Assessing the Invasiveness Risk of Non-Indigenous Fish in the Australian Ornamental Trade: Implementing the Risk Assessment Tool

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Executive Summary

Recent incursions and naturalisations of greylisted freshwater ornamental fishes in tropical northern Queensland have highlighted the significant threat posed by this industry to freshwater ecosystems in Australia. However, this threat is unsubstantiated without first understanding invasive potential and consequences of such an introduction. Currently, this information has not been evaluated for a number of ornamental species, with these species considered *greylisted* as they are absent on the national approved live import list (*whitelist*) and state-specific noxious species lists (*blacklists*). Trade of greylisted species is prolific within Australia, a remnant of what was largely an unregulated industry prior to the introduction of whitelist and blacklist legislation. Given the sizeable population of captive greylisted ornamental fishes within Australia, there is a dire need for such assessments.

Previous attempts to formulate a greylist produced a sizeable list involving ~800 ornamental species. However, no formal update of the greylist was continued, and the list may no longer be representative of the species in trade in Australia, nor those whose trade is of interest to the ornamental industry. The Technical Working Group (TWG), involving ornamental industry representatives and researchers, was formed to address this issue, and tasked with producing an updated greylist. This resulted in a greylist involving 447 non-indigenous freshwater ornamental fish species known to currently be in trade in Australia and of interest to industry.

Rapid risk assessment of these 447 greylisted species was conducted by three independent assessors using the South Australian Research Development Institute (SARDI) tool (Deveney 2018), produced specifically to assess ornamental species already in trade in Australia. The model involves 52 questions and sub-questions from three overarching categories: 1) estimation of the likelihood of release, 2) likelihood of invasion, and 3) an assessment of consequences. The assessors initially undertook a comparative exercise of the same subset of 10 diverse species to establish reasonable congruence before undertaking the exercise. This was independently verified for consistency before continuing risk assessment of their allocated species. Overall, the rapid risk assessments identified 12 (2.68%) high risk species, 35 (7.83%) moderate risk species, and 400 (89.49%) low risk species.

The considerable proportion of low-risk species resulting from these risk assessments is not congruent with posteriori knowledge. This is likely due to features of the tool that result in underscoring, as the tool is not wholly appropriate for an Australian-wide assessment and overlooks key information that may increase the level of risk a species poses in Australia. In addition, the necessity for comprehensive understanding and investigation of biological and reproductive information weakens its predictive power as its application in this context was limiting. A short maximum time limit of 3.25hrs was provided to complete each risk assessment which limited the results gathered, although in many cases the assessor's elapsed time was orders of magnitude higher to be able to complete a particular risk assessment due to the complexity of terminology and data gathered.

Data deficiencies were a continuing theme in the risk assessments, with all risk assessments involving some level of data deficiencies. This was considerable for 401 species (89.71%), with more than 30% of information currently unavailable to complete one of the risk assessment categories, resulting in an unreliable risk level. Using the alternative data deficiency method, i.e., considering data deficiencies overall rather than by category, the proportion of data deficient species reduced considerably, with low confidence in risk assessment level determined for 240 species (53.69%). Data deficiencies were largely due to the minimal understanding on basic biology and reproduction. Such information paucity highlights the need for additional research focused on creating a database of knowledge for ornamental species. It is anticipated the data deficiencies indicated here will aid in identifying key research priorities for future ornamental research, particularly concerning industry

collaboration. Precautionary principles were not applied in the SARDI tool, and as a result the prevalent data deficiencies may have resulted in underscoring of invasive potential. While this removes potential overinflation of risk scores, it mars true invasive risk. Calculation of the final score is weighted in such a way that revision of answers from negative to positive (or vice versa) upon new information being produced or identified may result in sizeable differences between the final risk level determined. As a result, addition of new information may alter risk assessment results considerably and more accurately determine risk.

Contents

List of Figures

List of Tables

Appendices

Introduction

Captive populations of freshwater ornamental fish species are considerable in Australia, with an estimated 11.3 million fish kept by 11% of Australian households (Animal Medicines Australia 2019). While the majority of these fish are imported into Australia, and subject to national *whitelist* regulations (i.e. List of Specimens taken to be Suitable for Live Import (Department of Agriculture, Water and Environment 2021)), a proportion are bred and supplied from breeders and hobbyists within Australia. Industry representatives indicate that 27% of fish are sourced via such local producers (O'Sullivan et al. 2008). Much of this internal trade is unregulated, with up to 40% of retailers sourcing fish from unlicenced hobbyists and breeders (O'Sullivan et al. 2008). This unregulated trade includes the sale of *greylist* species, i.e. species absent from both the whitelist and the various state-specific noxious species lists (*blacklists*) (O'Sullivan et al. 2008) that were imported prior to the introduction of whitelist and blacklist legislation. Currently, scientific knowledge and records surrounding the species involved, the volume bred and distributed, or the value of their trade within Australia is limited (Millington et al. 2022; Natural Resource Management Ministerial Council (NRMMC) 2006). However, previous estimates produced a greylist involving ~800 freshwater ornamental species (NRMMC 2006; Moore et al. 2010; Fredberg & McNeil 2010; Beyer & Fredberg 2010). Since these reports were produced, there has been no formal updating of the greylist, and it is likely that many of these species are no longer present in Australia or of no interest to the ornamental industry. Collaborations with key industry representatives including wholesalers, breeders, and importers are necessary to compile an updated and accurate greylist.

Non-indigenous greylisted fish pose a potential threat to the sensitive and unique aquatic ecosystems in Australia. Recent successful establishments of the greylist species jaguar cichlid (*Parachromis managuensis*) and incursions of the greylist species peacock bass (*Cichla* sp.) in tropical northern Queensland (Holmes et al. 2020; Catchment Solutions 2019) have highlighted the urgent need for proactive management of the fish breeding and hobbyist industry. Core to this are assessments that allow for an understanding of the risk such species pose. The South Australian Research Development Institute (SARDI) developed a risk assessment tool capable of identifying the risk level of grey-listed non-indigenous ornamental species traded within Australia (Deveney 2018). This tool uses queries to score three categories: 1) estimation of the likelihood of release, 2) likelihood of invasion, and 3) an assessment of consequences. Species are categorised as "high risk" (>150), "moderate risk" (51- 149), or "low risk" (<50) through the use of a series of scores based on the presence or absence of specific parameters that encompass different contributions to risk posed by each parameter. Some scores are positive and increase a species invasiveness, whereas others are scored negatively and decrease its assessed invasiveness. Most species with poor environmental match and no history of invasion score <15, but the low-risk range reflects that some species may have conflicting environmental match and invasion history. Moderate risk species are those with modest environmental match and some invasion history, but whose impacts are geographically and biologically limited. High risk species have broad climate match and a history of substantial impacts; these pose a substantial invasion risk and should be subject to risk management.

The aims of the current project were:

1. Through the Technical Working Group (TWG), to compile an updated greylist of non-indigenous, grey-listed fishes indicated by industry representatives as currently traded within Australia and of interest to the industry.
2. To conduct rapid risk assessments of this updated greylist.

Caveats

The ensuing risk assessments should be interpreted under the following caveats:

Search Restrictions

Limitations to searches performed with different browser search history in different physical locations are as such that they can produce different results, as search engines rely on algorithms which can produce substantially different results based on new information and search history. Additionally, resource availability on the internet is constantly changing due to its dynamic nature, with pages added, altered, and deleted daily. Availability may also be or become limited, with access to information behind paywalls, subscriptions, in languages other than English, or on private sites varying depending on the user. It is likely the same keywords entered by one user will show different results when compared with another due to these factors. As such, the risk assessments are limited by what information was made available to the assessor at the time of searching.

In some instances, it was necessary to source some information from non-peer reviewed sources due to information deficiencies in the scientific field. Non-peer reviewed sources were discriminately checked to ensure reasonable reliability of information, either by cross-referencing with other sources, or a judgement on website quality.

Time limitations

Given the considerable amount of information available online, risk assessments were completed within time constraints. In the interest of meeting budget and time allocations, risk assessors allotted approximately 3.25hrs to each assessment. As such, searches were kept to a strict set of websites and keywords, with only the first 20 search results reviewed. This may have resulted in some references being unintentionally missed or not included. Given the dynamic nature of the internet, and the factors that influence search results, it is likely that the first 20 search results will vary despite identical keywords. Accordingly, the assessments will remain subject to technical review after the submission of this report, with oversight from the Freshwater Vertebrate and Invertebrate Working Group.

Species name changes

Nomenclature in taxonomy continues to be dynamic as understanding of genetics and phylogeny advances. As such, species may have information published under multiple scientific names over time. While attention was given to identifying the various outdated scientific synonyms previously attributed to the species, and searches conducted using these alternate names, it is likely some were unintentionally excluded from search results.

Indigenous species

Several ornamental species native to Australia were unintentionally included in the updated greylist. While their risk assessments were conducted, they have been removed from the results given their inclusion is contrary to the purpose of this report, in reviewing non-indigenous species. This resulted in some risk assessment numbers being absent.

