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***Ancistrus tamboensis*: Report addressing the Department of Agriculture, Water and the Environment terms of reference for proposed amendments to the *List of Specimens taken to be Suitable for Live Import* (Live Import List)**



October 2022 (Updated May 2023)

Executive Summary

Consideration of the Department of Agriculture, Water and the Environment (DAWE) terms of reference for proposed amendments to the List of Specimens taken to be Suitable for Live Import (Live Import List) against information available for the bristlenose catfish (*Ancistrus tamboensis*) indicates the biosecurity risk posed allowing the importation of the species into Australia would be minimal. The species has not been reported as having established in the wild outside its natural range despite being traded internationally and domestically for over 50 years. Other benthic catfish (Order Siluriformes) species such as *Synodontis nigriventris* have not established self-maintaining wild populations in Australia despite decades of importation. Large numbers of *A. tamboensis* already exist in the domestic hobby having been kept in Australia prior to the introduction of the current live import list and post arrival quarantine system for ornamental fish. They have been regularly bred and traded in Australia over the last 50 years – these populations have not led to the establishment of feral populations in Australia.

Importantly, most of the information available about this species is from the ornamental fish hobby literature; there is little information in the scientific literature, especially as it relates to establishment risks. The absence of such reports despite the many decades of worldwide trade is precisely because of the benign nature of the species since scientific study (and associated literature) focuses almost exclusively on species found to be invasive. Indeed, three of the five criteria used in the Bomford methodology (Bomford 2008) for determining establishment success (as used in the Department's own assessments) pertain to the presence or absence of reported historical establishment – the other two criteria being the species' climatic and geographical range. The absence of published scientific literature about the species should not therefore be the sole basis of decision making, especially when there is a long history of trade to draw on – to do so is considered outside the intended applicability of the Environment Protection and Biodiversity Conservation Act's precautionary principle.

Of the many species that would add value to the ornamental fish hobby sector in Australia, this species has been selected for application to add to the Live Import List largely because it is not considered invasive or otherwise ecologically harmful, nor associated with diseases exotic to Australia. It is a relatively small, benign species similar in many respects to fish already deemed appropriate to be imported into Australia.

A. tamboensis would be a welcome addition to the species permitted live importation, especially given its existing domestic status, having been sustained in the Australian aquarium hobby since first legally imported in the 1970's, prior to the existence of the current regulatory framework. The addition of *A. tamboensis* would provide legal clarity for the species and be consistent with current import policy given it is closely related to and likely shares a similar environmental risk profile to other closely related species currently permitted live importation to Australia.

A structured risk assessment based on the methodology of Bomford (2008) estimated a 'low' risk. Recent risk assessments using the SARDI method were conducted on 8 closely related *Ancistrus* species, it is reasonable to accept *Ancistrus tamboensis* would have also been assessed low risk. These 8 *Ancistrus* sp. received SARDI risk scores between 0 and 32, which is considered low risk. These results further support and reinforce the data already

presented using the Bomford model and will enable high level of confidence in the data presented. *A. tamboensis* should be considered a lower risk than many if not most of the species currently permitted live importation to Australia. Given its long established presence and history in Australia as a mainstream staple of the aquarium industry, It is recommended that *A. tamboensis* is added to the Live Import List.

DAWE terms of reference

1. *Provide information on the taxonomy of the species.*

- Bristlenose catfish, *Ancistrus tamboensis* Fowler 1945
- Actinopterygii (ray-finned fishes); Siluriformes (Catfish), Loricardiidae (armoured catfishes), Hypostominae, *Ancistrus*
- *Synonyms*: None listed in FishBase
- *Common names*: bristlenose catfish, carachama.

2. *Provide information on the status of the species under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). 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? Include information on the conservation value of the species.*

- *Ancistrus tamboensis* is not CITES listed.
- This species is listed on the International Union for Conservation of Nature's Red List of Threatened Species as Least Concern (LC) as this species has a wide distribution, with no known major widespread threats (Velasquez *et al.* 2016).
- *A. tamboensis* is found in Peru in the Tambo River basin in the upper Ucayali drainage (Eastern Peru) (Velasquez *et al.* 2016). The species is considered least concern as it is spread over a large area, several parts of which are in national parks.
- The species is readily spawned in captivity and has been available in Australia in aquarium shops in limited quantities for many years.

