Application to amend the Live Import List to add 10 freshwater loaches

Submission by the
Invasive Species Council

October 2026

Document details

Invasive Species Council. Submission in response to the application to amend the Live Import List to add 10 freshwater loaches. 2026.

About the Invasive Species Council

The Invasive Species Council was formed in 2002 to advocate for stronger laws, policies and programs to keep Australian biodiversity safe from weeds, feral animals, exotic pathogens and other invaders. It is a not-for-profit charitable organisation, funded predominantly by donations from supporters and philanthropic organisations.

Intellectual property rights

© Invasive Species Council 2026

Unless otherwise noted, copyright and any other intellectual property rights in this publication are owned by the Invasive Species Council.



All material in this publication is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License. Creative Commons Attribution 4.0 International Licence is a standard form licence agreement that allows you to copy, redistribute, remix, transmit and adapt this publication provided you attribute the work, you do not use it commercially and you distribute your contribution under this creative commons licence. The licence terms are available from https://creativecommons.org/licenses/by-nc-sa/4.0/.

Inquiries

Invasive Species Council

Contact: Claire Bookless, Senior Policy Analyst

Address: PO Box 818, Katoomba NSW 2780, Australia

ABN: 27 101 522 829

Web: invasives.org.au

Email: contact@invasives.org.au

Contents

Introduction..... 2
Adverse implications of listing of so-called 'grey-list' species..... 3
Invasive potential of freshwater loaches..... 4
    Risk of establishment in the wild..... 4
    Pathogen and parasite risks..... 6
    Potential environmental impacts..... 7
    Proposed mitigation measures..... 9
    Appropriate risk ratings..... 10
References..... 13
Annexure 1 – Summary of traits and establishment risks of 10 loach species..... 17
    Table 1 – Summary of climatic tolerance and traits..... 17
    Table 2 – Expected establishment likelihood by species..... 21

Introduction

The aquarium trade is the leading pathway for the introduction of alien fish into Australia. Of the 41 alien fish species known to have established populations, up to 30 are thought to have arrived through the ornamental trade [1]. It is also a pathway for pathogens and parasites, and has been described as an 'efficient system for translocating aquatic pathogens' [2]. Australia imports 10–15 million ornamental fish a year, about 98% of them freshwater fish, mostly farmed in Asia, with some wild-caught stock [3]. Fish-keepers are numerous and disparate, and release into waterways is a known pathway for invasions.

Despite the high environmental risk, Australia's biosecurity safeguards for ornamental fish imports are dated. Any live fish imported into Australia must be on the Live Import List and on the Department of Agriculture, Fisheries and Forestry's (DAFF's) permitted list, and must meet import conditions under the *Biosecurity Act 2015*. But most permitted species were never assessed for invasion risk, because they were permitted before such assessments existed. DAFF's biosecurity conditions rest on a 27-year-old import risk analysis (1999) and a 2014 review of one virus group. They require a health certificate from the exporting country, inspection at the border and post-arrival quarantine of 7 days (21 days for goldfish). Only goldfish must be treated for parasites, and only five host groups (gouramis, bettas, paradise fish, cichlids and poeciliids) must be certified free of megalocytiviruses. The biosecurity conditions address a small proportion of potential pathogens and parasites [4] and cannot detect subclinical infections. There is also considerable latitude for illegal or non-compliant imports. In the late 1990s, the aquarium industry's peak body estimated that 300,000–600,000 fish were smuggled into Australia each year, equivalent to 5–10% of legal imports [5]. It was said, in 2006 by the Bureau of Rural Sciences, that almost any alien aquarium fish species sought by a hobbyist is 'effectively available in Australia' [6].

Against this background, the Invasive Species Council welcomes the opportunity to provide feedback on the proposed amendments to the Live Import List under the EPBC Act to permit the live import of 10 freshwater loach species: *Botia dario*, *Botia rostrata*, *Gastromyzon embalohensis*, *Gastromyzon lepidogaster*, *Gastromyzon ornaticauda*, *Gastromyzon venustus*, *Gastromyzon zebrinus*, *Syncrossus helodes*, *Syncrossus hymenophysa*, and *Yunnanilus cruciatus*.

We note with approval that on 19 June 2026 the Minister refused applications to add 7 other freshwater fish species to the Live Import List: 5 loaches (*Botia histrionica*, *Botia kubotai*, *Botia striata*, *Yasuhikotakia modesta* and *Yasuhikotakia morleti*) and 2 danios (*Danio erythromicron* and *Danio margaritatus*). While the Minister's reasons for these refusals have not been published, the department's assessments of the refused species, found moderate likelihood of establishment (except for *Botia Striata* which was low) and moderate environmental consequences, with low confidence because information on the species was inadequate. The current applications for loach species before the Minister share the features that underpinned those findings: inadequate information to allow reliable predictions of the impacts and consequences to the environment, wild-harvested supply, no reported captive breeding for several species, unassessed disease risks and – for most species – a wide northern Australian climate match.

In this submission, the Invasive Species Council presents an overview of the key ecological, biosecurity and legal risks associated with the proposed inclusion of the 10 loaches on the Live Import List. Our analysis highlights major gaps in scientific understanding of the species' wild ecology and behaviour, which limit the ability to predict risks after establishment. We also highlight the risks

of parasite and pathogen transmission from these fish to native wildlife, and urge detailed assessment of those risks.

We strongly urge the Minister to refuse the applications, based on what we do know about:

- the invasive potential of several of the loaches (notably the *Syncrossus* and *Botia* species), driven by their reproductive capacity, broad environmental tolerances and dietary adaptability, and a climate match that is expected to improve with global warming
- the risk of introducing novel pathogens and parasites to native fish and other species, and the inadequacy of current import conditions to detect or manage them
- the pressure that additional Australian demand would place on wild populations, several of which are already of conservation concern
- the problematic legal and regulatory precedent that approving an illicitly established trade would set for biosecurity enforcement in Australia.

Recommendation 1: Acknowledge that listing loach species already unlawfully kept in Australian aquaria would risk creating perverse incentives for the illegal importation of other non-listed species, and that prior unlawful trade is not a ground for listing. Consider the cumulative effect of serial applications, and conduct surveillance and enforcement against people illegally importing exotic fishes.

