strategy_for_conservation_through_sustainable_utilisation_of_wild_life.pdf)

**Leggett, R. and J.R. Merrick** (1987). Australian Native Fishes for Aquariums, Griffin Press.

**Lever, C.** (1996). Naturalised Fishes of the World Academic Press. ISBN 0-12-444745-725

**Macleay W.** (1883) Contribution to a knowledge of the fishes of New Guinea, No. 4. Proceedings of the Linnean Society of New South Wales 8 (2): 252-280.

**Majtánová, Unmack, Prasongmaneerut, Shams, Srikuhnath, Ráb and Ezaz** (2020) "*Evidence of Interspecific Chromosomal Diversification in Rainbowfishes (Melanotaeniidae, Teleostei)*" published Genes 2020, 11, 818; doi: 10.3390/genes11070818

**McCosker, J.** (1998). Mate choice and sexual selection in two species of Australian rainbowfish (*M. duboulayi* and *M. splendida splendida*): implication for speciation. Honours thesis, University of Queensland.

**McNee, Alex** ( no date on publication ) "A national approach to the management of exotic fish species in the aquarium trade: An inventory of exotic freshwater species" Published by Bureau of Rural Sciences, Canberra

**Merrick, J.R. and G.E. Schmida** (1984). Australian Freshwater Fishes, Biology and Management. Griffin Press.

**Millington M, Sierp M, Gaylard S** (2022) Assessing the Invasiveness Risk of Non-Indigenous Fish in the Australian Ornamental Trade. Department of Agriculture and Fisheries, Brisbane. 62pp.

**Morgan, David L., Allen, Gerald R., Pusey, Bradley J., and Burrows, Damien W.** (2011) *A review of the freshwater fishes of the Kimberley region of Western Australia*. Zootaxa, 2816. pp. 1-64.

**Munro ISR** (1964) Additions to the fish fauna of New Guinea. Papua and New Guinea Agricultural Journal 16: 162- 163.

**Munro, Ian. S.R.,** The Fishes of New Guinea (1967) Victor C.N. Blight, Government printer, Sydney N.S.W.

**Nichols J.T. & H.C. Raven** (1934) Two new fresh-water fishes (Percosoces) from New Guinea. American Museum Novitates, No. 755: 1-4.

**Northern Territory of Australia Fisheries Act 1988** as in force 10 December 2022 accessed 24 March 2023 available at: <http://www.nt.gov.au/dcm/legislation/current.html>

**NT Fisheries Act 2011**, NT Fisheries Regulation 2015, Northern Territory Legislation database. Available at; <https://industry.nt.gov.au/publications/fisheries-publications> (accessed 24 arch 2023)

NT Aquarium Fishery Management Advisory Committee - Established 24 August 2019 under Section 24 of the Fisheries Act 1988.

**Nugraha, M. F. I., Pouyaud, L., Carman, O., Widayastuti, U., Zairin Junior, M., Kadarusman and Avarre, J. C.** 2015. Genetic diversity of Boeseman's Rainbowfish (*Melanotaenia boesemani*) reared in Indonesian farms compared to endangered natural populations. *Tropical Conservation Science* 8(3): 796-812

**Ohee, H.L.** 2016. Freshwater fish diversity in an oil palm concession area in Mimika, Papua. *Biodiversitas* 17(2): 665-672.

**O'Leary, Rachel** (2018) *A basement full of Rainbows*, AMAZONAS, Aquatic Media Press LLC, Rochester, U.S.A. Nov/Dec 2014

**Osborne P.L. & R.G. Totome** (1992) Influences of oligomixis on the water and sediment chemistry of Lake Kutubu, Papua New Guinea. *Archive Für Hydrobiologie*, 124: 427-449.

**Panaquatic® Health Solutions Pty Ltd, 2009**, "Scientific review of the Biosecurity risks associated with the importation of rainbowfish for ornamental purposes", available at: <https://www.baphiq.gov.tw/public/Data/910614193571.pdf>, or [http://www.agriculture.gov.au/SiteCollectionDocuments/ba/animal/horsesubmissions/2009-24a-1\\_red\\_rainbowfish\\_attachment.pdf](http://www.agriculture.gov.au/SiteCollectionDocuments/ba/animal/horsesubmissions/2009-24a-1_red_rainbowfish_attachment.pdf)

**PIAA** (2017) Pet Industry Association of Australia (PIAA) National Code of Practice (PIAA 2017) [online] Available at: <https://static1.squarespace.com/static/5f48759535baa45c767263f5/t/5f72b2d5697fec0f70aad01c/1601352407406/PIAA+-+National+Code+of+Practice+2017+V2.pdf> (accessed 25 March 2023)

**Phelong, P.C.** (1996b) "Climex: a system to predict the distribution of an organism based on climate preferences". Available at: <http://www.agric.wa.gov.au>

**Pouyaud L.** (2007) Expedition Papua 2007 10 mai - 14 juin. Rapport de mission. IRD Indonesie, departement ressources vivantes - UR 175 pp 43.