3. *Provide information about the ecology of the species.*

As with most aquarium species, much of the information about the ecology, including environmental requirements, of *A. tamboensis* is not available in the peer reviewed scientific literature. Where such information is lacking, this assessment relies on hobbyist information websites, so applies largely to aquarium behaviour and requirements. (Aqua-Fish.net n.d., Aquatic Community n.d., Froese and Pauly n.d.—a., Velasquez *et al.* 2016., PlanetCatfish n.d.)

- *Lifespan of the species*: *A. tamboensis* is a relatively long-lived species, living for up to 12 years (Aqua-Fish.net n.d.)
- *Size and weight range*: The fish are normally 8-11 cm in tanks (Aqua-Fish.net n.d., Aquatic Community n.d.).

- *Natural geographic range*: *A. tamboensis* found the Tambo River basin in the upper Ucayali drainage, Peru (Froese and Pauly n.d.—a).
- *Habitat*: Habitat requirements are not well documented, except that it is found in flowing water over rocky or sandy bottoms but can also be found in some rocky areas (Velasquez *et al.* 2016). It is a tropical fish, requiring temperatures of 23-29°C (Froese and Pauly n.d.—a, PlanetCatfish n.d.). In tanks it requires moving water, indicating that in the wild it lives in areas with some water movement. Its food (algae scraped off surfaces) and preference for flowing water (PlanetCatfish n.d.) suggest it lives in fast flowing sections of streams.
- *Diet, including potential to feed on agricultural plants*: Diet in wild fish is not known. In aquaria they are vegetarian but will if offered eat some foods like live food or prawns, but normally vegetables. A number of hobby websites indicate that bogwood (waterlogged decaying timber) is a necessary part of the diet (e.g. PlanetCatfish n.d., Aqua-Fish.net n.d., Aquatic Community).
- *Social behaviour and groupings*: Details of social behaviours have not been reported. Males are territorial around nest sites, driving the female away after spawning, although hobby websites list them as peaceful to other species and their own (Aqua-Fish.net n.d.).
- *Territorial and aggressive behaviours*: None recorded. Aquarist websites promote them as a community tank species.
- *Natural predators*: Not reported but piscivorous birds, mammals or fish in their habitat would likely prey on them.
- *Characteristics that may cause harm to humans and other species*: No characteristics that may cause harm to human or other species have been reported in this species. FishBase reports the species as harmless to humans (Froese and Pauly n.d.—a).

4. Provide information on the reproductive biology of the species.

The reproductive biology of *A. tamboensis* is fairly well understood as it is routinely bred in aquaria.

- *Age at maturity (first breeding)*: about 6 months (Bows 2015).
- *How frequently breeding occurs*: The species is bred commercially for the ornamental fish trade. Females may spawn multiple times.
- *Can the female store sperm*: No, fertilisation is external; nest spawners.
- *How many eggs or live-born young are produced at each breeding event*: Under commercial breeding conditions, mature females produce 50-100 eggs about 3 or 4 times a year (). One aquarist website account indicates that each batch of eggs laid on a surface is between 20-50 eggs and if enough females are present, a male may care for two or three clutches at once (Bows 2015).

- *Has the species hybridised with other species (both in the wild and in captivity) or has it the potential to hybridise with any other species:* Hybridisation has not been reported in this species. However, the genus *Ancistrus* is a large one and varied with new species being found regularly.
 - *If the species can hybridise, are the progeny fertile:* N/A.
5. *Provide information on whether this species has established feral populations, and if so, where those populations are. Include information on whether this species has been introduced to other countries, even if it has not established feral populations.*

The species has not been reported as having established feral population outside of its natural geographic distribution (Froese and Pauly n.d.—a), despite being traded internationally for the aquarium trade for over 50 years.