Negative scores

The risk assessment of several species resulted in a negative score. For better readability, this was corrected to equal 0 using the MAX function in Excel. This did not result in a change to the risk level, as all negative scores receive a risk level of Low (<50).

Methods

Risk assessment tool

The South Australian Research Development Institute (SARDI) developed a risk assessment tool (Deveney 2018) capable of identifying the invasive potential of grey-listed non-indigenous ornamental species traded within Australia. This tool uses queries to score three categories: 1) estimation of the likelihood of release, 2) likelihood of invasion, and 3) an assessment of consequences. Through the use of a series of scores based on the presence or absence of specific parameters that encompass different contributions to risk posed by each parameter, species are categorised as:

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

Some scores are positive and increase a species invasiveness, whereas others are scored negatively and decrease its assessed invasiveness. Most species with poor environmental match and no history of invasion score <15, but the low-risk range reflects that some species may have conflicting environmental match and invasion history. Moderate risk species are those with modest environmental match and some invasion history, but whose impacts are geographically and biologically limited. High risk species have broad climate match and a history of substantial impacts; these pose a substantial invasion risk and should be subject to risk management.

Data deficiencies

Data deficiencies were a common feature in the risk assessments due to the limited scientific research conducted on many freshwater ornamental species, particularly regarding reproductive and biological information. Several questions (e.g., Q13) involved multiple sub-questions for scoring purposes and data deficiencies in each of these sub-questions were treated separately. A question/sub-question was considered deficient if adequate information was not identified during data collection to answer the query. Additionally, a question/sub-question was considered deficient if conflicting information was identified that could lead to contrasting answers. The SARDI tool methodology indicates the risk level is considered unreliable when a risk assessment category (Release Likelihood, Invasion Likelihood, Consequence) has >30% of queries listed as data deficient. However, based on this method, a considerable proportion of risk assessment results were determined unreliable due to the prevalence of data deficiencies. Post-assessment, it was suggested to the risk assessors that an altered data deficiency methodology contrary to the SARDI method was necessary to ensure usability of results. Thus, while data deficiencies are reported here for each category, and indicated where >30%, the overall data deficiency score across all three categories was also listed as an indicator of result reliability. Data deficiencies are indicated within each risk assessment, noted in the Caveat column (Table 2) for all species with a data deficiency score >30%, summarised in the three categories and overall (Table 5), and tabulated for the individual questions/sub-questions in each of the three risk assessment categories and overall (Appendix1, Appendix 2, Appendix 3).

All pathogen, parasite, and disease data are listed as data deficient, owing to further assessment being required for completion of this question. Establishing the level of notification for a particular disease according to current Australian guidelines was reliant on data not available to the assessors during the risk assessment process. Where possible, information on parasites and diseases has been included to assist in answering of that question.

The precautionary principle was not applied in these risk assessments, and multiple questions did not have a scoring option for when data were deficient. Where information was deficient, and keyword combinations had been exhausted according to the data collection guidelines, it was concluded that the question was answered in the negative, the question was scored as such, and the lack of evidence was recorded in the answer. Exceptions to this were control measures (Q37) where lack of information was considered to indicate some level of resistance, thereby qualifying as a score of 1.

Review process

Parallel methods were used by the three risk assessors when sourcing literature and information to answer the risk assessment questions. Data collection was initially in the Fishbase database (Froese & Pauly 2022) to confirm the approved scientific name. Several species in Fishbase were listed by an alternative approved scientific name than recorded in the updated greylist, and the outdated scientific greylist name was considered a synonym. Information was predominantly collected from 22 key databases and websites (Table 1) using a combination of primary and secondary keywords. A number of additional sources were also consulted ad hoc and at the discretion of the assessor. Results were screened by reviewing the text summary, title, and abstract, with relevant websites accessed and relevant documents read and downloaded into species-specific folders. When an abstract was not available as a preview, the full text was downloaded and the abstract and/or introduction were screened. References were compiled separately for each species, with in-text referencing and website/document link recorded. Due to the need for efficiency and time limitations imposed on each risk assessment (3.25 hours), only the first 20 search results were viewed. No limitation on field, content type, discipline, language, or publication date was applied.

Table 1. Key websites and the type of information they typically provided that were used to complete the rapid risk assessments.

Website name	Habitat	Range	Biology	Reproduction	Parasites	Disease	Disturbance	Invasive records	Native family
Fishbase[1]	Y	Y	Y	Y	Y	Y			
Climatch[2]	Y								
Google scholar search engine[3]	Y	Y	Y	Y	Y	Y	Y	Y	
Centre for Agriculture and Bioscience International[4]			Y					Y	
Explore United States Geographical Survey Invasive Species Research[5]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Food and Agricultural Organization[6]								Y	
Encyclopedia of Life[7]	Y		Y		Y				
Animal Diversity Web[8]			Y	Y					
Seriously Fish[9]			Y						
Native Fish Australia[10]									Y
Fishes of Australia[11]									Y
Griffith University Library database[12]	Y	Y	Y	Y	Y	Y	Y	Y	
World Organisation for Animal Health[13]					Y	Y			
Victorian Fisheries Authority[14]					Y	Y			
Department of Health[15]					Y	Y			
SpeciesLink[16]	Y	Y							
The International Union for Conservation of Nature Red List of Threatened Species[17]	Y	Y	Y				Y		
Koppen-Geiger[18]	Y								
Planet Catfish[19]	Y	Y	Y	Y					
Rainbowfish.angfa[20]	Y	Y	Y	Y					
ProQuest Journal Access[21]	Y	Y	Y	Y	Y	Y	Y	Y	Y
Research Gate[22]	Y	Y	Y	Y	Y	Y	Y	Y	Y

[1]Froese & Pauly 2022; [2]Department of Agriculture, Water and the Environment 2022, [3]Google 2022, [4]Centre for Agriculture and Bioscience International 2022, [5]United States Geographical Survey 2022, [6]Food and Agricultural Organization 2022, [7]National Museum of Natural History 2022, [8]University of Michigan Museum of Zoology 2022, [9]Seriously Fish 2022, [10]Native Fish Australia 2022, [11]Museums Victoria 2022, [12]Griffith University Library 2022, [13]World Organisation for Animal Health 2022, [14]Victorian Fisheries Authority 2022, [15]Department of Health 2021, [16]Species Link 2022, [17]The International Union for Conservation of Nature 2022, [18]Kottek et al. 2006, [19]Dignall 2022, [20]The Australian New Guinea Fishes Association 2022, [21]Proquest 2022, [22]ResearchGate 2022.

Comparative risk assessments

Risk assessment of control species were conducted to ensure the parallel data collection methods used by the three risk assessors were producing comparable results. Risk assessments of ten diverse species selected by the TWG were conducted by the assessors in isolation. Following completion, methods were compared and adjusted to take advantage of key websites and search terms identified.

Results

Comparative risk assessments

Ten species selected by the TWG from the updated greylist were independently risk assessed by risk assessors 1 and 2, with risk assessor 3 risk assessing only one of the ten (*Mastacembelus dayi*) due to their later addition to the project. Overall, the resulting risk levels determined for the assessed species were not unreasonably incongruent (Table 2). Differences in risk level determined were largely a result of differing access to resources, as well as varying interpretation of the question, which in many instances can be quite subjective. It was noted that the calculation of the final score is weighted in such a way that small dissimilarities in answers may result in sizeable differences between the final risk level. Given general concurrence in methods, no major changes were made to the data collection process.

Table 2. Results of comparative risk assessments conducted independently by the three risk assessors of ten diverse species selected by the TWG, with trade value, trade volume, invasion history, and invasion impacts indicated.

RA#: risk assessment abbreviation; Family: family group listed in Fishbase, Scientific name: approved species name sourced from Fishbase; Common name: common name sourced from Fishbase and/or the TWG; Volume: volume of trade per year in Australia provided by TWG (N – No fish in trade (nil individuals/year), L – Low numbers of fish in trade (≤ 5,000 individuals/year), M – Medium numbers of fish in trade (5,001 – 49,999 individuals/year), H – High numbers of fish in trade (≥ 50,000 individuals/year)); Value: value of trade per individual fish in Australia provided by TWG (L – Low value of trade (≤ $10 /individual), M – Medium value of trade ($11 – $999 /individual), H – High value of trade (≥ $1,000 /individual)); Intro: occurrence outside of native range via accidental or deliberate release; Impact: consequential impact recorded from introductions outside of native range; Risk level: rapid risk assessment result translated from the rapid risk assessment score (L – Low <50 in green, M – Medium <150 in yellow, H – High >150 in red) with risk assessor indicated (R1 – risk assessor 1, R2 – risk assessor 2, R3 – risk assessor 3); Score: risk assessment score (NA –comparative risk assessments not conducted by risk assessor 3) with risk assessor indicated (R1 – risk assessor 1, R2 – risk assessor 2, R3 – risk assessor 3); Caveats: limitations that influence result and score interpretation (DD: Low confidence in risk assessment level due to high data deficiencies; NA –comparative risk assessments not conducted by risk assessor 3) with risk assessor indicated (R1 – risk assessor 1, R2 – risk assessor 2, R3 – risk assessor 3).

