Synodontis eupterus: 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)

Submitted by the Aquarium Industry Association of Australia



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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 featherfin synodontis (*Synodontis eupterus*) indicates the risk of allowing the importation of the species would pose minimal biosecurity risk to Australia. The species has not been reported as having established in the wild outside its natural range despite being traded internationally for over 40 years. Related species such as *Synodontis nigriventris* have not established self-maintaining wild populations in Australia despite decades of importation. Small numbers of *S. eupterus* already exist in the domestic hobby having been regularly bred & traded in Australia over the last 40 years ─ although these are not large commercial numbers of fish, 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 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.

S. eupterus would be a welcome addition to the species permitted live importation, especially given the growing popularity of the ornamental fish hobby in Australia and the significant economic and social benefits of the aquarium fish trade to Australia. The addition of *S. eupterus* would be consistent with current import policy given it is closely related to and likely shares a similar environmental risk profile to other species currently permitted live importation to Australia.

This TOR report should be read together with the 'Frequently Asked Questions' (Appendix 1) document that forms part of the package of information submitted to the DEWA in support of the Aquarium Industry Association of Australia's application to add *S. eupterus* to the Live Import List.

A structured risk assessment based on the methodology of Bomford (2008) estimated a 'moderate' risk, generally consistent with the risk that would likely be posed by the vast majority of the species currently permitted live importation to Australia.

S. eupterus received a SARDI risk score of -70 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.

It is recommended that *S. eupterus* is added to the Live Import List.

DAWE terms of reference

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

   - Featherfin synodontis, *Synodontis eupterus* Boulenger 1901
   - Actinopterygii (ray-finned fishes); Siluriformes (Catfish), Mochokidae (Squeakers or upside-down catfishes).
   - *Synonyms: S. euptera, S. macrepipterus, S. ornatipinnis*
   - *Common names*: featherfin squeaker, upside down catfish, featherfin catfish

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.*

   - *Synodontis eupterus* is not CITES evaluated.
   - This species is listed on the International Union for Conservation of Nature's Red List of Least Concern (LC) as this species has a wide distribution, with no known major widespread threats (Awaïss *et al*. 2020).
   - *S. eupterus* is found in western Africa in several large river basins, including the Chad, Niger and Volta River basins as well as unconfirmed reports from the White Nile very distant to these other river basins (Awaïss *et al*. 2020). The species is considered abundant in some parts of its range being a favoured food fish for artisanal fishers and making up most of their catch (Shinkafi and Daneji 2011).
   - The species is readily spawned in with the aid of hormones (Shinkafi and Mamman 2012; Sipos *et al.* 2019) in commercial fish farms (Seriously Fish n.d.). Some are harvested from the wild for the aquarium trade (Awaïs *et al*. 2020).

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 *S. eupterus* 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 (Brough and Roche n.d., Seriously Fish n.d., Thoene 2015, Wikipedia n.d.

   - *Lifespan of the species:* 15 years in aquaria if maintained properly (Seriously Fish n.d.). *S. eupterus* is a relatively long-lived species, living for 8-10 years but with one report up to 25 years (Brough *et al.* n.d.).
   - *Size and weight range:* The fish grow to a maximum of 30 cm length, but are usually about 20cm long (Shinkafi and Daneji 2011).
   - *Natural geographic range*: *S. eupterus* is found in western Africa in serval large river basins, including the Chad, Niger and Volta River basins as well as unconfirmed reports from the White Nile very distant to these other river basins (Awaïss *et al*. 2020).

- *Habitat*: Habitat requirements or fishing methods are not well documented, except that it is found in moderately flowing water over muddy bottoms but can also be found in some rocky areas (Awaïss *et al.* 2020). It is a tropical fish with optimal water temperatures of 22-26°C, but a single specimen likely released by an aquarist was found in Croatia in 13.7°C water (Dulčić *et al.* 2018). If not discovered, it is unlikely this single specimen would have survived long at such a low temperature.

- *Diet, including potential to feed on agricultural plants*: Diet in wild fish includes phytoplankton, zooplankton, detritus, plant tissues, insects, crustaceans and insect parts (Shinkafi *et al.* 2010). Gut content studies of wild fish indicate they are bottom dwelling and bottom feeders, ingesting detritus with other foods such as insect larvae (Shinkafi *et al.* 2010). The food types indicate benthic feeding without ingestion of significant terrestrial plant material. A closely related species *S. nigrita* is an omnivore with a gut three times the length of the body, and feeds on phytoplankton, zooplankton, detritus, plant tissues, insects, crustaceans and insect parts (Shinkafi *et al*. 2010).

- *Social behaviour and groupings*: Details of social behaviours have not been reported, although they do pair up prior to spawning and make audible noises during spawning and when encountering predators (Awaïss *et al.* 2020; Brough *et al*. n.d.).

- *Territorial and aggressive behaviours*: None recorded. Some 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 *S. eupterus* is fairly well understood as it is routinely bred using hormone induced spawning techniques.

- *Age at maturity (first breeding)*: 2-3 years (Seriously fish n.d., Jared Patrick, Premier Pet, pers. com.).

- *How frequently breeding occurs*: The species is bred commercially for the ornamental fish trade. Females spawn about eight time per year (Jared Patrick, Premier Pet, pers. com.).

- *Can the female store sperm*: External fertilisation; broadcast spawners.

- *How many eggs or live-born young are produced at each breeding event*: Absolute fecundity ranges from about 100 eggs to over 20,000 (Shinakfi and Mamman 2012). Different stages of eggs in the ovaries indicate an extended spawning period, from June to August in Minna, Nigeria (Shinkafi and Mamman 2012). Hormone induced spawning has resulted in a wide ovulation range of 18190 ±15 181 eggs (Sipos *et al*. 2019).

- *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.

- *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 their natural geographic distribution (Froese and Pauly n.d.—a), despite being traded internationally for the aquarium trade for over 40 years in volumes in the order of 1.5 million fish per year (Jared Patrick, Premier Pet, pers. com.). Dulčić *et al.* (2018) reported finding a single specimen of *S. eupterus* in Croatia, indicating the fish can survive cooler (13.7°C) waters. The authors speculate the fish may have been released from a home aquarium after growing too large (19.3 cm) to maintain. The species is unlikely to breed and form self-sustaining populations so far outside its optimal water temperature range of 22-26°C.

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 did not identify any previous environmental risk assessment of this species. The species is not on the BRS 'grey list' of ornamental fish species, i.e. non-native species that are present in Australia through historical imports that are not on the Live Import List, nor is it 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 is known to be captive bred and traded domestically in Australia (Jared Patrick, Premier Pet, pers. com.). It is unknown how the first individuals arrived in Australia — it is plausible that they may have been shipped to Australia inadvertently as they resemble some closely related species on the current Live Import List. It is further noted that the species has been present in Australia for at least 40 years (Jared Patrick, Premier Pet, pers. com.).

   The addition of *S. eupterus* 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 species such as *Synodontis nigriventris* currently permitted live importation to Australia.

   Having a species recognised on the EPBC Act list as being approved is the only practical mechanism available to recognise the legal status of the fish species in Australia. Specifically, some jurisdictions require approval under the EPBC Act in order for the species to be kept and traded, regardless of the existing status of the species. As such, approving a species already here is still important. There is no valid argument rejecting consideration of the application due the fish being here when various jurisdictions actually require it.

   Additionally, *S. eupterus* has been further risk assessed by Michael Sierp (2022) of Aquatic Biosecurity Pty Ltd using 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 vertebrate and invertebrate working group. as a suitable method to determine risk associated with the trade of ornamental fish already in Australia. The report prepared by M Sierp has been attached as appendix B. It is further noted that trade value and volume data used for these assessments were set using expected figures should the species be approved for live import, ensuring any increase to propagule pressure and likelihood of release is accounted.

S. eupterus received a SARDI risk score of -70 which is considered low risk with the level of data deficiency not exceeding the no confidence threshold of 30%. It is also noted that the individual scores for likelihood of release, likelihood of invasion, and consequences of invasion were also all low with raw scores of 10, -1 and 7 respectively (Sierp 2022). 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.

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: S. eupterus* is not a schooling species which means that it less likely to establish than schooling species. 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). *S. eupterus* is not known to have established in the 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). However, it does breed in areas with seasonal flooding (Seriously Fish n.d.), so there would be suitable environments in northern Australia.