6. *Provide information on, and the results of any other environmental risk assessments undertaken on the species both in Australia and overseas, including any Import Risk Analyses undertaken.*

A search of the scientific literature identified a recent risk assessment of 8 *Ancistrus* sp. That are very closely related to *Ancistrus tamboensis* (Millington M, Sierp M, Gaylard S 2022 page 20). This assessment used the SARDI method contained in the report Deveney, M. (2018) Assessing the risks associated with the Australian Trade in live ornamental fish species: development of a risk assessment tool. Importantly the SARDI methodology also considers the already existing risk associated with the trade of species already present in Australia, something overlooked by other models. The SARDI methodology compiles risk scores from responses to 40 separate risk queries covering three separate categories, the likelihood of release, likelihood of invasion, and consequences of invasion. It must also be recognized that the SARDI risk assessment was developed with funding from environment and invasive committee (EIC) and endorsed by all federal, state and industry stakeholders and participants in the EIC, as well as the aquatic pest vertebrate and invertebrate working group, as a suitable method to determine risk associated with the trade of ornamental fish already in Australia. *Ancistrus cirrhosis*, *Ancistrus claro*, *Ancistrus dolichopterus*, *Ancistrus hoplogenyis*, *Ancistrus leucostictus*, *Ancistrus ranunculus*, *Ancistrus temminckii* and *Ancistrus triradiatus* all received SARDI risk scores between 0 and 32 which is considered low risk. These results further support and reinforce the data already presented using the Bomford model and will enable high level of confidence in the data presented.

The species is not on the BRS 'grey list' of likely high biosecurity risk ornamental fish species, i.e. non-native species that are present in Australia through historical imports that are not on the Live Import List, noting, the grey list is not extensive and does not cover all ornamental species that are historically present in Australia. It is also not one of the species of non-native freshwater fish that are reported to have established self-sustaining populations in the wild in Australia (Corfield et al. 2008). However, the species has been kept, bred and traded within Australia since the 1970's when it was legally imported in line with the regulations of the day, which is prior to the introduction of the current list of species approved for live import and the post arrival quarantine system.

([REDACTED]).

The addition of *A. tamboensis* to the Live Import List would be generally consistent with Australia's biosecurity arrangements for live fish given that the species is present in Australia and given that it is closely related to and likely shares a similar environmental risk profile with other benthic catfish currently permitted live importation to Australia. Its approval would also provide legal certainty for the species which has been sustained in Australia since the 1970's.

7. *Assess the likelihood that the species could establish a breeding population in the Australian environment should it ever be released from effective human control.*

Assessing the risk of the potential of introducing a new organism into the environment involves assessing the risk of it becoming established and spreading and the likely impacts if establishment occurred. The risk assessment method 'Exotic Freshwater Fish Model 1' developed by Mary Bomford has been adopted by DAWE for its freshwater fish risk assessments (Bomford 2008). The following considers each of the risk factors considered by Bomford to be applicable to freshwater fish and is guided by the recent Australian Government risk assessment of glass catfish (DAWE 2020a). The specific criteria in the DAWE terms of reference template are also covered. The potential impacts of established feral populations are addressed in the next term of reference (#8). A structured risk assessment based on the Bomford methodology is at Appendix A.

Importantly, most of the information available about this species is from the ornamental fish hobby literature; there is little information in the scientific literature, especially as it relates to establishment risks. The absence of such reports despite the many decades of worldwide trade is precisely because of the benign nature of the species since scientific study (and associated literature) focuses almost exclusively on species found to be invasive. Indeed, three of the five criteria used in the Bomford methodology (Bomford 2008) for determining establishment success (as used in the Department's own assessments) pertain to the presence or absence of reported historical establishment – the other two criteria being the species' climatic and geographical range. The absence of published scientific literature about the species should not therefore be the sole basis of decision making, especially when there is a long history of trade to draw on – to do so is considered outside the intended applicability of the Environment Protection and Biodiversity Conservation Act's precautionary principle.

Of the many species that would add value to the ornamental fish hobby sector in Australia, this species has been selected for application to add to the Live Import List taking into account the fact that the species has not been reported to be invasive or otherwise ecologically harmful, nor associated with diseases exotic to Australia. It is a relatively small, benign species similar in many respects to fish already deemed appropriate to be imported into Australia.