Assessor	RA#	Family	Scientific name	Common name	Trade	Value	Introductions	Impact	Risk level	Score	Caveats	
											By category	By overall
1	C1	Anabantidae	*Microctenopoma nanum*	Dwarf ctenopoma	LT	MV	No	No	L	15	DD	
2	C1	Anabantidae	*Microctenopoma nanum*	Dwarf ctenopoma	MV	LT	No	No	L	8	DD	DD
1	C2	Iguanodectidae	*Bryconops melanurus*		LT	LV	No	No	L	12	DD	
2	C2	Iguanodectidae	*Bryconops melanurus*		LV	LT	No	No	L	0	DD	DD
1	C3	Cichlidae	*Cichla ocellaris*	Peacock cichlid	HT	MV	Yes	Yes	H	160		
2	C3	Cichlidae	*Cichla ocellaris*	Peacock cichlid	MV	HT	Yes	Yes	H	320	DD	DD
1	C4	Cichlidae	*Crenicichla lepidota*	Pike cichlid	LT	MV	Yes	None	M	72		
2	C4	Cichlidae	*Crenicichla lepidota*	Pike Cichlid	MV	LT	No	No	L	12	DD	DD
1	C5	Cichlidae	*Amphilophus citrinellus*	Midas cichlid	HT	LV	Yes	Yes	H	162		
2	C5	Cichlidae	*Amphilophus citrinellus*	Midas cichlid	LV	HT	Yes	Yes	M	81	DD	DD
1	C6	Lepisosteidae	*Lepisosteus oculatus*	Spotted gar	LT	HV	Yes	None	L	12		
2	C6	Lepisosteidae	*Lepisosteus oculatus*	Spotted gar	HV	LT	No	No	L	18	DD	
1	C7	Mastacembelidae	*Mastacembelus dayi*	Black spotted eel	LT	HV	No	No	L	12	DD	
2	C7	Mastacembelidae	*Mastacembelus dayi*	Black spotted eel	HV	LT	No	No	L	0	DD	DD
3	C7	Mastacembelidae	*Mastacembelus dayi*	Black spotted eel	HV	LT	No	None	L	0	DD	DD
1	C8	Osteoglossidae	*Osteoglossum bicirrhosum*	Arawana	LT	HV	Yes	None	M	72	DD	
2	C8	Osteoglossidae	*Osteoglossum bicirrhosum*	Arawana	HV	MT	Yes	None	L	48	DD	DD
1	C9	Potamotrygonidae	*Potamotrygon motoro*	South American freshwater stingray	HT	MV	Yes	None	M	64		
2	C9	Potamotrygonidae	*Potamotrygon motoro*	South American freshwater stingray	MV	HT	Yes	None	M	63	DD	
1	C10	Tetraodontidae	*Pao baileyi*	Hairy puffer	LT	MV	No	No	L	0	DD	DD
2	C10	Tetraodontidae	*Pao baileyi*	Hairy puffer	MV	LT	No	No	L	4	DD	DD

Rapid risk assessment

A total of 447 greylisted non-indigenous ornamental freshwater fish species from 65 families were rapidly risk assessed using the SARDI 2018 tool (Table 4, Table 5). Overall, 12 species (2.68%) were assessed as high risk, 35 species (7.83%) assessed as moderate risk, and 400 species (89.49%) assessed as low risk (Table 3, Table 5). All assessed species from the Cyprinodontidae and Pangasiidae families were risk assessed as moderate or high risk (Table 4, Table 5).

Table 3. Summary risk level results for the 447 assessed species indicating the total count and proportion of species determined as low (<50), moderate (<150), and high risk (>150).

Risk level	Count	Proportion
Low	400	89.49%
Moderate	35	7.83%
High	12	2.68%
Total	447	

Table 4. Family summary of the total number of low (<50), moderate (<150), and high risk (>150) species in the 65 assessed families.

Family	Risk score			Family	Risk score			Family	Risk score		
	L	M	H		L	M	H		L	M	H
Adrianichthyidae	1			Doradidae	4			Pimelodidae	15		
Alestidae	3			Gastromyzontidae	1			Poeciliidae	3	1	
Ambassidae	2			Gobiidae	4	1		Polycentridae	1		
Anabantidae	5			Hemiodontidae	2			Polypteridae	10		
Anostomidae	1			Heptapteridae	1			Potamotrygonidae	3	2	
Aspredinidae	1			Iguanodectidae	4			Procatopodidae	4		
Auchenipteridae	1			Lebiasinidae	2			Pseudomugilidae	4		
Badidae	2			Lepisosteidae	5	1		Pseudopimelodidae	1		
Bagridae	2			Leptobarbidae	2			Rivulidae	5	1	
Botiidae	3			Leuciscidae	1		1	Schilbeidae	2		
Callichthyidae	3	1		Lobotidae	1			Serrasalmidae	1		
Catostomidae	1			Loricariidae	44	1		Siluridae	2		
Chalceidae	1			Mastacembelidae	12			Sisoridae	1		
Characidae	5			Melanotaeniidae	18			Sternopygidae	1		
Cichlidae	148	23	11	Mochokidae	7			Sundadanionidae	1		
Cobitidae	1			Mormyridae	2			Tanichthyidae	2		
Crenuchidae	2			Nemacheilidae	1			Tetraodontidae	15	1	
Ctenoluciidae	3			Nothobranchiidae	7			Tetraodontidae	2		
Curimatidae	1			Notopteridae	4	1		Toxotidae	2		
Cyprinidae	8			Osphronemidae	4			Vaillantellidae	1		
Cyprinodontidae		1		Osteoglossidae	3	2		Zerarchopteridae	2		
Danionidae	8			Pangasiidae			1				

Table 5. Rapid risk assessment scores and corresponding levels of 447 greylisted non-indigenous ornamental freshwater fish species grouped by assessor, then by family (not consecutively), with trade value, trade volume, invasion history, and invasion impacts indicated.

Assessor: risk assessor who completed the species assessment; **RA#**: risk assessment number (grouped by assessor then by species, non-consecutively); **Family**: family group listed in Fishbase, **Scientific name**: approved species name sourced from Fishbase; **Common name**: common name sourced from Fishbase and/or the TWG; **Volume**: volume of trade per year in Australia provided by TWG (N – No fish in trade (nil individuals/year), L – Low numbers of fish in trade (≤ 5,000 individuals/year), M – Medium numbers of fish in trade (5,001 – 49,999 individuals/year), H – High numbers of fish in trade (≥ 50,000 individuals/year)); **Value**: value of trade per individual fish in Australia provided by TWG (L – Low value of trade (≤ $10 /individual), M – Medium value of trade ($11 – $999 /individual), H – High value of trade (≥ $1,000 /individual)); **Introductions**: occurrence outside of native range via accidental or deliberate release; **Impact**: consequential impact recorded from introductions outside of native range; **Risk level**: rapid risk assessment result translated form the rapid risk assessment score (L – Low <50 in green, M – Moderate <150 in yellow, H – High >150 in red); **Score**: risk assessment score; **Caveats**: limitations that influence result and score interpretation (DD: Low confidence in risk assessment level due to high data deficiencies, NV: Negative score).

Assessor	RA#	Family	Scientific name	Common name	Trade	Value	Introductions	Impact	Risk level	Score	Caveats	
											By category	By overall
1	C1	Anabantidae	*Microctenopoma nanum*	Dwarf ctenopoma	LT	MV	No	No	L	15	DD	
2	C1	Anabantidae	*Microctenopoma nanum*	Dwarf ctenopoma	MV	LT	No	No	L	8	DD	DD
1	C2	Iguanodectidae	*Bryconops melanurus*		LT	LV	No	No	L	12	DD	
2	C2	Iguanodectidae	*Bryconops melanurus*		LV	LT	No	No	L	0	DD	DD
1	C3	Cichlidae	*Cichla ocellaris*	Peacock cichlid	HT	MV	Yes	Yes	H	160		
2	C3	Cichlidae	*Cichla ocellaris*	Peacock cichlid	MV	HT	Yes	Yes	H	320	DD	DD
1	C4	Cichlidae	*Crenicichla lepidota*	Pike cichlid	LT	MV	Yes	None	M	72		
2	C4	Cichlidae	*Crenicichla lepidota*	Pike Cichlid	MV	LT	No	No	L	12	DD	DD
1	C5	Cichlidae	*Amphilophus citrinellus*	Midas cichlid	HT	LV	Yes	Yes	H	162		
2	C5	Cichlidae	*Amphilophus citrinellus*	Midas cichlid	LV	HT	Yes	Yes	M	81	DD	DD
1	C6	Lepisosteidae	*Lepisosteus oculatus*	Spotted gar	LT	HV	Yes	None	L	12		
2	C6	Lepisosteidae	*Lepisosteus oculatus*	Spotted gar	HV	LT	No	No	L	18	DD	