- *Climate match—introduction to an area with a climate that closely matches that of the species' original range*: Climatch (original v1.0) was run with the source region set to circumscribe areas in Western Africa (Chad, Niger (including Benue) and Volta river basins) where the species is confirmed present as well as some areas in Northeast Africa from where the species has been reported but not confirmed (Awaïss *et al.* 2020). A climate match prediction was generated using the Euclidian algorithm applied to the 'world stations' data set. Climatch calculated a 'value X' (Climate Euclidian Sum Level 5) of 682, equating to a climate match score of 5. DAWE (2020a) suggested the need for some caution in predicting climate suitability for freshwater aquatic species because Climatch is based on terrestrial climate measurements. The recently released upgraded version of Climatch (v2.0) was not used in this assessment because at the time of conducting this assessment, it had yet to be calibrated for purposes of applying the Bomford methodology.

- *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). Dulčić et al. (2018) has however reported finding a single specimen of *S. eupterus* in Croatia, indicating the fish can survive cooler (13.7°C) waters. The authors speculate the fish may have been released from a home aquarium after growing too large (19.3 cm) to maintain. The species is unlikely to breed and form self-sustaining populations so far outside its optimal water temperature range of 22-26°C. The absence of established populations outside its natural range is despite being actively traded internationally as an aquarium species for many years (Jared Patrick, Premier Pet, pers. com.).

- *Overseas range*: The species is endemic to Western Africa in serval large river basins, including the Chad, Niger and Volta River basins as well as unconfirmed reports from the White Nile very distant to these other river basins (Awaïss *et al*. 2020). The confirmed area in Western Africa were used to determine a total overseas range of 76, 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, noting the finding of a single specimen in Croatia likely released by an aquarist (Dulčić *et al.* 2018). However, it can be assumed that the species has been released into non-native areas on many occasions over the 40+ 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: S. eupterus* belongs to the family Mochokidae (Squeakers or upside-down catfishes). FishBase recognises 133 species of *Synodontis.* Of these, three have been reported in the wild outside their natural range (although unknown if established as a feral population); the finding of a single specimen of *S. eupterus* in Croatia (Dulčić *et al.* 2018) and the 1996

report of *S. angelicus* and *S. nigriventris* found in a Philippine waterway (Froese and Pauly n.d.—b). Of a total 130+ species, 15 are reported in FishBase as traded internationally as commercial aquarium species and of these 15, there are, if we take worst case conservative approach, potentially 3 reported populations (representing three species) 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 four species around the world over the many decades that these species 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.)

If the Bomford (2008) methodology is applied to the genus *Synodontis*, where the genus success rate % = 100(Number of successful introductions to all countries of species in the genus/Total number of introductions to all countries of species in the genus), the 'genus level' taxa risk is 3/50 (6%). Notably, the related *S. nigriventris* is on the current list of specimens taken to be suitable for live import and has been imported to Australia for over 40 years without wild populations being established. Furthermore, *S. eupterus* 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 omnivore feeding primarily on benthic invertebrates, 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 22-27°C, pH 5.6-7.5 and hardness 8-20 dGH (Brough *et al.* n.d., Seriously Fish n.d.).

- *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*: Overall rate is unknown but experimental spawning has produced up to over 30 000 eggs (Sipos *et al*. 2019). However, ovary observations suggest several spawnings over the wet season are more likely (Shinkafi and Mamman, 2012). In commercial breeding conditions, females produce around 200 eggs about 8 times a year (Jared Patrick, Premier Pet, pers. com.).

- *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, *S. eupterus* 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. This conclusion can be ground-truthed to an extent by comparing the species with the related *S. nigriventris*, which has not

established self-maintaining wild populations despite several decades of importation to Australia for the aquarium trade. Furthermore, *S. eupterus* already exists in the domestic hobby having been bred traded in Australia over the last 40 years — although these are not large commercial numbers of fish, these populations have not led to the establishment of feral populations in Australia.

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 may compete for benthic invertebrates with other small tropical benthic fish typically in habitats with muddy or rocky substrates. These niche species could include bottom feeders such as eel tailed catfishes (*Neosilurus* spp., *Porochilus* spp.). Some juvenile fish such as golden perch and grunters may feed on benthic invertebrates. 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 the 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 *Synodontis eupterus*, although the cosmocercoid nematode *Raillietnema synodontisi* was found in aquarium fish in Czechoslovakia (Moravec and Řehulka 1987). No disease was recoded as the paper was primarily taxonomic.

- Probable *prey/food sources, including agricultural crops*: *S. eupterus* feeds on benthic invertebrates. It does not feed on any agricultural crops.

- *Habitat and local environmental conditions*: *S. eupterus* has not been reported to change its environment or habitat. It is a stream dwelling fish with an affinity towards a narrow temperature range.

- *Control/eradication programs that could be applied in Australia if the species was released or escaped*: Potential control 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 my cause habitat degradation.

- *Potential threat to humans*: The species is not reported as posing any threat to humans (Froese and Pauly n.d.—a).

Using the SARDI method, specifically risk queries 25 to 40, show little to no consequences of invasion should *S. eupterus* establish feral populations in Australia. A thorough review of all available literature showed that *S. eupterus* has no recorded impacts on any wild or farmed

aquatic species outside its natural range. It is not a parasitic or migratory species, nor is there any novel or notifiable diseases in the literature, causes no known harm to humans and has no record 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. (Sierp 2022).

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 *S. eupterus*, 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 routinely traded internationally and would be a welcome addition to the species permitted importation. In the order of 1.0 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 *S. eupterus* would represent about one percent of this (Jared Patrick, Premier Pet, pers. com.).

      Why this species has been chosen: Internationally, the species is in high demand by hobbyists. New catfish species would be popular in Australia, adding variety to the species available to Australian hobbyists. This species has the added peculiarity along with others in

the genus of sometimes swimming upside down, hence the name. The species is not aggressive and compatible to keep in aquaria with other most other tropical species. Two other Synodontis catfishes, *S. multipunctatus* and S. *nigriventris* are currently permitted for import to Australia; *S. eupterus* has the added attraction of feathery fins.

Although small numbers of this species are known to be present in the Australia hobby, these are not available with the reliability or in sufficiently large commercial volumes 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 Aquarium Industry Association of Australia (AIAA) National Code of Practice (AIAA 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 (closely related species are).

    - *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: *Synodontis eupterus*

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 *S. eupterus* (Boulenger 1901) 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

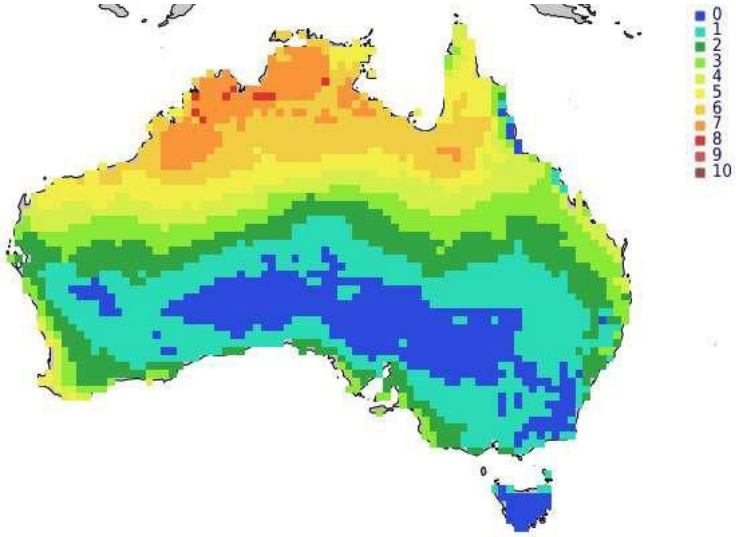
Propagule pressure—the release of large numbers of animals at different times and places

S. eupterus is not a schooling species which means that it less likely to establish than schooling species. There are examples of tropical aquarium species with known invasive characteristics such as *Poecilia reticulata* that have established small populations in disturbed habitats in urban and peri-urban areas such as those that exist in Darwin, Cairns or Brisbane (Arthington et al. 1999). *S. eupterus* is not known to have established in the many 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, similar in risk to glass catfish (*Kryptopterus vitreolus*) *as* noted in a recent Departmental risk assessment (DAWE 2020a). As the species lives in tropical flowing rivers on a muddy substrate there would be opportunities to establish in the few perennial rivers in northern monsoonal Australia. However, it does breed in areas with seasonal flooding (Seriously Fish n.d.), so there would be suitable environments in northern Australia. 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 (DAWE 2020a). It is unlikely that enough fish would be accidently or deliberately released into a suitable receiving environment to establish a breeding population.

