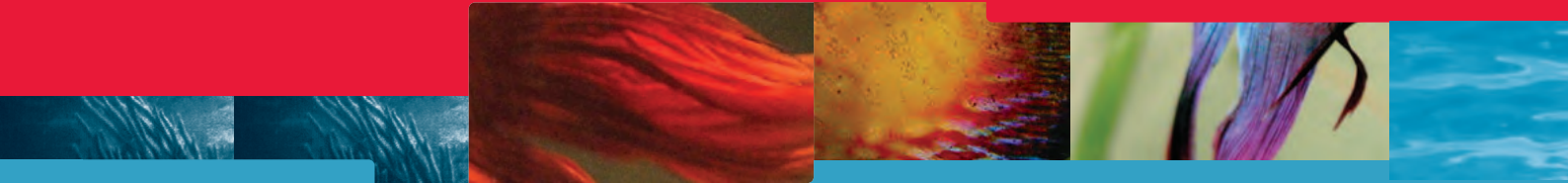




Australian Government
Department of Agriculture,
Fisheries and Forestry



A STRATEGIC APPROACH TO
**THE MANAGEMENT OF
ORNAMENTAL FISH
IN AUSTRALIA**

COMMUNICATION STRATEGY
AND GREY LIST REVIEW -
A REPORT TO OFMIG



Australian Government
Bureau of Rural Sciences

A strategic approach to the management of ornamental fish in Australia

Communication strategy and grey list review – a report to OFMIG

Andy Moore, Nicholas Marton and Alex McNee

March 2010

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Postal address:

Bureau of Rural Sciences
GPO Box 858
Canberra, ACT 2601

Copies available from:

www.brs.gov.au

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Executive summary

The ornamental aquarium fish trade in Australia is estimated to be worth approximately \$350 million annually. This ornamental fish industry encompasses commercial fish breeding facilities, wholesale traders and importers, retail outlets and the hobby sector.

While a valuable industry, the introduction of exotic (non-native) species can present a significant risk to freshwater ecosystems in Australia and has the potential to alter or degrade natural systems. Exotic fish species have been implicated in the decline of 42 per cent of Australian native fish and several frog species.

It is estimated that there are around 2000 species in the ornamental fish trade nationally, most of which are exotic to Australia. Many fish species in the ornamental fish trade are not on the current national permitted species lists established under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* or covered by quarantine regulations. It may be that such species have been permitted under previous statutory arrangements, but they are no longer on any national permitted lists and have not been assessed for potential risk to the Australian environment.

To date 30 ornamental fish species have found their way into Australian native aquatic ecosystems and have been shown to have a significant impact on these systems. Of the 30 ornamental species established in Australia, 10 (33 per cent) of these species are currently on the permitted imports list, demonstrating how aquarium species can find their way into freshwater systems. Future escapes of ornamental fish have the potential to compound current impacts on native faunal and floral assemblages. Several ornamental species also pose a direct threat to human health. The Ornamental Fish Management Implementation Group (OFMIG) was formed in 2006 to address this issue. OFMIG developed a national strategy which included the creation of a national noxious and 'grey list' for problem species. Grey list species are defined as those ornamental fish species detailed in *A Strategic Approach to the Management of Ornamental Fish in Australia* (DAFF, 2005) that are currently not on the noxious list, and require further investigation/consideration and risk assessment.

The Bureau of Rural Sciences (BRS) was tasked by the OFMIG with:

- 1) developing a communication strategy to reduce the incidence of ornamental fish releases into the wild and how to dispose of unwanted pet fish
- 2) reviewing those ornamental fish species currently on the grey list outlined in the national report *A Strategic Approach to the Management of Ornamental Fish in Australia*.

A communication strategy has been developed, together with associated communications material. The communication message was based on the target audience's (ornamental fish keepers and hobbyists) likely level of interest and understanding, and a brief explanation of why ornamental fish should never be released into the wild. The messages developed for industry provide more detail about the potential impacts ornamental fish can have if released into the wild and some basic statistics on the number of ornamental fish thought to be present in Australia.

A rapid risk assessment approach was developed to assess the potential impact of ornamental fish on the environment and other species if released into the wild. The risk assessment matrix is based on 16 criteria covering climate compatibility, establishment history, resilience and hardiness, impacts on environment and native species, genetic and disease threats, and captivity status. The approach has been independently assessed by the Australian Centre of Excellence for Risk Analysis (ACERA). An independent expert technical group also provided input for the first tranche of species run through the matrix. This report has assessed risk for 447 ornamental fish species from the national grey list.

The communication strategy directly contributes to addressing the need for increased engagement with the ornamental fish trade on the key issue of proper disposal of unwanted pests. The rapid risk assessment provides a scientific, transparent and repeatable process for reviewing the potential risk of ornamental fish to Australian freshwater ecosystems.

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1 Introduction

The introduction and spread of exotic (non-native) species is a significant threat to global biodiversity and ecological health (Courtenay and Moyle 1992; Vitousek et al. 1997; Rixon et al. 2005; Dudgeon et al. 2006). The introduction of exotic fish can lead to the homogenisation of global fish communities, where local distinctions between fish fauna are reduced (Rahel 2000; 2002). Exotic fish present a significant risk to the health of freshwater systems in Australia through competition with, or predation on, native species, aggressive interactions, introduced diseases and hybridisation (Corfield et al. 2008; Rowe et al. 2008). Exotic fish species are considered to be a contributing factor in the decline of 42 per cent of Australian native fish and several frog species (Wager and Jackson 1993; Morris et al. 2001; Reynolds 2009).

Once established, exotic fish can be very difficult and expensive to eradicate (Simberloff, 2003). There are 30 exotic ornamental (aquarium) fish species known to be established in Australian freshwater ecosystems, with many of these species shown to, or suspected of, having a significant impact on native biodiversity (Lintermans 2004; Corfield et al. 2008). Of the 30 ornamental species established in Australia, 10 (33 per cent) of these species are currently on the permitted imports list (maintained by the Department of Environment, Water, Heritage and the Arts) demonstrating how aquarium species can find their way into freshwater systems. It seems prudent, therefore, to review the potential risks associated with exotic species imported or traded within Australia.

The management of the ornamental fish trade in Australia is complex with different regulatory frameworks and management regimes in each jurisdiction. Movement of fish across borders appears to occur regularly, and with the exception of some major wholesale businesses or hobby groups, there is little understanding of what species are traded in Australia. Similarly, there is little understanding of the level of prohibited or noxious fish bred and traded within the industry (DAFF 2005).

There are two main pieces of legislation that cover the import of fish species; Part 13A – International Movement of Wildlife Specimens of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Part V – Quarantine of Animals and Plants of the *Quarantine Act 1908* (Quarantine Act). Many fish species in the trade are not on the current national permitted import lists established under the EPBC Act or covered by regulations under the Quarantine Act. It may be that such species have been permitted as imports under previous statutory arrangements. However, these species are no longer on the live import list and are unlikely to have been assessed for their potential risk to the environment. There is a need for greater consistency between mechanisms or controls across regulatory agencies to deal with noxious fish.

Past efforts to regulate the ornamental fish industry have had limited success, primarily as a result of limited consultation with stakeholders. It is important, therefore, that this process consults widely with industry and hobbyists. The Pet Industry Association of Australia (PIAA) supports the review of the ornamental fish trade industry and the consultative process including stakeholders from the industry and hobby sectors (DAFF 2005).

State, territory and Commonwealth government officials met in September 2002 with aquarium industry representatives to develop a greater understanding of the aquarium industry and identify practical ways to address issues of pest and disease within the aquarium fish trade. Following this meeting a report was presented to the Marine and Coastal Committee (MACC) of the Natural Resource Management Standing Committee (NRMSC) which outlined issues within the ornamental fish trade and included a recommendation to establish a working group to address these issues. As a result, the Ornamental Fish Policy Working Group (OFPWG) was established.

The report *A Strategic Approach to the Management of Ornamental Fish in Australia* (hereafter, 'the strategic plan') (DAFF, 2005) was developed by OFPWG and submitted to the Natural Resource Management Ministerial Council (NRMMC), which endorsed the report at their 11th Meeting on 24 November 2006. At this meeting NRMMC also agreed to provide funding for two years, with an option for a third, to implement the key recommendations of the strategic plan. At the 15th Australian Fisheries Management Forum meeting and the 21st MACC meeting, members supported the draft implementation plan and terms of reference and establishment of the Ornamental Fish Management Implementation Group (OFMIG). OFMIG is funded by the jurisdictions and the Commonwealth and includes representatives from state and territory jurisdictions, Department of the Environment, Water, Heritage and the Arts (DEWHA), ornamental fish trade, aquaculture and the aquarium hobby sector.

The strategic plan recommended the following actions to manage ornamental fish in Australia:

1. Agree on and adopt a national noxious species list across all jurisdictions, noting links to existing lists and lists under development for marine pest species
2. Agree to review the status of fish on the 'grey list' (species highlighted as possibly having biological/ecological traits that may make them invasive if released) as a national priority
3. Establish a scientific/technical working group reporting to NRMSC (through the MACC), to conduct assessments of fish on the grey list over the next 2–3 years
4. Adopt a regulatory framework and licensing to manage large fish-breeders and ornamental fish importers in each state and territory
5. Develop control mechanisms for the regulation and management of noxious fish and rare fish already in circulation in Australia, again noting links to control plans for marine pests of concern
6. Initiate a review of aquatic plants used in the ornamental fish trade to control and regulate the spread of a number of recognised aquatic pest species
7. Implement a national communication strategy to raise awareness in the community and industry about the management, control and regulation of ornamental fish and invertebrates.

PIAA, in association with state/territory governments, has committed to the implementation of the strategic plan recommendations to ensure the industry has an economically sound and environmentally sustainable future.

The primary tasks of OFMIG were to: pursue regulatory changes within jurisdictions to adopt the nationally agreed noxious fish list and associated changes for the management of the ornamental sector; undertake a review of those species currently on the grey list; and to develop a communication strategy and tools to increase awareness about the management of ornamental fish across Australia.

The Bureau of Rural Sciences (BRS) was involved in the development of the strategic plan and provided technical and executive support to OFMIG in the delivery of the implementation plan. BRS provided technical assistance in the development of a communication strategy and associated tools and worked with DEWHA to develop a rapid assessment method for 'grey list' species.

OBJECTIVE:

This report details the work undertaken by BRS since 2006 to assist with the implementation of the strategic plan. The objective was to develop: 1) a communications strategy; and 2) a rapid risk assessment method for 'grey list' species. This risk assessment method was used to review 447 out of 778 'grey list' fish species.

2 Communication strategy

The strategic plan recommends the implementation of:

...a national communication strategy to raise the awareness in the community and industry about the management, control and regulation of ornamental fish and invertebrates.

An initial draft communication strategy was prepared by OFPWG. The communication strategy was further developed by BRS in consultation with OFMIG. The final draft (Appendix 1) is a working document to be updated by OFMIG as required. It outlines the key issues, aims/objectives, key messages, target audience and a range of communication approaches and tools to support implementation of the communication strategy. The strategy is designed to be implemented by each of the relevant jurisdictions.

Through the development of the communication strategy, primary and secondary stakeholders were identified as well as relevant messages to target them. Two groups of primary stakeholders were identified, general public and industry, while secondary stakeholders included government compliance/enforcement officers and public aquariums. Other education sources, such as news sources and programs like “Totally Wild” and “Better Homes and Gardens” were also identified as secondary stakeholders.

Messages were based on the target group’s likely level of interest and understanding and included the slogan ‘bag it, freeze it, bin it’, and a brief explanation of why ornamental fish should never be released into the wild. The messages developed for industry provide more detail about the potential impacts ornamental fish can have if released into the wild and the number of ornamental fish thought to be present in Australia.

Consultation with animal ethics groups suggested euthanising fish by freezing them may not meet ethical requirements and OFMIG is continuing discussions as to the appropriate disposal message that can be broadly circulated. Currently, the only agreed option for disposing of unwanted fish is to return them to pet shops or state agencies.

Several communication products were developed including:

- Final strategic plan – *A Strategic Approach to the Management of Ornamental Fish in Australia*. Design, printing and distribution in hard and soft version (web distribution through BRS website) including associated ministerial and media materials
- Ornamental fish web page – design, establishment and maintenance of the web page <http://www.brs.gov.au/ornamental>, which is now hosted by PIRSA Fisheries and can be found at http://www.pirsa.gov.au/fisheries/home/the_national_ornamental_fish_management_implementation_group (Appendix 2) and dedicated email contact (including separate materials to include the national noxious list on www.feral.org.au – a website on feral animals in Australia managed by the Invasive Animal CRC)
- Draft communication strategy – for the implementation process (Appendix 1) including a network of key communication contacts within the jurisdictions
- Key messages – consultations on development of key messages for implementation of the strategy (including consultations with the Invasive Marine Species Unit within the Department of Agriculture, Fisheries and Forestry, looking at synergies on messages for freshwater and marine ornamental fish)
- Postcards – preparation and distribution of communication products including postcards for Pet Expo, and design and artwork for flyer and second postcard. A postcard was also developed to help promote the national release strategy to industry members, the hobby

sector and the general public (see Appendix 3) and distributed through the Melbourne Pet Show and stakeholders

- Press releases – were provided with the ministerial launch and articles were also provided to targeted trade magazines
- Additional draft communications material – was prepared for consideration by OFMIG at meetings.

3 Review of species on the grey list

A national noxious list comprising approximately 569 species was endorsed through the adoption of the strategic plan. Through the work of OFMIG, the states and territories have been working to implement the agreed noxious list through their respective legislation. A second list of species and genera that were potentially noxious were identified as the 'grey list' from the species known to be present in Australia (DAFF 2005). Grey list species are defined as those ornamental fish species detailed in the strategic plan grey list that are currently not on the noxious list, and require further investigation/consideration and risk assessment.

The strategic plan recommended that agreement be sought to:

... review the status of fish on the grey list as a national priority.

This action was agreed to and identified as a component of OFMIG's work program. OFMIG tasked BRS to undertake a review of the grey list to identify potentially high risk noxious species.

As the grey list contains individual species as well as whole families or genera not broken down to species level (e.g. catfish in the family Pangasiidae or puffer fish in the genus Tetraodon), it was necessary to identify to species level what fish were on the grey list. The online database FishBase (www.fishbase.org) was used due to the requirement for data to have been reviewed by relevant technical experts prior to being published on the site. Through FishBase, BRS determined there were approximately 780 species on the grey list. The number of species the list encompasses is not static. Ongoing research on species captured by the list has led to changes in the number of species assigned to the genera listed.

OFMIG agreed that a rapid risk assessment method using appropriate criteria and similar ranking systems to existing risk assessment models should be used to provide an initial assessment of grey list species.

Existing risk assessment systems for ornamental or alien fish were reviewed (Kolar and Lodge 2001, 2002; Clunie et al. 2002; Bomford 2003; Bomford and Glover 2004; Kolar 2004; Copp et al. 2005; Webb 2006; Wilding and Rowe 2008). A risk assessment based around the Fish Risk Assessment Model of New Zealand (Wilding and Rowe, 2008), an existing model from Australia (Bomford and Glover 2004) and a model from the United Kingdom (Copp et al. 2005) were seen as the most appropriate for adaptation for rapid risk assessment. The risk assessment provides an initial risk rating and identifies species that may present a greater risk to the Australian environment if they were to be released into the wild.

This chapter describes the risk assessment method including criteria, technical workshop, and independent assessment, as well as the results for grey list tranche 1 and 2 species. Due to the number of species to be reviewed, it was decided to complete the work in two tranches. Tranche 1 reviewed 132 species, which have been assessed by a technical working group. Tranche 2 reviewed 315 species, which have not been assessed by a technical working group.

3.1 Developing a rapid risk assessment method

The development of a risk assessment framework for reviewing potentially invasive species has to balance collecting sufficient relevant data with limited available resources. To assess whether species are likely to establish in a new environment relies on collecting and interpreting information on the biological/ecological traits of the species, as well as the climatic conditions it can tolerate. Generally, data can be difficult and costly to obtain, however, surrogates can be used such as the climatic conditions inherent to the species natural distribution. However, for many biological/ecological traits, data gathering can be more difficult. Therefore, risk assessments dealing with data poor species are likely to be dependent on a wide variety of source information, both domestic and international.

The risk assessment framework in the strategic plan promoted the use of the Bomford model which is based on climate matching data for the species being reviewed and predictions where that species may spread given its historical distribution (Bomford 2006). The conventional review method currently used by DEWHA for risk assessments of birds and reptiles was revised to broaden the base of information available to assist in this review.

The method developed, comprising a review matrix and the involvement of experts through a workshop, was agreed in principle at OFMIG's meeting in November 2008. The final review matrix methodology is the result of further development since November 2008. Comments and suggestions were included from industry, states, and the experts participating in the workshop on 16 October 2008.

The review matrix provides a useful framework for rapidly assessing available information across criteria that are relevant to decisions on whether a species could be considered high risk or not. Available information is used to develop a score for each criterion. The species' cumulative score is compared against a threshold score to indicate whether a species could be considered a high risk. A score of <12 was determined to be low risk, with high risk >13. The species cumulative score was calibrated against 31 exotic species known to be present and established in Australia to determine an appropriate threshold score. Where data are not available for a criterion, the highest score possible for that criterion is given as a default, with the exception of the score from the climate matching software Climatch.

3.2 Grey list species review method

This report outlines the grey list review method following OFMIG's meeting in April 2008 and through consultation with ACERA.

3.2.1 Review Process

The risk matrix and how it would be applied was discussed and accepted in principle at the 3rd OFMIG meeting on 17 April 2008 as a standard screening method to apply to the grey list and as an alternative to more costly risk assessments of individual species.

Representatives of DEWHA and BRS worked together to develop the approach and matrix for collating information to allow a transparent review of species on the grey list. The approach could be used for species that may require review in the future. The review matrix has been refined to include an appropriate threshold score to determine potentially high and low risk species. The matrix also addressed further comments provided by OFMIG members (Western Australia Department of Fisheries and PIAA) and as a result of suggestions from an expert workshop to review grey listed species held on 16 October 2008.

The criteria were grouped into three broad categories according to the key policy areas relevant to government consideration of the potential pest and invasiveness of a species: biodiversity; impacts; and trade (Table 1). This approach follows similar systems used for risk assessments of reptiles, amphibians and birds (Bomford et al. 2009a; Bomford et al. 2009b). The definitions section below provides explanations of the terms for categories used in the matrix. The Biodiversity Category includes criteria aimed at determining establishment in Australia. These criteria include climate matching (see Bomford 2006), previous establishment in Australia or outside the species natural range, and the resilience of the species. A criterion for hardiness was added following suggestions at the expert workshop in October 2008. The Impact Category includes likely impacts on native ecosystems including habitat, other species, genetics, disease and also includes threats to humans. The Trade Category includes criteria on whether a species has restricted trade in other countries, is a multiple use species, and captive status.