1	C7	Mastacembelidae	*Mastacembelus dayi*	Black spotted eel	LT	HV	No	No	L	12	DD	
2	C7	Mastacembelidae	*Mastacembelus dayi*	Black spotted eel	HV	LT	No	No	L	0	DD	DD
3	C7	Mastacembelidae	*Mastacembelus dayi*	Black spotted eel	HV	LT	No	None	L	0	DD	DD
1	C8	Osteoglossidae	*Osteoglossum bicirrhosum*	Arawana	LT	HV	Yes	None	M	72	DD	
2	C8	Osteoglossidae	*Osteoglossum bicirrhosum*	Arawana	HV	MT	Yes	None	L	48	DD	DD
1	C9	Potamotrygonidae	*Potamotrygon motoro*	South American freshwater stingray	HT	MV	Yes	None	M	64		
2	C9	Potamotrygonidae	*Potamotrygon motoro*	South American freshwater stingray	MV	HT	Yes	None	M	63	DD	
1	C10	Tetraodontidae	*Pao baileyi*	Hairy puffer	LT	MV	No	No	L	0	DD	DD
2	C10	Tetraodontidae	*Pao baileyi*	Hairy puffer	MV	LT	No	No	L	4	DD	DD
1	1	Osteoglossidae	*Arapaima gigas*	Arapaima	LT	HV	Yes	Yes	M	120		
1	2	Osteoglossidae	*Osteoglossum ferreirai*	Black arawana	LT	HV	Yes	None	L	8		
1	3	Osteoglossidae	*Scleropages formosus*	Asian bonytongue	MT	HV	Yes	None	L	36		
1	4	Pimelodidae	*Brachyplatystoma filamentosum*	Kumakuma	LT	MV	No	No	L	18	DD	
1	5	Pimelodidae	*Brachyplatystoma juruense*	Zebra catfish	LT	HV	Yes	None	L	0	DD	DD
1	6	Pimelodidae	*Brachyplatystoma tigrinum*	Tigerstriped catfish	LT	HV	Yes	None	L	0	DD	
1	7	Pimelodidae	*Brachyplatystoma vaillantii*	Laulao	LT	MV	No	No	L	12		
1	8	Pimelodidae	*Leiarius arekaima*		LT	HV	No	No	L	0	DD	DD
1	9	Pimelodidae	*Leiarius longibarbis*		LT	HV	No	No	L	8	DD	DD
1	10	Pimelodidae	*Leiarius marmoratus*		LT	HV	Yes	None	L	0	DD	
1	11	Pimelodidae	*Leiarius pictus*	Painted Catfish	LT	HV	Yes	None	L	4	DD	DD
1	12	Pimelodidae	*Perrunichthys perruno*	Leopard catfish	LT	HV	Yes	None	L	0	DD	DD
1	13	Pimelodidae	*Phractocephalus hemioliopterus*	Redtail catfish	LT	HV	Yes	None	L	10	DD	
1	48	Pimelodidae	*Pimelodus blochii*	Bloch's catfish	LT	MV	No	No	L	30	DD	
1	14	Pimelodidae	*Pseudoplatystoma fasciatum*	Barred sorubim	LT	MV	Yes	None	L	36	DD	
1	15	Pimelodidae	*Sorubim elongatus*	Slender shovelnose catfish	LT	HV	Yes	None	L	8	DD	DD
1	16	Pimelodidae	*Sorubim lima*	Duckbill catfish	LT	HV	Yes	None	L	10	DD	
1	17	Pimelodidae	*Sorubimichthys planiceps*	Firewood catfish	LT	MV	Yes	None	L	0	DD	DD
1	50	Polycentridae	*Monocirrhus polyacanthus*	Amazon leaffish	LT	MV	No	No	L	0	DD	
1	18	Polypteridae	*Polypterus bichir*	Nile bichir	LT	MV	Yes	None	L	36	DD	DD

1	19	Polypteridae	*Polypterus delhezi*	Barred bichir	LT	HV	Yes	None	L	5	DD	
1	20	Polypteridae	*Polypterus endlicherii*	Saddled bichir	HT	MV	No	No	L	42	DD	DD
1	21	Polypteridae	*Polypterus endlicheri congicus*		LT	MV	No	No	L	42	DD	DD
1	22	Polypteridae	*Polypterus endlicheri endlicheri*	Saddled bichir	LT	MV	No	No	L	42	DD	DD
1	23	Polypteridae	*Polypterus ornatipinnis*	Ornate bichir	LT	HV	Yes	None	L	5	DD	
1	24	Polypteridae	*Polypterus senegalus meridionalis*		LT	MV	Yes	None	L	36	DD	
1	25	Polypteridae	*Polypterus senegalus senegalus*	Gray bichir	HT	MV	Yes	None	L	36	DD	
1	26	Polypteridae	*Polypterus teugelsi*		LT	MV	No	No	L	0	DD	DD
1	27	Polypteridae	*Polypterus weeksii*	Mottled bichir	LT	MV	Yes	None	L	18	DD	DD
1	28	Potamotrygonidae	*Potamotrygon leopoldi*	White-blotched river stingray	MT	HV	Yes	None	L	18	DD	
1	29	Potamotrygonidae	*Potamotrygon magdalenae*	Magdalena river stingray	LT	MV	No	No	L	12	DD	DD
1	30	Potamotrygonidae	*Potamotrygon ocellata*	Red-blotched river stingray	MT	MV	No	No	L	0	DD	DD
1	31	Siluridae	*Ompok bimaculatus*	Butter catfish	MT	MV	No	No	L	36	DD	
1	32	Siluridae	*Ompok eugeneiatus*	Malay glass catfish	LT	MV	No	No	L	0	DD	
1	33	Tetraodontidae	*Carinotetraodon borneensis*		LT	MV	No	No	L	0	DD	DD
1	34	Tetraodontidae	*Carinotetraodon imitator*		LT	MV	No	No	L	0	DD	DD
1	35	Tetraodontidae	*Carinotetraodon irrubesco*	Red-tailed red-eye pufferfish	LT	MV	No	No	L	0	DD	DD
1	36	Tetraodontidae	*Carinotetraodon lorteti*	Redeye puffer	LT	MV	No	No	L	24	DD	
1	37	Tetraodontidae	*Carinotetraodon salivator*	Striped Redeye Puffer	LT	MV	No	No	L	0	DD	
1	38	Tetraodontidae	*Carinotetraodon travancoricus*	Malabar pufferfish	LT	MV	No	No	L	30	DD	
1	44	Tetraodontidae	*Dichotomyctere fluviatilis*	Green pufferfish	MT	MV	Yes	None	M	84	DD	
1	47	Tetraodontidae	*Dichotomyctere nigroviridis*	Spotted green pufferfish	MT	MV	Yes	None	L	42	DD	
1	41	Tetraodontidae	*Dichotomyctere ocellatus*	Eyespot pufferfish	HT	MV	No	No	L	28	DD	
1	39	Tetraodontidae	*Pao abei*	Red-spot puffer	LT	MV	Yes	None	L	6	DD	DD
1	42	Tetraodontidae	*Pao cambodgiensis*		LT	MV	No	No	L	0	DD	DD
1	43	Tetraodontidae	*Pao cochinchinensis*	Fang's puffer	LT	MV	Yes	None	L	12	DD	
1	49	Tetraodontidae	*Pao palembangensis*		LT	MV	No	No	L	18	DD	
1	40	Tetraodontidae	*Tetraodon barbatus*		LT	MV	No	No	L	12	DD	DD
1	45	Tetraodontidae	*Tetraodon lineatus*	Globe fish	MT	MV	Yes	None	L	48	DD	