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

Climatch (original v1.0) was run with the source region set to circumscribe areas in Western Africa (Chad, Niger (including Benue) and Volta river basins) where the species is confirmed present as well as some areas in Northeast Africa from where the species has been reported but not confirmed (Awaïss *et al.* 2020). A climate match prediction was generated using the Euclidian algorithm applied to the 'world stations' data set. Climatch calculated a 'value X' (Climate Euclidian Sum Level 5) of 682, equating to a climate match score of 5. DAWE (2020a) suggested the need for some caution in predicting climate suitability for freshwater aquatic species because Climatch is based on terrestrial climate measurements. The recently

released upgraded version of Climatch (v2.0) was not used in this assessment because at the time of conducting this assessment, it had yet to be calibrated for purposes of applying the Bomford methodology.



Score	0	1	2	3	4	5	6	7	8	9	10
Count	458	697	409	300	239	229	291	153	9	0	0

Figure 1 Climatch output for *Synodontis eupterus*

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). Dulčić et al. (2018) has however reported finding a single specimen of *S. eupterus* in Croatia, indicating the fish can survive cooler (13.7°C) waters. The authors speculate the fish may have been released from a home aquarium after growing too large (19.3 cm) to maintain. The species is unlikely to breed and form self-sustaining populations so far outside its optimal water temperature range of 22-26°C. The absence of established populations outside its natural range is despite being actively traded internationally as an aquarium species for many years (Jared Patrick, Premier Pet, pers. com.).

Overseas range:

The species is endemic to Western Africa in several large river basins, including the Chad, Niger and Volta River basins as well as unconfirmed reports from the White Nile very distant to these other river basins (Awaïss *et al*. 2020). The confirmed areas in Western Africa were used to determine a total overseas range of 76, 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, noting the finding of a single specimen in Croatia likely released by an aquarist (Dulčić *et al.* 2018). However, it can be assumed that the species has been released into non-native areas on many occasions over the 40+ 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:

S. eupterus belongs to the family Mochokidae (Squeakers or upside-down catfishes). FishBase recognises over 130 species of *Synodontis.* Of these, three have been reported in the wild outside their natural range (although unknown if established as a feral population); the finding of a single specimen of *S. eupterus* in Croatia (Dulčić *et al.* 2018) and the 1996 report of *S. angelicus* and *S. nigriventris* found in a Philippine waterway (Froese and Pauly n.d–b). Of the over 130 *Synodontis* species, 15 are reported in FishBase as traded internationally as commercial aquarium species and of these 15, there are, if we take worst case conservative approach, potentially 3 reported populations (representing three species) have been found potentially established outside the countries to which they are native. As internationally traded aquarium species, it is reasonable to assume (in the absence of published scientific data) that there would have been many past instances (perhaps in the hundreds) of inadvertent or deliberate introduction of these four species around the world over the many decades that these species 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 over the last many decades of international trade, this would mean that release events are rare and that the overall risk is commensurately low.) This level of introductions has resulted in 3 potentially established populations of three species.

If the Bomford (2008) methodology is applied to the genus *Synodontis*, where the genus success rate % = 100(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 3/50 (6%).

Notably, the related *S. nigriventris* is on the current list of specimens taken to be suitable for live import and has been imported to Australia for over 40 years without wild populations being established. Furthermore, small numbers of *S. eupterus* likely exist in the domestic hobby having been intermittently traded in Australia over the last 40 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 is a single report of a single specimen of *S. eupterus* being found outside its natural range, likely released by an aquarist (Dulčić *et al.* 2018), despite being traded internationally as an aquarium species for over 40 years. 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 may compete for benthic invertebrates with other small tropical benthic fish typically in habitats with muddy or rocky substrates. These niche species could include bottom feeders such as eel tailed catfishes (*Neosilurus* spp., *Porochilus* spp.). Some juvenile

fish such as golden perch and grunters may feed on benthic invertebrates. 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. Botiid 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	Featherfin synodontis
Scientific name	Synodontis eupterus Boulenger 1901
Date assessed	16 March 2021
Literature Search Type and Date:	FishBase March 2021

Risk criterion	**Value**	**Explanation**
A. Climate Match Score (1–8)	5	Climatch (v1.0) Euclidian Sum Level 5 (Value X) = 682. This value equates to a climate match score of 5.
B. Overseas Range Score (0–4)	4	*S. eupterus* is estimated to occupy a total range of 76, 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)	1	Conservatively, 50 past introductions of the 15 internationally traded species of the genus are assumed for the purposes of this risk assessment. There are three records (representing three species) on FishBase of *Synodontis* species being found to have been potentially established outside the countries to which they are native. The 'genus level' taxa risk is therefore 3/50 (6%).

Summary	*Score*	*Rank*
Establishment Risk	11	Moderate

Conclusion

The estimated risk of ‘moderate’ using the Bomford (2008) methodology is generally consistent with the risk that would be posed by most of the species currently permitted live importation to Australia. It is recommended that *Synodontis eupterus* is added to the Live Import List.

APPENDIX 1 – FAQ

ISSUE	REQUEST FOR INFORMATION	RESPONSE BY APPLICANT
A minimum size limit should be applied to the importation to reduce the chance of mistaken identity of juveniles with other similar looking fish species at the border	Please suggest and justify a suitable size limit to allow positive identification, with supporting evidence (Such as photos of fish at differing life stages – showing their similarities and differences to other similar fish).	This issue is outside of the terms of reference for the application. Under the current import conditions, fish specimens that cannot be identified as the species stated in import documentation (including health certification) are not released on inspection by DAWE. Size and sex limits have never been the responsibility of the applicant, but rather something that DAWE operations would usually handle. Over the years industry have worked with DAWE on mechanisms to ensure identification is easy, but size and sex should not impact an 'environmental' review as to whether the species can be added to the list. We will be happy to work with the relevant department when this species is approved on implementation of an appropriate size limit should it be deemed necessary.
This species on not on either the white or grey list, suggesting it could be from illegal imports, therefore on principle it should not be included on the Live Import list. To include it now, diminishes the intent of the list as it may be seen by others that you can get around the legalities by applying after the fact.		The Grey List is not and was never designed as a comprehensive list of all ornamental species that were present and traded in Australia. This is directly acknowledged in the 2006 report that published the grey list "A strategic approach to Ornamental fish management in Australia" (Appendix 2, Grey List, pg29). In any case regardless of how a species already present in Australia may have arrived in the past, does not (and should not) change or influence the process of a formal risk assessment when considering approval for addition to the allowable import list. There are some species on the grey list that were once allowable imports.
The applicant only presents an assessment of establishment likelihood, not biosecurity risk, as they have not considered the consequence to the environment, economy or socio-cultural values if this species were to establish.		With respect to risks associated with pathogens/diseases that may be carried in imported ornamental fish, a review of the scientific literature did not identify any hazards beyond those identified in the DEWA IRA (1999) and subsequent reviews (see TOR #8). These risks would be managed under the baseline import conditions that currently apply to all imported ornamental fish, which

		includes consideration of likely environmental, economic and social consequences of disease establishment, consistent with the Biosecurity Act (2015). Furthermore, it is our understanding based on DEWA advice that each species proposed for addition to the Live Import List is additionally reviewed by DEWA against its import risk analyses as part of the Live Import List approval process. If the intent of the stakeholder comment relates to the environmental, social and economic consequences of the fish species establishing in the wild in Australia, this is a core element of the TORs set out by DEWA and which the applicant has addressed (see TOR# 8), noting that there are no reports in the scientific literature of any ecological impacts as a result of the species establishing outside its natural range in other countries and that 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. Additionally, SARDI risk assessments were also commissioned to provide even greater support of the above claims.
Many species in the aquarium industry often have very little in the scientific literature particularly on tolerances (etc) and much of the information is garnished from industry and hobbyist websites. Consequently, it must be assumed that tolerances are likely to be greater than what is often just an ideal range.		This is not a fair or reasonable assumption; however, it is reasonable to suggest aquarium industry and hobby literature have thoroughly explored the tolerances of species commonly kept and traded. It is unreasonable to exclude or deem invalid the wealth of specific industry and hobbyist knowledge of a given species simply because it didn't come from a scientific journal, particularly when such information is not available in scientific journals. Most importantly, any judgement in this regard must be based on a sound understanding of the drivers for scientific research. Scientific research is typically undertaken on species that are considered to be problematic. The species that have been submitted for consideration for adding to the permitted species list have been chosen on the basis that