Recommendation 2: Conduct and publish a rigorous assessment of the 10 loach species before any listing decision including, given the absence of a species-specific assessment by DAFF, their pathogen and parasite risks (and the level of confidence that current data is sufficient to assess risks).

Recommendation 3: Advise the minister to refuse the applications to add the 10 loach species (*Botia dario*, *Botia rostrata*, *Gastromyzon embalohensis*, *Gastromyzon lepidogaster*, *Gastromyzon ornaticauda*, *Gastromyzon venustus*, *Gastromyzon zebrinus*, *Syncrossus helodes*, *Syncrossus hymenophysa* and *Yunnanilus cruciatus*) to the Live Import List.

Adverse implications of listing of so-called ‘grey-list’ species

Species excluded from the Live Import List remain largely unmanaged at state and territory levels, creating a category often referred to as ‘grey-listed’ species. While a subset of these taxa entered Australia prior to the establishment of formal import controls in 1963, a substantial proportion appears to have been illegally introduced via smuggling. Although trading or possessing smuggled specimens and their descendants constitutes a clear regulatory breach, enforcement remains exceptionally challenging due to difficulties in proving origin and their pervasive presence across the trade. Cumulative industry records since 2006 catalogue 1,166 grey-listed taxa [7–10], though many lack commercial appeal [11]. However, recent market monitoring indicates active commercial interest is concentrated on approximately 300 species [12].

Some of the 10 loach species proposed for addition to the Live Import List are reportedly already traded in Australia. Three applications state (at TOR 12) that *Gastromyzon* species are already present in the Australian hobby through retailers and online sellers, and at least one other, *Gastromyzon zebrinus*, has been listed for sale by Australian retailers [13] – although none of these

species are on industry-compiled grey-lists. The 2 *Syncrossus* species, however, are found on one grey-list compilation [10]. The applications do not explain how these fish arrived or in what numbers.

Listing species that are already circulating through unregulated channels would reward that trade and give the appearance of legitimising it after the fact. The Pet Industry Association of Australia (PIAA) claims that when legitimate import pathways do not exist – including for industry grey listed species – hobbyists 'find illegitimate ones' [14]. Presumably, the same is true for trade-suppliers. PIAA further claims that every successful application to add species to the Live Import List creates a precedent that opens doors for future applications. The industry therefore appears to treat listing species already illegally present in Australia as a precedent, not a one-off decision. Approving the listing of these loach species could therefore provide a concerning precedent of formalising an established illicit trade and incentivising future smuggling.

PIAA has openly declared its intention to execute an ongoing series of future import requests, reportedly filing 15 applications in January 2026 alone, with additional submissions anticipated throughout the year [14]. The aquarium market seeks continuous novelty to stimulate consumer interest. But the role of regulators is to prevent potentially irreversible threats to Australia's endemic species and aquatic environments, however, this presents a significant challenge under current regulatory parameters. Assessing each submission in isolation masks the broader threat, as the aggregate risk of introducing scores – or even hundreds – of species driven by commercial trends far exceeds what an individual evaluation can capture alone.

Recommendation 1: Acknowledge that listing loach species already unlawfully kept in Australian aquaria would risk creating perverse incentives for the illegal importation of other non-listed species, and that prior unlawful trade is not a ground for listing. Consider the cumulative effect of serial applications, and conduct surveillance and enforcement against people illegally importing exotic fishes.

Invasive potential of freshwater loaches

Risk of establishment in the wild

The aquarium trade represents a high-risk pathway for the establishment of invasive species. Of the 41 exotic fish species known to have established populations in Australia, up to 30 are now thought to have arrived in the country via the ornamental fish trade [1].

Although the responses to TOR 35 in some of the loach applications (such as the *Botia* and *Gastromyzon* applications) state that the species are 'unlikely to be dispersed unintentionally', the applications generally accept that release (both intentional and unintentional) from aquaria into the environment is a known pathway for aquatic invaders (TOR 12).

Recent Australian research suggests the highest release and establishment risks are for species popular in the aquarium trade, cheap to buy, available online, aggressive, long-lived and large-bodied [12]. This carries implications for the larger, long-lived species under consideration, such as members of the genus *Syncrossus*. Due to their aggressive nature and substantial adult size (reaching 25 to 30 cm), these fish are particularly prone to outgrowing standard residential aquariums.

Done secretively, most aquarium disposals go undetected unless the fish establishes. At least 20,000 aquarium fish are probably released each year into Australian waterways, but based on 3 studies

overseas of the numbers of aquarists (>6%) who admit to releasing aquarium fish (Box 1) it could be more than 100,000.

Box 1 – Predicted releases of aquarium fish into Australian waterways

'[V]ery few people deliberately empty the contents of their aquarium into the native aquatic environment,' claimed the Queensland Cichlid Group [15] (while opposing the prohibition of any of the hundreds of cichlid species introduced to Australia). Instead, they blamed poor design of outdoor ponds and floods for the aquarium fish regularly found in waterways. On the other hand, they warned that government inspections of private aquariums – the rise of the 'guppy gestapo' – would trigger widespread release of fish into the environment.

There is no information about the frequency of aquarium fish disposals in Australia, but 3 different surveys of hobby aquarists overseas suggest that releases in Australia could be in the tens of thousands each year:

Puget Sound (United States): 6.4% of surveyed aquarists reported having released fish. With 127,000 aquarium-owning households in the area, this would mean 2,500 to 21,000 fish released each year [16].

Montreal (Canada): 7% of surveyed aquarists reported having released fish, leading to an estimate of 5.1% of all aquarium fish being released each year [17].

Portugal: 8% of surveyed aquarists reported releasing aquarium animals (46% were fish and 30% were turtles), mainly due to the size of the species [18].

If extrapolated to Australia, with 1.1 million aquarium fish keepers, the survey reporting the lowest frequency of releases (the Puget Sound study) would mean releases of 22,000–200,000 aquarium fish a year. The second study would extrapolate to >560,000 fish a year (based on 11.3 million aquarium fish in Australia).