Table 1. Summary of risk matrix categories and criteria.

Category	Criterion	Definition	Score
Biodiversity	Climate match	Species with a high climate match score are likely to establish in Australia	1-8
	Established in Australia	Species that have already established in Australia	0-2
	Eradication	If there has been or is any eradication efforts in Australia for the species	no score
	Established beyond natural range	Species has established beyond its natural range	0-2
	CITES listing	Listed as an endangered species under the CITES Convention	no score
	Hardiness	Species ability to tolerate, survive or adapt to wide variety of environmental conditions	0-2
	Resilience	Population doubling time as an indicator of population growth	0-2
Impact	Current noxious status in Australia	Species already has a noxious listing in Australia	0-1
	Impact on habitat	Species known to modify or disturb habitat	0-2
	Impact on other species	Species known to impact other species through competition, aggression, predation	0-2
	Genetic risk to native species	Species is likely to pose a significant genetic risk through hybridisation/introgression with native fish	0-2
	Genetic risk of non-native hybridisation	Species is likely to pose a significant genetic risk through hybridisation/introgression with exotic species	0-2
	Known carrier of high-risk disease	Species is a known carrier of high-risk disease	0-2
	Direct threat to humans	Species likely to have attributes that are likely to be a direct threat to humans	0-2
Trade	Restricted trade elsewhere	Species has been banned or has restricted importation and trade in other countries	no score
	Multiple-use species	Species used in more than one sector (e.g. recreational fish, ornamental, etc)	1-2
	Captive status in industry	Conditions in which the species is kept (i.e. restricted to research facilities, domestic aquariums, etc)	0-2

BRS populated the matrix with information for grey list species with the exception of several genera which were considered by an expert group based on 'example' species. The expert workshop involved nominated experts and members of the aquarium industry.

The outputs of each tranche were reported to OFMIG for consideration and review at its regular meetings. OFMIG then reported these outcomes to the MACC, which develops recommendations for additions to the noxious list. These are provided to the NRMSC which consider and endorse any additions to the national noxious list.

Species classified as low risk through this process could be considered for further assessment as species suitable for live import into Australia under Commonwealth legislation and processes. A requirement of this legislated process is for a comprehensive environmental assessment of the proposed import on the Australian environment. The Bomford and Glover (2004) risk assessment model for freshwater fish may be applied in this process to contribute to the environmental assessment and information for the decision. The work conducted in reviewing the grey list under the OFMIG process could be used as an initial source of information if a live import list amendment application was made.

The review matrix and method as outlined provide a repeatable process for reviewing further species that may be added to the grey list for the purpose of recommending whether they be considered potentially noxious in Australia. To ensure consistent and repeatable results, future users outside this process will need to be mindful to apply the review matrix in an appropriate context using relevant and reliable information sources.

3.2.2 Scoring

A two staged approach was used to assess the outputs of the risk matrix. If a species received a moderate to high climate match using the software package 'Climatch' (4 or above) and was assigned the highest score (score of 2 or 2.1) for any of the 'impact' categories apart from 'current noxious status in Australia' or 'genetic risk of non-native hybridisation', then it was automatically deemed high risk. If it did not meet both of these criteria, the scores for each category were summed to give a relative risk score (see Application of the Threshold Score below).

3.2.3 Application of the threshold score

The review matrix has been used to identify grey listed species that are high risk (relative risk score >13), and species that are low risk (relative risk score <12) out of a maximum potential score of 33. Any species considered borderline (relative risk score 12 or 13) were deemed to warrant expert technical input at the review workshop, as were species where information was limited (i.e. more than three criteria with insufficient supporting literature).

3.2.4 Uncertainty

Many animal species (including fish) when assessed in terms of their potential impact on the environment or invasiveness may have limited scientific or other information to support views on their potential impacts or noxious status. It is accepted practice in Australia to apply the precautionary approach when there is little or no scientifically based evidence or information. In circumstances where there was either conflicting information from reliable sources or no information available, the precautionary approach was used. To identify where the precautionary approach was used, 0.1 was added to the score for that category; for instance, instead of a score of 2 for 'impact on other species', it would be assigned 2.1. This does not impact on the final threshold score but allows easy identification of where the precautionary approach was used, and how many times it was used for any species or criterion.

3.2.5 Calibration

The threshold score of 12 for potentially high risk species was determined by calibrating the matrix with a number of fish species known to have established in Australia. We assessed 31 exotic species known to have established in Australia, with many of these species shown to have clear impacts on species or habitats. Among these species were particularly invasive species like European carp (*Cyprinus carpio*) and *Gambusia* (*Gambusia holbrooki*). Also included in the calibration process were species that have been kept in captivity in Australia for decades and not known to have established in the wild. A similar system of calibration has been used in New Zealand and the United Kingdom.

3.2.6 Risk matrix categories and criteria

See Table 1 for a summary of the risk matrix categories and criteria.

3.2.6.1 BIODIVERSITY

The following criteria relate to the distribution and abundance of a species. A species is more likely to establish itself in Australia if it is: widely distributed; can tolerate a wide range of climatic conditions; lives in a region with closely matching climatic conditions to Australia; or previously has established itself outside its natural range, either in Australia or elsewhere.

3.2.6.1.1 *Climate match*

The climate score is derived from the risk assessment climate matching model Climatch; the revised model used for previous risk assessments (e.g. Bomford 2006).

Risk assessment models (Bomford 2003; 2006; Bomford and Glover 2004; Bomford et al. 2005; Bomford et al. 2009a; Bomford et al. 2009b) have been developed by BRS to assess the risk of exotic vertebrates establishing in Australia. An integral part of these models is climate matching between each species' natural geographic distribution and similar environments in Australia.

Species which have a high Climatch score show attributes which are likely to make them successful colonisers in Australia. Conversely species with a low Climatch score will have a lower probability of establishment. Climatch scores ranging from 1-8 were assigned to fixed ranges of Climatch scores (Table 2).

Table 2. Climate match scoring system.

Climate Match score	Climatch score
1	0
2	1-40
3	41-150
4	151-400
5	401-1000
6	1001-1500
7	1501-2500
8	>2500

NB: where no geographical information is available, the species is assigned a precautionary Climatch score of 4.1.

The Climatch score is the single highest possible score in the risk matrix, reflecting its importance as the key criterion in determining if a species is likely to establish itself in Australia. The ‘World stations’ (Maywald and Sutherst 1985; Busby 1991) database was generally used in Climatch for climate matching, however, due to the paucity of data, it was sometimes necessary to use the ‘Worldclim’ (Hijmans et al. 2005) dataset as this infers the likely climate in an area where there are no weather stations available to provide site specific data. For some species there were no data available on distribution and in these cases a precautionary score of 4.1 was assigned based on the median initial subsample of 132 species. It was agreed that these species were the most appropriate to use as a subsample as they represented species from over 80 per cent of genera and 95 per cent of families on the grey list.

3.2.6.1.2 *Established in Australia*

This criterion indicates if the species has previously established populations or currently has populations in Australia. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Not established in Australia
- 1 = Recorded occurrence in Australia
- 2 = Reproducing population or widespread in Australia

3.2.6.1.3 *Eradication effort*

This criterion indicates if there is, has been, or will be an eradication effort of any scale in Australia for the species. Accurate data for this criterion are difficult to obtain. For this reason this criterion is used for information purposes only and does not contribute to the overall risk score. This criterion has the following rating system:

- Ongoing – An eradication program is currently in place and eradication efforts are ongoing
- Eradicated – An eradication program has been implemented previously and the species has been successfully eradicated from Australia
- Not at this time – An eradication program in Australia has yet to be implemented for this species
- Not required – The species has not established in Australia and so an eradication effort is not currently required for this species

3.2.6.1.4 *Established internationally*

This criterion indicates if the species has established populations outside their natural range in any other country. This information is taken primarily from FishBase (<http://www.fishbase.org/search.php>) and other internet resources providing data on fish species (see website list Appendix 5). This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = No established populations outside the species natural range
- 1 = Limited distribution outside the species natural range, typically in the same continental region
- 2 = Widespread distribution outside the species natural range
- 2.1 = No information available (precautionary approach)

3.2.6.1.5 *CITES listing*

This criterion indicates if the species is listed under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This criterion is of limited value in

determining whether a species is likely to establish itself if introduced to Australia and so is used for information purposes only and does not contribute to the overall relative risk score. It follows a simple yes/no scoring system. Listing information is gathered from CITES (<http://www.cites.org/>).

3.2.6.1.6 Hardiness

Hardiness is used as an indicator of the species' ability to tolerate, survive, or adapt to a wide range of temperatures, pH, salt or freshwater aquatic environments, or the ability to survive out of water for extended periods of time. Information for this criterion was gathered from FishBase (<http://www.fishbase.org/search.php>), various ichthyological and aquarium sites (see website list Appendix 5) and through an expert technical panel. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Low
- 1 = Medium
- 2 = High
- 2.1 = No information available (precautionary approach)

3.2.6.1.7 Resilience

This criterion indicates the rate of population doubling as an indicator of the rate of potential population growth. This is likely to be a good indicator of the rate of population expansion (i.e. range extension) once established. This attribute is also likely to provide an indication of the difficulty of eradication once established. FishBase (<http://www.fishbase.org/search.php>) lists a category on resilience for most species and provides information on population doubling time. Information was also provided by an expert technical panel. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Slow population growth
- 1 = Moderate population growth
- 2 = Fast population growth
- 2.1 = Unknown rate of population growth (precautionary approach)

3.2.6.2 IMPACTS

The following criteria relate to the environmental impact a species is likely to have if it successfully establishes in Australia. Possible impacts include habitat modification or disturbance, negative interaction with native species, particularly predation or aggression, the genetic risk to the gene pool of native species through hybridisation, the genetic risk of hybridisation with established noxious species and inheriting some or all of the pest characteristics of that species or increasing hybrid vigour (heterosis) to bottlenecked populations, or the potential introduction of high risk diseases.

3.2.6.2.1 Current noxious status in Australia

This impact indicates if the species has a noxious status in any Australian states or territories. Currently no distinction is made between being listed as noxious in a single state or territory and being listed as noxious in multiple states or territories.

- 0 = Not listed in any jurisdiction
- 1 = Listed in at least one jurisdiction

3.2.6.2.2 Potential impact on habitat

This impact indicates if the species has the potential to significantly modify or disturb habitats in which it establishes. Information on this criterion has been gathered from FishBase

(<http://www.fishbase.org/search.php>), various ichthyological and aquarium internet sites (see website list Appendix 5) and through an expert technical panel. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = No impact on habitat
- 1 = Low impact on habitat
- 2 = Medium or high impact on habitat
- 2.1 = Unknown impact on habitat (precautionary approach)

3.2.6.2.3 Potential impact on other species

This impact indicates if the species has characteristics or behaviours which could significantly impact other species in environments if it establishes. Strong negative impacts include predation and aggression which are likely to affect the distribution and abundance of other species in these areas. Information on this criterion has been gathered from FishBase (<http://www.fishbase.org/search.php>), various ichthyological and aquarium internet sites (see website list Appendix 5) and through an expert technical panel. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = No impact on other species
- 1 = Low impact on other species
- 2 = Medium or high impact on other species
- 2.1 = Unknown impact on other species (precautionary approach)

3.2.6.2.4 Genetic risk to native species

This impact indicates if the species poses a significant genetic risk to native fish species through hybridisation and introgression. Hybridisation with native species will alter and dilute the gene pool of native species and in extreme cases may lead to the genetic extinction of the native species, particularly in cases where the introduced species is abundant and the native species is rare. Introgression is the introduction, through hybridisation, of non-native genetic information into the native gene pool, which may alter the fitness of native species. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Low or no risk of hybridisation – introduced species shares no or only distant phylogenetic relationship with native species
- 1 = Medium risk of hybridisation – introduced species belongs to the same phylogenetic family as native species
- 2 = High risk of hybridisation – introduced species belongs to the same phylogenetic genus as native species
- 2.1 = Unknown risk of hybridisation – introduced species has an unresolved phylogeny but may have close ancestral relationship with native species (precautionary approach)

3.2.6.2.5 Genetic risk from hybridisation with established noxious species

This impact indicates if the species poses a significant genetic risk through hybridisation with established noxious species and inheriting some or all of the characteristics of the noxious species or through hybrid vigour (heterosis) to bottlenecked populations. Established noxious species are defined as those listed on the national noxious fish list. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Low or no risk of hybridisation – introduced species shares no or only distant phylogenetic relationship with established noxious species
- 1 = Medium risk of hybridisation – introduced species belongs to the same phylogenetic Family as established noxious species

- 2 = High risk of hybridisation – introduced species belongs to the same phylogenetic Genus as established noxious species
- 2.1 = Unknown risk of hybridisation – introduced species has an unresolved phylogeny but may have close ancestral relationship with established noxious species (precautionary approach)

3.2.6.2.6 *Known carrier of high risk disease*

This impact indicates if the species is a known carrier of high risk disease that could pose a significant risk to native fish species. High risk disease is defined here as those listed on Australia's National List of Reportable Diseases of Aquatic Animals (2007) and included in the Import Risk Analysis on Live Ornamental Finfish (1999). Information on this criterion has been gathered from FishBase (<http://www.fishbase.org/search.php>), various ichthyological and aquarium internet sites (see website list Appendix 5) and through an expert technical panel. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Not known to carry high risk disease
- 1 = May carry high risk disease
- 2 = Is known to carry high risk disease
- 2.1 = Unknown disease risk (precautionary approach)

3.2.6.2.7 *Direct threat to humans*

This impact indicates if species are known to possess attributes that may be a direct threat to humans. These attributes may include venomous spines, toxins, stinging or stunning apparatus. Large predatory species or species with an aggressive nature would also be included in this criterion. Information on this criterion has been gathered from FishBase (<http://www.fishbase.org/search.php>), various ichthyological and aquarium internet sites (see website list Appendix 5) and through an expert technical panel. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Not known to possess attributes of direct impact to humans
- 1 = Known to carry minor attributes of direct threat to humans
- 2 = Known to carry significant attributes of direct threat to humans

3.2.6.3 TRADE

The following criteria relate to how international trade in a species might influence escape and establishment of that species, or its potential impact if it escapes. If trade in a species has been restricted elsewhere, it may suggest that this species has been recognised by that country as a potential threat, for one reason or another, and so may pose a similar threat if introduced to Australia. However, trade may be restricted for a variety of reasons not related to pest invasiveness. If a species has multiple uses across sectors this relates to how widespread the species is likely to become if it is introduced to Australia and thus how many different pathways exist to escape into the wild.

The more widespread a species is dispersed across activities or industries, the greater and more varied the risk of the species escaping captivity and establishing in the wild. However, some pathways to escape pose a greater risk than others. Therefore, the extent and type of industry use will also be a determining factor of the likelihood of escape. Together these two factors can be considered as the breadth and depth of risk of escape into the wild due to industry trade.

3.2.6.3.1 *Restricted trade elsewhere*

This criterion indicates if the importation or movement of the species has been limited to, or within, other countries. If trade in a species has been restricted elsewhere, it may suggest that the species has been recognised by that country as a potential threat, for one reason or another, and so may pose a

similar threat if introduced to Australia. However, trade may be restricted for a variety of reasons not related to pest invasiveness. This information is difficult to ascertain and is likely to be available only for a limited number of countries. For this reason this criterion is currently used for information purposes only and does not contribute to the overall relative risk score. However, this criterion could help inform the decision process where the review ranking is borderline. This criterion has a simple rating system of yes (trade in the species is restricted elsewhere), no (trade in the species is not restricted elsewhere), or trade in the species is unknown.

3.2.6.3.2 Multiple use species

This criterion indicates the use and benefits of the species across various sectors, including recreational fishing, aquaculture, the aquarium industry, or religious/ethnic activities. If a species has multiple uses across sectors this relates to how widespread the species is likely to become if it is introduced to Australia and thus how many different pathways exist to escape into the wild. The more widely a species is dispersed across industries, the greater and more varied the risk of the species escaping captivity and establishing in the wild. Information on this criterion has been gathered from FishBase (<http://www.fishbase.org/search.php>), various ichthyological and aquarium internet sites (see website list Appendix 5) and through an expert technical panel. This criterion can be considered as the breadth of risk due to industry use. This criterion is given a ranking score of 1 or 2, with the following scoring system:

- 1 = Used in less than or equal to one industry
- 2 = Used in more than one industry
- 2.1 = Breadth of use of this species is unknown (precautionary approach)

3.2.6.3.3 Captive status in industry

This criterion indicates under what conditions the species is kept within an industry. Some pathways to escape pose a greater risk than others. Therefore, the conditions of captivity may determine the likelihood of escape. This criterion is given a ranking score from 0-2, with the following scoring system:

- 0 = Use is restricted to a limited purpose or highly contained
- 1 = Use is not restricted or contained but the species is not widely kept
- 2 = Use is not restricted or contained and the species is widely kept
- 2.1 = Depth of use of this species is unknown (precautionary approach)

3.3 Independent review of the rapid risk assessment tool

BRS had the risk matrix process externally reviewed by the Australian Centre for Excellence in Risk Assessment (ACERA) to provide an independent review of the method. Noting that the risk matrix was not designed as a formalised quantitative risk assessment, ACERA found it reflected comparably on similar systems that exist already such as that used by Biosecurity Australia for weed risk assessment for plants proposed for import (Walton et al. 1998). ACERA suggested several minor refinements primarily around how the final score is assessed. Evaluation of these refinements indicated that they did not change the results of the rapid risk assessment.

3.4 Technical workshop

OFMIG agreed that a small group of experts should be consulted on borderline species, or species with insufficient information. Borderline species are those species that have scores of 11 or 12. Species evaluated as having insufficient information were lacking on three or more criteria. BRS convened a technical workshop of experts on 16 October 2008 to review the risk identification

method and its results. The workshop included scientists from around Australia and representatives from the aquarium and pet industries. The group included Dr Peter Kind (Qld DPI Fisheries), Roland McKay (independent scientist), Tarmo Raadik (DSE Vic), Dr Michael Hammer (independent scientist), Dr Tracey Bradley (Vic DPI veterinarian), Dr Gavin Hinten (BRS), Dos O'Sullivan (aquaculture expert), Shane Willis (hobby and industry representative), Anthony Ramsey (hobby and industry representative), Nick Gascoigne (DEWHA) and Melinda Thompson (DEWHA).