1	46	Tetraodontidae	*Tetraodon mbu*	Fresh water puffer fish	LT	MV	No	No	L	20	DD	DD
1	51	Auchenipteridae	*Tatia intermedia*		MV	LT	Yes	None	L	0	DD	DD
1	52	Badidae	*Badis badis*	Badis	LV	LT	No	No	L	12	DD	
1	53	Badidae	*Dario dario*		LV	LT	No	No	L	0	DD	
1	54	Bagridae	*Bagroides melapterus*		MV	LT	No	No	L	0	DD	DD
1	55	Bagridae	*Mystus bimaculatus*		LV	LT	No	No	L	0	DD	DD
1	56	Botiidae	*Syncrossus beauforti*	Chameleon loach	MV	LT	Yes	None	L	0	DD	DD
1	57	Botiidae	*Syncrossus helodes*	Tiger botia	MV	LT	No	No	L	36	DD	DD
1	58	Botiidae	*Syncrossus hymenophysa*	Tiger loach	MV	LT	No	No	L	12	DD	DD
1	59	Callichthyidae	*Aspidoras pauciradiatus*	Sixray corydoras	LV	LT	No	No	L	5	DD	DD
1	60	Callichthyidae	*Aspidoras spilotus*		LV	LT	No	No	L	0	DD	DD
1	61	Callichthyidae	*Dianema longibarbis*	Porthole catfish	MV	LT	No	No	L	20	DD	
1	62	Callichthyidae	*Megalechis thoracata*		LV	MT	Yes	None	M	64		
1	63	Catostomidae	*Myxocyprinus asiaticus*	Chinese sucker	HV	LT	No	No	L	16	DD	
1	64	Chalceidae	*Chalceus macrolepidotus*	Pinktail chalceus	LV	LT	Yes	None	L	0	DD	
1	65	Characidae	*Axelrodia riesei*	Ruby tetra	LV	LT	Yes	None	L	0	DD	DD
1	66	Characidae	*Axelrodia stigmatias*		LV	LT	No	No	L	5	DD	
1	67	Characidae	*Exodon paradoxus*	Bucktooth tetra	MV	LT	Yes	None	L	10	DD	
1	68	Characidae	*Pseudochalceus kyburzi*		MV	LT	No	No	L	0	DD	DD
1	69	Characidae	*Tucanoichthys tucano*		LV	LT	No	No	L	0	DD	DD
1	70	Cobitidae	*Acantopsis dialuzona*		LV	LT	Yes	None	L	0	DD	DD
1	71	Crenuchidae	*Ammocryptocharax elegans*		LV	LT	No	No	L	0	DD	DD
1	72	Crenuchidae	*Crenuchus spilurus*	Sailfin tetra	LV	LT	No	No	L	6	DD	
1	73	Curimatidae	*Curimatopsis macrolepis*	Shinyscaled curimata	LV	LT	No	No	L	0	DD	DD
1	74	Cyprinodontidae	*Jordanella floridae*	Flagfish	LV	LT	Yes	None	M	56		
1	75	Doradidae	*Acanthodoras spinosissimus*	Talking catfish	MV	LT	No	No	L	8	DD	DD
1	76	Doradidae	*Agamyxis pectinifrons*	Whitebarred catfish	LT	LV	Yes	None	L	0	DD	DD
1	77	Doradidae	*Platydoras costatus*	Raphael catfish	MT	LV	Yes	None	L	12	DD	DD
1	78	Doradidae	*Platydoras hancockii*	Blue-eye catfish	LT	MV	No	No	L	8	DD	

1	79	Gastromyzontidae	*Sewellia lineolata*		LT	MV	No	No	L	0	DD	
1	80	Gobiidae	*Rhinogobius rubromaculatus*		LT	MV	No	No	L	12		
1	81	Gobiidae	*Sicyopus rubicundus*		LT	MV	No	No	L	0	DD	DD
1	82	Gobiidae	*Stigmatogobius sadanundio*		LT	MV	No	No	M	72	DD	
1	83	Gobiidae	*Stiphodon atropurpureus*		LT	MV	Yes	None	L	6		
1	84	Gobiidae	*Stiphodon ornatus*		LT	MV	No	No	L	6		
1	86	Hemiodontidae	*Hemiodus gracilis*		LT	MV	No	No	L	0	DD	DD
1	87	Hemiodontidae	*Hemiodus thayeria*		LT	MV	No	No	L	0	DD	DD
1	88	Heptapteridae	*Brachyrhamdia meesi*		LT	MV	Yes	None	L	0	DD	DD
1	89	Iguanodectidae	*Iguanodectes spilurus*	Poor man's tropheus	LT	LV	No	No	L	0	DD	DD
1	90	Lebiasinidae	*Pyrrhulina brevis*		LT	LV	No	No	L	6	DD	
1	91	Lebiasinidae	*Pyrrhulina lugubris*		LT	LV	No	No	L	0	DD	DD
1	92	Leptobarbidae	*Leptobarbus hoevenii*	Hoven's carp	LT	LV	Yes	None	L	36		
1	93	Leptobarbidae	*Leptobarbus rubripinna*		LT	LV	Yes	None	L	16	DD	DD
1	94	Leuciscidae	*Cyprinella lutrensis*	Red shiner	LT	LV	Yes	Yes	H	192		
1	95	Leuciscidae	*Notropis chrosomus*	Rainbow shiner	LT	MV	No	No	L	5	DD	
1	96	Lobotidae	*Datnioides microlepis*	Finescale tigerfish	MT	HV	Yes	None	L	8	DD	
1	97	Toxotidae	*Toxotes blythii*		LT	MV	No	No	L	0	DD	DD
1	98	Toxotidae	*Toxotes siamensis*		LT	MV	No	No	L	0	DD	DD
1	101	Vaillantellidae	*Vaillantella maassi*		LT	MV	No	No	L	0	DD	DD
1	100	Sundadanionidae	*Sundadanio axelrodi*		LT	LV	No	No	L	0	DD	DD
1	102	Loricariidae	*Ancistrus cirrhosus*	Jumbie teta	LT	MV	Yes	None	L	18	DD	
1	103	Loricariidae	*Ancistrus claro*		LT	MV	No	No	L	10	DD	
1	104	Loricariidae	*Ancistrus dolichopterus*	Bushymouth catfish	HT	LV	Yes	None	L	32	DD	
1	105	Loricariidae	*Ancistrus hoplogenys*		MT	LV	Yes	None	L	7	DD	DD
1	106	Loricariidae	*Ancistrus leucostictus*		MT	LV	No	No	L	0	DD	
1	107	Loricariidae	*Ancistrus ranunculus*		LT	LV	No	No	L	18	DD	
1	108	Loricariidae	*Ancistrus temminckii*		LT	LV	Yes	None	L	0	DD	DD
1	109	Loricariidae	*Ancistrus triradiatus*		LT	LV	No	No	L	12	DD	

1	110	Loricariidae	*Baryancistrus chrysolomus*	l047	LT	HV	No	No	L	4	DD	DD
1	111	Loricariidae	*Baryancistrus xanthellus*	l018	LT	HV	No	No	L	4	DD	DD
1	112	Loricariidae	*Chaetostoma formosae*		LT	MV	No	No	L	6	DD	
1	113	Loricariidae	*Chaetostoma thomsoni*		LT	MV	Yes	None	L	0	DD	
1	114	Loricariidae	*Dekeyseria brachyura*		MT	MV	No	No	L	5	DD	
1	115	Loricariidae	*Farlowella amazonum*		LT	MV	No	No	L	6	DD	DD
1	116	Loricariidae	*Farlowella vittata*		LT	MV	Yes	None	L	0	DD	
1	117	Loricariidae	*Hemiancistrus sabaji*	L075	LT	MV	No	No	L	0	DD	DD
1	118	Loricariidae	*Hemiancistrus subviridis*	l200	LT	MV	No	No	L	0	DD	DD
1	119	Loricariidae	*Hypancistrus inspector*	l260	MT	MV	No	No	L	5	DD	
1	120	Loricariidae	*Hypancistrus zebra*	l048	LT	HV	Yes	None	L	4		
1	121	Loricariidae	*Leporacanthicus galaxias*	l007	MT	HV	No	No	L	0	DD	DD
1	122	Loricariidae	*Loricaria simillima*		LT	MV	Yes	None	L	24		
1	123	Loricariidae	*Otocinclus affinis*	Golden otocinclus	HT	LV	No	No	L	16	DD	DD
1	124	Loricariidae	*Otocinclus cocama*		LT	MV	No	No	L	6	DD	DD
1	125	Loricariidae	*Otocinclus flexilis*		LT	LV	No	No	L	36	DD	
1	126	Loricariidae	*Otocinclus macrospilus*		LT	LV	No	No	L	0	DD	DD
1	127	Loricariidae	*Otothyropsis piribebuy*		LT	MV	No	No	L	0	DD	DD
1	128	Loricariidae	*Panaqolus albivermis*	l204	LT	HV	No	No	L	4	DD	
1	129	Loricariidae	*Panaqolus maccus*	l104, Clown panaque	LT	MV	No	No	L	0	DD	
1	130	Loricariidae	*Panaque nigrolineatus*	L090, l191, Royal panaque	MT	HV	Yes	None	L	10	DD	DD
1	131	Loricariidae	*Panaque suttonorum*	Blue-eye panaque	LT	HV	Yes	None	L	8	DD	DD
1	132	Loricariidae	*Peckoltia braueri*		LT	MV	No	No	L	6	DD	DD
1	133	Loricariidae	*Peckoltia brevis*		LT	MV	No	No	L	5	DD	DD
1	134	Loricariidae	*Peckoltia compta*	L134	LT	MV	No	No	L	10	DD	DD
1	135	Loricariidae	*Peckoltia vittata*	L15	LT	MV	No	No	L	10	DD	DD
1	136	Loricariidae	*Pseudacanthicus leopardus*		LT	HV	Yes	None	L	4	DD	DD
1	137	Loricariidae	*Pseudacanthicus pirarara*		LT	HV	No	No	L	8	DD	
1	138	Loricariidae	*Pseudacanthicus spinosus*	l096	LT	HV	No	No	L	8	DD	DD