- *Propagule pressure—the release of large numbers of animals at different times and places enhances the chance of successful establishment: A. tamboensis* is not a schooling species which means it may be less likely to establish than schooling species (DAWE 2020a). As the species lives in tropical flowing rivers on a sandy or rocky substrate there would be opportunities to establish in the few perennial rivers in northern monsoonal Australia. There would be suitable environments in upland

northern Australia. The natural range is above elevations of 600m above sea level (Froese and Pauly n.d.—a). The range is quite narrow which would restrict it to small, upland streams in northern Australia. It is unlikely therefore that enough fish would be released into a suitable receiving environment to establish a breeding population as a result of an accident or being deliberately released into the local waterways in or near populated areas. There are examples of tropical aquarium species such as *Poecilia reticulata* that have established small populations in disturbed habitats in urban and peri-urban areas like those found in Darwin, Cairns or Brisbane (Arthington et al. 1999). *A. tamboensis* is not known to have established in any such habitats overseas despite the trade in this species for decades. A moderate to high probability of establishing a self-sustaining population would require deliberate release into very specific waterways – it is unlikely therefore to happen at random; a risk similar to that noted for the glass catfish (*Kryptopterus vitreolus*) in a recent Departmental risk assessment (DAWE 2020a).

- *Climate match—introduction to an area with a climate that closely matches that of the species' original range:* Climatch (v2.0) was run with the source region set to circumscribe areas in eastern Peru described in Velasquez *et al.* (2016). A climate match prediction was generated using the Euclidian algorithm applied to the 'world stations' data set. Climatch calculated a 'value 5' (Climate Euclidian Sum Level 5) of 401, equating to a climate match score of 3 using recalibrated 'value 5' ranges for Climatch v2.0 provided by ABARES¹. DAWE (2020a) suggested the need for some caution in predicting climate suitability for freshwater aquatic species because Climatch is based on terrestrial climate measurements.
- *History of establishment elsewhere—previous successful establishment:* There are no reports on FishBase of introductions or establishment of this species outside its known natural range (Froese and Pauly n.d.—a). The species is unlikely to breed and form self-sustaining populations so far outside its optimal water temperature range of 23-29°C. The absence of established populations outside its natural range is despite being actively traded internationally, and domestically within Australia as an aquarium species, for over 50 years ().
- *Overseas range:* The species is endemic to eastern Peru (Velasquez *et al.* 2016). The confirmed area in eastern Peru was used to determine a total overseas range of 12, 1° latitude x 1° longitude grid squares for purposes of the Bomford (2008) assessment.
- *Introduction success:* The species is not known to have established outside its native range. However, it can be assumed that the species has been released into non-native areas on many occasions over the 50-plus years of trade worldwide as an aquarium species. The introduction success rate is conservatively considered to be less than 0.25 (Bomford 2008).
- *Taxonomic group—belonging to a family or genus which has a high establishment success rate:* *A. tamboensis* belongs to the family Locariidae (armoured catfishes). FishBase recognises 70 species of *Ancistrus* and lists only two of these as being

¹ Recalibrated Climatch v2 'value 5' ranges corresponding to climate match scores 1-8: 1(0), 2 (1-276), 3(277-1036), 4(1037-2763), 5(2764-6907), 6(6908-10361), 7(10362-17268), 8 (>17268)

aquarium fish (*A. dolichopterus* and *A. temminckii*). Of these, none have been reported in the wild outside their natural range (Froese and Pauly n.d.—b). As internationally traded aquarium species, it is reasonable to assume that there would have been many past instances (perhaps in the hundreds) of inadvertent or deliberate introduction of these two species around the world over the many decades that they have been traded – an introduction being a release event where one or more individuals of these species are directly or indirectly released into natural waters outside their natural range. A conservative 50 past introductions are assumed for the purposes of this risk assessment. (If a much smaller number of release events are deemed to have occurred world over during the last many decades of international trade, this would mean that release events are very rare and that the overall risk is commensurately minute.). The ‘genus level’ taxa risk is therefore 0/50 (0%). Furthermore, *A. tamboensis* already exist in the domestic hobby having been bred & traded in Australia over for more than 40 years – although these are not large commercial numbers of fish, these populations have not led to the establishment of feral populations in Australia.