		these are not considered ecologically problematic despite years of international trade. Thus, the harmless nature of these species is precisely and logically the reason they have not been the subject of scientific research.
This species in not allowed into our state or territory (e.g. NT) – it is not an allowable import. Allowing a species in and therefore making it more affordable is not a valid reason for listing.		This issue is outside of the terms of reference for the application and is not relevant. Philosophical objections to adding more species to the permitted import list are not valid and need to be disregarded in any assessment. It is further noted that the only mechanism for Industry to have the keeping of new species recognised in Jurisdictions such as NT, WAS & TAS is to have them listed as suitable for live import in the EPBC act
This species may have been determined to have an establishment risk greater than low (i.e. moderate). Whilst there may be other species of moderate risk on the list this should not set a precedent for inclusion.		The fact that 'moderate risk' species are already present on the current list of species suitable for allowable import does indeed set the standard and expectation for what Australia views as appropriate in terms as an appropriate and acceptable level of risk. These include species that have gone through the formal EPBC ToRs and associated Bomford assessment process, including Bomford assessments undertaken by the Australian Government. Some of the existing species that are imported and traded that are deemed 'medium' have been imported with 100,000's and have posed no risk to the environment, and as such this limited establishment risk suggests they are of no risk.
Currently there are x number of fish on the Live Import List.	What evidence is there that one new species will have significant economic benefit or should be added?	This issue is outside of the terms of reference for the application and is not relevant. Philosophical objections to adding more species to the permitted import list are not valid and need to be disregarded in any assessment. This notwithstanding, it must be understood that fundamental to all hobbies of this nature, is the importance of variety and new species. It is this variety and availability of new species that sustains the ornamental fish hobby and the industries that support the hobby. Any new consumer item

		creates greater interest in those products, which is why the fashion industry is constantly releasing new colours in clothes and shoes. With a digital global economy, Australians are seeing new emerging international trends, which includes new varieties of fish as techniques allow species that had not been able to be bred, now available. Furthermore, it is good policy to permit the legal import of species that meet the required criteria addressed within the TOR. To reject them simply continues to provide an environment where smugglers are allowed to profit as they satisfy the consumer demand in these species in place of the legitimate industry
Potential impact of this species, if it were to establish a feral population in Australia	Provide evidence of what would happen if the fish become established in Australian waters.	This matter is directly and clearly addressed in the Department's TORs. There are no known diseases specific to this species that are exotic to Australia. The species is not reported to be invasive. In any case, this species is relatively benign, relatively small and similar in many respects to fish already deemed appropriate to be imported into Australia. The absence of information in formal scientific literature is not an adequate reason to suggest the species could be harmful in some respects. If there were problems with the species, then scientific studies would have been undertaken. Scientific research is typically undertaken on species that are considered to be problematic. The species that have been submitted for consideration for adding to the permitted species list have been chosen precisely because they are not considered ecologically problematic despite years of international trade. Additionally, SARDI risk assessments were also commissioned to provide even greater support of the above claims.

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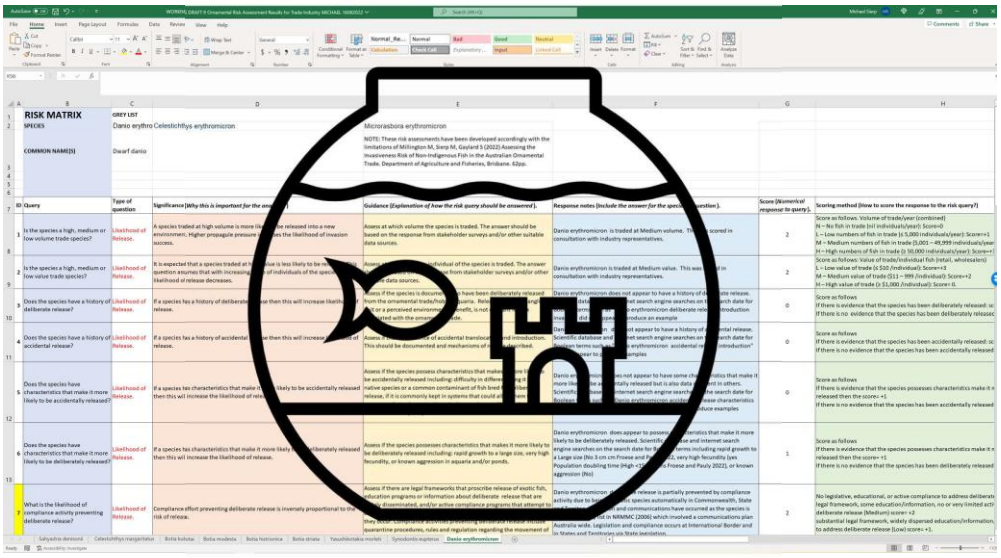
Client Reference : Aquarium Industry Association of Australia AIAA

Our Reference : R0590

Date : 09/09/2022

ASSESSMENT OF NINE ORNAMENTAL FISH RISK SPECIES USING THE SARDI METHOD FOR THE AIAA

Michael T. Sierp BSc. Hons. PhD, MBA, Dip. Mar Survey, CertIV Occ. Diving, CertIII Maritime Ops, Master <24m.



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1.2 PURPOSE

This Report is the introduction to nine ornamental fish risk assessments conducted in August 2022 with respect to Australian waters. The opinions expressed are given in good faith. This Report is issued without prejudice. In the opinion of the author the report constitutes a statement of the conditions at the time the work was carried out.

It is to be clearly understood that the condition/state of items hereafter reported upon are strictly the opinion of the undersigned and that opinion reflects the data found in August 2022 only, not exhaustively.

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2. SUMMARY

This technical report illustrates the results of processing nine ornamental fish species using 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. South Australian Research and Development Institute (Aquatic Sciences), Adelaide. SARDI Publication No. F2018/000280-1. SARDI Research Report Series No.991. 85pp.

The results are given in excel spreadsheets as an appendix with point scores and % data omissions.

Trade value and Trade volume data were provided by industry members.

The species progressed through the model included:

SCIENTIFIC NAME	**COMMON NAME**
Sahyadria denisonii	RED LINE TORPEDO BARB
Celestichthys marginatus	CELESTIAL PEARL DANIO
Botia kubotai	KUBOTAI LOACH
Botia modesta	REDTAIL LOACH
Botia histronica	HISTRONICA LOACH
Botia striata	BOTIA STRIATED LOACH
Yasushikotakia morleti	SKUNK LOACH
Synodontis eupterus	FEATHER FIN SYNODONTIS
Danio erythromicron	EMERALD TIGER RASBORA

The SARDI method results for these species appeared to be Low Risk noting some data was absent.

3. PROJECT DETAILS AND METHODS

Table 1. Background details

	Details
Principal	Dr Michael Sierp Relevant Qualifications: BSc.(Hons).PhD. MBA. Dip. Marine Surveying, CertIVOcc. Div. CertIII Transport and Logistics Master <24m

Dr Sierp is an experienced environmental scientist in the field of aquatic biosecurity, fresh and marine waters. He co-authored the report Millington M, Sierp M, Gaylard S (2022) Assessing the Invasiveness Risk of Non-Indigenous Fish in the Australian Ornamental Trade. Department of Agriculture and Fisheries, Brisbane. 62pp.

4. INTRODUCTION

Aquatic Biosecurity Pty Ltd was approached by the Aquarium Industry Association of Australia (AIAA) to process nine ornamental fish species through the SARDI risk assessment Deveney 2018. This was to be a complimentary study to Millington et al 2018 where 447 species were assessed.

Through the use of a series of scores based on the presence or absence of specific parameters that encompass different contributions to risk posed by each parameter, species are categorised as:

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

4. METHODS

A series of reference websites were used in the collation of the data required which lead to individual papers and abstracts. This information was then added to the templates and scores given accordingly. The data was taken from but not limited to the following sources:

Table 1. Key websites and the type of information they typically provided that were used to complete the rapid risk assessments (from Millington et al 2022).