**Powell, A.** 2009. *Chilatherina fasciata*, Lake Wanam. *Fishes of Sahul* **23(3)**, 536–537

**Price, David S.** (1997) *Chilatherina alleni*, a new species of Rainbowfish (Melanotaeniidae) from Irian Jaya. *Revuefr. Aquariol.*, 24 (1997),3-4, 19 Decembre 1997

**Queensland Fisheries Act 1994.** Available at: <http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/F/FisherA94>

**Queensland Fisheries Regulation 1995.** Available at: [www.legislation.qld.gov.au/LEGISLTN/CURRENT/F/FisherR95](http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/F/FisherR95)

**Reeskamp G.A.** (1961) Report of a Preliminary Survey of the Ajamaroe Lakes, Netherlands New Guinea. Indo-Pacific Fisheries Council - Occasional Paper 61/12. Food and Agricultural Organization of the United Nations.

**Renyaan, S.J.** (1993). The Freshwater Fishes of Lake Sentani, Jayapura, Irian Jaya. Proceedings of the Biological Society of New Guinea, R. Hoeft, Ed., Wau Ecology Institute.

**RSG**, Rainbowfish Study Group of North America, (1992), *The Best of the RSG*.

**Saunders, T., Allsop, Q., Wilson D.** (2017) "*Fish Kills Investigation Manual*" published by NT Dept Primary Industries. (copy available from Author 2)

**Schmida, G.E.** (2000) "*Rainbowfish, A Complete Pet Owners Manual*"

**Smith P.T., B.Y. Imbun and F.P. Duarte** (2016) Impacts of a Fish Kill at Lake Kutubu, Papua New Guinea. *Pacific Science*, 70(1): 21-33.

**Stelbrink B, Stöger I, Hadiaty RK, Schliewen UK, Herder F** (2014): Age estimates for an adaptive lake fish radiation, its mitochondrial introgression, and an unexpected sister group: sailfin silversides of the Malili Lakes system in Sulawesi. *BMC Evolutionary Biology* 14: 94.

**Tappin** (2011) "*Rainbow Fishes, their care and keeping in captivity*" available as a download from URL - <https://rainbowfish.angfaqlld.org.au/Book.htm>

**Tappin, A.R.** (2011) "*Rainbow Fishes, their care and keeping in captivity*" accessed on 25/03/2023. Available at: <https://rainbowfish.angfaqlid.org.au/Papuae.htm>

**Travis, N.** 1984. the barred rainbowfish, *chilatherina fasciata*. *fishes of sahu* **2(1)**, 55–56.

**University of Queensland** (1998). Rainbowfish Workshop. Proceedings of workshop discussing various student projects – UQ and Griffith Universities

**Unmack, P.R, Allen, G.R, and J.B Johnson** (2013). Phylogeny and biogeography of rainbowfishes (Melanotaeniidae) from Australia and New Guinea. *Molecular Phylogenetics and Evolution* 67: 15–27

**Unmack & Hammer** (2015) "Burdekin River Rainbowfish on the verge of disappearing from Running River" , *Fishes of Sahul*; V24 NO. 4, page 933

**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

**Walstad, Diana** (2017) Mycobacteriosis in Aquarium Fish. located at: <http://dianawalstad.com>

**Weber, M. 1907.** Süßwasserfische von Neu-Guinea. Ein Beitrag zur Frage nach dem früheren Zusammenhang von Neu-Guinea und Australien. In: Wichmann, A. (ed.), *Nova Guinea. Résultats de l'expédition scientifique Néerlandaise à la Nouvelle-Guinée en 1903*, pp. 201-267, plates 11-13. E. J. Brill, Leiden, Netherlands

**Weber, M.** Professor at the University of Amsterdam, and **De Beaufort, L. F.** (1911) The fishes of the Indo-Australian Archipelago index of the ichthyological papers of P. Bleeker Leiden —. E.J. Brill Ltd

**Weber, M. 1913.** Süßwasserfische aus Niederländisch Süd- und Nord-Neu-Guinea. *Nova Guinea. Résultats de l'expédition scientifique Néerlandaise à la Nouvelle-Guinée. Zoologie. Leiden* 9(4): 513-613.

**Weber, M.** Professor at the University of Amsterdam, and **De Beaufort, L. F.** (1922) The fishes of the Indo-Australian Archipelago. iv heteromi, solenichthyes, synentognathi, percoces, labyrinthici, microcvprini - - Leiden E. J. Brill Ltd.

**Whitley G.P.** (1938) Descriptions of some New Guinea fishes. *Records of the Australian Museum* 20(3): 223-233.

**Whitley, G.P.** (1957). Fishes from inland New Guinea. *Records of the Australian Museum* 24(3): 23-30.

**Wilson D.N.**(2017) "*Running River Rainbowfish, Melanotaenia sp. Fact Sheet*" available at URL [https://www.aquagreen.com.au/plant\\_data/Melanotaenia\\_sp.html](https://www.aquagreen.com.au/plant_data/Melanotaenia_sp.html)

**Wilson, D.N. & Biggs, C** (2004) "Aquarium and Pond Keepers Code of Conduct" available at: [http://www.aquagreen.com.au/files/Code\\_of\\_Conduct\\_V5.pdf](http://www.aquagreen.com.au/files/Code_of_Conduct_V5.pdf)