Prior to the workshop, 132 species from the grey list were assessed and assigned a preliminary numerical score based on available information for the 14 criteria. The numerical score was then translated to a category of high, intermediate or low risk based on calibration with other species established in Australia already.

The technical group discussed each species in turn and information on the genus provided from the rapid risk matrix. The scores for the 14 criteria were examined by the technical group, and where possible additional data and expert opinion were used to adjust the score and consequently the risk status.

3.4.1 Outcomes of workshop

The criteria 'impact on habitat' and to a lesser extent 'impact on other species' were typically data poor prior to the workshop. However, with input from the industry representatives and expert scientists, a number of species that initially scored an 'unknown' and therefore received a precautionary high score were able to be assigned an informed score.

It was also identified that adding a criterion for hardiness could provide additional useful information that was not being incorporated elsewhere. Hardiness scores were assigned for the 132 species at the workshop and for all species assessed since the workshop. In total, 322 changes were made to the scores for the criteria, of which 132 were from the inclusion of the criterion 'hardiness'. The remaining 190 changes were primarily from additional data being supplied which reduced the reliance on the precautionary approach and enabled a score of zero, 1 or 2 to be given. These changes resulted in reduced uncertainty and changes in status for 87.5 per cent of species.

A secondary, but also useful outcome of the workshop was to assign each species to a category based on the level of stakeholder interest in the species. Representatives from industry identified species or genera that were commercially important and representatives from the hobbyist sector identified species that were considered to be desirable and/or widely kept. In this way, species of 'interest to hobbyists', 'interest to trade', and 'of no interest' were separated.

3.4.2 Tranche 1 – Species reviewed by technical working group

The review can be divided into two tranches, species that were assessed through both the risk matrix and the expert technical group and those that were assessed through the matrix but have not been reviewed by the expert technical group.

Results from the tranche 1 assessment (Table 3; also see Appendix 4) of 132 species (16.9 per cent of the 778 species on the grey list) assigned a low risk rating for two species and a high risk rating for 130 species. Low risk species are listed in Table 4. High risk species, which have been identified by the technical working group as not of interest to industry and are recommended for noxious listing are listed in Table 5. Species that have been determined to be high risk and identified by the expert technical group as of importance to industry and hobbyists are listed in Table 6. Further review of species in Table 6 is awaiting completion of the public consultation and listing process currently being undertaken by various jurisdictions. Species in Table 6 may be subjected to a more detailed biological and socio-economic risk assessment in the future due to their economic and social value.

Table 3. Summary of family, genus and species assessed to date, including those that have been assessed by the expert technical working group.

Ornamental fish assessed by matrix and expert working group (1st tranche)				
	Currently on grey list	Low risk	High risk	Total (% of grey list)
Family	29	2	28	28 (96.5%)
Genus	74	2	59	60 (81%)
Species	778	2	130	132 (16.9%)

Table 4. Species identified in tranche 1 as having a low risk.

Family	Species	Common name
Fundulidae	<i>Leptolucania ommata</i>	Pygmy killifish
Acipenseridae	<i>Huso dauricus</i>	Kaluga

Table 5. Species agreed through technical workshop review to be proposed for addition to the national noxious list, as these species were identified as being both high risk and of no interest to industry or hobbyists.

Family	Species	Common name
Acipenseridae	<i>Acipenser fulvescens</i>	Lake sturgeon
Acipenseridae	<i>Acipenser brevirostrum</i>	Shortnose sturgeon
Acipenseridae	<i>Acipenser persicus</i>	Persian sturgeon
Acipenseridae	<i>Acipenser sinensis</i>	Chinese sturgeon
Acipenseridae	<i>Acipenser sturio</i>	European sturgeon
Pangasiidae	<i>Pangasius elongatus</i>	
Pangasiidae	<i>Pangasius nieuwenhuisii</i>	
Polypteridae	<i>Erpetoichthys calabaricus</i>	Reedfish
Acipenseridae	<i>Acipenser ruthenus</i>	Sterlet
Acipenseridae	<i>Acipenser dabryanus</i>	Yangtze sturgeon
Acipenseridae	<i>Acipenser medirostris</i>	Green sturgeon
Acipenseridae	<i>Acipenser mikadoi</i>	Sakhalin sturgeon
Acipenseridae	<i>Acipenser naccarii</i>	Adriatic sturgeon
Acipenseridae	<i>Acipenser oxyrinchus oxyrinchus</i>	Atlantic sturgeon
Acipenseridae	<i>Acipenser baerii baicalensis</i>	Baikal sturgeon
Acipenseridae	<i>Acipenser nudiventris</i>	Fringebarbel sturgeon
Acipenseridae	<i>Acipenser schrenckii</i>	Amur sturgeon
Acipenseridae	<i>Acipenser multiscutatus</i>	Japanese sturgeon
Acipenseridae	<i>Acipenser oxyrinchus destotoi</i>	Gulf sturgeon
Ctenoluciidae	<i>Ctenolucius hujeta</i>	Gar characin
Eleotridae	<i>Oxyeleotris heterodon</i>	Sentani gudgeon
Pangasiidae	<i>Pangasius gigas</i>	Mekong giant catfish
Pangasiidae	<i>Pangasius conchophilus</i>	
Pangasiidae	<i>Pangasius krempfi</i>	
Pangasiidae	<i>Pangasius kunyit</i>	
Poeciliidae	<i>Tomeurus gracilis</i>	

Acipenseridae	<i>Huso huso</i>	Beluga
Eleotridae	<i>Oxyeleotris urophthalmoides</i>	
Eleotridae	<i>Oxyeleotris siamensis</i>	
Acipenseridae	<i>Acipenser stellatus</i>	Starry sturgeon
Pimelodidae	<i>Perrunichthys perruno</i>	Leopard catfish
Pimelodidae	<i>Leiarius spp</i>	Painted catfish
Poeciliidae	<i>Alfaro cultratus</i>	Knife-edged livebearer
Protopteridae	<i>Protopterus dolloi</i>	Slender lungfish
Rivulidae	<i>Leptolebias opalescens</i>	Opal pearlfish
Arapaimidae	<i>Arapaima gigas</i>	Arapaima
Eleotridae	<i>Gobiomorphus gobioides</i>	Giant bully
Poeciliidae	<i>Heterandria bimaculata</i>	Twospot livebearer
Chacidae	<i>Chaca bankanensis</i>	Angler catfish
Eleotridae	<i>Allomogurnda nesolepis</i>	Yellowbelly gudgeon
Eleotridae	<i>Dormitator maculatus</i>	Fat sleeper
Acipenseridae	<i>Acipenser baerii baerii</i>	Siberian sturgeon
Chacidae	<i>Chaca chaca</i>	Squarehead catfish
Potamotrygonidae	<i>Paratrygon aiereba</i>	Discus ray
Lebiasinidae	<i>Lebiasina bimaculata</i>	Twospot lebiasina
Pangasiidae	<i>Pangasius pangasius</i>	Yellowtailed catfish
Pangasiidae	<i>Pangasius nasutus</i>	
Rivulidae	<i>Leptolebias aureoguttatus</i>	
Rivulidae	<i>Leptolebias marmoratus</i>	Marbled pearlfish
Rivulidae	<i>Leptolebias minimus</i>	Barred tail pearlfish
Eleotridae	<i>Gobiomorus dormitor</i>	Bigmouth sleeper
Eleotridae	<i>Oxyeleotris urophthalmus</i>	
Acipenseridae	<i>Acipenser gueldenstaedtii</i>	Russian sturgeon
Acipenseridae	<i>Acipenser transmontanus</i>	White sturgeon
Lepidosirenidae	<i>Lepidosiren paradoxa</i>	South American lungfish
Pangasiidae	<i>Pangasius larnaudii</i>	Spot pangasius
Eleotridae	<i>Gobiomorphus huttoni</i>	Redfin bully
Poeciliidae	<i>Alfaro huberi</i>	
Chacidae	<i>Chaca burmensis</i>	Burmensis frogmouth catfish
Pangasiidae	<i>Pangasianodon hypophthalmus</i>	Sutchi catfish
Pangasiidae	<i>Pangasius macronema</i>	
Protopteridae	<i>Protopterus aethiopicus</i>	Marbled lungfish
Schilbeidae	<i>Schilbe marmoratus</i>	Shoulderspot catfish
Eleotridae	<i>Gobiomorus maculatus</i>	Pacific sleeper
Eleotridae	<i>Hypseleotris cyprinoides</i>	Tropical carp-gudgeon
Percidae	<i>Perca fluviatilis</i> ¹	European perch
Protopteridae	<i>Protopterus amphibius</i>	Gilled lungfish
Eleotridae	<i>Hypseleotris tohizonae</i>	
Eleotridae	<i>Dormitator latifrons</i>	Pacific fat sleeper
Ictaluridae	<i>Ictalurus punctatus</i>	Channel catfish
Schilbeidae	<i>Schilbe intermedius</i>	Silver catfish
Eleotridae	<i>Oxyeleotris marmorata</i>	Marble goby

¹*Perca fluviatilis* (European/redfin perch) is a species of interest for some jurisdictions. For example, Victoria has recently set a recreational catch limit for redfin perch, which indicates it is a recreationally valuable species for these jurisdictions).

Table 6. Species identified as high risk but deferred for further assessment due to interest from industry and/or hobby sector (Blue – denotes of interest to hobby, Yellow – denotes of interest to industry, which may require more detailed biological and/or social assessment).

Family	Species	Common name
Anabantidae	<i>Microctenopoma nanum</i>	Dwarf ctenopoma
Anabantidae	<i>Microctenopoma ansorgii</i>	Ornate ctenopoma
Anabantidae	<i>Ctenopoma acutirostre</i>	Spotted ctenopoma
Characidae	<i>Bryconops melanurus</i>	
Characidae	<i>Bryconops affinis</i>	Orangefin tetra
Characidae	<i>Hollandichthys multifasciatus</i>	
Cichlidae	<i>Caquetaia umbrifera</i>	Turquoise cichlid
Cichlidae	<i>Caquetaia spectabilis</i>	
Cichlidae	<i>Caquetaia kraussii</i>	Bucketmouth
Cichlidae	<i>Crenicichla lacustris</i>	
Cichlidae	<i>Amphilophus zaliosus</i>	Arrow Cichlid
Cichlidae	<i>Amphilophus labiatus</i>	Red devil
Cichlidae	<i>Crenicichla lepidota</i>	Pike Cichlid
Cichlidae	<i>Crenicichla saxatilis</i>	Ringtail pike cichlid
Cichlidae	<i>Amphilophus citrinellus</i>	Midas Cichlid
Cichlidae	<i>Herichthys cyanoguttatus</i>	Rio Grande cichlid
Cichlidae	<i>Cichlasoma urophthalmus</i>	Mexican mojarra
Cyprinidae	<i>Cyprinus carpio</i>	Common carp/ Koi
Fundulidae	<i>Adinia xenica</i>	Diamond killifish
Fundulidae	<i>Fundulus chrysotus</i>	Golden topminnow
Mastacembelidae	<i>Mastacembelus erythrotaenia</i>	Fire eel
Mastacembelidae	<i>Macrogathus pancalus</i>	Barred spiny eels
Mastacembelidae	<i>Mastacembelus armatus</i>	Zig-zag eel
Notopteridae	<i>Chitala blanci</i>	Indochina featherback
Notopteridae	<i>Chitala ornata</i>	
Osteoglossidae	<i>Osteoglossum bicirrhosum</i>	Silver Arawana
	<i>Phractocephalus</i>	
Pimelodidae	<i>hemiliopterus</i>	Redtail catfish
Pimelodidae	<i>Brachyplatystoma vaillantii</i>	Laulao
Pimelodidae	<i>Sorubimichthys planiceps</i>	Firewood catfish
Pimelodidae	<i>Pseudoplatystoma fasciatum</i>	Barred sorubim
Pimelodidae	<i>Brachyplatystoma filamentosum</i>	Kumakuma
Pimelodidae	<i>Sorubim elongatus</i>	Slender shovelnose catfish
Pimelodidae	<i>Sorubim lima</i>	Duckbill catfish
Polypteridae	<i>Polypterus endlicheri</i>	Saddled bichir
Polypteridae	<i>Polypterus retropinnis</i>	West African bichir
Potamotrygonidae	<i>Plesiotrygon iwamae</i>	Long-tailed river stingray
Potamotrygonidae	<i>Potamotrygon hystrix</i>	Porcupine river stingray
Potamotrygonidae	<i>Potamotrygon motoro</i>	Ocellate river stingray
Potamotrygonidae	<i>Potamotrygon orbignyi</i>	Smooth back river stingray
Siluridae	<i>Ompok bimaculatus</i>	Butter catfish
Siluridae (Anabantidae)	<i>Sandelia bainsii</i>	Eastern Cape Rocky
Siluridae (Anabantidae)	<i>Sandelia capensis</i>	Cape Kurper
Tetraodontidae	<i>Carinotetraodon travancoricus</i>	Malabar pufferfish
Tetraodontidae	<i>Auriglobus amabilis</i>	
Tetraodontidae	<i>Auriglobus nefastus</i>	Greenbottle pufferfish

Tetraodontidae	<i>Chonerhinos silus</i>	
Tetraodontidae	<i>Colomesus psittacus</i>	Banded puffer
Tetraodontidae	<i>Carinotetraodon lorteti</i>	Redeye puffer
Tetraodontidae	<i>Tetraodon baileyi</i>	Hairy puffer
Tetraodontidae	<i>Colomesus asellus</i>	Amazon puffer
Tetraodontidae	<i>Tetraodon mbu</i>	Fresh water puffer fish
Tetraodontidae	<i>Carinotetraodon borneensis</i>	
Tetraodontidae	<i>Takifugu vermicularis</i>	Purple puffer
Tetraodontidae	<i>Takifugu radiatus</i>	
Tetraodontidae	<i>Tetraodon nigroviridis</i>	Spotted green pufferfish
Tetraodontidae	<i>Chelonodon laticeps</i>	Bluespotted blaasop
Tetraodontidae	<i>Takifugu rubripes</i>	Japanese pufferfish
Tetraodontidae	<i>Chelonodon pleurospilus</i>	Blaasop beauty

3.4.3 Tranche 2 – Species not reviewed by technical working group

Since the expert workshop in October 2008, BRS has run an additional 315 grey list species through the risk matrix process (Appendix 4). Table 7 presents a summary table of this second tranche of species which has not yet been reviewed by the technical working group. Table 8 presents a breakdown of the number of species reviewed in each tranche and the number left on the grey list to complete. Tables 9, 10 and 11 represent the species which were rated by the rapid risk matrix as representing a low, medium and high risk.

Table 7. Summary of Family, Genus and Species assessed to date, including those that have not yet been assessed by the expert technical working group.

Ornamental fish assessed by matrix but not expert panel (2 nd tranche)					
	Currently on grey list	Low risk	High risk	Total (% of grey list)	Combined tranche 1 & 2 (% of grey list)
Family	29	5	15	17 (58.6%)	29 (100%)
Genus	74	5	29	33 (44.5%)	74 (100%)
Species	778	6	250	315 (40.4)	447 (57.5%)

Table 8. Breakdown of the number of species reviewed in both tranches and species on the grey list yet to be reviewed.

Category	Number of species	Percent of grey list
Species reviewed by workshop (1 st tranche)	132	17%
Species reviewed since workshop (2 nd tranche)	315	40%
Total species reviewed	447	57%
Total species remaining	331	42%

Table 9. Low risk species from tranche 2 that have not been reviewed by the technical working group.

Low risk		
Family	Species Name	Common Name
Pimelodidae	<i>Leiarius pictus</i>	
Characidae	<i>Astyanax jordani</i>	
Characidae	<i>Astyanax leopoldi</i>	
Ctenoluciidae	<i>Boulengerella maculata</i>	Spotted-pike characin
Ictaluridae	<i>Ictalurus australis</i>	Panuco catfish
Potamotrygonidae	<i>Potamotrygon schroederi</i>	Rosette river stingray

Table 10. Borderline species from tranche 2 that have not been reviewed by the technical group. Borderline species are defined as species with a relative risk score of 12 or 13 and are deemed to warrant review by the technical working group.

Borderline		
Family	Species Name	Common Name
Ictaluridae	<i>Ameiurus brunneus</i>	Snail bullhead
Characidae	<i>Astyanax kennedyi</i>	
Ctenoluciidae	<i>Boulengerella lateristriga</i>	striped-pike characin
Cichlidae	<i>Cichla pinima</i>	
Ctenoluciidae	<i>Ctenolucius beani</i>	
Pangasiidae	<i>Helicophagus typus</i>	
Siluridae	<i>Ompok goae</i>	
Polypteridae	<i>Polypterus teugelsi</i>	
Potamotrygonidae	<i>Potamotrygon constellata</i>	Thorny river stingray
Potamotrygonidae	<i>Potamotrygon falkneri</i>	Largespot river stingray
Potamotrygonidae	<i>Potamotrygon scobina</i>	Raspy river stingray
Anabantidae	<i>Ctenopoma argentoventer</i>	Silverbelly ctenopoma
Ictaluridae	<i>Ameiurus serracanthus</i>	Spotted bullhead
Characidae	<i>Astyanax armandoi</i>	Penjamo tetra
Characidae	<i>Astyanax bourgeti</i>	
Characidae	<i>Astyanax brevirohinus</i>	
Characidae	<i>Astyanax dnophos</i>	
Characidae	<i>Astyanax multidentis</i>	
Characidae	<i>Astyanax validus</i>	
Characidae	<i>Bryconops caudomaculatus</i>	
Characidae	<i>Bryconops cyrtogaster</i>	
Cichlidae	<i>Cichla melaniae</i>	
Cichlidae	<i>Cichla orinocensis</i>	
Cichlidae	<i>Crenicichla johanna</i>	
Cichlidae	<i>Crenicichla lenticulata</i>	
Cichlidae	<i>Crenicichla maculata</i>	
Cichlidae	<i>Crenicichla marmorata</i>	
Cichlidae	<i>Crenicichla strigata</i>	
Cichlidae	<i>Crenicichla ternetzi</i>	
Anabantidae	<i>Ctenopoma nigropannosum</i>	Twospot climbing perch
Eleotridae	<i>Eleotris amblyopsis</i>	Large scaled spiny cheek sleeper
Dasyatidae	<i>Himantura lobistoma</i>	Tube-mouth whip-ray
Ictaluridae	<i>Ictalurus dugesii</i>	Lerma catfish
Ictaluridae	<i>Ictalurus mexicanus</i>	Rio Verde catfish
Ictaluridae	<i>Ictalurus ochoterrenai</i>	Chapala catfish
Pimelodidae	<i>Leiarius arekaima</i>	

Lepisosteidae	<i>Lepisosteus platostomus</i>	Shortnose gar
Lepisosteidae	<i>Lepisosteus platyrhincus</i>	Florida gar
Ictaluridae	<i>Noturus albater</i>	Ozark madtom
Ictaluridae	<i>Noturus furiosus</i>	Carolina madtom
Ictaluridae	<i>Noturus lachneri</i>	Ouachita madtom
Ictaluridae	<i>Noturus taylori</i>	Caddo madtom
Siluridae	<i>Ompok binotatus</i>	
Siluridae	<i>Ompok eugeneiatus</i>	Malay glass catfish
Siluridae	<i>Ompok hypophthalmus</i>	
Siluridae	<i>Ompok leiacanthus</i>	
Siluridae	<i>Ompok miostoma</i>	
Siluridae	<i>Ompok platyrhynchus</i>	
Siluridae	<i>Ompok pluriradiatus</i>	
Cichlidae	<i>Petenia splendida</i>	Bay snook
Polypteridae	<i>Polypterus palmas palmas</i>	Shortfin bichir
Polypteridae	<i>Polypterus senegalus meridionalis</i>	
Potamotrygonidae	<i>Potamotrygon castexi</i>	Vermiculate river stingray
Potamotrygonidae	<i>Potamotrygon henlei</i>	Bigtooth river stingray
Potamotrygonidae	<i>Potamotrygon leopoldi</i>	White-blotched river stingray
Potamotrygonidae	<i>Potamotrygon ocellata</i>	Red-blotched river stingray
Potamotrygonidae	<i>Potamotrygon schuhmacheri</i>	
Potamotrygonidae	<i>Potamotrygon signata</i>	Parnaiba river stingray
Potamotrygonidae	<i>Potamotrygon yepezi</i>	Maracaibo river stingray

Table 11. High risk species from tranche 2 that have not been reviewed by the technical group.