Based on the above research, it should be assumed that each of these 10 species of loach will be released into Australian waterways. Indeed, although it is not mentioned in the application, there are some overseas precedents for the releases of one of the loach species: online FishBase records show *Botia dario* as having been released in the Philippines [19]. While there is no information on whether it established there or on its ecological impacts that probably reflects an absence of monitoring and study, not evidence of harmlessness. It also illustrates why it is difficult to accurately predict establishment risk: the life-history values for many species are inferred, the climate matches rest on sparse source data, and no species has been assessed under Australian conditions.

Based on the information provided in the applications, the establishment risk of the 10 species may not be uniform. Annexure 1, Table 1 summarises the reported climatic tolerance and traits of each of the species that impact on their ability to establish, while Table 2 outlines what might be expected establishment risks for these species based on the data from the applications.

To summarise, the available information indicates that establishment risk is high for the *Syncrossus* species, whose warm-water tolerances, flood-pulse spawning and generalist diet align closely with northern Australian river systems, a suitability expected to increase with warming. It is moderate to high for *Botia dario* and *Botia rostrata*, which have wide native ranges, very high fecundity and cool-water tolerance that may let them persist further south than the applicants' climate maps

suggest, and, for *Botia dario*, a record of introduction elsewhere. And establishment risk is more low to moderate for *Yunnanilus cruciatus* and lower for the five *Gastromyzon* species, whose narrow ecological specialisations may constrain their potential to establish.

But even for species with lower or moderate establishment risks (based on available information), the applications' assertions that escaping individuals pose no threat does not withstand scrutiny and inclusion on the Live Import List. As we outline further below, these species carry substantial risks regarding pathogen and parasite transmission and wild harvest pressures, and the lack of scientific data underpinning the applications – concerning the species' natural habitats, biology and behaviours, and their likely impacts in Australia conditions – warrants a precautionary approach to their inclusion on the live Import List.

Pathogen and parasite risks

The applications assert that none of the 10 loach species possesses traits likely to cause biosecurity issues if released, and cite (at TOR 21 and 22) a lack of evidence that they host or vector any disease listed on the *National List of Reportable Diseases of Aquatic Animals*. However, this conclusion is flawed for 2 reasons: it relies on a narrow regulatory scope and mistakes a lack of targeted scientific study for an absence of risk.

First, evaluating risk solely against the official reportable diseases list overlooks the vast majority of potential aquatic pathogens and parasites. The national list captures only a small fraction of known threats, leaving unlisted or unstudied pathogens completely unaddressed. Paradoxically, several applications explicitly acknowledge these unlisted disease risks:

- **Wild-caught parasites:** The *Gastromyzon zebrinus* application notes that wild-harvested specimens frequently carry unlisted parasites, such as nematodes.
- **Systemic infections:** The *Syncrossus helodes* application highlights botiid susceptibility to 'skinny disease', a chronic condition linked to intestinal flagellates.
- **General vectors:** The *Botia dario* application concedes the species should be treated as a potential vector for common freshwater ornamental parasites.
- **Mechanical transport:** The *Yunnanilus cruciatus* application acknowledges, 'like all freshwater fish imported from Southeast Asia', a broad risk of mechanically transmitting exotic pathogens.

Second, the apparent absence of documented pathogen or parasite impacts on or risks to Australian native species reflects a lack of research rather than low risk. Minor trade species rarely undergo comprehensive pathogen and parasite screening, and none of the applications cites a dedicated species-level hazard assessment. Because Australian native fish have no evolutionary exposure to these exotic organisms, unstudied pathogens pose unquantified and potentially severe risks.

This reliance on restricted reportable disease lists and an absence of impact on native freshwater species mirrors systemic shortcomings in Australia's broader biosecurity framework. Approval under the EPBC Act is only the first step; DAFF must also add approved species to its permitted list. Current biosecurity import conditions (BICON) rely heavily on outdated assessments – namely the 1999 *Import Risk Analysis on Live Ornamental Finfish* [20] and a 2014 review focused on gourami iridoviruses [21].

The 1999 IRA only considered 104 hazards, about 0.17 per host species compared with 1.27 per host

in a New Zealand assessment of ornamental fishes and invertebrates and 43.3 per host in 6 single-species studies [22]. It only assessed 44 hazards and only 9 were addressed with any risk reduction measures. None of the 9 assessed hazards was known to be a risk to native fish, and the measures were adopted mainly for economic reasons. Additionally, although it was later acknowledged that farmed barramundi presented distinct pathogen risks compared to wild-caught specimens [23], no updated analysis has been conducted regarding the hazards of captive-breeding practices across the much broader array of freshwater ornamental fish species.

Without updated pathogen and parasite risk analysis, newly listed loaches would be subject to standard freshwater ornamental import conditions. Under these arrangements, exporting authorities need only certify visual health and 14 days of pre-export holding, followed by a brief 7-day post-arrival quarantine.

Even if species-specific pathogen risks were assessed and specific biosecurity conditions were imposed on their import, there are questions about the efficacy of quarantine and related measures for aquarium fish imports. We outline these issues in the proposed mitigation measures section below.

Recommendation 2: Conduct and publish a rigorous assessment of the 10 loach species before any listing decision including, given the absence of a species-specific assessment by DAFF, their pathogen and parasite risks (and the level of confidence that current data is sufficient to assess risks).

Potential environmental impacts

The potential environmental impacts of introducing each of these fish species to Australia have not been formally researched, and are therefore highly uncertain. Despite this lack of empirical data, several types of environmental harm can be identified from the available information.