1	139	Loricariidae	*Pseudocanthicus sp.*	l097	LT	HV	No	No	L	4	DD	DD
1	140	Loricariidae	*Pseudohemiodon apithanos*		LT	MV	No	No	L	0	DD	DD
1	141	Loricariidae	*Pterygoplichthys gibbiceps*	Leopard pleco	MT	LV	Yes	None	L	28		
1	142	Loricariidae	*Rineloricaria lanceolata*	Chocolate-colored catfish	LT	MV	Yes	None	L	20	DD	
1	143	Loricariidae	*Rineloricaria parva*		LT	MV	No	No	M	50	DD	
1	144	Loricariidae	*Scobinancistrus aureatus*	l014	LT	HV	Yes	None	L	0	DD	
1	145	Loricariidae	*Scobinancistrus pariolispos*	l048	LT	HV	No	No	L	12	DD	DD
1	146	Loricariidae	*Sturisomatichthys aureum*		LT	MV	No	No	L	10	DD	
1	147	Melanotaeniidae	*Chilatherina axelrodi*	Axelrod's rainbowfish	MT	LV	No	No	L	0	DD	
1	148	Melanotaeniidae	*Chilatherina bleheri*	Bleher's rainbowfish	MT	LV	No	No	L	6	DD	
1	149	Melanotaeniidae	*Chilatherina sentaniensis*	Sentani rainbowfish	MT	LV	No	No	L	6	DD	
1	150	Melanotaeniidae	*Glossolepis dorityi*		MT	LV	No	No	L	0	DD	DD
1	151	Melanotaeniidae	*Glossolepis maculosa*	Spotted rainbowfish	MT	LV	No	No	L	12	DD	DD
1	152	Melanotaeniidae	*Glossolepis multisquamata*	Sepik rainbowfish	MT	LV	No	No	L	12	DD	DD
1	153	Melanotaeniidae	*Glossolepis wanamensis*	Lake Wanam rainbowfish	MT	LV	No	No	L	6		
1	154	Melanotaeniidae	*Melanotaenia batanta*	Batanta rainbowfish	MT	LV	No	No	L	0	DD	DD
1	155	Melanotaeniidae	*Melanotaenia boesemani*	Boeseman's rainbowfish	HT	LV	Yes	None	L	32		
1	156	Melanotaeniidae	*Melanotaenia herbertaxelrodi*	Lake Tebera rainbowfish	HT	LV	Yes	None	L	16		
1	157	Melanotaeniidae	*Melanotaenia kamaka*	Kamaka rainbowfish	HT	LV	No	No	L	7	DD	DD
1	158	Melanotaeniidae	*Melanotaenia lacustris*	Lake Kutubu rainbowfish	HT	LV	Yes	None	L	32		
1	159	Melanotaeniidae	*Melanotaenia lakamora*	Lakamora rainbowfish	MT	LV	No	No	L	6	DD	DD
1	160	Melanotaeniidae	*Melanotaenia papuae*	Papuan rainbowfish	MT	LV	No	No	L	6	DD	DD
1	161	Melanotaeniidae	*Melanotaenia parkinsoni*	Parkinson's rainbowfish	MT	LV	No	No	L	6	DD	DD
1	162	Melanotaeniidae	*Melanotaenia parva*	Lake Kuromai rainbowfish	MT	LV	No	No	L	7		
1	163	Melanotaeniidae	*Melanotaenia praecox*	Dwarf rainbowfish	HT	LV	No	No	L	14		
1	164	Melanotaeniidae	*Melanotaenia sexlineata*	Fly River rainbowfish	MT	LV	No	No	L	18	DD	
1	165	Mochokidae	*Microsynodontis batesii*		LT	MV	No	No	L	0	DD	DD
1	166	Mochokidae	*Synodontis angelicus*	Angel squeaker	MT	HV	Yes	None	L	12	DD	DD

1	167	Mochokidae	*Synodontis brichardi*		LT	LV	No	No	L	12	DD	
1	168	Mochokidae	*Synodontis flavitaeniatus*	Orangestriped squeaker	LT	LV	No	No	L	18	DD	
1	169	Mochokidae	*Synodontis lucipinnis*		LT	LV	No	No	L	18	DD	DD
1	170	Mochokidae	*Synodontis ocellifer*		LT	LV	Yes	None	L	42	DD	
1	171	Mochokidae	*Synodontis petricola*	Cuckoo Catfish	MT	LV	No	No	L	28		
1	172	Mormyridae	*Brienomyrus brachyistius*		LT	LV	No	No	L	12	DD	DD
1	173	Mormyridae	*Mormyrus longirostris*	Eastern bottlenose mormyrid	LT	MV	No	No	L	30	DD	
1	174	Nemacheilidae	*Schistura balteata*	Sumo loach	LT	MV	No	No	L	0	DD	
1	175	Nothobranchiidae	*Nothobranchius eggersi*		LT	LV	No	No	L	48		
1	176	Nothobranchiidae	*Nothobranchius foerschi*		LT	LV	No	No	L	24		
1	177	Nothobranchiidae	*Nothobranchius guentheri*	Redtail notho	LT	LV	No	No	L	28		
1	178	Nothobranchiidae	*Nothobranchius korthausae*		LT	LV	No	No	L	24	DD	
1	179	Nothobranchiidae	*Nothobranchius palmqvisti*		LT	LV	No	No	L	18	DD	
1	180	Nothobranchiidae	*Nothobranchius rachovii*	Bluefin notho	LT	LV	No	No	L	24		
1	181	Nothobranchiidae	*Nothobranchius rubripinnis*		LT	LV	No	No	L	24	DD	
1	182	Osphronemidae	*Macropodus spechti*		LT	LV	No	No	L	18	DD	
1	183	Osphronemidae	*Parosphromenus parvulus*		LT	LV	No	No	L	6	DD	DD
1	184	Osphronemidae	*Parosphromenus harveyi*		LT	LV	No	No	L	0	DD	
1	185	Osphronemidae	*Sphaerichthys vaillanti*		LT	LV	No	No	L	5	DD	
1	186	Poeciliidae	*Belonesox belizanus*	Top Minnow	LT	LV	Yes	Yes	M	112		
1	187	Poeciliidae	*Micropoecilia picta*	Swamp guppies	LT	LV	No	No	L	0	DD	DD
1	188	Poeciliidae	*Poecilia parae*		LT	LV	No	No	L	10	DD	
1	189	Poeciliidae	*Poecilia wingei*		HT	LV	No	No	L	30	DD	
1	190	Procatopodidae	*Congopanchax myersi*	Hummingbird lampeye	LT	LV	No	No	L	0	DD	
1	191	Procatopodidae	*Lamprichthys tanganicanus*	Tanganyika killifish	LT	MV	Yes	Yes	L	12	DD	
1	192	Procatopodidae	*Poropanchax normani*	Norman's lampeye	MT	LV	Yes	None	L	0	DD	DD
1	193	Procatopodidae	*Procatopus aberrans*	Bluegreen lampeye	LT	LV	No	No	L	0	DD	DD
1	194	Cichlidae	*Protomelas annectens*		LT	LV	No	No	L	24	DD	

1	195	Cichlidae	*Protomelas similis*		MT	LV	No	No	L	12	DD	DD
1	196	Cichlidae	*Protomelas spilonotus*		MT	LV	No	No	L	12	DD	
1	197	Cichlidae	*Protomelas taeniolatus*	Spindle hap	HT	LV	No	No	L	28		
1	198	Cichlidae	*Protomelas virgatus*		LT	LV	No	No	L	10	DD	DD
1	199	Cichlidae	*Protomelas sp. "Steveni"*		MT	LV	No	No	L	6	DD	DD
1	200	Pseudomugilidae	*Pseudomugil connieae*	Popondetta blue-eye	LT	LV	No	No	L	6	DD	
1	201	Pseudomugilidae	*Pseudomugil furcatus*	Forktail rainbowfish	LT	LV	Yes	None	L	12		
1	202	Pseudomugilidae	*Pseudomugil ivantsoffi*		LT	LV	No	No	L	6	DD	DD
1	203	Pseudomugilidae	*Pseudomugil luminatus*	Red neon blue-eye	LT	LV	No	No	L	6		
1	204	Pseudopimelodidae	*Microglanis poecilus*	Dwarf marbled catfish	LT	MV	No	No	L	0	DD	DD
1	205	Rivulidae	*Austrolebias adloffi*		LT	LV	No	No	L	24	DD	DD
1	206	Rivulidae	*Austrolebias bellottii*	Argentine pearlfish	LT	LV	Yes	None	M	56		
1	207	Rivulidae	*Austrolebias carvalhoi*		LT	LV	No	No	L	24	DD	
1	208	Rivulidae	*Austrolebias nigripinnis*	Blackfin pearlfish	LT	LV	Yes	None	L	18		
1	209	Rivulidae	*Cynolebias microphthalmus*		LT	LV	No	No	L	0	DD	DD
1	210	Rivulidae	*Simpsonichthys constanciae*	Featherfin pearlfish	LT	LV	No	No	L	0	DD	
1	212	Schilbeidae	*Parailia pellucida*	Glass schilbid	LT	MV	No	No	L	30	DD	DD
1	213	Schilbeidae	*Pareutropius debauwi*	African glass catfish	LT	MV	No	No	L	8	DD	DD
1	214	Serrasalmidae	*Myloplus schomburgkii*	Disk tetra	HT	MV	Yes	None	L	12	DD	DD
1	215	Sisoridae	*Hara jerdoni*		LT	MV	No	No	L	0	DD	DD
1	216	Sternopygidae	*Eigenmannia virescens*	Glass knifefish	MT	MV	Yes	None	L	42		
1	217	Tanichthyidae	*Tanichthys micagemmae*		LT	LV	No	No	L	24	DD	
1	218	Tanichthyidae	*Tanichthys thacbaensis*		LT	LV	No	No	L	24	DD	DD
1	219	Zerarchopteridae	*Nomorhamphus celebensis*	Poso halfbeak	LT	LV	No	No	L	0	DD	DD
1	220	Zerarchopteridae	*Nomorhamphus liemi*		LT	LV	No	No	L	0	DD	DD
2	1	Cichlidae	*Guianacara geayi*		LV	MT	No	No	L	0	DD	DD
2	2	Cichlidae	*Guianacara sphenozona*		LV	MT	No	No	L	0	DD	DD
2	3	Cichlidae	*Guianacara dacrya*		LV	MT	No	No	L	0	DD	DD
2	4	Cichlidae	*Geophagus winemilleri*		LV	MT	No	No	L	12	DD	DD