- *Ability to find food sources*: As an herbivore grazing on algal films and bogwood, the species is expected to find food sources in the unlikely event it is introduced into the wild.
- *Ability to survive and adapt to different climatic conditions (e.g. temperatures, rainfall patterns)*: Temperature range is 23-29°C, pH 6.5-7.5 and hardness 6-20 dGH (PlanetCatfish n.d., Aqua-Fish.Net n.d.). The species range is quite narrow which would restrict it to small, upland streams in northern Australia.
- *Ability to find shelter*: As a stream dwelling tropical fish with an affinity for flowing streams there would be limited habitat in the type of rivers that have the required temperature range in Northern Australia.
- *Rate of reproducing*: The overall rate is unknown but in home aquaria 20-50 eggs per batch are laid, hatching in about 10 days. The male guards the eggs and does not leave, even to feed, during incubation (Bows 2015, Aquarimax Pets 2012). Under commercial aquaculture conditions, mature females can produce 50-100 eggs and spawn 3-4 times a year ().
- *Any characteristics that the species has which could increase its chance of survival in the Australian environment*: The species is not considered to have any characteristics that would increase its likelihood of survival in the wild in Australia.

In summary, *A. tamboensis* is considered unlikely to establish, in main because the species is not reported to have established breeding populations outside its natural range despite being traded internationally as an ornamental species for many decades and there are few areas in Australia expected to have habitat suitable for the species to establish. *A. tamboensis* already exists in the domestic hobby having been bred and traded in Australia over the last 50 years – although these are not large commercial numbers of fish, these populations have not led to the establishment of feral populations in Australia.

Using the SARDI method on 8 closely related *Ancistrus* sp, specifically risk queries 25 to 40, show little to no consequences of invasion should *Ancistrus* sp. establish feral populations in Australia (Millington M, Sierp M, Gaylard S 2022). The SARDI risk assessment included a thorough review of all available literature showed that the *Ancistrus* species has no recorded impacts on any wild or farmed aquatic species outside its natural range. It is not a parasitic species, nor is there any novel or notifiable diseases in the literature. It is not a migratory species, causes no harm to humans and has no records of altering the function of ecosystems, nor does it outcompete or prey on any fish species, beyond its natural range. It also cannot hybridise with any Australian native fish. Furthermore, there is no evidence in any literature, worldwide, that the species has ever caused any deleterious environmental, social, or economic impacts. (Millington M, Sierp M, Gaylard S 2022).

8. *Provide a comprehensive assessment of the potential impact of the species should it establish feral population/s in Australia. Include, but do not restrict your assessment to the impact of this species on:*
- *Similar niche species (i.e. competition with other species for food, shelter etc.):* In the unlikely event this species establishes in the wild in Australia, it is unlikely to compete with native fish due to the specialised feeding behaviour on algal films, whereas most native species feed on benthic invertebrates or detritus (Merrick and Schmida 1984). No competition would be expected with mid-water or surface feeding fish. There are no reports in the scientific literature of any ecological impacts as a result of this species establishing outside its natural range in other countries. As noted in TOR 7 above, the absence of such reports is an indication of the benign nature of the species since scientific literature focuses almost exclusively on species that have some ecological impact.
 - *Is the species susceptible to, or could it transmit any pests or disease:* No significant pests or diseases have been associated with this species, including any of the diseases to which there are disease-specific risk management measures applied by DAWE for importation of ornamental fish to Australia. No specific diseases have been associated with *Ancistrus tamboensis*.
 - *Probable prey/food sources, including agricultural crops:* *A. tamboensis* feeds on algae and bogwood. It does not feed on any agricultural crops.
 - *Habitat and local environmental conditions:* *A. tamboensis* has not been reported to change its environment or habitat. It is a stream dwelling fish, living on rocky and sandy substrates, with an affinity to a narrow temperature range.
 - *Control/eradication programs that could be applied in Australia if the species was released or escaped:* Potential controls measures include listing as a noxious species; eradication or containment programs (including movement controls) or broader education/awareness building campaigns such as labelling aquarium fish bags with messaging.
 - *Characteristic or behaviour of the species which may cause land degradation i.e. soil erosion from hooves, digging:* There are no reports of this species exhibiting any behaviours that may cause habitat degradation.

- *Potential threat to humans: A. tamboensis* nor any of the seventy species in the genus are reported as posing any threat to humans (Froese and Pauly n.d.—a).
9. *What conditions or restrictions, if any, could be applied to the import of the species to reduce any potential for negative environmental impacts (e.g. single sex imports, de-sexing animal prior to import etc.).*

Potential environmental impacts from importation of live animals into Australia can take the form of direct pest risks or indirect risks associated with the introduction of new diseases that may be carried in imported stock. In the case of *A. tamboensis*, importation under Australia's current import conditions would reduce potential disease risks to an acceptable level, consistent with previous Australian Government disease risk analyses (Kahn *et al.* 1999, DOA 2014).