- **Competition with native freshwater fishes:** Alien ornamental fish may compete with native species for limited food, shelter, and spawning sites. The applications note that species like *Syncrossus helodes*, *Syncrossus hymenophysa*, *Botia dario* and *Botia rostrata* pose potential competition risks to small native benthic fishes for food resources or rocky shelter sites.
- **Predation on native invertebrates and fishes:** Introduced ornamental fish may prey on native fish, their eggs, fry, and other aquatic fauna. Benthic carnivores/predators such as *Syncrossus helodes*, *Syncrossus hymenophysa*, *Botia dario* and *Botia rostrata* consume macroinvertebrates, molluscs, and small fishes/eggs, while micropredators like *Yunnanilus cruciatus* target zooplankton and insect larvae.
- **Introduction and spread of pathogens and parasites:** Escaped ornamental fish may act as vectors for non-native viruses, bacteria, fungi, and parasites, causing morbidity and mortality in native aquatic species. All 10 loach species – including wild-harvested taxa such as the five *Gastromyzon* species and wild-caught/farmed *Botia*, *Syncrossus*, and *Yunnanilus cruciatus* – carry risks of introducing exotic pathogens and parasites. These risks are not possible to quantify in the absence of species and pathway-specific risk analyses and research and testing on Australian native biota.
- **Aggressive behaviour and direct interference:** Certain species exhibit territorial or aggressive behaviour, which can impact the territories and behaviours of native species.

Large, aggressive riverine predators such as *Syncrossus helodes* and *Syncrossus hymenophysa* display territoriality that can interfere with and displace native fishes.

- **Habitat alteration and environmental degradation:** Physical behaviours of introduced fishes can alter and degrade aquatic habitats. Benthic foraging and periphyton/biofilm grazing by benthic species, including *Botia dario*, *Botia rostrata*, and the five *Gastromyzon* species, could cause micro-scale substrate disturbance or shifts in riffle periphyton and biofilm assemblages.
- **Cascading ecosystem effects:** High predation pressure or altered water quality can disrupt lower trophic levels; for instance, intensive predation by aggressive predators like *Syncrossus helodes* and *Syncrossus hymenophysa*, or benthic invertebrate depletion by *Botia dario* and *Botia rostrata*, can alter food-web structure and cascade through aquatic communities. The introduction and establishment of multiple exotic species – including resulting hybrids – can have cumulative impacts on native ecosystems that are both unpredictable and significant.

Based on the climate matches and environmental tolerances identified in the applications, the establishment of these loach species poses a potential significant threat to high-value freshwater ecosystems across northern and eastern Australia. Warm-water river systems, tropical and subtropical floodplains, and lowland coastal catchments – such as those found in the Top End, Queensland, and northern New South Wales – offer suitable thermal and hydrological conditions, especially for the *Syncrossus* and *Botia* species. These regions encompass internationally recognised Ramsar wetlands and nationally significant wetlands, including Kakadu National Park, the Wet Tropics, major floodplain and billabong networks, and river catchments. In these sensitive habitats, invasive benthic predators and competitors could disrupt aquatic food webs, threaten native fish species, and degrade critical wetland environments.

There are also potentially significant environmental impacts resulting from wild harvest from their native habitats. The 10 loach species are predominantly harvested from the wild, meaning their inclusion on the Live Import List would generate additional Australian demand and exacerbate pressures on already vulnerable wild populations. Examples include:

- *Botia rostrata* – IUCN Vulnerable, with local catch frequency falling from 60% to 20% between 2004 and 2009 [24]
- *Gastromyzon zebrinus* – IUCN Near Threatened, with suspected over-collection by traders [25]
- *Gastromyzon lepidogaster* – IUCN Least Concern, with suspected over-collection by traders [26]
- *Gastromyzon venustus* – IUCN Least Concern, but is only found in a ‘single small tributary in Brunei Darussalam, the whole tributary is within protected areas (Ulu Temburong National Park)’ [27]
- *Botia dario* – IUCN Least Concern, the application indicates this species ‘is heavily harvested for ornamental trade’, and the IUCN recommends this threat be monitored [28].

Current BICON conditions do not require fish to be legally or sustainably harvested.

While the applications all conclude that the species do not possess any of the aspects of an organism that will cause problems should it escape effective human control, taken together, these potential

ecological threats and the unquantified biosecurity risks demonstrate that the introduction of these 10 freshwater loach species pose an unacceptable level of risk to Australia's native aquatic biodiversity. In the absence of rigorous, species-specific impact assessments and robust biosecurity controls – and monitoring of impacts of harvesting on source wild populations – approving their inclusion on the Live Import List presents a significant risk of potentially irreversible environmental harm.

Proposed mitigation measures

The applications propose (at TOR 53) a range of restrictions that are 'typically applied to non-native fish species to prevent environmental harm', including prohibiting imports from countries lacking health certifications, subjecting them to quarantine at approved facilities, conditioning disposal of dead fish and associated materials, and mandating non-release and disposal conditions 'for retailers and hobbyists'. Four applications – for *Syncrossus helodes*, *Syncrossus hymenophysa*, *Yunnanilus cruciatus*, *Botia dario* – also propose limiting consignments per year to 'reduce propagule pressure'. The applications claim '[s]uch measures are designed to prevent accidental establishment in the wild, reduce invasion potential, and protect native ecosystems while permitting limited legitimate use'.

For the following reasons, we do not accept that the proposed measures are adequate to mitigate the risks posed by these species.

- **Inspection and quarantine are weak and mostly ineffective.** Since 1999, pathogens and parasites in imported aquarium fish have regularly entered Australia, and some have established in the wild [29,30].
    - Goldfish herpesvirus (CyHV-2), one of the 9 regulated hazards, was detected in 2003 and has since been found in pet shops and wild goldfish despite quarantine [2].
    - Gourami iridovirus, another regulated hazard, caused about 90% losses of Murray cod fingerlings in an aquaculture facility in 2003, although there had been no prior evidence that Australian fish were susceptible. It was later found in imported gouramis and in apparently healthy ornamental fish [31,32].
    - *Edwardsiella ictaluri*, which the 1999 analysis assessed as needing no measures, was detected in 2011 in captive native catfish held with imported ornamental fish. It has since been found in wild catfish in the Tully River, where eradication was considered infeasible [33,34]. DAFF warned that impacts on naïve catfish populations 'could be dramatic', but still did not change the import conditions [35].
    - Researchers have rated Australia at 'high risk' of introducing invasive parasites [36]. Myxozoans were found in more than 60% of tested imported fish populations and monogeneans in about 40%, including in goldfish treated before export [36,37]. A study of aquarium fish in Western Australia found *Cryptosporidium* in about 10% of 200 fish, including probable new species [38]. Current import conditions do not specifically target any of these parasites. The only parasite treatment required is for two gill flukes in goldfish, and loaches would not be covered by it.
    - A 2012 Inspector-General of Biosecurity (IGB) audit of the effectiveness of DAFF controls to manage biosecurity risks in the importation of freshwater and marine ornamental fish concluded that the system was 'not capable' of ensuring a high level of protection against new and emerging fish diseases and was 'not adequate' for

detecting sub-clinically infected fish. The audit also recorded deficiencies in privately operated quarantine premises [39].