Website name	Habitat	Range	Biology	Reproduction	Parasites	Disease	Disturbance	Invasive records	Native family
Fishbase[1]	Y	Y	Y	Y	Y	Y			
Climatch[2]	Y								
Google scholar search engine[3]	Y	Y	Y	Y	Y	Y	Y	Y	
Centre for Agriculture and Bioscience International[4]			Y					Y	
Explore United States Geographical Survey Invasive Species Research[5]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Food and Agricultural Organization[6]								Y	
Encyclopedia of Life[7]	Y		Y		Y				
Animal Diversity Web[8]			Y	Y					
Seriously Fish[9]			Y						
Native Fish Australia[10]									Y
Fishes of Australia[11]									Y
World Organisation for Animal Health[13]					Y	Y			
Victorian Fisheries Authority[14]					Y	Y			
Department of Health[15]					Y	Y			
The International Union for Conservation of Nature Red List of Threatened Species[17]	Y	Y	Y				Y		
Koppen-Geiger[18]	Y								
Planet Catfish[19]	Y	Y	Y	Y					
ProQuest Journal Access[21]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Research Gate[22]	Y	Y	Y	Y	Y	Y	Y	Y	Y

The SARDI excel template was filled out sequentially for each species accordingly with Deveney 2018 and where data deficiencies existed they were noted.

Queries ID14, ID16, ID28 and ID32 were updated after seeking qualification from Dr M.Deveney (SARDI) in his email on 25/10/2022 and are indicated by **.

The excel templates are attached as an excel file appendix to this report.

5.0 RESULTS – APPENDIX A RISK ASSESSMENT CRITERA RESULTS

[SEE APPENDIX FOR TEMPLATES]

Table 2. Results

SCIENTIFIC NAME	COMMON NAME	Score	Category	Data Deficiency %
Sahyadria denisonii	Red line torpedo barb	0	Low	27.5
Celestichthys marginatus	Celestial pearl danio	0	Low	22.5
Botia kubotai	Kubotai loach	-162	Low	27.5
Botia modesta	Redtail loach	-200	Low	30
Botia histronica	Histronica loach	0	Low	30
Botia striata	Botia striated loach	0	Low	27.5
Yasushikotakia morleti	Skunk loach	0	Low	30
Synodontis eupterus	Feather fin synodontis	-70	Low	27.5
Danio erythromicron	Emerald tiger rasbora	-27	Low	22.5

The results are significantly lower fromV1 to V2 after qualifying ID 14,16,28 and 32 with Dr M.Deveney's new interpretation from 25/10/2022.

6.0 BIBLIOGRAPHY COMPLIMENTARY WITH THE BIBLIOGRAPHY FROM *MILLINGTON M, SIERP M & GAYLARD S (2022)*

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Moravec, F. and J. Řehulka (1987). "First record of the cosmocercoid nematode Raillietnema synodontisi Vassiliades, 1973 from the aquarium-reared upside-down catfish Synodontis eupterus Boulenger." Folia Parasitologica **34**(2): 163-164.

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APPENDIX 2

RISK MATRIX

GREY LIST

SPECIES

Synodontis eupterus

Featherfin squeaker

NOTE: These risk assessments have been developed accordingly with the limitations of Millington M, Sierp M, Gaylard S (2022) Assessing the Invasiveness Risk of Non-Indigenous Fish in the Australian Ornamental Trade. Department of Agriculture and Fisheries, Brisbane. 62pp.

**Point score is taken from email M.Deveney Tue 25/10/2022 1:09 PM

ID	Query	Type of question	Significance (*Why this is important forthe analysis?*)	Guidance (*Explanation of how the risk query shouldbe answered*).	Response notes (*Include the answer for the species in question*).	Score (*Numerical response to query*).	Scoring method (How to score the response tothe risk query?)	Max Score	Data deficient
1	Is the species a high, medium or low volume trade species?	Likelihood of Release.	A species traded at high volume is morelikely to be released into a new environment. Higher propagule pressureincreases the likelihood of invasion success.	Assess at which volume the species is traded. The answer should be based on the response from stakeholder surveys and/or other suitable data sources.	Synodontis eupterus is traded at Medium volume.This was scored in consultation with industry representatives.	2	Score as follows. Volume of trade/year (combined) N – No fish in trade (nil individuals/year): Score=0L – Low numbers of fish in trade (≤ 5,000 individuals/year): Score=+1 M – Medium numbers of fish in trade (5,001 –49,999 individuals/year): Score=+2 H – High numbers of fish in trade (≥ 50,000 individuals/year): Score=+3.	3	
2	Is the species a high, medium or low value trade species?	Likelihood of Release.	It is expected that a species traded at high value is less likely to be released.This question assumes that with increasing value of individuals of the species the likelihood of release decreases.	Assess at which value an individual of the species istraded. The answer should be based on the responsefrom stakeholder surveys and/or other suitable data sources.	Synodontis eupterus is traded at Medium value.This was scored in consultation with industry representatives.	2	Score as follows: Value of trade/individual fish(retail, wholesalers) L – Low value of trade (≤ $10 /individual): Score=+3 M – Medium value of trade ($11 – 999 /individual): Score=+2 H – High value of trade (≥ $1,000 /individual): Score= 0.	3	
3	Does the species have a history of deliberate release?	Likelihood of Release.	If a species has a history of deliberate release then this will increase likelihoodof release.	Assess if the species is documented to have been deliberately released from the ornamental trade/hobby/aquaria. Release for food or angling, bait ora perceived environmental benefit, is not relevant for riskassociated with the ornamental trade.	Synodontis eupterus does appear to have a history of deliberate release. Scientific database and internet search engine searches on the search date for Boolean terms such as "Synodontis eupterus deliberate release introduction invasion" did appear to produce examples from Croatia (Dulcic et al 2018)and Croatia (https://eol.org/pages/217595)	1	Score as follows If there is evidence that the species has been deliberately released: score= +1 If there is no evidence that the species has been deliberately released: score= 0.	1	
4	Does the species have a history of accidental release?	Likelihood of Release.	If a species has a history of accidental release then this will increase likelihoodof release.	Assess if there is evidence of accidental translocationand introduction. This should be documented and mechanisms of release described.	Synodontis eupterus does not appear to have a history of accidental release through. Scientific database and internet search engine searches on thesearch date for Boolean terms such as "Synodontis eupterus accidental release introduction" did not appear to produce examples	0	Score as follows If there is evidence that the species has been accidentally released: score= +1 If there is no evidence that the species has been accidentally released: score= 0.	1	
5	Does the species have characteristics that make it more likely to be accidentally released?	Likelihood of Release.	If a species has characteristics that makeit more likely to be accidentally released then this will increase the likelihood of release.	Assess if the species possess characteristics that makesit more likely to be accidentally released including: difficulty in differentiating it from native species or a common contaminant of fish bred for deliberate release, if it is commonly kept in systems that could allow them to escape, and attachment and survival on equipment likelyto be translocated to open systems.	Synodontis eupterus does not appear to have some characteristics that make it more likely to be accidentally released but is also data deficient in others. Scientific database and internet search engine searches on the search date for Boolean terms such as "Synodontis eupterus accidental release characteristics resemble similar equipmentsystems survival" did not produce examples	0	Score as follows If there is evidence that the species possesses characteristics make it more likely to be accidentally released then the score= +1 If there is no evidence that the species has been accidentally released then the score= 0.	1	
6	Does the species have characteristics that make it more likely to be deliberately released?	Likelihood of Release.	If a species has characteristics that makeit more likely to be deliberately released then this will increase the likelihood of release.	Assess if the species possesses characteristics that makes it more likely to be deliberately released including:rapid growth to a large size, very high fecundity, or known aggression in aquaria and/or ponds.	Synodontis eupterus does appear to possess characteristics that make it more likely to be deliberately released. Scientific database and internetsearch engine searches on the search date for Boolean terms including rapid growth to a Large size (Yes 30cm cm Froese and Pauly 2022, very high fecundity (Yes Ofori-danson 1992) Population doubling time (medium Froese and Pauly 2022), or known aggression (Yes) https://www.seriouslyfish.com/species/Synodontis-eupterus/	1	Score as follows If there is evidence that the species possesses characteristics make it more likely to be deliberately released then the score= +1 If there is no evidence that the species has been deliberately released then the score= 0.	1	