2	5	Cichlidae	*Geophagus sveni*		LV	MT	No	No	L	36	DD	DD
2	6	Cichlidae	*Geophagus surinamensis*	Redstriped eartheater	LV	MT	Yes	Yes	M	72	DD	DD
2	7	Cichlidae	*Geophagus steindachneri*	Redhump eartheater	LV	MT	No	No	L	12	DD	DD
2	8	Cichlidae	*Geophagus brachybranchus*		LV	MT	No	No	L	0	DD	DD
2	9	Cichlidae	*Geophagus altifrons*		LV	MT	Yes	None	M	105	DD	
2	10	Cichlidae	*Etroplus suratensis*	Pearlspot	MV	LT	Yes	Yes	M	120	DD	
2	11	Cichlidae	*Etroplus canarensis*	Canara pearlspot	MV	LT	No	No	L	4	DD	DD
2	12	Cichlidae	*Ectodus descampsii*		LV	LT	No	No	L	5	DD	DD
2	13	Cichlidae	*Dimidiochromis compressiceps*	Malawi eyebiter	LV	MT	No	No	L	6	DD	DD
2	14	Cichlidae	*Cyphotilapia gibberosa*		MV	MT	No	No	L	6	DD	DD
2	15	Cichlidae	*Cryptoheros cutteri*		LV	LT	No	No	L	0	DD	DD
2	16	Cichlidae	*Crenicichla geayi*	Halfbanded pike cichlid	MV	LT	No	No	L	10	DD	DD
2	17	Cichlidae	*Copadichromis borleyi*	Haplochromis borleyi redfin	LV	HT	No	No	L	6	DD	DD
2	18	Cichlidae	*Cincelichthys pearsei*	Pantano cichlid	MV	LT	No	No	L	10	DD	DD
2	19	Cichlidae	*Cichlasoma urophthalmus*	Mexican mojarra	LV	MT	Yes	Yes	H	288	DD	
2	20	Cichlidae	*Cichla temensis*	Speckled pavon	MV	HT	Yes	Yes	M	120	DD	DD
2	21	Cichlidae	*Cichla piquiti*		MV	MT	Yes	Yes	H	196	DD	
2	22	Cichlidae	*Cichla monoculus*		MV	HT	Yes	Yes	H	192	DD	DD
2	23	Cichlidae	*Cichla kelberi*		MV	HT	Yes	Yes	H	240		
2	24	Cichlidae	*Chindongo socolofi*	Pindani	LV	HT	No	No	L	42	DD	
2	25	Cichlidae	*Chindongo saulosi*		LV	HT	Yes	None	L	7	DD	DD
2	26	Cichlidae	*Chindongo flavus*		LV	HT	No	No	L	24	DD	DD
2	27	Cichlidae	*Chindongo elongatus*	Elongate mbuna	LV	HT	No	No	L	28	DD	DD
2	28	Cichlidae	*Chindongo demasoni*		LV	HT	No	No	L	28	DD	DD
2	29	Cichlidae	*Cheilochromis euchilus*	Malawi thick lip	LV	LT	No	No	L	12	DD	
2	30	Cichlidae	*Caquetaia umbrifera*	Turquoise cichlid	LV	HT	No	No	L	28	DD	
2	31	Cichlidae	*Caquetaia spectabilis*		MV	HT	No	No	L	24	DD	
2	32	Cichlidae	*Caquetaia kraussii*	Bucketmouth	MV	MT	Yes	Yes	M	120	DD	
2	33	Cichlidae	*Callochromis macrops*		LV	LT	No	No	L	20	DD	DD

2	34	Cichlidae	*Biotoecus opercularis*		MV	LT	No	No	L	0	DD	DD
2	35	Cichlidae	*Biotodoma wavrini*	Orinoco eartheater	MV	LT	No	No	L	0	DD	DD
2	36	Cichlidae	*Biotodoma cupido*	Greenstreaked eartheater	MV	LT	No	No	L	8		
2	37	Cichlidae	*Aulonocranus dewindti*		LV	LT	No	No	L	10	DD	
2	38	Cichlidae	*Astatotilapia calliptera*	Eastern happy	LV	MT	Yes	None	M	60	DD	
2	39	Cichlidae	*Astatotilapia burtoni*		LV	MT	Yes	None	H	192	DD	
2	40	Cichlidae	*Anomalochromis thomasi*		LV	MT	No	No	L	0	DD	DD
2	41	Cichlidae	*Hypselecara temporalis*	Emerald cichlid	LV	LT	No	No	L	12	DD	DD
2	42	Cichlidae	*Krobia itanyi*	Dolphin cichlid	MV	LT	No	No	L	0	DD	DD
2	43	Cichlidae	*Labeotropheus trewavasae*	Scrapermouth mbuna	LV	HT	No	No	L	0	DD	DD
2	44	Cichlidae	*Labidochromis freibergi*		LV	MT	No	No	L	0	DD	DD
2	45	Cichlidae	*Labidochromis sp. Hongi*		LV	HT	No	No	L	0	DD	DD
2	46	Cichlidae	*Labidochromis textilis*		LV	LT	No	No	L	0	DD	DD
2	47	Cichlidae	*Lethrinops auritus*	Golden sand-eater	MV	LT	No	No	L	5	DD	DD
2	48	Cichlidae	*Lethrinops christyi*		MV	LT	No	No	L	0	DD	DD
2	49	Cichlidae	*Lethrinops oculatus*		MV	LT	No	No	L	0	DD	DD
2	50	Cichlidae	*Lethrinops parvidens*	Lethrinops red flush	MV	LT	No	No	L	0	DD	DD
2	51	Cichlidae	*Maskaheros argenteus*	White cichlid	MV	LT	No	No	L	5	DD	DD
2	52	Cichlidae	*Maylandia aurora*		LV	LT	No	No	L	12	DD	DD
2	53	Cichlidae	*Maylandia barlowi*		LV	MT	No	No	L	12	DD	
2	54	Cichlidae	*Mylochromis ericotaenia*		MV	LT	No	No	L	5	DD	DD
2	55	Cichlidae	*Mylochromis incola*	Golden mola hap	MV	LT	No	No	L	5	DD	DD
2	56	Cichlidae	*Mylochromis mola*		LV	LT	No	No	L	0	DD	DD
2	57	Cichlidae	*Neolamprologus brevis*		MV	LT	No	No	L	10	DD	DD
2	58	Cichlidae	*Neolamprologus buescheri*		MV	LT	No	No	L	0	DD	DD
2	59	Cichlidae	*Neolamprologus caudopunctatus*		LV	LT	No	No	L	0	DD	
2	60	Cichlidae	*Neolamprologus falcicula*		MV	LT	No	No	L	0	DD	DD
2	61	Cichlidae	*Neolamprologus multifasciatus*		LV	LT	No	No	L	0	DD	DD
2	62	Cichlidae	*Neolamprologus petricola*		MV	LT	No	No	L	0	DD	DD