High Risk		
Family	Species Name	Common Name
Ictaluridae	<i>Ameiurus platycephalus</i>	Flat bullhead
Characidae	<i>Astyanax alburnus</i>	
Characidae	<i>Astyanax bimaculatus</i>	Twospot astyanax
Characidae	<i>Astyanax giton</i>	
Cichlidae	<i>Cichla jariina</i>	
Cichlidae	<i>Cichla kelberi</i>	
Cichlidae	<i>Cichla mirianae</i>	
Cichlidae	<i>Cichla nigromaculata</i>	
Cichlidae	<i>Cichla pleiozona</i>	
Cichlidae	<i>Cichla temensis</i>	Speckled pavon
Cichlidae	<i>Cichla thyrorus</i>	
Cichlidae	<i>Crenicichla acutirostris</i>	
Cichlidae	<i>Crenicichla albopunctata</i>	
Cichlidae	<i>Crenicichla alta</i>	Millet
Cichlidae	<i>Crenicichla cametana</i>	
Cichlidae	<i>Crenicichla compressiceps</i>	
Cichlidae	<i>Crenicichla cyanonotus</i>	
Cichlidae	<i>Crenicichla cyclostoma</i>	
Cichlidae	<i>Crenicichla empheres</i>	
Cichlidae	<i>Crenicichla lucius</i>	
Cichlidae	<i>Crenicichla lugubris</i>	
Cichlidae	<i>Crenicichla multispinosa</i>	
Cichlidae	<i>Crenicichla nickeriensis</i>	
Cichlidae	<i>Crenicichla sveni</i>	
Cichlidae	<i>Crenicichla wallacii</i>	
Eleotridae	<i>Eleotris sandwicensis</i>	Sandwich Island Sleeper

Poeciliidae	<i>Heterandria anzueto</i>	
Poeciliidae	<i>Heterandria tuxtlaensis</i>	Livebearing fish
Dasyatidae	<i>Himantura pareh</i>	
Fungulidae	<i>Lucania goodei</i>	Bluefin killifish
Anabantidae	<i>Microctenopoma congicum</i>	Congo ctenopoma
Ictaluridae	<i>Noturus elegans</i>	Elegant madtom
Ictaluridae	<i>Noturus eleutherus</i>	Mountain madtom
Ictaluridae	<i>Noturus exilis</i>	Slender madtom
Ictaluridae	<i>Noturus fasciatus</i>	Saddled madtom
Ictaluridae	<i>Noturus flavater</i>	Checkered madtom
Ictaluridae	<i>Noturus flavipinnis</i>	Yellowfin madtom
Ictaluridae	<i>Noturus flavus</i>	Stonecat
Ictaluridae	<i>Noturus maydeni</i>	Black River madtom
Ictaluridae	<i>Noturus phaeus</i>	Brown madtom
Ictaluridae	<i>Noturus placidus</i>	Neosho madtom
Ictaluridae	<i>Noturus stanauli</i>	Pygmy madtom
Siluridae	<i>Ompok javanensis</i>	
Siluridae	<i>Ompok rhadinurus</i>	
Siluridae	<i>Ompok sindensis</i>	
Cichlidae	<i>Parachromis dovii</i>	Guapote
Cichlidae	<i>Parachromis motaguensis</i>	False yellowjacket cichlid
Polypteridae	<i>Polypterus endlicheri congicus</i>	
Polypteridae	<i>Polypterus palmas buettikoferi</i>	
Polypteridae	<i>Polypterus palmas polli</i>	
Potamotrygonidae	<i>Potamotrygon brachyura</i>	Short-tailed river stingray
Potamotrygonidae	<i>Potamotrygon magdalenae</i>	Magdalena river stingray
Potamotrygonidae	<i>Potamotrygon marinae</i>	
Anabantidae	<i>Anabas cobojius</i>	Gangetic koi
Characidae	<i>Astyanacinus goyanensis</i>	
Characidae	<i>Astyanacinus multidentis</i>	
Characidae	<i>Astyanacinus platensis</i>	
Characidae	<i>Astyanax altior</i>	Yucatan tetra
Characidae	<i>Astyanax chico</i>	
Characidae	<i>Astyanax clavitaeniatus</i>	
Characidae	<i>Astyanax cremnobates</i>	
Characidae	<i>Astyanax guaporensis</i>	
Characidae	<i>Astyanax hastatus</i>	
Characidae	<i>Astyanax hermosus</i>	
Characidae	<i>Astyanax intermedius</i>	
Characidae	<i>Astyanax jacuhiensis</i>	
Characidae	<i>Astyanax jenynsii</i>	
Characidae	<i>Astyanax latens</i>	
Characidae	<i>Astyanax leonidas</i>	
Characidae	<i>Astyanax magdalenae</i>	
Characidae	<i>Astyanax obscurus</i>	
Characidae	<i>Astyanax pampa</i>	
Characidae	<i>Astyanax paris</i>	
Characidae	<i>Astyanax pelegri</i>	
Characidae	<i>Astyanax puka</i>	
Characidae	<i>Astyanax robustus</i>	
Characidae	<i>Astyanax rupununi</i>	
Characidae	<i>Astyanax schubarti</i>	
Characidae	<i>Astyanax siapae</i>	
Characidae	<i>Astyanax stilbe</i>	
Characidae	<i>Astyanax totae</i>	
Characidae	<i>Astyanax tumbayaensis</i>	

Characidae	<i>Astyanax unitaeniatus</i>	
Characidae	<i>Astyanax varzeae</i>	
Characidae	<i>Astyanax villwocki</i>	
Characidae	<i>Bryconops colaroja</i>	
Characidae	<i>Bryconops durbini</i>	
Characidae	<i>Bryconops giacopinii</i>	
Characidae	<i>Bryconops humeralis</i>	
Characidae	<i>Bryconops inpai</i>	
Characidae	<i>Bryconops vibex</i>	
Cichlidae	<i>Cichla intermedia</i>	
Cichlidae	<i>Cichla monoculus</i>	
Cichlidae	<i>Cichla piquiti</i>	
Cichlidae	<i>Cichla vazzoleri</i>	
Cichlidae	<i>Crenicichla adspersa</i>	
Cichlidae	<i>Crenicichla anthurus</i>	
Cichlidae	<i>Crenicichla cincta</i>	
Cichlidae	<i>Crenicichla frenata</i>	
Cichlidae	<i>Crenicichla minuano</i>	
Cichlidae	<i>Crenicichla notophthalmus</i>	
Cichlidae	<i>Crenicichla phaiospilus</i>	
Cichlidae	<i>Crenicichla proteus</i>	
Cichlidae	<i>Crenicichla rosemariae</i>	
Cichlidae	<i>Crenicichla sedentaria</i>	
Cichlidae	<i>Crenicichla tigrina</i>	
Characidae	<i>Ctenobrycon alleni</i>	
Characidae	<i>Ctenobrycon spilurus</i>	Silver tetra
Anabantidae	<i>Ctenopoma kingsleyae</i>	Tailspot ctenopoma
Anabantidae	<i>Ctenopoma muriei</i>	Ocellated labyrinth fish
Anabantidae	<i>Ctenopoma ocellatum</i>	Eyespot ctenopoma
Anabantidae	<i>Ctenopoma weeksii</i>	Mottled ctenopoma
Pangasiidae	<i>Helicophagus leptorhynchus</i>	
Pangasiidae	<i>Helicophagus waandersii</i>	
Dasyatidae	<i>Himantura bleekeri</i>	Bleeker's whipray
Dasyatidae	<i>Himantura pacifica</i>	Pacific chupare
Dasyatidae	<i>Himantura pastinacoides</i>	Round whip ray
Dasyatidae	<i>Himantura schmardae</i>	Chupare stingray
Dasyatidae	<i>Himantura uarnacoides</i>	Whitenose whip ray
Ictaluridae	<i>Ictalurus balsanus</i>	Balsas catfish
Ictaluridae	<i>Ictalurus pricei</i>	Yaqui catfish
Characidae	<i>Knodus savannensis</i>	
Anabantidae	<i>Microctenopoma lineatum</i>	
Anabantidae	<i>Microctenopoma milleri</i>	
Ictaluridae	<i>Noturus baileyi</i>	Smoky madtom
Ictaluridae	<i>Noturus crypticus</i>	Chucky madtom
Ictaluridae	<i>Noturus funebris</i>	Black madtom
Ictaluridae	<i>Noturus gilberti</i>	Orangefin madtom
Ictaluridae	<i>Noturus gladiator</i>	
Ictaluridae	<i>Noturus hildebrandi hildebrandi</i>	Least madtom
Ictaluridae	<i>Noturus hildebrandi lautus</i>	
Ictaluridae	<i>Noturus leptacanthus</i>	Speckled madtom
Ictaluridae	<i>Noturus munitus</i>	Frecklebelly madtom
Ictaluridae	<i>Noturus stigmosus</i>	Northern madtom
Ictaluridae	<i>Noturus trautmani</i>	Scioto madtom
Siluridae	<i>Ompok borneensis</i>	
Siluridae	<i>Ompok fumidus</i>	
Siluridae	<i>Ompok jaynei</i>	

Siluridae	<i>Ompok pinnatus</i>	Long-fin glass catfish
Siluridae	<i>Ompok urbaini</i>	
Siluridae	<i>Ompok weberi</i>	
Polypteridae	<i>Polypterus senegalus senegalus</i>	Gray bichir
Potamotrygonidae	<i>Potamotrygon boesemani</i>	
Characidae	<i>Astyanax aeneus</i>	Banded tetra
Cichlidae	<i>Crenicichla brasiliensis</i>	
Cichlidae	<i>Crenicichla britskii</i>	
Cichlidae	<i>Crenicichla celidochilus</i>	
Cichlidae	<i>Crenicichla copenamensis</i>	
Cichlidae	<i>Crenicichla gaucho</i>	
Cichlidae	<i>Crenicichla geayi</i>	Halfbanded pike cichlid
Cichlidae	<i>Crenicichla hadrostigma</i>	
Cichlidae	<i>Crenicichla haroldoi</i>	
Cichlidae	<i>Crenicichla heckeli</i>	
Cichlidae	<i>Crenicichla hemera</i>	
Cichlidae	<i>Crenicichla hummelincki</i>	
Cichlidae	<i>Crenicichla igara</i>	
Cichlidae	<i>Crenicichla iguapina</i>	
Cichlidae	<i>Crenicichla iguassuensis</i>	
Cichlidae	<i>Crenicichla inpa</i>	
Cichlidae	<i>Crenicichla isbrueckeri</i>	
Cichlidae	<i>Crenicichla jaguarensis</i>	
Cichlidae	<i>Crenicichla jegui</i>	
Cichlidae	<i>Crenicichla jupiaensis</i>	
Cichlidae	<i>Crenicichla jurubi</i>	
Cichlidae	<i>Crenicichla labrina</i>	
Cichlidae	<i>Crenicichla menezesi</i>	
Cichlidae	<i>Crenicichla mucuryna</i>	
Cichlidae	<i>Crenicichla niederleinii</i>	
Cichlidae	<i>Crenicichla pellegrini</i>	
Cichlidae	<i>Crenicichla percna</i>	
Cichlidae	<i>Crenicichla prenda</i>	
Cichlidae	<i>Crenicichla punctata</i>	
Cichlidae	<i>Crenicichla pydanielae</i>	
Cichlidae	<i>Crenicichla regani</i>	
Cichlidae	<i>Crenicichla santosi</i>	
Cichlidae	<i>Crenicichla scottii</i>	
Cichlidae	<i>Crenicichla semicincta</i>	
Cichlidae	<i>Crenicichla sipaliwini</i>	
Cichlidae	<i>Crenicichla stocki</i>	
Cichlidae	<i>Crenicichla tendybaguassu</i>	
Cichlidae	<i>Crenicichla tingui</i>	
Cichlidae	<i>Crenicichla urosema</i>	
Cichlidae	<i>Crenicichla vaillanti</i>	
Cichlidae	<i>Crenicichla virgatula</i>	
Cichlidae	<i>Crenicichla vittata</i>	
Cichlidae	<i>Crenicichla yaha</i>	
Cichlidae	<i>Crenicichla zebrina</i>	
Anabantidae	<i>Ctenopoma multispine</i>	Manyspined ctenopoma
Poeciliidae	<i>Heterandria attenuata</i>	
Poeciliidae	<i>Heterandria cataractae</i>	
Poeciliidae	<i>Heterandria dirempta</i>	
Poeciliidae	<i>Heterandria formosa</i>	Least killifish
Poeciliidae	<i>Heterandria jonesii</i>	Barred killifish
Poeciliidae	<i>Heterandria litoperas</i>	

Poeciliidae	<i>Heterandria obliqua</i>	
Dasyatidae	<i>Himantura alcockii</i>	Pale-spot whip ray
Dasyatidae	<i>Himantura krempfi</i>	Marbled freshwater whip ray
Dasyatidae	<i>Himantura microphthalmalma</i>	Smalleye whip ray
Dasyatidae	<i>Himantura oxyrhyncha</i>	Marbled whipray
Dasyatidae	<i>Himantura walga</i>	Dwarf whipray
Lepisosteidae	<i>Lepisosteus osseus</i>	Longnose gar
Anabantidae	<i>Microctenopoma fasciolatum</i>	Banded ctenopoma
Ictaluridae	<i>Noturus insignis</i>	Margined madtom
Ictaluridae	<i>Noturus miurus</i>	Brindled madtom
Ictaluridae	<i>Noturus nocturnus</i>	Freckled madtom
Siluridae	<i>Ompok canio</i>	
Siluridae	<i>Ompok pabo</i>	Pabo catfish
Polypteridae	<i>Polypterus ansorgii</i>	Guinean bichir
Polypteridae	<i>Polypterus bichir bichir</i>	Nile bichir
Polypteridae	<i>Polypterus bichir katangae</i>	
Polypteridae	<i>Polypterus endlicheri endlicheri</i>	Saddled bichir
Polypteridae	<i>Polypterus makelembembe</i>	
Polypteridae	<i>Polypterus ornatipinnis</i>	Ornate bichir
Polypteridae	<i>Polypterus weeksii</i>	Mottled bichir
Characidae	<i>Astyanax mexicanus</i>	Mexican tetra
Cichlidae	<i>Crenicichla macrophthalmalma</i>	
Cichlidae	<i>Crenicichla missioneira</i>	
Cichlidae	<i>Crenicichla semifasciata</i>	
Eleotridae	<i>Dormitator lebretonis</i>	
Dasyatidae	<i>Himantura draco</i>	Dragon stingray
Dasyatidae	<i>Himantura fluviatilis</i>	Ganges stingray
Dasyatidae	<i>Himantura hortlei</i>	Hortle's whipray
Dasyatidae	<i>Himantura marginata</i>	Blackedge whipray
Dasyatidae	<i>Himantura signifer</i>	White-edge freshwater whip ray
Ictaluridae	<i>Ictalurus furcatus</i>	Blue catfish
Ictaluridae	<i>Ictalurus lupus</i>	Headwater catfish
Lepisosteidae	<i>Lepisosteus oculatus</i>	Spotted gar
Fungulidae	<i>Lucania parva</i>	Rainwater killifish
Ictaluridae	<i>Noturus gyrinus</i>	Tadpole madtom
Siluridae	<i>Ompok malabaricus</i>	Goan catfish
Osteoglossidae	<i>Osteoglossum ferreirai</i>	Black arawana
Polypteridae	<i>Polypterus bichir lapradei</i>	Bichir
Polypteridae	<i>Polypterus delhezi</i>	Barred bichir
Osteoglossidae	<i>Scleropages formosus</i>	Asian bonytongue
Ictaluridae	<i>Ameiurus catus</i>	White catfish
Characidae	<i>Astyanax fasciatus</i>	Banded astyanax
Cichlidae	<i>Cichla ocellaris</i>	Peacock cichlid
Cichlidae	<i>Crenicichla reticulata</i>	
Dasyatidae	<i>Himantura gerrardi</i>	Sharpnose stingray
Dasyatidae	<i>Himantura kittipongi</i>	
Ictaluridae	<i>Pylodictis olivaris</i>	Flathead catfish
Ictaluridae	<i>Ameiurus natalis</i>	Yellow bullhead
Dasyatidae	<i>Himantura fava</i>	honeycomb whipray
Dasyatidae	<i>Himantura imbricata</i>	Scaly whipray
Siluridae	<i>Ompok pabda</i>	Pabdah catfish
Cichlidae	<i>Parachromis managuensis</i>	Guapote tigre
Ictaluridae	<i>Ameiurus melas</i>	Black bullhead
Ictaluridae	<i>Ameiurus nebulosus</i>	Brown bullhead
Cyprinidae	<i>Rutilus rutilus</i>	Roach
Cyprinidae	<i>Tinca tinca</i>	Tench

4 Next steps

4.1 Communication

The implementation of the communication activities is the responsibility of OFMIG and the jurisdictions. A second postcard and a brochure are being developed by a communications working group within OFMIG. The brochure will be targeted at serious hobbyists and the industry sector and goes into more detail to explain the noxious list and relevant legislation. The postcard will be targeted at novice hobbyists and explains the process for correct disposal of unwanted fish (including noxious/high risk species). These brochures are intended to be made available in aquarium and pet stores. Retailers will also be supplied with more comprehensive information to assist them in responding to customer's questions. All information will be circulated to aquarium hobbyist clubs, societies and associations to maximise exposure.