- A 2012 study found that up to a quarter of imported cyprinid species were mislabelled [40]. The IGB audit also documented the release of a non-permitted species that resembled permitted ones [39]. Health certification and import conditions apply to the species named on the documents, so a mislabelled or misidentified fish can bring in unassessed pathogens under the wrong species' conditions. All loaches the subject of these applications are close relatives within the same order – Cypriniformes (we note there appear to be some taxonomic errors in the *Botia dario*, *Botia rostrata* applications). The applications describe frequent misidentification and mixed consignments for these species.
- We note the department's assessment of previous applications for related loach species rated disease transmission as a moderate impact, the highest-rated of its impact categories, and cited botiid 'skinny disease' and previous introductions of goldfish ulcer disease and Asian fish tapeworm into native fish [41].

- **Increased propagule pressure from commercial trade:** Market abundance and lower retail prices correlate with higher release rates for aquarium and pet species [42,43]. Expanding the size and frequency of species introductions elevates establishment risks [44,45], particularly when the receiving environment offers suitable conditions. While several applications acknowledge (at TOR 53) the risk of heightened propagule pressure and suggest mitigating it by capping annual and per-consignment import volumes (e.g. limiting adult or egg quantities), they omit specific numerical limits and fail to explain how such restrictions could be practically administered or enforced. While certain loach species are already traded illicitly or mislabeled within Australia, granting commercial approval could potentially drastically increase overall propagule pressure by broadening market access and increasing potential release events nationwide – a risk that putative import caps cannot adequately offset.
- **Widespread distribution:** Establishment risk increases where the receiving environment has a suitable climate and habitat, and as more species are kept in higher numbers and in more places. None of the proposed biosecurity conditions will prevent the loach species being kept or traded in states or territories with suitable waterway habitats like tropical Queensland, including the Wet Tropics World Heritage Area, the Top End, including near Kakadu National Park, and subtropical Queensland and NSW.
- **Lack of regulation of end users:** The applications (at TOR 53) propose to 'mandate' no-release and disposal conditions for retailers and hobbyists, and the circulation of targeted education materials. Current BICON conditions impose no such requirements. They apply to importers and approved arrangement sites only, and biosecurity control ends when fish are released from quarantine. The risk posed at the post-quarantine retail and household stage, where release occurs, is therefore not addressed or mitigated.

Appropriate risk ratings

The applications do not use a risk rating framework and answers to relevant TOR are qualitative. Each application concludes that the species 'does not possess any of the aspects of an organism that will

cause problems should it escape effective human control'. The applicants note that the SARDI screening tool is unsuitable for an Australia-wide assessment, but offer no alternative method, scores or calculations. The applications' conclusions therefore cannot be independently reproduced or tested, and several answers within the reports themselves point the other way.

As outlined in Recommendation 2, the Invasive Species Council recommends the National EPA conduct and publish a rigorous assessment of the 10 loach species before any listing decision, including their pathogen and parasite risks, given the absence of up-to-date or species-specific assessments by DAFF. Based on available evidence, we expect such an assessment would yield a higher risk rating than the applicants' conclusions for most of these species, including for the following reasons:

- **Propagule pressure.** The applications acknowledge that release from aquaria is a known pathway for establishment of ornamental freshwater fish (TOR 12). Under current BICON conditions, permits to import ornamental fish last a year and allow 'unlimited numbers of fish'. None of the applications estimate likely import volumes, and only 4 mention volume caps without specifying a number. While some species may already be present in the Australian trade (although not on the permitted list), listing would increase the size of the commercial market for these species, thereby increasing the likelihood of their release and establishment, especially for the large *Syncrossus* species.
- **Species-specific competitive advantages.** Certain loaches possess unique traits that enhance their establishment potential. Members of the genus *Syncrossus* are large-bodied, long-lived benthic generalists whose seasonal spawning migrations align well with northern Australia's monsoonal river systems. The species of *Botia* exhibit high fecundity, rapid maturation, robustness, and broad thermal tolerance – and there is some indication that *Botia dario* has been found in waters outside its native range. Although *Yunnanilus cruciatus* has a restricted climate match this niche may not reflect its true climatic tolerance, and its diminutive size, secretive habits, plant-attached eggs, and preference for vegetated lentic habitats provide introduction and survival pathways.
- **Climate match.** On the information available in the applications, parts of northern and eastern Australia match the native ranges of at least 9 of the 10 species, with *Syncrossus* and *Botia* species the closest fit for the monsoonal north, coastal Queensland and, for the *Botia*, the subtropical east coast to northern NSW. Several species also tolerate cooler conditions than their native-range average suggests (*Botia dario* to about 15 °C; *Botia rostrata* from plains with winter minima of 5–15 °C; *Yunnanilus cruciatus* to about 18 °C). The applications state that warming will increase establishment risk for the *Syncrossus* species (TOR 47), will bring more Australian freshwaters closer to preferred conditions for *Botia dario* in the north and east (TOR 47), and may slightly increase it for *Yunnanilus cruciatus* (TOR 47). Only the *Gastromyzon* species, which need cooler, fast, highly oxygenated water, are expected to be limited by warming.