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7	What is the likelihood of compliance activity preventing deliberate release?	Likelihood of Release.	Compliance effort preventing deliberate release is inversely proportional to the risk of release.	Assess if there are legal frameworks that proscribe release of exotic fish, education programs or information about deliberate release that are widely disseminated, and/or active compliance programs that attempt to detect deliberate releases when they occur or as soon as possible after they occur. Compliance activities preventing deliberate release include quarantine procedures, rules and regulation regarding the movement of fish.	Synodontis eupterus deliberate release is partially prevented by compliance activity due to being an exotic species automatically in Commonwealth, State and Territory legislation and communications have occurred as the species is listed in the grey list in NRMMC (2006) which involved a communications plan Australia wide. Legislation and compliance occurs at International Border and in States and Territories via State legislation.	2	No legislative, educational, or active compliance to address deliberate release (High) score=+3 legal framework, some education/information, no or very limited active compliance to address deliberate release (Medium) score= +2 substantial legal framework, widely dispersed education/information, active compliance program to address deliberate release (Low) score= +1.	3		Fisheries Management and Biosecurity Act(s); NRMMC (2006) A STRATEGIC APPROACH TO THE MANAGEMENT OF ORNAMENTAL FISH IN AUSTRALIA. Department of Agriculture, Fisheries and Forestry. Accessed 15/7/2021 http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.150.1666&rep=rep1&type=pdf 40pp; Release of Aquatic Organisms Policy
8	What is the likelihood of compliance activity preventing accidental release?	Likelihood of Release.	Compliance effort preventing accidental release is inversely proportional to the risk of release.	Assess if there are legal frameworks that proscribe activities that can inadvertently release exotic fish (controls on the location of fish farms and ponds, licensing or registration processes), education programs or information to aid in preventing accidental release that are widely disseminated, and/or active compliance programs that attempt to detect inadvertent releases when they occur or as soon as possible after they occur. Compliance activities preventing accidental release include improvement of identification expertise, public awareness.	Synodontis eupterus accidental release is partially prevented by compliance activity due to being an exotic species automatically in Commonwealth, State and Territory legislation and communications have occurred as the species is listed in the grey list in NRMMC (2006) which involved a communications plan Australia wide. Legislation and compliance occurs at International Border and in States and Territories via State legislation	2	No legislative, educational, or active compliance to address accidental release (High) score=+3 legal framework, some education/information, no or very limited active compliance to address accidental release (Medium) score=+2 substantial legal framework, widely dispersed education/information, active compliance program to address accidental release (Low) score= +1.	3		Fisheries Management and Biosecurity Act(s); NRMMC (2006) A STRATEGIC APPROACH TO THE MANAGEMENT OF ORNAMENTAL FISH IN AUSTRALIA. Department of Agriculture, Fisheries and Forestry. Accessed 15/7/2021 http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.150.1666&rep=rep1&type=pdf 40pp
9	Is the species domesticated or reared in a way that makes it more or less likely to survive if released?	Likelihood of invasion.	Domestication has the potential to enhance fitness (in terms of growth rate, mating success and/or fecundity) in domesticated strains (including transgenic strains) over wild strains (e.g. Muir and Howard, 1999). Domestication or rearing in a way that makes it more likely to survive if released increases the likelihood of invasion.	Assess if the taxon has been selectively bred for traits of benefit to humans (domesticated) or subjected to other selection or genetic modification.	Synodontis eupterus does have a history of domestication, selective breeding and inherited negative or deleterious traits of benefit to humans. Scientific database and internet search engine searches on the search date for Boolean terms such as "Synodontis eupterus domestication selective breeding genetic modification inherited negative deleterious" did appear to provide an example Pangraksa 2016	1	Score as follows: If a species domesticated or reared in a way that makes it less likely to surviveif released score= -1 If the species is not domesticated or reared in a way that makes it neither more nor less likely to survive if released score= 0 If a species is domesticated or reared in a way that makes it more likely to survive if released score= +1.	1		
10	Has the species established populations outside their native range?	Likelihood of invasion.	If a species has successfully established self-sustaining populations outside their native range then this will increase the likelihood of invasion.	Assess if there are records of established populations of the species in question outside their native range.	Synodontis eupterus does not appear to have established invasive populations outside its native range despite the occurences in Croatia according to Dulcic et al 2018 and Portugal I-naturalist report in Portugal (https://eol.org/pages/217595)	0	Score as follows no invasive populations score= 0 species has established non-native population(s) with defined limited range score= 1 species has established numerous populations but is limited to one continent score= 3 species has become broadly invasive on two or more continents score= 5.	5		
11	Is species reproductive tolerance suited to climates in the risk assessment area?	Likelihood of invasion.	The likelihood of invasion increases as the number of climate zones in the species' native range matching with Australian climate zones increases.	Using Climatch http://data.daff.gov.au:8080/Climatch/climatch.jsp assess how the climate in the species' native range matches the climate zone in Australia.	Highest Climatch score = 3 Score = 0	0	Climatch score 0-4.9 score= 0 Climatch score 5-7.9 score= 3 Climatch score 8-10 score= 5.	5		
12	What is the quality of the climate match?	Likelihood of Invasion.	The likelihood of invasions rises as the quality of climate match data improves.	Using Koppen-Geiger climate types (http://koeppen-geiger.vu-wien.ac.at/present.htm), estimate of the quality of the data used to generate the climate match, and if specific climatic requirements are present in the species' native environment that do not occur in Australia.	Synodontis eupterus area Aw, Am, Af, As Australia has Af, Am, Aw, Bwh, Bsk, Bwk,Bsh Cfa, Cfb, Csa,Cwa, Csb Corresponding Australian area Aw, Am	-1	Match quality high or species climatically tolerant score= 0 some climatic differences present that decrease likelihood of establishment score= -1 climate match poor, specific climatic features occur in native range that are not present in receiving habitat score= -3.	0		
13	Is the species environmentally versatile?	Likelihood of Invasion.	Environmental versatility is directly proportional to the species' likelihood of invasion.	Assess if the following traits apply: euryhaline, desiccation tolerant, takes wide range of food items, tolerates a wide range of water quality conditions, habitat variability, oxygen depletion tolerance and high temperature tolerance.	Scientific data base and internet search engine searches on the search for Boolean terms including : "euryhaline (No) omnivorous (Yes) water quality tolerant (No) water quality (No) habitat variability (No) oxygen depletion tolerance (No) temperature tolerance (No) https://www.seriouslyfish.com/species/Synodontis-eupterus/ Did not appear to find 3 examples	-1	If more than three traits apply score= +2 If fewer than three traits score= -1.	2	1	