4.2 Grey list

The ornamental fish trade continues to evolve. At present there are three national fish lists recognised in the strategic plan for the import or control of ornamental fish in Australia (DAFF, 2005). These are: 1) the permitted species lists maintained by DEWHA and the Australian Quarantine and Inspection Service, 2) the agreed noxious list, and 3) the grey list. However, among the 2000 or more ornamental fish species likely to be in Australia at present there is a fourth group of fish which are not on any of the previous lists (McNee, 2002). This fourth group is yet to be identified or reviewed in terms of risk and warrants consideration in terms of implementation of a national approach to the management of ornamental fish.

The 315 species assessed in tranche 2 now require review by the expert technical working group to be organised by OFMIG. This will provide an opportunity for industry and hobbyists to identify those species within these risk groups that are of particular commercial or hobbyist interest. This will provide additional species that may be subjected to more rigorous biological and socio-economic assessments.

Although BRS completed the risk assessment for 447 species, there is still a further 331 grey list species that need to go through all stages of review (tranche 3). OFMIG now has carriage of tranche 3. The first step will be to analyse tranche 3 using the risk matrix. The borderline and high risk species from the tranche 3 assessment could then be added to those from the tranche 2 assessment and put to the stakeholder review workshop as a single group. The outputs from this review would then provide the next group of species to be put out for consultation prior to addition to the national noxious species list, and a final group of species (combined blue and yellow lists) from the three tranches of review that need to be subject to a more rigorous biological and socio-economic risk assessment process. The development and agreement to this broader risk assessment process can be progressed by OFMIG alongside the tranche 3 risk matrix review as one of the priority actions of the group.

4.2.1 Progressing to Phase 2

At their 29th meeting on 27 February 2009, the MACC endorsed a Phase 2 work plan for OFMIG, building on the work completed in the initial two years (Table 12). A number of important aspects of the national strategy have been addressed as part of the work presented in this report. This project provides an important foundation for future work requirements and will assist OFMIG to make decisions on the on-going implementation of the national strategy.

Table 12. Implementation work plan for the management of ornamental fish in Australia during Phase 1 (2007/08 to 2008/09) and Phase 2 (2009/10).

(Phase 2 priorities highlighted in bold)

RECOMMENDATION	TASKS	PRIORITY	AGENCY RESPONSIBLE	DATE FOR IMPLEMENTATION	Progress
Adopt national noxious fish list	Draft regulations or gazette list in each jurisdiction	High	Each jurisdiction	1 December 2007	Completed for all jurisdictions except WA by March 2009
	Develop communication tools for national approach	High	OFMIG	ongoing	
Review status of fish on the grey list	Appoint and resource Scientific/Technical Advisory Group	High	MACC	31 March 2007	Completed
	Risk assessment for grey list species	High	Scientific/Technical Advisory Group	30 April 2007	1st tranche completed
				(commencement)	2nd tranche ready for consultation
Regulatory framework and licensing to manage large fish breeders and ornamental fish importers	Develop regulatory and licensing policies	Medium	Each jurisdiction	1 Dec 2007	Completed
	Advise industry groups of new arrangements	Medium	Each jurisdiction	1 July 2007	Completed
Control mechanisms for regulation and management of noxious fish and rare fish already in circulation in Australia	Options paper on management and control approaches	High	OFMIG	30 June 2007 (commencement)	In progress

Control plans for escaped ornamental fish	Development of control or eradication plans for priority species	Medium	Each jurisdiction	1 June 2008	On-going in each jurisdiction
Review of aquatic plants used in ornamental fish trade	Identification of plants and draft management strategy	Medium	OFMIG (through Australian Weeds Committee)	1 December 2007 (dependent on Weeds Committee)	Completed
National communication strategy	Develop and resource national strategy	High	OFMIG (MACC)	1 September 2007	On-going
	Produce communication tools	Medium	DAFF, DEWHA, States	On-going	On-going
Monitor and evaluate National Plan implementation	Review implementation in each jurisdiction	Low	OFMIG (MACC)	On-going to 30 June 2008	Completed (report to MACC)
Roll out of eradication or control programs	National approach for: <ul style="list-style-type: none"> - destruction orders - amnesty - buyback - sterilisation 	Medium	Each jurisdiction as required	1 December 2007 (on-going)	On-going

5 References

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6 Appendices

6.1 Appendix 1: OFMIG communications strategy

Communications Strategy – Ornamental Fish in Australia

Communication Strategy

for

The implementation of the national campaign

Ornamental Fish Policy Working Group
Natural Resource Management Ministerial Council

September 2007

Last updated: 8/07/2009
Prepared by Vicki Pow

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Background

The ornamental fish trade in Australia is estimated to be worth approximately \$350 million annually. This figure is not concise but does include commercial fish breeding facilities, wholesale traders, retail outlets and the hobby industry.

The trade in Australia is complex and complicated with each jurisdiction having different regulatory frameworks and management regimes. Translocation of fish across borders occurs without any enforcement or punishment and no one really understands (outside of some major wholesale businesses or hobby groups) what species are being traded in Australia, or the level of prohibited or noxious fish being bred and traded in the industry.

Ornamental fish present a significant risk to freshwater systems in Australia and have the potential to trigger or contribute to a major aquatic animal pest or disease incursion in Australia in the future.

A number of populations of exotic or non-endemic ornamental fish species are established in Australia, and these 'pests' are seriously impacting on biodiversity in our freshwater systems. Some aquatic plants, such as *Caulerpa taxifolia* (which was traded in the aquarium industry until recently), can have devastating effects on marine systems if released, and future escapes and invasions need to be avoided.

Many fish species in the trade are not on the current national permitted species lists established under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* or covered by quarantine regulations. It may be that such species have been permitted under previous statutory arrangements, but they are no longer on the list and are unlikely to have been assessed for their potential risk to the environment. There is no consistency between mechanisms or controls across regulatory agencies to deal with the serious issue of noxious aquatic pests, with the exception of a few species.

Past efforts to regulate the ornamental fish industry have failed, primarily as a result of heavy-handed approaches to regulation and a lack of consultation and failure to engage effectively with industry stakeholders.

The Pet Industry Association of Australia (PIAA) has supported this review of the ornamental fish trade. The PIAA, in association with state and territory governments, has committed to the implementation of this report's recommendations, to ensure that the industry has an economically sound and environmentally sustainable future.

The recommendations of the report address the need for a nationally recognised noxious species list and new management frameworks for the ornamental sector as a whole. The report also recognises the importance of improved communication with all stakeholders and the wider community through a comprehensive communication plan.

The Ornamental Fish Policy Working Group (OFPWG) is responsible for the implementation of the national communications strategy.

Need for a Communication Strategy

A communications strategy is necessary to minimise misinformation and produce community understanding and awareness about the potential threat of ornamental fish, live rock and plants to our freshwater environment.

A national campaign would bring together all state and territory organisations that have the responsibility for regulating the ornamental fish industry and be proactive in developing strategies and messages that could be applied across the nation.

There will be two phases to the strategy –

1. the announcement of the release of the final report
2. the implementation of the recommendations for a national campaign

Key Issues and Considerations

- Many fish species in the trade are not on the current national permitted species lists established under Part 13A of the *Environment Protection and Biodiversity Conservation Act 1999* or covered by quarantine regulations.
- Certain species have been permitted under previous statutory arrangements but they are no longer on the list and are unlikely to have been assessed for their potential risk to the environment.
- Each state or territory has their own list of permitted species with different regulatory frameworks and management regimes and as a result there is no consistency between mechanisms or controls across regulatory agencies to deal with the serious issue of noxious aquatic pests, with the exception of a few species (eg. European carp).
- Translocation of fish across borders occurs with impunity and no one really understands (outside of some major wholesale businesses or hobby groups) what species are being traded in Australia, or the level of prohibited or noxious fish being bred and traded.

STAGE 2 – National Campaign

Aims

- To raise awareness to stakeholders of the availability of the final report - Management of Ornamental Fish in Australia.
- To implement a strategy to raise community understanding and awareness to risks and the potential threat of ornamental fish, aquatic plants and live rock to our environment if released into our waterways.

Objectives

The objectives for the implementation of the Ornamental Fish Strategy are:

- to minimise misinformation and raise community awareness to the potential threat of ornamental fish, aquatic plants and live rock to our freshwater environment;
- to initiate behavioural change to encourage the community to dispose of their unwanted / noxious ornamental fish, live rock and aquatic plants in the correct way;
- to achieve better communication by developing networks and cooperative working partnerships between the regulators, industry and major hobby groups; and
- to provide timely updates on changes in regulatory arrangements to improve hobby and trade practice and to ensure that the industry has an economically sound and environmentally sustainable future.

Key Messages

There are key messages for the various sectors of the ornamental fish industry as well as public awareness and community education. It will form the basis of the national promotion.

- Ornamental fish are wonderful pets, but they should never be released into our natural waterways.

General public messages

- Safely dispose of your unwanted fish or aquatic plants or live rock - "bag it, freeze it, bin it" or take the fish, plants to your local aquarium.
- Never release unwanted fish into our natural waterways.
- Ornamental fish, aquatic plants and live rock are a risk to our waterways in Australia and can trigger or contribute to a future major aquatic animal pest or disease spread, particularly in freshwater systems, if released.
- Take care in cleaning aquarium tanks as this can accidentally introduce unwanted species into our waterways.
- Governments and industry are working together to protect our freshwater environments.

Industry messages

- Many ornamental fish species in the trade are not on the current national permitted species lists. Check before you buy.

A recent review suggests that there are over 1100 exotic ornamental fish species in Australia. The current 'permitted import' list states that there are only 481 species or genera that have been assessed as permitted imports.

- Illegally importing exotic ornamental fish species increases the risk of introducing new diseases and pests to our natural waterways.
- Take care in cleaning aquarium tanks as this can also introduce unwanted species into our waterways and can affect our native fish populations and waterways.
- Importers of ornamental fish can apply to have new species included on the 'permitted imports' list.
- Some aquatic plants can also have devastating effects on marine systems if released, seriously impacting on biodiversity in our freshwater systems.
- No one really knows which species are being traded in Australia, or the numbers of prohibited or noxious fish being bred and traded in the industry.
- The Pet Industry Association of Australia (PIAA), is working with state and territory governments, to ensure that the industry has an economically sound and environmentally sustainable future.

Target Audience

The target audience can be broadly divided into two groups – the general public and the industry sector.

Primary targets

- General public
- Commercial fish breeders
- Importers / Wholesalers / Retailers
- Private aquarium owners (including those with fish ponds), hobbyists and enthusiasts.
- Indigenous groups / NESB

Secondary targets and stakeholders

- State or territory government compliance / enforcement officers
- AQIS and customs officers
- Public aquariums
- Industry representatives
- Media - metropolitan, rural and regional media
- Educational programmes such as 'Totally Wild', Discovery channel programmes, or lifestyle programmes such as 'Better Homes and Garden' where there is a segment devoted to pet care or pet problems.

Communications Strategy

This is the second stage of this communications strategy. A communications strategy is necessary to minimise misinformation and raise community understanding and awareness by providing balanced information about the potential threat of ornamental fish and plants to our water environment.

It planned that with the implementation of the Ornamental Fish Strategy and associated Communications Strategy, communication materials will be developed and be utilised by all jurisdictions, thus reducing costs and effort for each jurisdiction while ensuring a consistent message across the country.

Some jurisdictions have already developed communication tools and a review of this material and their effectiveness will be taken into consideration when developing the communications tools for the national promotion. It is hoped that this material will supplement the new material.

There is great potential for the communications strategy to 'fill the gap' in information and provide a more balanced perspective. The existing tools will supplement or value add to the new material.

NOTE: All material developed will require clearance from the OFPWG.

Communication tools

- Slogan for campaign
- National badging for all materials relating to this campaign
- Information/ fact sheets with more detail
- Promotional poster
- ID Guide
- Supporting material / giveaways such as DL Brochure with key messages
- Dedicated website
- Promotional opportunities at specific shows
- Media Release
- Advertisements – print, radio and television (depending on funds available) and associated editorials
- Community Service Announcements
- Optional – Ministerial launch of campaign

Slogan for national campaign

A slogan is to be developed for the campaign.
"Bag it, freeze it, bin it" has been agreed to by the working group.

Note: We are currently checking with animal welfare groups, RSPCA and Australian Veterinary Association to confirm that freezing is the most humane way of disposing of fish.

Banner/logo/badging

A 'look' for material relating to this campaign needs to be developed. This would incorporate a template for such things as information sheets, poster and any other promotional material. Badging will need to be agreed to – Is it the same as for the Strategy? Show industry-governments working together.

Information Sheets

Most jurisdictions have already developed information sheets and brochures. These will be used to supplement the new material.

Promotional Poster

A promotional poster will be developed with key messages and appropriate images relating to the campaign and slogan. It will be available for public aquariums, the aquarium trade and importers, aquarium industry associations and other key stakeholders groups. It will also be available to download from website.

Identification Guide

To develop an identification guide along similar lines to the Protected Marine Species Identification Guide developed by DEH for NHT. Small laminated flip-type booklet approx 11.5cm x 18.5cm. On each page would be an image of a noxious species with a description of elements of characteristics such as size, colour and specific feature. Purpose would be to assist enforcement officers to recognise noxious species.

Supporting material / giveaways

Brochure, suggest DL 6 panel size for distribution as an in-store counter promotion for the aquarium trade, hobby clubs and vets. Brochure would contain basic information but would provide contacts for more information.

Optional: Develop tools such as fridge magnets with key messages on them and to be available as giveaways as various events, trade shows etc.

Dedicated website and promotional material

A dedicated website is to be developed for information relating to ornamental fish and will include importing details, information sheets, what to do if you have illegal fish, contact lists and useful links.

The website will be the primary mode for providing information and online resources to various stakeholders, such as the aquarium industry, importers, enforcement agencies, trade, private aquarium owners (including those with fish ponds), hobbyists and enthusiasts. The website could have a secured area for access by registered users, such as enforcement/compliance officers.

- Useful links – A list of useful links to key websites and resources to obtain additional information about bycatch.

It was suggested that we use the www.feral.org.au to place our information. At present there is information on carp. This avenue is currently being investigated. Other portals are being investigated as well.

Promotional opportunities at specific shows

To identify promotional opportunities at specific shows, such as conferences, trade shows and exhibitions. For example, as part of a joint display with state agency at the Pet Expo 2007 in Melbourne, 5-6 October.

Media

A media release is to be prepared and distributed among metropolitan, regional and rural media outlets announcing the release of the Ornamental strategy. Media releases should also be prepared for various stages of the promotion, such as additions to 'permitted species' lists.

It is essential that we engage the media during the course of the campaign and promote the key messages.

Prepared articles are to be distributed to key industry journals, newsletters and publications. There are opportunities with some journals or magazines for the placement of an advertisement and an accompanying editorial.

Also seek opportunities television shows, particularly children's television shows, such as Totally Wild or the pet segment of Better Homes and Garden – pet care, Dr Harry or similar shows advising them of the pleasures of keeping ornamental fish, aquatic plants but also the possible environmental risks if they are dumped or let loose into waterways.

Additional activity

- Profile on BRS webpage
- Articles for Contours, E-clips and E-bulletin
- Articles for other relevant government publications or distribution outlets
- Advertisements and articles for industry publications - PIAA

Optional - Ministerial launch

If a Ministerial launch is planned to officially launch the campaign then it will be co-ordinated at an agreed time through the relevant Minister's office. It is likely to be a joint launch as there are two Ministers involved – Minister for Agriculture Fisheries and Forestry and the Minister for Environment and Water Resources. This will need to be negotiated.

Launch:

- Invitations prepared and distributed
- Speech
- Media release
- Interview and Photograph opportunities

Media:

- Media alert for launch
- Media kit prepared for Ministerial launch to contain: Ministerial Media Release, poster, background information and the Strategy
- Ministerial media release (drafted)

Budget

A limited budget has been allocated for activities relating to implementation of the Ornamental Fish Strategy.

Proposed allocation of funding for the national communications component of the national strategy implementation over a two year period is below: The allocated funds are for a National communication strategy - public notices, posters, pamphlets and E-reference with annual funding of \$80,000 for two years (totalling \$160,000).

Evaluation

Success of the media strategy will be measured by:

- Media coverage received following the launch of campaign
- Enquiries by industry and key stakeholder groups
- Hits on the dedicated website
- Requests for information by public

Summary of Activity

Activity	Responsible Agency	Contact	Deadline
COMMUNICATIONS TOOLS:			
Slogan			
Banner /logo			
Brochure - DL			
Poster with key messages			
Laminated booklet – id fish (refer NHT Protected Species ID guide)			
Promotional material – fridge magnets, etc			
Promotional opportunities at key conference and/or trade shows			
Website <ul style="list-style-type: none"> • Development of website and associated material • Development of Secured area for website 			
MINISTERIAL LAUNCH			
Minute/s			
Event Brief			
Speech			
Media Release			
Launch Details:			
Invitation list			
Draft and distribute invite			
RSVP point of contact			
Set-up, pack down			
Attendance, logistics (AV equip, lectern)			
Venue / catering			
Order of proceedings			
Photographer			
Launch materials:			
Display copies of brochure, poster etc			
Minister’s media release			
Poster for lectern			
Photo opps at venue			
BRS pull up banner			
Media			
Media alert of the launch. <i>2 alerts to be sent out</i>			
Media alert follow up.			

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Media release on launch day by relevant Minister/s			
Working Party or BRS spokesperson(s) for interviews			
Media kits - Compile copies of release, poster, Strategy, background information etc for distribution at the launch and direct mail on request			
ADDITIONAL MEDIA			
Contours, E-clips and E-bulletin articles	BRS		
Paid advertisements in industry journals			
Articles in industry newsletters			
MONITORING:			
Media monitoring for 4 weeks post launch.	BRS		

6.2 Appendix 2: BRS ornamental fish website

Ornamental fish: pets or pests?