It must be acknowledged that despite the information provided in the applications, the evidence on the wild ecology and likely impacts of these species in Australia is weak. Many life-history values in the applications are inferred from congeners (including fecundity, age at maturity and spawning for the *Gastromyzon* species), IUCN assessments for several species note little or no population information, and none of the 10 has been studied under Australian conditions. Risks associated with

their pathogens and parasites have also not been assessed. This leaves major uncertainty about how they would disperse, and whether they would interact with native fauna, alter ecosystem processes and introduce disease. Because freshwater fish cannot realistically be eradicated once established in connected river systems, adding these loaches to the Live Import List presents an unacceptable biosecurity risk.

In light of these substantial scientific uncertainties and the potential for serious, irreversible environmental harm, the National EPA should advise the Minister to strictly apply the precautionary principle under section 391 of the EPBC Act and refuse the application.

Recommendation 3: Advise the Minister to refuse the applications to add the 10 loach species (*Botia dario*, *Botia rostrata*, *Gastromyzon embalohensis*, *Gastromyzon lepidogaster*, *Gastromyzon ornaticauda*, *Gastromyzon venustus*, *Gastromyzon zebrinus*, *Syncrossus helodes*, *Syncrossus hymenophysa* and *Yunnanilus cruciatus*) to the Live Import List.

References

1. Corfield J, Diggles B, Jubb C, McDowall R, Moore A, Richards A, et al. 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. 2008 p. 277.

2. Becker JA, Tweedie A, Rimmer A, Landos M, Lintermans M, Whittington RJ. Incursions of Cyprinid herpesvirus 2 in goldfish populations in Australia despite quarantine practices. Aquaculture. 2014;432: 53–59.

3. ITC. Trade Map - Trade statistics for international business development. In: International Trade Centre [Internet]. 2023. Available: https://www.trademap.org/

4. Trujillo-González A, Becker JA, Hutson KS. Parasite dispersal from the ornamental goldfish trade. Adv Parasitol. 2018;100: 239–281.

5. Lintermans M. Human-assisted dispersal of alien freshwater fish in Australia. N Z J Mar Freshw Res. 2004;38: 481–501.

6. Bureau of Rural Sciences. A strategic approach to the management of ornamental fish in Australia. Natural Resource Management Ministerial Council; 2006.

7. Fredberg J, McNeil DG. Review of non-native ornamental fish species grey listed in Australia. SARDI Aquatic Sciences; 2010.

8. Beyer K, Fredberg J. Review of Grey Listed Non-native Ornamental Fish Species: Report to the Ornamental Fish Management Implementation Group (OFMIG). SARDI Aquatic Sciences; 2010.

9. Moore A, Marton N, McNee A. A strategic approach to the management of ornamental fish in Australia: communication strategy and grey list review – a report to OFMIG. Bureau of Rural Sciences; 2010.

10. Millington M, Sierp M, Gaylard S. Assessing the Invasiveness Risk of Non-Indigenous Fish in the Australian Ornamental Trade: Implementing the Risk Assessment Tool. Queensland Department of Agriculture and Fisheries; 2022.

11. Millington MD, Holmes BJ, Balcombe SR. Systematic review of the Australian freshwater ornamental fish industry: the need for direct industry monitoring. Manag Biol Invasions. 2022;13: 406.

12. Millington M. The Underbelly of the Ornamental Industry. Unregulated trade and invasive species raise concern for unique native freshwater ichthyofauna. PhD thesis, Griffith University. 2023.

13. Striped Borneo Sucker (Gastromyzon zebrinus). In: Seven Fishes [Internet]. [cited 21 Oct 2026]. Available: https://7fishs.com.au/products/striped-borneo-sucker

14. Ramsay A. Why Australia's Aquarium Trade Needs More Species (And Why That Matters for Innovation) - Pet Industry Association Australia. 6 Jan 2026 [cited 21 Oct 2026]. Available: https://piaa.org.au/why-australias-aquarium-trade-needs-more-species/

15. Anonymous. The National Noxious Species List. Queensland Cichlid Group; 2008. Available: https://cichlidpower.org.au/VCS_3/PDF/Noxious_List_Docs/National_Noxious_Species_List_Article_QCG_2008.pdf

16. Strecker AL, Campbell PM, Olden JD. The Aquarium Trade as an Invasion Pathway in the Pacific Northwest. Fisheries. 2011;36: 74–85. doi:10.1577/03632415.2011.10389070

17. Gertzen E, Familiar O, Leung B. Quantifying invasion pathways: fish introductions from the aquarium trade. Can J Fish Aquat Sci. 2008;65: 1265–1273. doi:10.1139/F08-056

18. Banha F, Diniz A, Anastácio PM. Patterns and drivers of aquarium pet discharge in the wild. Ecol Indic. 2019;106: 105513.

19. Froese, R. and D. Pauly. Editors. FishBase: Botia Dario. 2026. Available: https://www.fishbase.se/summary/Botia-dario

20. Kahn S, Wilson D, Perera R, Hayder H, Gerrity S. Import risk analysis on live ornamental finfish. Australian Quarantine and Inspection Service; 1999.

21. Department of Agriculture, Fisheries and Forestry. Importation of freshwater ornamental fish: review of biosecurity risks associated with gourami iridovirus and related viruses Final import risk analysis report. Australian Government; 2014.

22. Diggles B, Arthur JR. Pathogen risk analysis for aquatic animals: experiences from nine case studies. Fish Health Section, Asian Fisheries Society Selangor, Malaysia; 2011. pp. 271–290.

23. Department of Agriculture and Fisheries. Animal Biosecurity Policy Memorandum 2004/18: Interim conditions suspending the importation of barramundi cod for ornamental purposes. Australian Government; 2004. Available: https://www.agriculture.gov.au/sites/default/files/sitecollectiondocuments/ba/memos/2004/animal/2004-18.pdf

24. Chaudhry S. IUCN Red List of Threatened Species: Botia rostrata. IUCN Red List Threat Species 2009. 2009 [cited 21 Oct 2026]. Available: https://www.iucnredlist.org/en

25. Lumbantobing, D. IUCN Red List of Threatened Species: Gastromyzon zebrinus. IUCN Red List Threat Species 2019. 2019 [cited 21 Oct 2026]. Available: https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T91171997A91172002.en

26. Lumbantobing, D. IUCN Red List of Threatened Species: Gastromyzon lepidogaster. IUCN Red List Threat Species 2019. 2019 [cited 21 Oct 2026]. Available: https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T169533A91169587.en

27. Lumbantobing, D. IUCN Red List of Threatened Species: Gastromyzon venustus. IUCN Red List Threat Species 2019. 2019 [cited 21 Oct 2026]. Available: https://dx.doi.org/10.2305/IUCN.UK.2019-2.RLTS.T91171797A91171814.en

28. Chaudhry S. IUCN Red List of Threatened Species: Botia dario. IUCN Red List Threat Species 2010. 2010 [cited 21 Oct 2026]. doi:https://dx.doi.org/10.2305/IUCN.UK.2010-4.RLTS.T166603A6245334.en

29. Whittington R, Chong R. Global trade in ornamental fish from an Australian perspective: the case for revised import risk analysis and management strategies. Prev Vet Med. 2007;81: 92–116.