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14	Is the species' native range well defined?	Likelihood of Invasion.	If a species' native range is well definedthen this increases the certainty that invasive records are accurate, and provides improved certainty of climate match.	Assess if the species' native range is uncertain. Uncertainty can be confirmed if the native range is notwell documented and/or unclear.	IUCN redlist and https://www.seriouslyfish.com/species/Synodontis-eupterus/ list native range of this species. The species is well defined **	-1	If populations that have been categorised as invasive are in the native range: Score= -3 If the native range is not well defined: Score= -1 If the native range is well defined and/or invasive populations are known to be introduced score= +1	1	1
15	Does the species have invasive relatives?	Likelihood of Invasion.	The status as a member of an invasive genus adds to the likelihood of invasion. Invasive history of a species and its congeners and confamilials is deemed tobe a good predictor of invasiveness potential (Ruesink et al., 1995; Reichard2001).	Assess if the species is related to invasive species.	Synodontis eupterus is not listed on the Global Invasive Species Database (ISSG) it does not appearto be a member of an invasive genus or family from areview of available literature	0	If the species is a member of an invasive Genus score= +3 If the species is a member of an invasive Family score= +1 If the species is not a member of an invasivegenus or family score= 0.	3	1
16	Is the species likely to avoid predation?	Likelihood of Invasion.	Avoidance of predation increases the likelihood that an introduced species will survive, establish and breed.	Assess if the species has characteristics that are likely to decrease predation including if it is unpalatable to predators, spiny or armored, toxic to fish, unusually cryptic or burrowing or likely to inhabit in systems devoidof predators.	Synodontis eupterus is reported as a ray finned fish by Froese and Pauly 2022 with spines ** (yes https://www.seriouslyfish.com/species/Synodontis-eupterus/), unpalatable (?), armoured (no), toxic (No), unusually cryptic (Yes spots https://www.seriouslyfish.com/species/Synodontis-eupterus/) burrowing (?) and likely to inhabit in systems without predators (?)	1	If the species is unpalatable to predators in the receiving environment score= 1 If the species is palatable to predators in the receiving environment or there are no predators inthe receiving environment score= 0.	1	
17	Are predators absent from waters where thespecies is likely to become invasive?	Likelihood of Invasion.	If predators are absent then the likelihoodof invasion is increased.	Assess if the species is suited to and likely to be introduced to environments with no natural predators.	Using climatch and the Koppen-Geiger climate typesit does not appear that predators would not be present	0	If predators are likely to be absent in suitable environments score= +1 If predators are likely to be present in suitable environments score= 0.	1	
18	Does the species exhibit parental care, is it a livebearer or Caquetaia kraussii?	Likelihood of Invasion.	If a species expresses parental care, mouth-brooding and/or live-bearing behavior, this will increase its likelihoodof successful establishment.	Assess if the species uses parental care, mouth- brooding and/or live-bearing. Parental care in fish includes the protection of the clutch after spawning. Mouth-brooding fish hold eggs or newly hatched young intheir mouths. Live-bearing fish bear live young rather than depositing eggs.	No evidence of mouthbrooding and parental care (https://www.fishlaboratory.com/fish/featherfin- catfish/)	0	If a species displays parental care, is a livebeareror mouth-brooder score= +1 If the species does not display parental care, is nota livebearer or mouthbrooder score= 0.	1	
19	Is the species known to reduce age-at-maturity in response to environment?	Likelihood of Invasion.	If the species displays decreased age-at-maturity in response to environmental stressors then this will increase the likelihood of invasion.	Assess if the species can adapt its age-at-maturity in response to environmental pressures.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "age at maturity plasticity" did not appear to provide examples and isdata deficient (Froese and Pauly 2022)	0	If the species is known to reduce age-at-maturityin response to environment score= +2 If the species does not reduce age-at-maturity in response to environment score= 0.	2	1
20	Is the species hermaphroditic?	Likelihood of Invasion.	Hermaphroditism is expected to facilitate successful establishment, thus the likelihood of invasion increases. Some fish that exhibit this characteristic are simultaneous hermaphrodites, which means that they can be both genders at the same time and are able to mate withany individual in their species if present.Other fish species are sequential hermaphrodites, which means that they can change sex once or even multiple times in their lifetime.	Assess if the species is hermaphroditic, reproduces asexually or is parthenogenesis: this occurs where bothmale and female reproductive organs are present in thesame individual.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "hermaphroditic" and"hermaphrodite" did not appear to provide exampleswhich suggest it is a hermaphrodite.	0	If the species is hermaphroditic score= +3; if the species is not hermaphroditic score= 0.	3	1
21	Is the species dependent on the presence of a specific habitat feature to complete its life cycle, and is this particular habitat feature present inthe areas susceptible to invasions?	Likelihood of Invasion.	The presence of a habitat feature required by the species to complete itslife cycle is expected to increase the species' likelihood of invasion.	Assess if the species requires a specific habitat featureto complete its life cycle. Some species require specifichabitat features (e.g. fast-flowing water, particular species of plant or types of substrata) in order to reproduce successfully.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus breeding habitat didnot present particular examples	0	If the species is dependent on the presence of specific habitat features to establish, and this particular habitat feature is present in the areas susceptible to invasions score= +1 If the species is dependent on the presence of habitat features to complete its life cycle, and thisparticular habitat feature is not present in the areas susceptible to invasions score= -1 If the species is not dependent on the presence of a specific habitat features to complete its life cyclescore= 0.	1	

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22	Does the species have reproductive characteristics other than parental care thatincrease its likelihood of being invasive?	Likelihood of Invasion.	If a species possesses such reproductivetraits then this will increase its likelihood of invasion.	Assess if the species has reproductive characteristics that increase its likelihood of being invasive including high fecundity (>10,000 eggs/kg), batch spawning, serial(multiple) spawning, extended spawning, embryos that can resist environmental extremes or enter diapause.	Scientific database and internet search engine searches on the search date for Boolean terms including high fecundity (Yes Ofori-danson 1992), population doubling is medium (Froese and Pauly 2022) batch spawning (yes), extended spawning (?),embryos that can resist environmental extremes or enter diapause" did not provide examples.	1	If the species has reproductive characteristics that increase its likelihood of being invasive score= +1If the species has no reproductive characteristics that increase its likelihood of being invasive: score= -1.	1	
23	Is the species' generation time facilitative of invasions?	Likelihood of Invasion.	Generation time is directly proportional tothe species' likelihood of invasion.	Assess the species' average time from hatching to maturity in years.	Synodontis eupterus's minimum population doublingtime is 1.4 - 4.4 years (Froese and Pauly 2022)	0	Minimum population doubling time <1.4 years score= +1 1.4-4.4 years score= 0 ≥4.4 years score= -1.	1	1
24	Does the species tolerate or benefit from environmental disturbance?	Likelihood of Invasion.	If the species tolerates or benefits from environmental disturbance then the likelihood of establishment is increased.	Assess if there is evidence that the species benefits from temporary changes in the average environmental conditions or unusual events, particularly human impacts.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "habitat disturbanceenvironmental disturbance" did not appear to providean example to support this	-1	If the species tolerates or benefits from environmental disturbance score= +1 If the species does not tolerate or benefit from environmental disturbance score= -1.	1	1
25	Where the species occurs outside its nativerange are there impacts on wild aquatic species?	Consequence.	History of impacts on wild aquatic species outside its native range is expected to increase the probable consequence (further impact).	Assess if there is evidence of impacts on wild aquatic species such as the decline, endangerment or extinctionof native species, including correlational evidence.	Scientific database and internet search engine searches for Boolean terms including Synodontis eupterus "introduction species impacts" did not appear to find examples of invasion. Any invasion willimpact on an ecosystem through predation or competition.	0	No impacts on wild aquatic species recorded score= 0 Species has had impacts on wild aquatic species outside its native range but this impact is found over a limited range score = +1 Species has had impacts on wild aquatic species outside its native range in more than one natural ecosystem on one continent score= +3 Species has had impacts on wild aquatic species outside its native range on two or more continents score= +5.	5	
26	Where the species occurs outside its nativerange are there impacts on farmed aquatic species?	Consequence.	History of impacts on farmed aquatic species outside its native range is expected to increase the probable consequence (further impact).	Assess if there is evidence of impacts on farmed speciessuch as costs from control of the species or productivity losses.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "introduction aquaculture impacts" did not appear to provide examples to support this.	0	No impacts on farmed aquatic species score= 0 Species has impacts on farmed aquatic species outside its native range but this impact is found ina natural ecosystem with limited range score= +1Species has had impacts on farmed aquatic species outside its native range in more than onenatural ecosystem on one continent score= +3 Species has had impacts on farmed aquatic species outside its native range on two or more continents score= +5.	5	
27	In the species' non-native rangeis there evidencethat the species has altered the structure or function of a natural ecosystem?	Consequence.	If the species in question has altered the structure or function of a natural ecosystem then this increases the probable consequence.	Is there evidence that the species has caused changesin the structure or function of a natural ecosystem in its invasive range.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "introduction ecosystem engineer" did not appear to provide examples to support this.	0	No evidence of structural change score= 0 Species has altered the structure or function of a natural ecosystem in a limited range score= +1; species has altered the structure or function of more than one natural ecosystem in one continentscore= +3 Species has altered the structure or function of natural ecosystems in two or more continents score= +5.	5	
28	Does establishment of the species posea risk to human health?	Consequence.	If a species is known to cause harm to humans, e.g. poison, venom this will increase the probable consequence.	Assess if the species is harmful to humans including poisonous, venomous, or traumatogenic.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "harmful harmless threat" did not appear to provide examples to supportthis. Froese and Pauly 2022 suggest harmless **	0	If the species is known to pose a risk to humanhealth score= +2 If the species does not pose a risk to humanhealth score= 0.	2	
29	Where established outside its native range does the species out compete native species?	Consequence.	If a species has a record of outcompeting native species where it has established outside its native range then this will increase the probable consequence.	Assess if there is evidence where the species has established outside its native range if interactions occurthat which decrease the fitness of native species.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "range extension outcompete" did not appear to provide examples	0	If the species out competes native species whereit has established outside its native range score= +1 If the species does not out compete native specieswhere it has established outside its native range: Score= 0.	1	1