The ornamental fish industry in Australia - which includes traders, fish breeders, retail outlets and the hobby industry - is estimated to be worth \$350 million a year.

Aquarium fish make great pets, but if they are released into the wild they can pose a serious threat to Australia's aquatic biodiversity.

Ornamental fish and aquarium plants can be dumped or released, often making their way into our waterways. This has resulted in a number of exotic fish species establishing a presence in Australia, seriously affecting the biodiversity of our freshwater systems.

Whereas some control is already occurring, through quarantine regulations and State fishery regulations, there is no consistency between the regulatory agencies dealing with the issue of noxious, aquatic pests. Despite several attempts to regulate the industry, nothing workable has eventuated.

To address this problem, the Natural Resource Management Ministerial Council has endorsed a national strategy - *A Strategic Approach to the Management of Ornamental Fish in Australia*. The strategy was developed by the Ornamental Fish Policy Working Group in close consultation with industry and other stakeholders. It looks at the potential for aquarium fish to become pests and makes seven main recommendations on managing and regulating their trade. Key recommendations include the need for a nationally recognised noxious species list; new management frameworks for the ornamental sector, better communication with stakeholders and a public awareness campaign on the dangers of releasing fish where they can get into waterways, and what to do with them if they are no longer wanted.

An Ornamental Fish Management Implementation Group has been created to progress the implementation of the strategy. This group has representatives from all jurisdictions as well as industry and hobby sector representatives and a member from the Aquatic Animal Health Committee.

The latest facts about keeping ornamental fish

Ornamental fish are well-suited to aquariums but, if released into Australia's natural waterways, could threaten Australia's aquatic environment.

The national strategy released in 2006: *A Strategic Approach to the Management of Ornamental Fish in Australia*, contains a proposed national noxious ornamental aquarium fish species list and a "grey" list of species that require further review.

The states and territories have either formalised or are in the process of formalising the noxious species list in their legislation. Where there was not unanimous agreement on the status of a species, it was added to the grey list.

Scientists and industry representatives from around Australia, including from the state and Australian governments, recently reviewed a risk identification method and results for categorising grey list ornamental fish according to the probability of their establishment in the wild and their potential environmental impact.

Results of the workshop are still being reviewed. However there is a significant number of grey list species that fall into the high risk category.

The listing of grey-listed species as noxious is the responsibility of the Natural Resource Management Ministerial Council and will then be taken up by the states and territories.

Treatment of noxious species, the regulations and how they are enforced is determined by state and territory governments.

A copy of A Strategic Approach to the Management of Ornamental Fish in Australia can be obtained through the BRS Shop.

Updates from the Chair of the Ornamental Fish Management Implementation Group on the review of grey-list species

18 November 2008

In 2006 the national strategy, A Strategic Approach to the Management of Ornamental Fish in Australia, was approved by the Australian, state and territory governments through the Natural Resource Management Ministerial Council (NRMMC). It contains a list of noxious ornamental aquarium fish species that the states and territories have agreed to control through legislation.

Where there was not unanimous agreement on the noxious status of an ornamental fish species, it was added to a list to be reviewed to determine whether it presented a high risk to the Australian environment if released either deliberately or accidentally. The national strategy states that these species require further technical consideration and risk assessment. This list is commonly called the 'grey list'.

Scientists and industry representatives from around Australia, recently reviewed a range of ornamental fish species on the grey list and considered their risk of establishing in the wild and their potential environmental impact. The review covered approximately 140 of the 780 species currently on the grey list. The review process identified species that were considered high and low risk and species that were of direct importance to the aquarium trade and hobby sector. The results of the review were considered by the Ornamental Fish Management Implementation Group (OFMIG) on 7 November 2008. The recommendations of that meeting were:

- high risk species unlikely to be of direct importance to the trade and hobby sectors (as identified by representatives of industry and hobby groups) will be released for public comment before states and territories proceed to list them as noxious
- high risk species identified as being of importance to the trade and hobby sectors will be subject to stakeholder consultation to discuss management options
- a stakeholder workshop will be run in 2009 to consult with stakeholders.

The recommendations from OFMIG will be considered by the NRM Marine and Coastal Committee (MACC) prior to implementation. The decision to list grey-listed species as noxious is the responsibility of the Natural Resource Management Ministerial Council, which is representative of all governments in Australia. Control through legislation will then be taken up by the states and territories.

You should be aware that species not listed on the national live import list are prohibited imports. People importing and keeping them may need to demonstrate lawful import. For a copy of the live import list please see the following website: <http://www.environment.gov.au/biodiversity/trade-use/lists/import/pubs/live-import-list.pdf>

Further information and a copy of A Strategic Approach to the Management of Ornamental Fish in Australia can be obtained at the following website: <http://www.daff.gov.au/brs/fisheries-marine/environment/ornamental>

Yours sincerely

Will Zacharin
Chair
Ornamental Fish Management Implementation Group

Last reviewed: 21 Nov 2008

Contact:

Email Bureau of Rural Sciences
About Bureau of Rural Sciences and Contact details
Media Inquiries

6.3 Appendix 3: Postcard – Strategic approach to the management of ornamental fish in Australia



6.4 Appendix 4: Useful websites consulted for this review

<http://animal-world.com/encyclo/fresh/fresh.htm>
<http://aquatic-hobbyist.com>
<http://aquaticpredators.com>
<http://aquaworld.netfirms.com>
<http://fisc.er.usgs.gov/afs/>
<http://fish.mongabay.com>
<http://fpcs.fish.govt.nz/>
www.amonline.net.au/fishes/index.cfm
www.aquariacentral.com
www.aquarticles.com
www.aquaticcommunity.com
www.arcbc.org.ph/arcweb/pdf/vol2no4/12-15_sr_invasive_aquatic_animals.pdf
www.cites.org/
www.defra.gov.uk
www.fishbase.org
www.fishprofiles.com
www.geocities.com
www.liveaquaria.com
www.nanfa.org
www.planetcatfish.com
www.pond-life.me.uk
www.scotcat.com
www.seriouslyfish.com
www.theaquariumwiki.com
www.thetropicaltank.co.uk
www.tropicalfishfinder.co.uk
www.wcs.org/globalconservation/Africa/madagascar/freshwaterfishconservation
www.wetwebmedia.com

6.5 Appendix 5: Results of tranche 1 and 2 (i.e. all species assessed to date)

Highlighted cells in the 'Family' column refer to the level of interest shown in them; Blue = of interest to hobbyists, Yellow = of interest to industry, Purple = of no interest. Highlighted cells in the 'Total' and 'Climatch x Impact' columns refer to the level of risk the species poses; Green = low risk, Red = high risk. These colours only appear on the 132 species that have been assessed by the technical working group as level of interest and final scores have not been assigned for the other 315 species assessed to date.

Family	Species	Biodiversity							Impacts							Trade			Total		Climate x Impact
		Climate match	Established in Australia	Eradication effort	Established beyond natural range internationally	CITES listing	Hardiness	Resilience	Current noxious status in Australia	Impact on habitat	Impact on other species	Genetic risk to native species	Genetic risk of non-native hybridisation	Known carrier of high risk disease	Direct threat to humans	Restricted trade elsewhere	Multiple use species	Captive status in industry	Total	Unknowns	
Fundulidae	<i>Leptolucania ommata</i>	3	0	NR	0	No	2	2	0	0	0	0	0	0	0	No	1	1	9	0	low risk
Acipenseridae	<i>Huso dauricus</i>	3	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	1	1	11	1	high impact, low climate
Acipenseridae	<i>Acipenser fulvescens</i>	3	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	12	1	high impact, low climate
Acipenseridae	<i>Acipenser brevirostrum</i>	3	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	12	1	high impact, low climate
Acipenseridae	<i>Acipenser persicus</i>	4	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	1	1	12	1	high risk
Acipenseridae	<i>Acipenser sinensis</i>	3	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	12	1	high impact, low climate
Acipenseridae	<i>Acipenser sturio</i>	5	0	NR	0	Yes		0	0	2	2.1	0	0	0	0	Yes	2	1	12	1	high risk
Pangasiidae	<i>Pangasius elongatus</i>	2	0	NR	0	No	2	2	0	2	2	0	0	0	0	No	1	1	12	0	high impact, low climate
Pangasiidae	<i>Pangasius nieuwenhuisii</i>	2	0	NR	0	No	2	2	0	2	2	0	0	0	0	No	1	1	12	0	high impact, low climate

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Polypteridae	<i>Erpetoichthys calabaricus</i>	3	0	NR	0	No	2	1	0	2.1	2	0	0	0	0	No	1	1	12	1	high impact, low climate
Mastacembelidae	<i>Mastacembelus erythrotaenia</i>	3	0	NR	0	No	2	1	0	1	2	0	0	0	0	No	2	1	12	0	high impact, low climate
Pimelodidae	<i>Phractocephalus hemiliopterus</i>	1	0	NR	0	No	2	0	0	2	2	0	0	2.1	0	No	2	1	12	1	high impact, low climate
Cichlidae	<i>Caquetaia umbrifera</i>	2	0	NR	0	No	2	1	0	2	2	0	1	0	0	No	1	1	12	0	high impact, low climate
Acipenseridae	<i>Acipenser ruthenus</i>	3	0	NR	2	Yes	2	0	0	2	1	0	0	0	0	Yes	2	1	13	0	high impact, low climate
Acipenseridae	<i>Acipenser dabryanus</i>	5	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	1	1	13	1	high risk
Acipenseridae	<i>Acipenser medirostris</i>	4	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	13	1	high risk
Acipenseridae	<i>Acipenser mikadoi</i>	4	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	13	1	high risk
Acipenseridae	<i>Acipenser naccarii</i>	5	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	1	1	13	1	high risk
Acipenseridae	<i>Acipenser oxyrinchus oxyrinchus</i>	4	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	13	1	high risk
Acipenseridae	<i>Acipenser baerii baicalensis</i>	4	0	NR	0	Yes	2	0	0	2	1	0	0	2.1	0	Yes	1	1	13	2	high risk
Acipenseridae	<i>Acipenser nudiiventris</i>	4	0	NR	1	Yes	2	0	0	2	2.1	0	0	0	0	Yes	1	1	13	2	high risk
Acipenseridae	<i>Acipenser schrenckii</i>	4	0	NR	1	Yes	2	0	0	2	2.1	0	0	0	0	Yes	1	1	13	2	high risk
Acipenseridae	<i>Acipenser multiscutatus</i>	4	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2.1	1	13	3	high risk
Acipenseridae	<i>Acipenser oxyrinchus destotoi</i>	4	0	NR	0	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2.1	1	13	3	high risk
Ctenoluciidae	<i>Ctenolucius hujeta</i>	4	0	NR	0	No	2.1	1	0	2.1	1	0	0	0	0	No	2	1	13	2	high risk
Eleotridae	<i>Oxyeleotris heterodon</i>	2	0	NR	0	No	2	2	0	0	2	2	1	0	0	No	1	1	13	0	high impact, low climate
Pangasiidae	<i>Pangasius gigas</i>	4	0	NR	1	Yes	2	0	0	2	2	0	0	0	0	No	1	1	13	1	high risk
Pangasiidae	<i>Pangasius conchophilus</i>	4	0	NR	0	No	2	0	0	2	2	0	0	0	0	No	2	1	13	0	high risk
Pangasiidae	<i>Pangasius krempfi</i>	2	0	NR	0	No	2	2	0	2	2	0	0	0	0	No	2	1	13	0	high impact, low climate
Pangasiidae	<i>Pangasius kunyit</i>	2	0	NR	0	No	2	2	0	2	2	0	0	0	0	No	2	1	13	0	high impact, low climate

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Fundulidae	<i>Adinia xenica</i>	5	0	NR	0	No	2	2	0	1	1	0	0	0	0	No	1	1	13	0	low impact, high climate
Fundulidae	<i>Fundulus chrysotus</i>	4	0	NR	0	No	2	2	1	1	1	0	0	0	0	No	1	1	13	0	low impact, high climate
Pimelodidae	<i>Brachyplatystoma vaillantii</i>	3	0	NR	0	No	2	0	0	2	2	0	0	2.1	0	No	1	1	13	1	high impact, low climate
Tetraodontidae	<i>Carinotetraodon travancoricus</i>	2	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	1	13	0	high impact, low climate
Tetraodontidae	<i>Auriglobus amabilis</i>	2	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	1	13	0	high impact, low climate
Tetraodontidae	<i>Auriglobus nefastus</i>	2	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	1	13	0	high impact, low climate
Tetraodontidae	<i>Chonerhinos silus</i>	2	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	1	13	0	high impact, low climate
Tetraodontidae	<i>Colomesus psittacus</i>	3	0	NR	0	No	2	1	0	2	2	1	0	0	0	No	1	1	13	0	high impact, low climate
Cichlidae	<i>Caquetaia spectabilis</i>	2	0	NR	0	No	2	1	0	2	2	0	1	0	0	No	2	1	13	0	high impact, low climate
Poeciliidae	<i>Tomeurus gracilis</i>	2	0	NR	0	No	2	2	0	1	2	0	1	2.1	0	No	1	1	14	1	high impact, low climate
Acipenseridae	<i>Huso huso</i>	4	0	NR	1	Yes	2	0	0	2	2.1	0	0	0	0	Yes	2	1	14	2	high risk
Eleotridae	<i>Oxyeleotris urophthalmoides</i>	2	0	NR	0	No	2	1	0	2.1	2	2	1	0	0	No	1	1	14	1	high impact, low climate
Eleotridae	<i>Oxyeleotris siamensis</i>	4	0	NR	0	No	2	1	0	0	2	2	1	0	0	No	1	1	14	0	high risk
Pimelodidae	<i>Sorubimichthys planiceps</i>	4	0	NR	0	No	2	0	0	2	2	0	0	2.1	0	No	1	1	14	1	high risk
Potamotrygonidae	<i>Plesiopygion iwamae</i>	3	0	NR	0	No	2	0	0	2.1	2	0	0	2	1	Yes	1	1	14	1	high impact, low climate
Cichlidae	<i>Caquetaia kraussii</i>	3	0	NR	0	No	2	1	0	2	2	0	1	0	0	Unknown	2	1	14	0	high impact, low climate
Acipenseridae	<i>Acipenser stellatus</i>	5	0	NR	1	Yes	2	0	0	2	2	0	0	0	0	Yes	2	1	15	0	high risk
Notopteridae	<i>Chitala blanci</i>	6	0	NR	1	No	2.1	0	0	2.1	1	0	0	0	0	No	2	1	15	2	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Notopteridae	<i>Chitala ornata</i>	5	0	NR	1	No	2.1	0	0	2.1	2.1	0	0	0	0	No	2	1	15	3	high risk
Pimelodidae	<i>Perrunichthys perruno</i>	4	0	NR	0	No	2	1	0	2	2	0	0	2.1	0	No	1	1	15	2	high risk
Pimelodidae	<i>Leiarius spp</i>	4	0	NR	0	No	2	1	0	2	2	0	0	2.1	0	No	1	1	15	2	high risk
Poeciliidae	<i>Alfaro cultratus</i>	3	0	NR	0	No	2.1	2	0	2.1	1	0	1	2.1	0	No	1	1	15	3	high impact, low climate
Protopteridae	<i>Protopterus dolloi</i>	4	0	NR	0	No	2	0	0	2.1	1	0	2	2.1	0	No	1	1	15	2	high risk
Rivulidae	<i>Leptolebias opalescens</i>	4	0	NR	0	Yes	2.1	2	0	2.1	1	0	0	2.1	0	No	1	1	15	4	high risk
Arapaimidae	<i>Arapaima gigas</i>	4	0	NR	1	Yes	2	0	0	1	2	0	0	2.1	0	Yes	2	1	15	1	high risk
Eleotridae	<i>Gobiomorphus gobioides</i>	3	0	NR	0	No	2	1	0	0	1	2	1	2.1	0	Unknown	1	2.1	15	2	high impact, low climate
Poeciliidae	<i>Heterandria bimaculata</i>	3	0	NR	0	No	2	2	0	1	2	0	1	2.1	0	No	1	1	15	1	high impact, low climate
Chacidae	<i>Chaca bankanensis</i>	2	0	NR	0	No	2	2	0	2	2	0	0	0	2	No	1	1	14	0	high impact, low climate
Eleotridae	<i>Allomogurnda nesolepis</i>	2	0	NR	0	No	2	2	0	2.1	2	2	1	0	0	No	1	1	15	1	high impact, low climate
Eleotridae	<i>Dormitator maculatus</i>	7	0	NR	0	No	2	1	0	0	1	1	0	0	0	No	1	1	14	0	low impact, high climate
Cichlidae	<i>Crenicichla lacustris</i>	4	0	NR	0	No	2	1	1	2	2	0	1	0	0	No	1	1	15	0	high risk
Pimelodidae	<i>Pseudoplatystoma fasciatum</i>	4	0	NR	0	No	2	1	0	2	2	0	0	0	0	No	2	2	15	0	high risk
Pimelodidae	<i>Brachyplatystoma filamentosum</i>	3	0	NR	0	No	2	0	0	2	2	0	0	2.1	2	No	1	1	15	1	high impact, low climate
Potamotrygonidae	<i>Potamotrygon hystrix</i>	4	0	NR	1	No	2	0	0	2	2	0	0	0	2	Yes	1	1	15	0	high risk
Potamotrygonidae	<i>Potamotrygon motoro</i>	4	0	NR	0	No	2	0	0	2	2	0	0	1	2	Yes	1	1	15	0	high risk
Tetraodontidae	<i>Carinotetraodon lorteti</i>	4	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	1	15	0	high risk
Tetraodontidae	<i>Tetraodon baileyi</i>	4	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	1	15	1	high risk
Polypteridae	<i>Polypterus endlicheri</i>	6	0	NR	0	No	2	1	0	1	2	0	0	1	0	No	1	1	15	0	high risk
Polypteridae	<i>Polypterus retropinnis</i>	5	0	NR	0	No	2	2	0	1	2	0	0	1	0	No	1	1	15	0	high risk
Anabantidae	<i>Microctenopoma nanum</i>	5	0	NR	0	No	2	2	1	1	1	0	0	0	0	No	1	1	14	0	low impact, high climate