30. Kaminskas S. Alien pathogens and parasites impacting native freshwater fish of southern Australia: a scientific and historical review. Aust Zool. 2021;41: 696–730.

31. Go J, Whittington R. Experimental transmission and virulence of a megalocytivirus (Family Iridoviridae) of dwarf gourami (Colisa lalia) from Asia in Murray cod (Maccullochella peelii peelii) in Australia. Aquaculture. 2006;258: 140–149.

32. Rimmer AE, Becker JA, Tweedie A, Lintermans M, Landos M, Stephens F, et al. Detection of dwarf gourami iridovirus (Infectious spleen and kidney necrosis virus) in populations of ornamental fish prior to and after importation into Australia, with the first evidence of infection in domestically farmed Platy (Xiphophorus maculatus). Prev Vet Med. 2015;122: 181–194.

33. Kelly E, Martin P, Gibson-Kueh S, Morgan D, Ebner B, Donaldson J, et al. First detection of Edwardsiella ictaluri (Proteobacteria: Enterobacteriaceae) in wild Australian catfish. J Fish Dis. 2018;41: 199–208.

34. Lymbery A, Kueh S, Kelly E, Morgan D, Buller N, Martin T, et al. A survey of Edwardsiella ictaluri in wild catfish populations in Australia. Fisheries Research and Development Corporation and Murdoch University; 2016.

35. Department of Agriculture, Fisheries and Forestry. Emergency Animal Diseases Bulletin No. 108. Edwardsiella ictaluri – a significant pathogen of fish. In: Australian Government [Internet]. 2011. Available: https://www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/ead-bulletin/108

36. Trujillo-González A. Parasite threats from the ornamental fish trade. 2018.

37. Trujillo-González A, Becker J, Vaughan D, Hutson K. Monogenean parasites infect ornamental fish imported to Australia. Parasitol Res. 2018;117: 995–1011.

38. Zanguee N, Lymbery J, Lau J, Suzuki A, Yang R, Ng J, et al. Identification of novel Cryptosporidium species in aquarium fish. Vet Parasitol. 2010;174: 43–48.

39. Interim Inspector-General of Biosecurity. Audit report. An examination of the effectiveness of Department of Agriculture, Fisheries and Forestry controls to manage biosecurity risks in the importation of freshwater and marine ornamental fish. Australian Government; 2012.

40. Collins RA, Armstrong KF, Meier R, Yi Y, Brown SD, Cruickshank RH, et al. Barcoding and border biosecurity: identifying cyprinid fishes in the aquarium trade. PloS One. 2012;7: e28381.

41. Department of Climate Change, Energy, Environment and Water. Assessment of the Potential Impacts of Botia histrionica (Burmese loach) on the Environment. Canberra: Australian Government; 2026.

42. Stringham OC, Lockwood JL. Pet problems: Biological and economic factors that influence the release of alien reptiles and amphibians by pet owners. J Appl Ecol. 2018;55: 2632–2640.

43. Lockwood JL, Welbourne DJ, Romagosa CM, Cassey P, Mandrak NE, Strecker A, et al. When pets become pests: the role of the exotic pet trade in producing invasive vertebrate animals. Front Ecol Environ. 2019;17: 323–330.

44. Simberloff D. The role of propagule pressure in biological invasions. Annu Rev Ecol Evol Syst. 2009;40: 81–102.

45. Cassey P, Delean S, Lockwood JL, Sadowski JS, Blackburn TM. Dissecting the null model for biological invasions: A meta-analysis of the propagule pressure effect. PLoS Biol. 2018;16: e2005987.

Annexure 1 – Summary of traits and establishment risks of 10 loach species

Table 1 – Summary of climatic tolerance and traits

Source: applicants' Terms of Reference reports (Q9, Q10, Q18, Q23-25, Q28, Q32-33, Q42, Q44-47). "Inferred" means the applicant derived the value from congeners rather than measuring it for the species.

Species	Climate and tolerances	Habitat flexibility	Reproduction and maturity	Diet and size	Australian climate match claimed by applicant
Botia dario	Ganges-Brahmaputra (India, Bangladesh, Bhutan), monsoonal. Preferred 19-32 °C (the applicant's table also cites 15-28 °C extremes); pH 6.5-8.2; freshwater only	Fast rivers and streams over gravel and rock; tolerates moderate to strong flow	Up to ~49,000 non-adhesive drifting eggs per clutch (elsewhere 13,880-27,510); seasonal spawner (Apr-Jul); matures ~1-2 yr	Benthic carni-omnivore, ~89% animal prey; to ~15 cm	Top End and coastal Qld; subtropical east coast Brisbane to northern NSW. Climatch map shows a narrow coastal fringe
Botia rostrata	Lower Ganges and middle-lower Brahmaputra; humid subtropical monsoon with plains winters of 5-15 °C. 19-27 °C; pH 6.0-7.5; GH 2-12; survives short-term heat stress	Hill streams and mainstream rivers; uses pools and slack water within flowing systems	~14,000-21,000 eggs per female; one monsoon spawning season with multi-week window; matures ~1-2 yr	Carnivorous benthic forager (insect larvae, molluscs, worms); 11-12 cm	Qld and northern NSW humid subtropical belt (Mackay to Gold Coast); monsoonal Top End and Cape York