10. *Provide a summary of the types of activities that the specimen may be used for if imported into Australia (e.g. pet, commercial, scientific).*

- *Benefit of this species for these activities:* Permitting importation of this species will support the ornamental fish industry. In a broader context, the ornamental fish hobby is an important one. Aside creating employment and contributing to the economy of all states and Territories, it has become especially important during the CoViD pandemic where individuals subject to movement restrictions are turning increasingly to the hobby for recreation – the hobby therefore plays a significant part in helping alleviate the stressors associated with the pandemic and post-CoViD recovery, both from economic and social perspectives.

The direct and indirect economic benefits of ornamental fish importation carry through the aquarium industry supply chain and into the hobby. The economic beneficiaries include, but are not limited to, aquarium fish importers, wholesalers, aquarium hard goods distributors, retail pet and aquarium shops, commercial and hobby breeders as well as freight and logistics providers and other associated vendors.

Importantly, keeping ornamental fish fosters companion animal care which has benefits to society beyond the direct economic value of the trade. There are companionship as well as mental health benefits. There has never been a more important time for these benefits to flow through Australian society. The aquarium hobby also plays an often-undervalued educational role, especially relevant to younger Australians. The benefits in this respect include, but are not limited to, an increased understanding of, and appreciation for, biology, chemistry, physiology as well as geography and natural history.

- *Potential trade in the species:* The species is traded internationally as evidenced by its availability in the global market, and would be a welcome addition to the species permitted importation. In the order of 2 million fish of the species are traded internationally and given the growing popularity of the hobby in Australia, the likely market demand in Australia for imported *A. tamboensis* would be about 60,000 fish per year, a demand currently unable to be met exclusively from domestically bred stock. ([REDACTED]).

- *Why this species has been chosen:* To bring legal clarity and certainty to the species that has been kept, bred and traded domestically since it was first imported into Australia in the 1970's. Additionally, the species is in high demand by hobbyists. This catfish species is very popular in Australia, and adds to the variety to the species available to Australian hobbyists. It is well regarded among aquarists to keep tank glass and plants free of algae. The species is not aggressive and compatible to keep in aquaria with other most other tropical species.

Although large numbers of this species are known to be present in the Australian hobby, these are still not available with the reliability or in sufficiently large commercial volumes consistently needed by the industry. Imported stock would provide reliable access to the numbers, range in sizes and varieties (such as new colour morphs) needed to meet Australian hobby demand.

11. *Provide detailed guidelines on the way in which the species should be kept, transported and disposed of in accordance with the types of activity that the species may be used for if imported into Australia.*

- *The containment (e.g. cage, enclosure) and management standards for this species to prevent escape or release. This should also talk about the security standards for this specimen:* The fish will be transported as per the International Air Transport Association (IATA) guidelines and the provisions of the *BICON Import Conditions for Freshwater Aquarium Fish: Effective 18 July 2020* (DAWE 2020b)
- *The disposal options for surplus specimens:* Fish will be imported for purposes of supplying the aquarium fish trade and as such no surplus specimens are expected. In the event of mortality, animals will be disposed as per the provisions of the *BICON Import Conditions for Freshwater Aquarium Fish: Effective 18 July 2020* (DAWE 2020b) and in accordance with the Pet Industry Association of Australia (PIAA) National Code of Practice (PIAA 2008).

12. *Provide information on all other Commonwealth, state and territory legislative controls on the species, including:*

- *The species' current quarantine status:* The species is not currently on the permitted species list.
- *Pest or noxious status:* The species is not listed on any state or federal pest or noxious species list.
- *Whether it is prohibited or controlled by permit or licence in any state or territory:* The species is not prohibited or controlled by permit or licence in any state or territory.

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Appendix A: Bomford model risk assessment: *Ancistrus tamboensis*

Assessing the risk of the potential of introducing a new organism into the environment involves assessing the likelihood of it becoming established and spreading and the likely impacts if the species does establish. The following analysis applies the assessment method for determining the risk of establishment of exotic freshwater fish introduced to Australia (Model 1) described in Bomford (2008) and is guided by the recent DAWE risk assessment of glass catfish (DAWE 2020a).