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Tetraodontidae	<i>Colomesus asellus</i>	3	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	2	15	0	high impact, low climate
Anabantidae	<i>Microctenopoma ansorgii</i>	4	0	NR	1	No	2	2	1	1	1	0	0	0	0	No	1	1	14	0	low impact, high climate
Anabantidae	<i>Ctenopoma acutirostre</i>	4	0	NR	0	No	2	1	1	2.1	2	0	0	0	0	No	1	1	14	1	high risk
Cichlidae	<i>Amphilophus zaliosus</i>	4	0	NR	0	No	2	1	0	2	2	0	2	0	0	Unknown	1	1	15	1	high risk
Acipenseridae	<i>Acipenser baerii baerii</i>	3	0	NR	2	Yes	2	0	0	2	2	0	0	2	0	Yes	2	1	16	0	high impact, low climate
Chacidae	<i>Chaca chaca</i>	5	0	NR	0	No	2	2.1	1	1	2	0	0	0	1	Unknown	1	1	16	1	high risk
Potamotrygonidae	<i>Paratrygon aiereba</i>	4	0	NR	0	No	2	0	0	2	2	0	0	2.1	2	Yes	1	1	16	1	high risk
Lebiasinidae	<i>Lebiasina bimaculata</i>	2	0	NR	0	No	2.1	2.1	1	2.1	2	0	0	0	0	Unknown	2	2.1	15	4	high impact, low climate
Pangasiidae	<i>Pangasius pangasius</i>	5	0	NR	2	No	2	0	0	2	0	0	0	2.1	0	No	2	1	16	1	high risk
Pangasiidae	<i>Pangasius nasutus</i>	5	0	NR	0	No	2	2	0	2	2	0	0	0	0	No	2	1	16	0	high risk
Rivulidae	<i>Leptolebias aureoguttatus</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	2.1	0	No	1	1	16	5	high risk
Rivulidae	<i>Leptolebias marmoratus</i>	4	0	NR	0	Yes	2.1	2	0	2.1	2.1	0	0	2.1	0	No	1	1	16	5	high risk
Rivulidae	<i>Leptolebias minimus</i>	4	0	NR	0	Yes	2.1	2	0	2.1	2.1	0	0	2.1	0	No	1	1	16	5	high risk
Eleotridae	<i>Gobiomorus dormitor</i>	5	0	NR	0	No	2	0	0	0	1	2	1	2.1	0	Unknown	1	2.1	16	2	high risk
Eleotridae	<i>Oxyeleotris urophthalmus</i>	3	0	NR	1	No	2	1	0	2.1	2	2	1	0	0	No	1	1	16	1	high impact, low climate
Characidae	<i>Bryconops melanurus</i>	5	0	NR	0	No	2	2	1	1	2	0	0	0	0	No	1	1	15	0	high risk
Potamotrygonidae	<i>Potamotrygon orbignyi</i>	4	0	NR	0	No	2	0	0	2	2	0	0	2.1	2	Yes	1	1	16	1	high risk
Characidae	<i>Bryconops affinis</i>	4	0	NR	1	No	2	2	1	1	2	0	0	0	0	No	1	1	15	0	high risk
Pimelodidae	<i>Sorubim elongatus</i>	4	0	NR	0	No	2	2	0	2	2	0	0	2.1	0	No	1	1	16	1	high risk
Pimelodidae	<i>Sorubim lima</i>	5	0	NR	0	No	2	1	0	2	2	0	0	2.1	0	No	1	1	16	1	high risk
Tetraodontidae	<i>Tetraodon mbu</i>	5	0	NR	0	No	2	1	0	2	2	1	0	0	1	No	1	1	16	0	high risk
Tetraodontidae	<i>Carinotetraodon borneensis</i>	4	0	NR	1	No	2	2	0	2	2	1	0	0	0	No	1	1	16	1	high risk
Tetraodontidae	<i>Takifugu vermicularis</i>	4	0	NR	0	No	2	1	0	2	2	1	0	0	1	No	2	1	16	0	high risk
Tetraodontidae	<i>Takifugu radiatus</i>	4	0	NR	0	No	2	2	0	2	2	1	0	0	1	No	1	1	16	1	high risk
Cichlidae	<i>Amphilophus labiatus</i>	5	1	No	1	No	2	1	0	1	2	0	1	0	0	No	1	1	16	0	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Acipenseridae	<i>Acipenser gueldenstaedtii</i>	6	0	NR	2	Yes	2	0	0	2	2	0	0	0	0	Yes	2	1	17	0	high risk
Acipenseridae	<i>Acipenser transmontanus</i>	5	0	NR	1	Yes	2	0	0	2	2	0	0	2	0	Yes	2	1	17	0	high risk
Lepidosirenidae	<i>Lepidosiren paradoxa</i>	6	0	NR	1	No	2	0	0	2	2	0	0	0	0	No	2	2.1	17	1	high risk
Pangasiidae	<i>Pangasius larnaudii</i>	6	0	NR	0	No	2	2	0	2	2	0	0	0	0	No	2	1	17	0	high risk
Eleotridae	<i>Gobiomorphus huttoni</i>	3	0	NR	0	No	2	2	0	0	1	2	1	2.1	0	Unknown	2	2.1	17	2	high impact, low climate
Poeciliidae	<i>Alfaro huberi</i>	5	0	NR	0	No	2	2	0	1	2	0	1	2.1	0	No	1	1	17	1	high risk
Osteoglossidae	<i>Osteoglossum bicirrhosum</i>	4	0	NR	1	No	2	1	1	0	2	2	0	0	0	No	2	1	16	0	high risk
Cichlidae	<i>Crenicichla lepidota</i>	6	0	NR	1	No	2	2	1	1	1	0	1	0	0	No	1	1	17	0	low impact, high climate
Chacidae	<i>Chaca burmensis</i>	6	0	NR	0	No	2	2.1	0	1	2	0	0	0	1	No	1	1	16	1	high risk
Pangasiidae	<i>Pangasianodon hypophthalmus</i>	5	0	NR	2	No	2	0	0	2	2.1	0	0	2	0	No	2	1	18	1	high risk
Pangasiidae	<i>Pangasius macronema</i>	5	0	NR	0	No	2	2	0	2	2	0	0	2	0	No	2	1	18	0	high risk
Protopteridae	<i>Protopterus aethiopicus</i>	6	0	NR	1	No	2	0	0	2.1	2	0	2	1	0	No	1	1	18	1	high risk
Schilbeidae	<i>Schilbe marmoratus</i>	4	0	NR	0	No	2	2	0	2	2	0	2	2.1	0	No	1	1	18	1	high risk
Eleotridae	<i>Gobiomorus maculatus</i>	6	0	NR	0	No	2	1	0	0	1	2	1	2.1	0	Unknown	1	2.1	18	2	high risk
Eleotridae	<i>Hypseleotris cyprinoides</i>	5	0	NR	0	No	2	2	0	0	1	2	1	2.1	0	Unknown	1	2.1	18	2	high risk
Tetraodontidae	<i>Tetraodon nigroviridis</i>	6	0	NR	0	No	2	2	0	2	2	1	0	0	0	No	1	2	18	0	high risk
Siluridae (Anabantidae)	<i>Sandelia bainsii</i>	6	0	NR	0	Yes	2	1	0	2.1	2	0	1	2.1	0	No	1	1	18	2	high risk
Characidae	<i>Hollandichthys multifasciatus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	2.1	16	4	high risk
Mastacembelidae	<i>Macrognathus pancalus</i>	6	0	NR	0	No	2	2	0	1	2.1	0	0	2.1	0	No	2	1	18	2	high risk
Tetraodontidae	<i>Chelonodon laticeps</i>	6	0	NR	0	No	2	2	0	2	2	2	0	0	0	No	1	1	18	0	high risk
Tetraodontidae	<i>Takifugu rubripes</i>	3	0	NR	1	No	2	1	0	2	2	1	0	2	1	No	2	1	18	0	high impact, low climate
Cichlidae	<i>Crenicichla saxatilis</i>	5	0	NR	1	No	2	2	1	2	2	0	1	0	0	No	1	1	18	0	high risk
Cichlidae	<i>Amphilophus citrinellus</i>	5	1	No	2	No	2	1	0	1	2	0	1	1	0	Unknown	1	1	18	0	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Percidae	<i>Perca fluviatilis</i>	4	1	No	2	No	2	1	0	1	2	0	0	2	0	No	2	2	19	1	high risk
Protopteridae	<i>Protopterus amphibius</i>	6	0	NR	1	No	2	0	0	2	2	0	2	2.1	0	No	1	1	19	1	high risk
Eleotridae	<i>Hypseleotris tohizonae</i>	6	0	NR	0	No	2	2	0	0	1	2	1	2.1	0	Unknown	1	2.1	19	2	high risk
Eleotridae	<i>Dormitator latifrons</i>	7	0	NR	0	No	2	2	0	0	1	1	0	0	0	No	2	2	17	0	low impact, high climate
Siluridae (Anabantidae)	<i>Sandelia capensis</i>	7	0	NR	0	No	2	1	0	2.1	2	0	1	2.1	0	No	1	1	19	2	high risk
Mastacembelidae	<i>Mastacembelus armatus</i>	7	0	NR	0	No	2	2	0	1	1	0	0	2.1	0	No	2	2	19	1	high risk
Tetraodontidae	<i>Chelonodon pleurospilus</i>	6	0	NR	0	No	2	2	0	2	2	2	0	0	1	No	1	1	19	0	high risk
Siluridae	<i>Ompok bimaculatus</i>	7	0	NR	0	No	2	1	0	2.1	2	0	0	2	0	No	2	1	19	1	high risk
Ictaluridae	<i>Ictalurus punctatus</i>	7	0	NR	2	No	2	0	0	2	2	0	0	2	0	yes	2	2	21	0	high risk
Schilbeidae	<i>Schilbe intermedius</i>	7	0	NR	0	No	2	2	0	2.1	2	0	2	2.1	0	No	1	1	21	2	high risk
Eleotridae	<i>Oxyeleotris marmorata</i>	5	0	NR	2	No	2	2	1	0	2	2	1	0	0	No	2	1	20	0	high risk
Cichlidae	<i>Herichthys cyanoguttatus</i>	7	0	NR	2	No	2	1	1	2	2	0	1	0	0	No	1	1	20	0	high risk
Cichlidae	<i>Cichlasoma urophthalmus</i>	5	1	No	1	No	2	2	1	2	2	0	1	2	0	No	2	1	22	0	high risk
Cyprinidae	<i>Cyprinus carpio</i>	8	2	ongoing	2	No		1	1	2	2	0	1	2	0	unknown	2	2	25	0	high risk
SPECIES THAT HAVE NOT BEEN THROUGH TECHNICAL WORKING GROUP																					
Anabantidae	<i>Anabas cobojius</i>	4	0	NR	0	No	2	2	0	2.1	2.1	0	0	0	0	No	2	1	15	2	high risk
Anabantidae	<i>Ctenopoma argentoventer</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	No	1	1	13	4	high risk
Anabantidae	<i>Ctenopoma kingsleyae</i>	5	0	NR	0	No	2.1	1	1	2.1	2	0	0	0	0	Unknown	1	1	15	2	high risk
Anabantidae	<i>Ctenopoma multispine</i>	6	0	NR	0	No	2	1	0	2.1	2.1	0	0	0	0	No	2	1	16	2	high risk
Anabantidae	<i>Ctenopoma muriei</i>	5	0	NR	0	No	2	2	0	2.1	2.1	0	0	0	0	No	1	1	15	2	high risk
Anabantidae	<i>Ctenopoma nigropannosum</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	No	1	1	13	3	high risk
Anabantidae	<i>Ctenopoma ocellatum</i>	5	0	NR	0	No	2	1	1	2.1	2	0	0	0	0	Unknown	1	1	15	1	high risk
Anabantidae	<i>Ctenopoma weeksii</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	Unknown	1	1	15	3	high risk
Anabantidae	<i>Microctenopoma congicum</i>	5	0	NR	0	No	2	2	1	2.1	0	0	0	0	0	Unknown	1	1	14	1	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Anabantidae	<i>Microctenopoma fasciolatum</i>	5	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	Unknown	1	1	16	3	high risk
Anabantidae	<i>Microctenopoma lineatum</i>	5	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	No	1	1	15	3	high risk
Anabantidae	<i>Microctenopoma milleri</i>	5	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	No	1	1	15	3	high risk
Characidae	<i>Astyanacinus goyanensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanacinus multidentis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanacinus platensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax aeneus</i>	5	0	NR	0	No	2	2	1	2.1	2.1	0	0	0	0	No	1	1	16	2	high risk
Characidae	<i>Astyanax alburnus</i>	3	0	NR	0	No	2.1	2	1	2.1	2	0	0	0	0	No	1	1	14	2	high impact, low climate
Characidae	<i>Astyanax altior</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax armandoi</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Astyanax bimaculatus</i>	5	0	NR	0	No	2	2	1	2.1	0	0	0	0	0	No	1	1	14	1	high risk
Characidae	<i>Astyanax bourgeti</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Astyanax brevirohinus</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Astyanax chico</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax clavitaeniatus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax cremnobates</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax dnophos</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Astyanax fasciatus</i>	7	0	NR	0	No	2	2	1	1	2.1	0	0	0	0	No	2	1	18	1	high risk
Characidae	<i>Astyanax giton</i>	3	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	14	3	high risk
Characidae	<i>Astyanax guaporensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	3	high risk
Characidae	<i>Astyanax hastatus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax hermosus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax intermedius</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax jacuhiensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Characidae	<i>Astyanax jenynsii</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax jordani</i>	3	0	NR	0	No	1	2	1	2.1	0	0	0	0	0	No	1	1	11	1	high impact, low climate
Characidae	<i>Astyanax kennedyi</i>	4	0	NR	0	No	1	2	1	2.1	0	0	0	0	0	No	1	1	12	2	high risk
Characidae	<i>Astyanax latens</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax leonidas</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax leopoldi</i>	2	0	NR	0	No	2.1	2	1	2.1	0	0	0	0	0	No	1	1	11	2	high impact, low climate
Characidae	<i>Astyanax magdalenae</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax mexicanus</i>	8	0	NR	0	No	2.1	2	1	2.1	0	0	0	0	0	No	1	1	17	2	high risk
Characidae	<i>Astyanax multidentis</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Astyanax obscurus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax pampa</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax paris</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax pelegri</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax puka</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax robustus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax rupununi</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax schubarti</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax siapae</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax stilbe</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax totae</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax tumbayaensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax unitaeniatus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax validus</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Astyanax varzeae</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Astyanax villwocki</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Bryconops caudomaculatus</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Bryconops colaroja</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Characidae	<i>Bryconops cyrtogaster</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	13	3	high impact, low climate
Characidae	<i>Bryconops durbini</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Bryconops giacopinii</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Bryconops humeralis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Bryconops inpai</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Bryconops vibex</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Characidae	<i>Ctenobrycon alleni</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	3	high risk
Characidae	<i>Ctenobrycon spilurus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	3	high risk
Characidae	<i>Knodus savannensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	0	0	0	No	1	1	15	4	high risk
Cichlidae	<i>Cichla intermedia</i>	4	0	NR	0	No	2.1	2	0	2.1	2	0	1	0	0	No	1	1	15	3	high risk
Cichlidae	<i>Cichla jariina</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	14	4	high risk
Cichlidae	<i>Cichla kelberi</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	14	4	high risk
Cichlidae	<i>Cichla melaniae</i>	2	0	NR	0	No	2.1	1	0	2.1	2	0	1	0	0	No	2	1	13	2	high impact, low climate
Cichlidae	<i>Cichla mirianae</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	14	4	high risk
Cichlidae	<i>Cichla monoculus</i>	2	0	NR	2	No	2	1	0	2.1	2	0	1	0	0	No	2	1	15	1	high impact, low climate
Cichlidae	<i>Cichla nigromaculata</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	14	4	high risk
Cichlidae	<i>Cichla ocellaris</i>	4	0	NR	2	No	2	2	0	2.1	2	0	1	0	0	No	2	1	18	1	high risk
Cichlidae	<i>Cichla orinocensis</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	No	1	1	13	3	high impact, low climate
Cichlidae	<i>Cichla pinima</i>	2	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	12	3	high impact, low climate
Cichlidae	<i>Cichla piquiti</i>	4	0	NR	0	No	2.1	1	0	2.1	2	0	1	0	0	No	2	1	15	3	high risk
Cichlidae	<i>Cichla pleiozona</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	14	4	high risk
Cichlidae	<i>Cichla temensis</i>	2	0	NR	1	No	2.1	1	0	2.1	2	0	1	0	0	No	2	1	14	2	high impact, low climate
Cichlidae	<i>Cichla thyrurus</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	1	1	14	4	high risk
Cichlidae	<i>Cichla vazzoleri</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	1	0	0	No	2	1	15	4	high risk
Cichlidae	<i>Crenicichla acutirostris</i>	2	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	14	2	high impact, low climate

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Cichlidae	<i>Crenicichla adspersa</i>	4	0	NR	0	No	2.1	1	1	2.1	2	0	1	0	0	No	1	1	15	3	high risk
Cichlidae	<i>Crenicichla albopunctata</i>	2	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	14	2	high impact, low climate
Cichlidae	<i>Crenicichla alta</i>	2	0	NR	0	No	2	2	1	2.1	2	0	1	0	0	No	1	1	14	1	high impact, low climate
Cichlidae	<i>Crenicichla anthurus</i>	3	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	15	2	high impact, low climate
Cichlidae	<i>Crenicichla brasiliensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla britskii</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	2	high risk
Cichlidae	<i>Crenicichla cametana</i>	2	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	14	2	high impact, low climate
Cichlidae	<i>Crenicichla celidochilus</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla cincta</i>	3	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	15	2	high risk
Cichlidae	<i>Crenicichla compressiceps</i>	2	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	14	2	high impact, low climate
Cichlidae	<i>Crenicichla copenamensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla cyanonotus</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla cyclostoma</i>	2	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	14	2	high impact, low climate
Cichlidae	<i>Crenicichla empheres</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla frenata</i>	3	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	15	2	high impact, low climate
Cichlidae	<i>Crenicichla gaucho</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla geayi</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla hadrostigma</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla haroldoi</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla heckeli</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla hemera</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Cichlidae	<i>Crenicichla hummelincki</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla igara</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla iguapina</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla iguassuensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla inpa</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla isbrueckeri</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla jaguarensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla jegui</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla johanna</i>	2	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	13	3	high impact, low climate
Cichlidae	<i>Crenicichla jupiaensis</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla jurubi</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla labrina</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla lenticulata</i>	2	0	NR	0	No	2.1	1	1	2.1	2	0	1	0	0	No	1	1	13	2	high impact, low climate
Cichlidae	<i>Crenicichla lucius</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla lugubris</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla macrophthalmia</i>	5	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	17	3	high risk
Cichlidae	<i>Crenicichla maculata</i>	2	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	13	3	high impact, low climate
Cichlidae	<i>Crenicichla marmorata</i>	2	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	13	3	high impact, low climate
Cichlidae	<i>Crenicichla menezesi</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla minuano</i>	5	0	NR	0	No	2.1	2	1	2.1	0	0	1	0	0	No	1	1	15	2	high risk
Cichlidae	<i>Crenicichla missioneira</i>	5	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	17	3	high risk
Cichlidae	<i>Crenicichla mucuryna</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Cichlidae	<i>Crenicichla multispinosa</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla nickeriensis</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla niederleinii</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla notophthalmus</i>	4	0	NR	0	No	2.1	2	1	2.1	1	0	1	0	0	No	1	1	15	3	high risk
Cichlidae	<i>Crenicichla pellegrini</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla percna</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla phaiospilus</i>	3	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	15	3	high risk
Cichlidae	<i>Crenicichla prenda</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla proteus</i>	3	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	15	3	high impact, low climate
Cichlidae	<i>Crenicichla punctata</i>	4	0	NR	0	No	2	2	1	2.1	2.1	0	1	0	0	No	1	1	16	2	high risk
Cichlidae	<i>Crenicichla pydanielae</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla regani</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla reticulata</i>	5	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	2	1	18	3	high risk
Cichlidae	<i>Crenicichla rosemariae</i>	4	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	15	4	high risk
Cichlidae	<i>Crenicichla santosi</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla scottii</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla sedentaria</i>	3	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	15	3	high impact, low climate
Cichlidae	<i>Crenicichla semicineta</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla semifasciata</i>	5	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	17	2	high risk
Cichlidae	<i>Crenicichla sipaliwini</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla stocki</i>	4	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla strigata</i>	2	0	NR	0	No	2.1	1	1	2.1	2	0	1	0	0	No	1	1	13	2	high impact, low climate
Cichlidae	<i>Crenicichla sveni</i>	2	0	NR	0	No	2.1	2	1	2.1	2	0	1	0	0	No	1	1	14	2	high impact, low climate