Species	Climate and tolerances	Habitat flexibility	Reproduction and maturity	Diet and size	Australian climate match claimed by applicant
Gastromyzon embalohensis	Embaloh and Mendalam rivers (Kapuas basin), West Kalimantan; equatorial Af, 24-32 °C. Optimum 20-24 °C, stress above ~28 °C; pH 6.5-7.5; dissolved oxygen >7.5 mg/L	Obligate fast riffles; poor tolerance of slow water and pollution	~100 eggs per batch, multiple spawns (inferred); maturity ~6 months (inferred); no captive breeding reported	Periphyton grazer; to ~6 cm	Wet Tropics (Ingham-Cooktown), Top End coastal catchments
Gastromyzon lepidogaster	Applicant's climate text refers to Kuamut-Kinabatangan, Sabah (Af, 23-28 °C, ~3,400 mm) and is identical to *G. ornaticauda*. Ideal 20-24 °C; practicable 18-25 °C; high dissolved oxygen	Obligate rheophile	~100 eggs, multiple spawns (inferred); maturity ~6-12 months (inferred)	Periphyton plus small invertebrates; ~5-7 cm	Wet Tropics (Tully-Innisfail-Mission Beach); orographic rain belts
Gastromyzon ornaticauda	Kuamut headwaters only (Kinabatangan, Sabah); Af, 23-28 °C. Ideal 20-24 °C; practicable 18-25 °C	Obligate rheophile; disturbance-sensitive	As *G. lepidogaster* (inferred)	Periphyton grazer; ~5-7 cm	As *G. lepidogaster*

Species	Climate and tolerances	Habitat flexibility	Reproduction and maturity	Diet and size	Australian climate match claimed by applicant
Gastromyzon venustus	Brunei (Belalong/Temburong) and northern Borneo; Af, 23-32 °C. Ideal 20-24 °C; practicable 18-25 °C	Obligate rheophile; sensitive to pollution, sediment and flow change	Never bred in captivity; applicant rates viable gamete production in Australia "unlikely"; inferred ~100 eggs, 6-12 months	Algae and biofilm grazer; ~5 cm	Lowland Wet Tropics rainforest; pockets of the Top End
Gastromyzon zebrinus	Upper Sambas basin, West Kalimantan; Af, 27-29 °C, 2,000-3,500 mm. Optimum 20-24 °C; short-term 28-32 °C only with high oxygen and flow; pH 6.5-7.5. IUCN Near Threatened	Obligate fast riffles	~100 eggs (inferred); ~6 months (inferred); not bred in captivity	Periphyton grazer; ~6 cm	Far-north tropics only; Climatch target map appears to show essentially no match
Syncrossus helodes	Mekong, Chao Phraya, Mae Khlong; monsoonal, 24-30 °C. Prefers 23-28 °C; stressed below ~20 °C and by sustained 30 °C or more; pH 6.0-7.5 (to ~8.0 if acclimated)	Large rivers and seasonally flooded floodplains; moderate to high flow	Seasonal migratory spawner into floodplains; fecundity unquantified; matures after multiple years	Benthic carnivore (molluscs, insect larvae, worms, small fish); to ~30 cm	Northern and eastern Australia; Climatch scores across much of the north and east, highest in the Top End

Species	Climate and tolerances	Habitat flexibility	Reproduction and maturity	Diet and size	Australian climate match claimed by applicant
Syncrossus hymenophysa	Sumatra, Borneo, Malay Peninsula; humid tropics. 25-30 °C typical (23-30 °C workable); pH 5.0-7.5	Headwater streams to large rivers and lakes; broad velocity tolerance; tolerates flow, turbidity and pH swings	Seasonal migratory egg-scatterer in wet season; fecundity undocumented; multi-year maturity	Opportunistic carnivore and omnivore; to ~25 cm	Tropical and north-eastern Australia; applicant states warming expands suitable habitat
Yunnanilus cruciatus	Central Vietnamese coastal rivers; Am to Cwa/Cfa climate, 23-28 °C, winters 16-17 °C. Tolerates ~18-30 °C; pH 6.0-7.5; GH 3-12	Vegetated backwaters; the application says it uses both flowing and still water but also calls it a slow-water specialist (Q18 vs Q24)	10-20 mildly adhesive eggs on aquatic plants, repeated spawns; matures 12-16 months	Micropredator on zooplankton and insect larvae; ~3.5 cm	Wet Tropics, central Qld coast, Top End and Kimberley billabongs; Climatch shows only a thin northern fringe

Table 2 – Expected establishment likelihood by species

Species	Main factors raising establishment likelihood	Main factors limiting it	Establishment likelihood (expected)
Syncrossus hymenophysa	Broad temperature and habitat tolerance; generalist predator; migratory spawner; warming expands suitable area	Longer generation time; fecundity undocumented	**Higher**
Syncrossus helodes	Warm-water match across the north and east; flood-pulse and disturbance tolerance; generalist predator; risk rises with warming	Needs floodplain and seasonal flow cues; sensitive to heavy pollution and hypoxia	**Moderate to higher**
Botia dario	Hardy; very high fecundity; drifting eggs; tolerates cool minima; wide pH range	Strong seasonal spawning; prefers well-oxygenated flowing water	**Moderate to higher**
Botia rostrata	High fecundity; ~1-2 yr maturity; tolerates a wide thermal range; matches subtropical east coast	Prefers well-oxygenated flowing water; narrower maximum temperature	**Moderate to higher**
Yunnanilus cruciatus	Small, cryptic, repeated spawning; plant-borne adhesive eggs; uses vegetated still water; tolerates 18-30 °C	Low fecundity; limited Climatch match; sensitive to pollution and heavy metals	**Moderate to lower**

Species	Main factors raising establishment likelihood	Main factors limiting it	Establishment likelihood (expected)
Gastromyzon (all five)	Periphyton diet readily available; short generation time (inferred); some Wet Tropics streams are potentially suitable	Obligate cool, fast, highly oxygenated water; stenothermal; poor tolerance of disturbance; no captive breeding; applicants state risk falls with warming	**Lower**