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ID	Query	Type of question	Significance (*Why this is important forthe analysis?*)	Guidance (*Explanation of how the risk query shouldbe answered*).	Response notes (*Include the answer for the species in question*).	Score (*Numerical response to query*).	Scoring method (How to score the response tothe risk query?)	Max Score	Data deficient
30	Is the species parasitic or micro predatory?	Consequence.	Invasions of parasitic fish have a historyof high consequence, particularly wherethose species were not present prior to the invasion.	Assess if the species is a parasite which is obligately or facultatively dependent on a non-mutual relationship with another species, or whether the species is a micropredator, consuming parts of other species withoutkilling them, and if suitable hosts or prey are available inthe receiving environment.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "parasitic micropredatory" did not appear to provide examplesto support this.	0	If the species is parasitic and suitable hosts are present score= +1; if the species is not parasitic orno hosts are present score= 0.	1	0
31	Does the species prey on a native species, particularly those previously subjected to low (or no) predation?	Consequence.	Invaders that feed on native species with poor resilience to predation is expected toresult in an increase of the probable consequence.	Assess if the species is likely to prey on native speciesand if the species is likely to establish in hydrosystems normally devoid of predatory fish (generally remote systems with low species richness).	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "predator native species" did appear to provide an example wheresmall fish would be seen as food https://www.seriouslyfish.com/species/Synodontis-eupterus	1	If the species has a history of preying on native species score= +1 If the species has no history of preying on native species score= 0.	1	
32	Does the species host, and/or is it a vector, for recognised pests and pathogens, especially non-native?	Consequence.	If a species is the host, and/or a vector,for recognised pests and pathogens, especially non-native ones, this will increase the risk for consequence.	Assess if the species is a recorded host of serious with non-native pathogens and parasites, with the host eitherbeing the original introduction vector of the disease or asa host of the disease brought in by another species.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "pathogens parasitespests disease" did appear to provide specific examples. Parasites were described by Moravec andRehulka (1987) who described the cosmocercoid nematode Raillietnema synodontisi Vassiliades, Onyedineke et al 2010 described Procamellanus and Camelanus Nematodes, Paramphistomum, Clinostomum and Bucephalus Trematodes, and Pomporhynchus, Quadrigydae Acanthocephala. Box et al 2021 also described infection with Dracunculus species nematodes. **	3	Species is not described as carrying a disease/pathogen score= 0 Species hosts a pathogen/parasite of low significance or which is not recorded as causingdisease score=+1 Species hosts a disease of moderate significancebut which is not notifiable score= +2 Species hosts a notifiable and/or environmentally significant disease score= +3.	3	1
33	Does the species feed on a broad range of diet items?	Consequence.	If a species feeds on a broad range of diet items, the probable consequence is increased.	Assess if the species feeds on a wide range of both plantand animal taxa. Assess if the species is an opportunistic, general feeder that is not specifically adapted to consuming either animal or plant material.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "diet" did provide theexample from https://www.seriouslyfish.com/species/Synodontis-eupterus/ that the species is omnivorous and will accept most all foods	2	Species is known to feed on a broad range of dietitems score= +2 Species is not known to feed on a broad range ofdiet items score= 0.	2	
34	Can the species hybridize naturally with native species?	Consequence.	Interspecific hybridization with native species under natural conditions increases the probable consequence.	Asses if interspecific hybridization with native species inthe area likely to be invaded is recorded under natural conditions.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "hybridization" doesnot appear to provide an examples	0	Species is known to hybridize naturally with species native to the recipient area score= +2No data of hybridization but native species insame Family present score=1 Species is known not to hybridize with native species, or there are no native species in thesame family: score= 0.	2	1
35	Does the species generally inhabit environments that are facilitative of dispersal?	Consequence.	If the species prefers environments thatare facilitative of dispersal the probable consequence is increased.	Assess if the species generally inhabits environments where natural dispersal of eggs or larvae will occur (fluvial) , or if the species prefers environments that areclosed water bodies (lacustrine) where natural dispersalis less likely.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus " dispersal" does appear to provide examples as it is found in in fluvialhabitats such as rivers (Froese and Pauly 2022) anddrainages (Dulcic et al 2018)	1	If the environment in which the species is likely to establish is facilitative of species dispersal score= +1 If the receiving environment is not facilitative of species dispersal score= 0.	1	
36	Is the species migratory?	Consequence.	If there is evidence of migratory behaviorthis will increase the probable consequence.	Assess if the species move from one region or habitat to another according to the seasons.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "migratory " did notappear to provide examples to support this. IUCNredlist states not migratory	0	If the species is migratory: Score=+1 If the species is not migratory: Score=0.	1	1
37	Is the species susceptible to control measures?	Consequence.	Susceptible to control measures is inversely proportional to the species' probable consequence.	Assess if there the species is documented to be resistantto control agents including piscicides or if there are no control options available.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "control measures eradication pest" does not appear to provide examples including	0	If the species is susceptible to control measures(can be eradicated) score=0 If the species possess some resistance to control measures (can be controlled with additional or particular effort) score= +1 If the species possess high resistance to control measures (very difficult to control or can not be controlled) score= +3.	3	

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38	Is there a history of economic loss caused by the fish species within its invasiverange?	Consequence.	History of economic loss increases the probable consequence.	Assess if the species has caused economic impacts including reduced productivity, costs of mitigation, remediation and eradication, research costs, reduced earnings, impacts to export markets, banning of sale of commercially popular species, interruption of commercialaquatic activities, increased requirements for biosecurity/management in aquaculture or irrigation or decreased quality of commercially valuable water.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "economic loss" doesnot appear to provide examples to support this	0	No history of economic loss score= 0 Some economic loss over limited geographicrange score= +1 Substantial economic loss on one continentscore= +2 Substantial economic loss on more than one continent score= +5.		5	
39	Are there any icon species, high value environmental assets, or other environmentally significant valuesin Australia placed at risk by the establishmentof this species?	Consequence.	If the species places any icon species, high value environmental assets, or other environmentally significant values in Australia at risk will increase the probableconsequence.	Assess if there are native species which have public appeal, promotional and publicity value, or which have been used to harness conservation for that species andother taxa that may be affected by establishment of thespecies. Assess if the species has a history of impacts that could affect these icon species. Impacts include predation, competition, reduced habitat quality, geneticeffects such as hybridization or introgression, introduction of parasites or pathogens, changes in disturbance regimes, resource pools and supply rates, predation etc. Icon species, high value asset include forexample threatened species, habitats or ecosystem types that are likely to be exposed to the pest species during the invasion process.	Scientific database and internet search engine searches on the search date for Boolean terms including Synodontis eupterus "environmental loss"does not appear to provide examples to support this.	0	Impacts on icon species, high value environmentalassets, or other environmentally significant valuesin Australia unlikely score= 0 Some impact on icon species, high value environmental assets, or other environmentally significant values in Australia likely score= +2 Substantial impacts on icon species, high value environmental assets, or other environmentally significant values in Australia likely score= +5.		5	
40	Are there any socially significant assetsor amenities (notrelated to humanhealth) threatened by the establishment of this species?	Consequence.	If the species threatens any socially significant assets or amenities (not related to human health) in Australia thiswill increase the probable consequenceof invasion.	Assess if the species has a history of impacts that affectthe way humans use the invaded environment, with particular relevance to industry, notable environmental features or lifestyle that have social value.	Scientific database and internet search engine searches on the search date for Boolean terms including Botia sp."social loss" does not appear toprovide examples to support this	0	Impacts on socially significant assets or amenities(not related to human health) in Australia unlikely score= 0 Direct or indirect impacts on socially significant assets or amenities (not related to human health)in Australia likely score= +2 Substantial impacts on socially significant assetsor amenities (not related to human health) in Australia likely score= +4.		4	

Likelihood of:	*Raw score*	*Raw max*	*Score*	*Deficiency %*
Release	**10**	**16**	**6**	**27.50**
Invasion	**-1**	**29**	**0**	
Consequence	**7**	**46**	**2**	
Total	**-70**	**21344**	**0**	

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