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Cichlidae	<i>Crenicichla tendybaguassu</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla ternetzi</i>	2	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	13	3	high impact, low climate
Cichlidae	<i>Crenicichla tigrina</i>	4	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	15	4	high risk
Cichlidae	<i>Crenicichla tingui</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla urosema</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla vaillanti</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla virgatula</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla vittata</i>	5	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	1	1	16	3	high risk
Cichlidae	<i>Crenicichla wallacii</i>	2	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	14	3	high impact, low climate
Cichlidae	<i>Crenicichla yaha</i>	4	0	NR	0	No	2.1	2	1	2.1	2.1	0	1	0	0	No	1	1	16	4	high risk
Cichlidae	<i>Crenicichla zebrina</i>	4	0	NR	0	No	2.1	1	1	2.1	2.1	0	1	0	0	No	2	1	16	4	high risk
Cichlidae	<i>Parachromis dovii</i>	3	0	NR	0	No	2.1	1	0	2	2	0	1	0	0	No	2	1	14	1	high impact, low climate
Cichlidae	<i>Parachromis managuensis</i>	4	0	NR	2	No	2	1	0	2.1	2	0	1	2	0	No	2	1	19	1	high risk
Cichlidae	<i>Parachromis motaguensis</i>	4	0	NR	0	No	2.1	1	0	2.1	2	0	1	0	0	No	1	1	14	2	high risk
Cichlidae	<i>Petenia splendida</i>	3	0	NR	0	No	2	1	0	2.1	1	0	1	0	0	No	2	1	13	1	high impact, low climate
Ctenoluciidae	<i>Boulengerella lateristriga</i>	2	0	NR	0	No	2.1	2.1	0	2.1	2.1	0	0	0	0	No	1	1	12	4	high impact, low climate
Ctenoluciidae	<i>Boulengerella maculata</i>	1	0	NR	0	No	2.1	2.1	0	2.1	2.1	0	0	0	0	No	1	1	11	4	high impact, low climate
Ctenoluciidae	<i>Ctenolucius beani</i>	2	0	NR	0	No	2.1	2.1	0	2.1	2	0	0	0	0	No	1	1	12	3	high impact, low climate
Cyprinidae	<i>Rutilus rutilus</i>	5	2	unknown	2	No	2	1	0	2.1	2.1	0	1	0	0	No	2	1	20	2	high risk
Cyprinidae	<i>Tinca tinca</i>	5	2	unknown	2	No	2	1	0	2	2.1	0	1	0	0	No	2	1	20	1	high risk
Dasyatidae	<i>Himantura alcockii</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	1	1	16	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Dasyatidae	<i>Himantura bleekeri</i>	2	0	NR	0	No	2	0	0	2.1	2.1	2	0	0	2	No	2	1	15	2	high impact, low climate
Dasyatidae	<i>Himantura draco</i>	5	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	1	1	17	3	high risk
Dasyatidae	<i>Himantura fava</i>	4	0	NR	0	No	2.1	2.1	0	2.1	2.1	2	0	0	2	No	2	1	19	5	high risk
Dasyatidae	<i>Himantura fluviatilis</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	2	1	17	4	high risk
Dasyatidae	<i>Himantura gerrardi</i>	5	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	2	1	18	3	high risk
Dasyatidae	<i>Himantura hortlei</i>	2	0	NR	0	No	2.1	2.1	0	2.1	2.1	2	0	0	2	No	2	1	17	4	high impact, low climate
Dasyatidae	<i>Himantura imbricata</i>	6	0	NR	0	No	2	0	0	2.1	2.1	2	0	0	2	No	2	1	19	2	high risk
Dasyatidae	<i>Himantura kittipongi</i>	4	0	NR	0	No	2.1	2.1	0	2.1	2.1	2	0	0	2	No	1	1	18	5	high risk
Dasyatidae	<i>Himantura krempfi</i>	4	0	NR	0	No	2	0	0	2.1	2.1	2	0	0	2	No	1	1	16	3	high risk
Dasyatidae	<i>Himantura lobistoma</i>	1	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	1	1	13	3	high impact, low climate
Dasyatidae	<i>Himantura marginata</i>	4	0	NR	0	No	2	0	0	2.1	2.1	2	0	0	2	No	2	1	17	3	high risk
Dasyatidae	<i>Himantura microphthalma</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	1	1	16	4	high risk
Dasyatidae	<i>Himantura oxyrhyncha</i>	4	0	NR	0	No	2	0	0	2.1	2.1	2	0	0	2	No	1	1	16	2	high risk
Dasyatidae	<i>Himantura pacifica</i>	3	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	1	1	15	3	high risk
Dasyatidae	<i>Himantura pareh</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	1	1	14	3	high impact, low climate
Dasyatidae	<i>Himantura pastinacoides</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	2	1	15	3	high impact, low climate
Dasyatidae	<i>Himantura schmardae</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	2	1	15	3	high impact, low climate
Dasyatidae	<i>Himantura signifer</i>	4	0	NR	0	No	2	0	0	2.1	2.1	2	0	0	2	No	2	1	17	3	high risk
Dasyatidae	<i>Himantura uarnacoides</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	2	1	15	3	high impact, low climate
Dasyatidae	<i>Himantura walga</i>	3	0	NR	0	No	2.1	0	0	2.1	2.1	2	0	0	2	No	2	1	16	3	high impact, low climate
Eleotridae	<i>Dormitator lebretonis</i>	5	0	NR	0	No	2	2	1	2.1	2.1	1	0	0	0	No	1	1	17	2	high risk
Eleotridae	<i>Eleotris amblyopsis</i>	1	0	NR	0	No	2	2	0	2.1	2.1	2	0	0	0	No	1	1	13	2	high impact, low climate

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Eleotridae	<i>Eleotris sandwicensis</i>	3	0	NR	0	No	2.1	1	0	2.1	2.1	2	0	0	0	No	1	1	14	3	high impact, low climate
Fungulidae	<i>Lucania goodei</i>	5	0	NR	0	No	2	2	0	2.1	1	0	0	0	0	No	1	1	14	1	high risk
Fungulidae	<i>Lucania parva</i>	7	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	No	1	1	17	3	high risk
Ictaluridae	<i>Ameiurus brunneus</i>	3	0	NR	0	No	2	1	0	2.1	2.1	0	0	0	0	No	1	1	12	2	high impact, low climate
Ictaluridae	<i>Ameiurus catus</i>	4	0	NR	1	No	2.1	1	0	2.1	2.1	0	0	2	0	Unknown	2	2.1	18	4	high risk
Ictaluridae	<i>Ameiurus melas</i>	7	0	NR	2	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	20	4	high risk
Ictaluridae	<i>Ameiurus natalis</i>	7	0	NR	2	No	2	1	0	2.1	2.1	0	0	0	0	No	2	1	19	2	high risk
Ictaluridae	<i>Ameiurus nebulosus</i>	5	0	NR	2	No	2	1	0	2.1	2	0	0	2	0	Unknown	2	2.1	20	2	high risk
Ictaluridae	<i>Ameiurus platycephalus</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk
Ictaluridae	<i>Ameiurus serracanthus</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Ictaluridae	<i>Ictalurus australis</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	11	4	high impact, low climate
Ictaluridae	<i>Ictalurus balsanus</i>	6	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Ictalurus dugesii</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Ictaluridae	<i>Ictalurus furcatus</i>	5	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	2	0	Unknown	2	2.1	17	4	high risk
Ictaluridae	<i>Ictalurus lupus</i>	7	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	17	4	high risk
Ictaluridae	<i>Ictalurus mexicanus</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high risk
Ictaluridae	<i>Ictalurus ochoterenai</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Ictaluridae	<i>Ictalurus pricei</i>	6	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus albater</i>	3	0	NR	0	No	2	2	0	2.1	2.1	0	0	0	0	No	1	1	13	2	high impact, low climate
Ictaluridae	<i>Noturus baileyi</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk
Ictaluridae	<i>Noturus crypticus</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus elegans</i>	3	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high impact, low climate
Ictaluridae	<i>Noturus eleutherus</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk
Ictaluridae	<i>Noturus exilis</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk
Ictaluridae	<i>Noturus fasciatus</i>	3	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high impact, low climate
Ictaluridae	<i>Noturus flavater</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Ictaluridae	<i>Noturus flavipinnis</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	5	high risk
Ictaluridae	<i>Noturus flavus</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk
Ictaluridae	<i>Noturus funebris</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus furiosus</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Ictaluridae	<i>Noturus gilberti</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus gladiator</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus gyrinus</i>	6	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	17	4	high risk
Ictaluridae	<i>Noturus hildebrandi hildebrandi</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus hildebrandi lautus</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk
Ictaluridae	<i>Noturus insignis</i>	4	0	NR	1	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Ictaluridae	<i>Noturus lachneri</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Ictaluridae	<i>Noturus leptacanthus</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus maydeni</i>	3	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high impact, low climate
Ictaluridae	<i>Noturus miurus</i>	5	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Ictaluridae	<i>Noturus munitus</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Ictaluridae	<i>Noturus nocturnus</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Ictaluridae	<i>Noturus phaeus</i>	3	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high impact, low climate
Ictaluridae	<i>Noturus placidus</i>	3	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high impact, low climate
Ictaluridae	<i>Noturus stanauli</i>	4	0	NR	0	No	2	2	0	2.1	2.1	0	0	0	0	No	1	1	14	3	high risk
Ictaluridae	<i>Noturus stigmosus</i>	3	0	NR	1	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high impact, low climate
Ictaluridae	<i>Noturus taylori</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Ictaluridae	<i>Noturus trautmani</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk
Ictaluridae	<i>Pylodictis olivaris</i>	7	0	NR	2	No	2	0	0	2.1	2.1	0	0	0	0	No	2	1	18	2	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Lepisosteidae	<i>Lepisosteus oculatus</i>	7	0	NR	0	No	2	1	0	2.1	2.1	0	0	0	0	No	2	1	17	2	high risk
Lepisosteidae	<i>Lepisosteus osseus</i>	7	0	NR	0	No	1	0	1	2.1	2	0	0	0	0	No	2	1	16	1	high risk
Lepisosteidae	<i>Lepisosteus platostomus</i>	4	0	NR	0	No	2	0	0	2.1	2.1	0	0	0	0	No	2	1	13	2	high risk
Lepisosteidae	<i>Lepisosteus platyrhincus</i>	4	0	NR	0	No	1	0	1	2.1	2.1	0	0	0	0	No	2	1	13	2	high risk
Osteoglossidae	<i>Osteoglossum ferreirai</i>	4	0	NR	0	No	2.1	2.1	0	2.1	2.1	2	0	0	0	No	2	1	17	5	high risk
Osteoglossidae	<i>Scleropages formosus</i>	4	0	NR	2	Yes	2.1	0	0	2.1	2.1	2	0	0	0	Yes	2	1	17	3	high risk
Pangasiidae	<i>Helicophagus leptorhynchus</i>	5	0	NR	0	No	2	2.1	0	2.1	2.1	0	0	0	0	No	1	1	15	3	high risk
Pangasiidae	<i>Helicophagus typus</i>	2	0	NR	0	No	2	2.1	0	2.1	2.1	0	0	0	0	No	1	1	12	3	high impact, low climate
Pangasiidae	<i>Helicophagus waandersii</i>	4	0	NR	0	No	2	2.1	0	2.1	2.1	0	0	0	0	No	2	1	15	3	high risk
Pimelodidae	<i>Leiarius arekaima</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	No	1	1	13	4	high risk
Pimelodidae	<i>Leiarius pictus</i>	1	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	No	1	1	10	3	high impact, low climate
Poeciliidae	<i>Heterandria anzuetoi</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	14	4	high impact, low climate
Poeciliidae	<i>Heterandria attenuata</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	5	high risk
Poeciliidae	<i>Heterandria cataractae</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	5	high risk
Poeciliidae	<i>Heterandria dirempta</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	5	high risk
Poeciliidae	<i>Heterandria formosa</i>	4	0	NR	0	No	2	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	3	high risk
Poeciliidae	<i>Heterandria jonesii</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	5	high risk
Poeciliidae	<i>Heterandria litoperas</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	5	high risk
Poeciliidae	<i>Heterandria obliqua</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	16	5	high risk
Poeciliidae	<i>Heterandria tuxtlaensis</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	1	0	0	Unknown	1	2.1	14	4	high impact, low climate
Polypteridae	<i>Polypterus ansorgii</i>	5	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Polypteridae	<i>Polypterus bichir bichir</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Polypteridae	<i>Polypterus bichir katangae</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Polypteridae	<i>Polypterus bichir lapradei</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	17	4	high risk
Polypteridae	<i>Polypterus delhezi</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	17	4	high risk
Polypteridae	<i>Polypterus endlicheri congicus</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	14	4	high risk
Polypteridae	<i>Polypterus endlicheri endlicheri</i>	5	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	16	4	high risk
Polypteridae	<i>Polypterus mokelembembe</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	16	5	high risk
Polypteridae	<i>Polypterus ornatipinnis</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Polypteridae	<i>Polypterus palmas buettikoferi</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	5	high risk
Polypteridae	<i>Polypterus palmas palmas</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high risk
Polypteridae	<i>Polypterus palmas polli</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk
Polypteridae	<i>Polypterus senegalus meridionalis</i>	3	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Polypteridae	<i>Polypterus senegalus senegalus</i>	5	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	15	4	high risk
Polypteridae	<i>Polypterus teugelsi</i>	2	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	12	4	high impact, low climate
Polypteridae	<i>Polypterus weeksii</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Potamotrygonidae	<i>Potamotrygon boesemani</i>	4	0	NR	0	No	2.1	2.1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	6	high risk
Potamotrygonidae	<i>Potamotrygon brachyura</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	14	5	high risk
Potamotrygonidae	<i>Potamotrygon castexi</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Potamotrygonidae	<i>Potamotrygon constellata</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	12	4	high impact, low climate
Potamotrygonidae	<i>Potamotrygon falkneri</i>	3	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	12	4	high impact, low climate
Potamotrygonidae	<i>Potamotrygon henlei</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Potamotrygonidae	<i>Potamotrygon leopoldi</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Potamotrygonidae	<i>Potamotrygon magdalenae</i>	5	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	4	high risk
Potamotrygonidae	<i>Potamotrygon marinae</i>	2	0	NR	0	No	2.1	2.1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	14	5	high impact, low climate
Potamotrygonidae	<i>Potamotrygon ocellata</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Potamotrygonidae	<i>Potamotrygon schroederi</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	11	4	high impact, low climate
Potamotrygonidae	<i>Potamotrygon schuhmacheri</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Potamotrygonidae	<i>Potamotrygon scobina</i>	2	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	12	4	high impact, low climate
Potamotrygonidae	<i>Potamotrygon signata</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Potamotrygonidae	<i>Potamotrygon yepezi</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Siluridae	<i>Ompok binotatus</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Siluridae	<i>Ompok borneensis</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk
Siluridae	<i>Ompok canio</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	16	4	high risk
Siluridae	<i>Ompok eugeneiatus</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Siluridae	<i>Ompok fumidus</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk
Siluridae	<i>Ompok goae</i>	2	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	12	4	high impact, low climate
Siluridae	<i>Ompok hypophthalmus</i>	2	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	13	4	high impact, low climate
Siluridae	<i>Ompok javanensis</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	5	high risk
Siluridae	<i>Ompok jaynei</i>	4	0	NR	0	No	2	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Siluridae	<i>Ompok leiacanthus</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Siluridae	<i>Ompok malabaricus</i>	6	0	NR	0	No	2	1	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	17	3	high risk
Siluridae	<i>Ompok miostoma</i>	4	0	NR	0	No	2.1	0	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	5	high risk
Siluridae	<i>Ompok pabda</i>	6	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	2	0	Unknown	2	2.1	19	4	high risk

Fm	Sp	Cm	EA	EE	EI	CT	Ha	Re	Nx	IH	IS	GN	GI	DS	TH	RT	MU	CS	TT	UK	CI
Siluridae	<i>Ompok pabo</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	2	2.1	16	4	high risk
Siluridae	<i>Ompok pinnatus</i>	4	0	NR	0	No	2	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	4	high risk
Siluridae	<i>Ompok platyrhynchus</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Siluridae	<i>Ompok pluriradiatus</i>	2	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	13	4	high impact, low climate
Siluridae	<i>Ompok rhadinurus</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	5	high risk
Siluridae	<i>Ompok sindensis</i>	4	0	NR	0	No	2.1	1	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	14	5	high risk
Siluridae	<i>Ompok urbaini</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk
Siluridae	<i>Ompok weberi</i>	4	0	NR	0	No	2.1	2	0	2.1	2.1	0	0	0	0	Unknown	1	2.1	15	5	high risk