Bomford (2008) identified a range of factors that determined establishment success of freshwater fish, including propagule pressure, climate match, history of establishment elsewhere, geographic range and taxonomic group. These risk factors together with potential impacts should *A. tamboensis* Fowler, 1945 establish wild populations in Australia are discussed below, as are the outputs of applying the Bomford (2008) methodology. These findings should be considered together with information addressing the DAWE terms of reference for proposed amendments to the *List of Specimens taken to be Suitable for Live Import (Live Import List)* in the body of this submission.

Establishment success

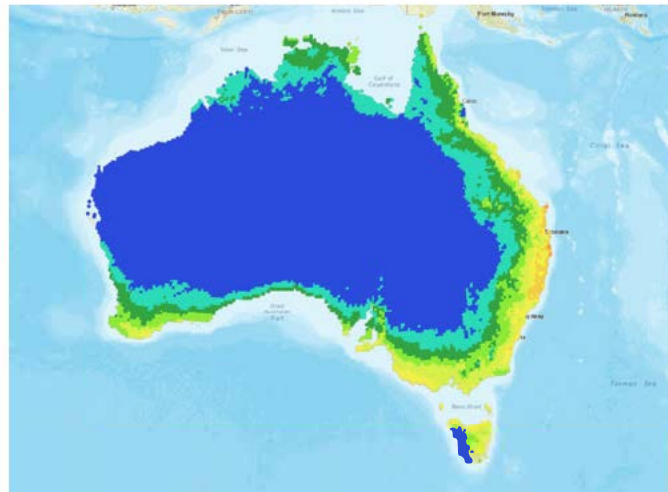
Propagule pressure—the release of large numbers of animals at different times and places
A. tamboensis is not a schooling species which means it may be less likely to establish than schooling species (DAWE 2020a). As the species lives in tropical flowing rivers on a sandy or rocky substrate there would be opportunities to establish in the few perennial rivers in northern monsoonal Australia. There would be suitable environments in upland northern Australia. The natural range is above elevations of 600m above sea level (Froese and Pauly n.d.—a). The range is quite narrow which would restrict it to small, upland streams in northern Australia. It is unlikely therefore that enough fish would be released into a suitable receiving environment to establish a breeding population as a result of an accident or being deliberately released into the local waterways in or near populated areas. There are examples of tropical aquarium species such as *Poecilia reticulata* that have established small populations in disturbed habitats in urban and peri-urban areas like those found in Darwin, Cairns or Brisbane (Arthington et al. 1999). *A. tamboensis* is not known to have established in any such habitats overseas despite the trade in this species for decades. A moderate to high probability of establishing a self-sustaining population would require deliberate release into very specific waterways – it is unlikely therefore to happen at random; a risk similar to that noted for the glass catfish (*Kryptopterus vitreolus*) in a recent Departmental risk assessment (DAWE 2020a).

Climate match—introduction to an area with a climate that closely matches that of the species' original range:

Climatch (v2.0) was run with the source region set to circumscribe areas in eastern Peru described in Velasquez *et al.* (2016). A climate match prediction was generated using the Euclidian algorithm applied to the 'world stations' data set. Climatch calculated a 'value 5' (Climate Euclidian Sum Level 5) of 401, equating to a climate match score of 3 using recalibrated 'value 5' ranges for Climatch v2.0 provided by ABARES². DAWE (2020a)

² Recalibrated Climatch v2 'value 5' ranges corresponding to climate match scores 1-8: 1(0), 2 (1-276), 3(277-1036), 4(1037-2763), 5(2764-6907), 6(6908-10361), 7(10362-17268), 8 (>17268)

suggested the need for some caution in predicting climate suitability for freshwater aquatic species because Climatch is based on terrestrial climate measurements.



Score	0	1	2	3	4	5	6	7	8	9	10
Count	13280	2490	1555	818	692	303	94	4	0	0	0

Figure 1 Climatch output for *Ancistrus tamboensis*

History of establishment elsewhere—previous successful establishment:

There are no reports on FishBase of introductions or establishment of this species outside its known natural range (Froese and Pauly n.d.—a). The absence of established populations outside its natural range is despite being actively traded internationally as an aquarium species for many years ([REDACTED]).

Overseas range:

The species is endemic to eastern Peru. The confirmed areas in eastern Peru were used to determine a total overseas range of 12, 1° latitude x 1° longitude grid squares for purposes of the Bomford (2008) assessment.

Introduction success:

The species is not known to have established outside its native range. However, it can be assumed that the species has been released into non-native areas on some occasions over the 50-plus years of trade worldwide as an aquarium species. The introduction success rate is conservatively considered to be less than 0.25 (Bomford 2008).

Taxonomic group—belonging to a family or genus which has a high establishment success rate:

A. tamboensis belongs to the family Locariidae (armoured catfishes). FishBase recognises 70 species of *Ancistrus*. Of these, none have been reported in the wild outside their natural

range. There are no reported populations that have been found potentially established outside the countries to which they are native. As internationally traded aquarium species, it is reasonable to assume that there would have been many past instances (perhaps in the hundreds) of inadvertent or deliberate introduction of these two species around the world over the many decades that they have been traded – an introduction being a release event where one or more individuals of these species are directly or indirectly released into natural waters outside their natural range. A conservative 50 past introductions are assumed for the purposes of this risk assessment. (If a much smaller number of release events are deemed to have occurred world over during the last many decades of international trade, this would mean that release events are very rare and that the overall risk is commensurately minute.). The 'genus level' taxa risk is therefore 0/50 (0%). If the Bomford (2008) methodology is applied to the genus *Ancistrus*, where the genus success rate % = 100 x (Number of successful introductions to all countries of species in the genus/Total number of introductions to all countries of species in the genus), then the 'genus level' taxa risk is 0/50 (0%).

Small numbers of *A. tamboensis* exist in the domestic hobby having been intermittently traded in Australia over the last 50 years – although these are not large commercial numbers of fish, these populations have not led to the establishment of feral populations in Australia.

Potential impacts of established feral populations

There are no reports of *A. tamboensis* being found outside its natural range in the wild. Accordingly, there is no evidence of any detrimental impact caused by the establishment of the species. In the unlikely event this species establishes in the wild in Australia, it is unlikely to compete for benthic film algae with other small tropical benthic fish typically in habitats with sandy or rocky substrates. No competition would be expected with mid-water or surface feeding fish.

Disease transmission to Australian fish and aquarium fish populations

No significant pests or diseases have been associated with this species, including any of the diseases to which there are disease-specific risk management measures applied for importation of ornamental fish to Australia. Silurid fishes as a group are considered of low risk in terms of disease risk in that they are subject to the minimum one-week post arrival quarantine isolation on importation to Australia (DAWE 2020b).

Bomford 2008 Exotic Freshwater Fish Risk Assessment Model

Common name	Bristlenose catfish
Scientific name	<i>Ancistrus tamboensis</i> Fowler 1945
Date assessed	December 2021
Literature Search Type and Date:	FishBase December 2021

Risk criterion	Value	Explanation
A. Climate Match Score (1–8)	3	Climatch (v2.0) Euclidian Sum Level 5 (Value X) = 401. This value equates to a climate match score of 3.
B. Overseas Range Score (0-4)	2	<i>A. tamboensis</i> estimated to occupy a total range of 12, 1° latitude x 1° longitude grid squares.
C. Establishment Score (0-3)	0	The species is considered to have been "introduced but never established", representing an establishment score of 0.
D. Introduction Success Score (0-4)	1	The species is not known to have established outside its native range. However, after many decades of trade worldwide it can be assumed it has been released into non-native areas on many occasions. The introduction rate is conservatively considered (that is erring on the side of overestimation) to be <0.25, representing an introduction success score of 1.
E. Taxa Risk Score (0-5)	0	Conservatively, 50 past introductions of the 2 internationally traded species of the genus are assumed for the purposes of this risk assessment. There are no records on FishBase of <i>Ancistrus</i> species being found to have been potentially established outside the countries to which they are native. The 'genus level' taxa risk is therefore 0/50 (0%).

Summary	Score	Rank
Establishment Risk	6	Low

Conclusion

The estimated risk of 'low' using the Bomford (2008) methodology is generally much lower than the risk likely posed by many if not most of the species currently permitted live importation to Australia. It is recommended that *Ancistrus tamboensis* is added to the Live Import List.