2	63	Cichlidae	*Neolamprologus sexfasciatus*		MV	LT	No	No	L	5	DD	DD
2	64	Cichlidae	*Neolamprologus similis*		MV	LT	No	No	L	10	DD	DD
2	65	Cichlidae	*Neolamprologus toae*		MV	LT	No	No	L	0	DD	DD
2	66	Cichlidae	*Neolamprologus tretocephalus*		MV	LT	No	No	L	0	DD	DD
2	67	Cichlidae	*Naevochromis chrysogaster*		MV	LT	No	No	L	5	DD	DD
2	68	Cichlidae	*Iodotropheus stuartgranti*		LV	LT	No	No	L	6	DD	DD
2	69	Cichlidae	*Lamprologus signatus*		LV	LT	No	No	L	0	DD	DD
2	70	Cichlidae	*Lepidiolamprologus attenuatus*		LV	LT	No	No	L	6	DD	DD
2	71	Cichlidae	*Lepidiolamprologus hecqui*		LV	LT	No	No	L	0	DD	DD
2	72	Cichlidae	*Labidochromis chisumulae*		LV	HT	No	No	L	7	DD	DD
2	73	Cichlidae	*Laetacara araguaiae*		LV	LT	Yes	None	L	6	DD	DD
2	74	Cichlidae	*Gymnogeophagus meridionalis*		LV	LT	No	No	L	12	DD	DD
2	75	Cichlidae	*Gymnogeophagus terrapurpura*		LV	LT	No	No	L	6	DD	DD
2	76	Cichlidae	*Nanochromis nudiceps*		MV	LT	No	No	L	5	DD	DD
2	77	Cichlidae	*Gymnogeophagus balzanii*	Argentine humphead	LV	MT	No	No	L	24	DD	DD
2	78	Cichlidae	*Haplochromis latifasciatus*		LV	MT	No	No	L	6	DD	DD
2	79	Cichlidae	*Haplochromis nyererei*		LV	MT	No	No	L	6	DD	DD
2	80	Cichlidae	*Haplochromis phytophagus*		LV	MT	No	No	L	6	DD	DD
2	81	Cichlidae	*Hypsophrys nematopus*		LV	LT	Yes	Yes	L	12	DD	DD
2	82	Cichlidae	*Maylandia greshakei*	William's mbuna	LV	HT	No	No	L	14	DD	
2	83	Cichlidae	*Maylandia hajomaylandi*		LV	HT	No	No	L	14	DD	
2	84	Cichlidae	*Nanochromis transvestitus*		MV	LT	No	No	L	10	DD	
2	85	Cichlidae	*Nandopsis tetracanthus*	Biajaca	LV	MT	No	No	L	40	DD	DD
2	86	Cichlidae	*Nimbochromis linni*		MV	LT	No	No	L	10	DD	
2	87	Cichlidae	*Nimbochromis livingstonii*		LV	HT	No	No	L	10	DD	
2	88	Cichlidae	*Maylandia pulpican*		LV	HT	No	No	L	14	DD	
2	89	Cichlidae	*Maylandia callainos*		LV	HT	Yes	Yes	L	24	DD	
2	90	Cichlidae	*Maylandia lombardoi*		LV	HT	Yes	None	L	16	DD	
2	91	Cichlidae	*Maylandia zebra*	Zebra mbuna	LV	HT	Yes	Yes	L	24	DD	

2	92	Cichlidae	*Nimbochromis polystigma*		LV	HT	No	No	L	14	DD	
2	93	Cichlidae	*Nimbochromis venustus*		LV	HT	No	No	L	14	DD	
2	94	Cichlidae	*Nannacara adoketa*		LV	LT	No	No	L	24	DD	
2	95	Cichlidae	*Hemichromis lifalili*		LV	LT	Yes	None	L	24	DD	
2	96	Cichlidae	*Herotilapia multispinosa*	Rainbow cichlid	LV	MT	Yes	Yes	L	24	DD	DD
2	97	Cichlidae	*Heros efasciatus*		LV	MT	No	No	M	60	DD	
2	98	Cichlidae	*Maylandia estherae*	Red zebra	LV	HT	Yes	Yes	M	72	DD	
2	99	Cichlidae	*Heros severus*	Banded cichlid	LV	MT	Yes	Yes	L	24	DD	DD
2	100	Cichlidae	*Mesoheros festae*	Guayas cichlid	LV	MT	Yes	Yes	M	84	DD	
2	101	Cichlidae	*Labeotropheus fuelleborni*	Blue mbuna	LV	HT	Yes	Yes	L	32	DD	DD
2	102	Cichlidae	*Hemichromis guttatus*		LV	LT	Yes	Yes	M	96	DD	
2	103	Cichlidae	*Herichthys carpintis*	Lowland cichlid	LV	HT	Yes	Yes	H	216	DD	DD
2	104	Cichlidae	*Hemichromis bimaculatus*	Jewelfish	LV	LT	Yes	None	M	108	DD	
2	105	Cichlidae	*Herichthys cyanoguttatus*	Rio Grande cichlid	LV	MT	Yes	Yes	H	210	DD	
3	1	Cichlidae	*Melanochromis baliodigma*		LV	MT	No	None	L	24	DD	
3	2	Cichlidae	*Melanochromis chipokae*		LV	MT	No	None	L	12	DD	
3	3	Cichlidae	*Melanochromis dialeptos*		LV	MT	No	None	L	6	DD	
3	4	Notopteridae	*Chitala blanci*	Indochina featherback	HV	LT	Yes	None	L	8	DD	
3	5	Notopteridae	*Chitala borneensis*	Indonesian featherback	HV	LT	No	None	L	3	DD	DD
3	6	Notopteridae	*Chitala chitala*	Clown knifefish	HV	LT	Yes	Yes	L	16	DD	
3	7	Notopteridae	*Chitala hypselonotus*	Sumatran featherback	HV	LT	No	None	L	0	DD	DD
3	8	Notopteridae	*Chitala ornata*		HV	LT	Yes	Yes	M	120	DD	
3	9	Mastacembelidae	*Macrognathus pancalus*	Barred spiny eels	MV	LT	No	None	L	15	DD	DD
3	10	Mastacembelidae	*Mastacembelus armatus*	Zig-zag eel	MV	MT	Yes	None	L	42	DD	DD
3	11	Mastacembelidae	*Mastacembelus erythrotaenia*	Fire eel	HV	MT	Yes	None	L	6	DD	DD
3	12	Mastacembelidae	*Mastacembelus frenatus*	Longtail spiny eel	MV	LT	Yes	None	L	6	DD	DD
3	13	Mastacembelidae	*Mastacembelus ellipsifer*	Siamese Spiny Eel	HV	LT	No	None	L	0	DD	DD
3	14	Mastacembelidae	*Mastacembelus shiranus*	Malawi spinyeel	HV	LT	No	None	L	0	DD	DD
3	15	Mastacembelidae	*Mastacembelus zebratus*		HV	LT	No	None	L	0	DD	DD

3	16	Mastacembelidae	*Mastacembelus favus*	Tire track eel	HV	MT	No	None	L	0	DD	DD
3	17	Mastacembelidae	*Mastacembelus vanderwaali*	Ocellated spiny eel	HV	MT	No	None	L	10	DD	DD
3	18	Adrianichthyidae	*Oryzias woworae*		LV	LT	No	None	L	0	DD	
3	19	Alestidae	*Alestopetersius smykalai*		LV	LT	No	None	L	6	DD	DD
3	20	Alestidae	*Micralestes stormsi*		LV	LT	No	None	L	0	DD	DD
3	21	Ambassidae	*Parambassis pulcinella*		LV	LT	No	None	L	0	DD	DD
3	22	Alestidae	*Phenacogrammus aurantiacus*		MV	LT	No	None	L	0	DD	DD
3	23	Ambassidae	*Gymnochanda filamentosa*		LV	LT	No	None	L	0	DD	DD
3	24	Anostomidae	*Leporinus nijsseni*		LV	LT	No	None	L	6	DD	
3	25	Aspredinidae	*Bunocephalus coracoideus*	Guitarrita	MV	LT	No	None	L	4	DD	DD
3	26	Ctenoluciidae	*Boulengerella lateristriga*	striped-pike characin	LV	LT	No	None	L	0	DD	DD
3	27	Ctenoluciidae	*Boulengerella maculata*	Spotted-pike characin	LV	LT	No	None	L	0	DD	DD
3	28	Ctenoluciidae	*Ctenolucius hujeta*	Freshwater Barracuda	MV	LT	Yes	None	L	0	DD	DD
3	29	Danionidae	*Boraras brigittae*		LV	HT	No	None	L	0	DD	
3	30	Danionidae	*Boraras merah*		LV	HT	No	None	L	0	DD	DD
3	31	Danionidae	*Danio kyathit*		LV	LT	No	None	L	0	DD	DD
3	32	Danionidae	*Danio roseus*		LV	LT	Yes	None	L	0	DD	DD
3	33	Danionidae	*Danio tinwini*		LV	LT	No	None	L	0	DD	DD
3	34	Danionidae	*Devario sondhii*		LV	LT	No	None	L	0	DD	DD
3	35	Danionidae	*Microdevario kubotai*		LV	LT	Yes	None	L	0	DD	DD
3	36	Danionidae	*Trigonostigma espei*	Lambchop rasbora	LV	LT	Yes	None	L	0	DD	DD
3	37	Anabantidae	*Ctenopoma acutirostre*		MV	LT	No	None	L	0	DD	
3	38	Anabantidae	*Ctenopoma ansorgii*		MV	MT	Yes	None	L	24	DD	
3	39	Anabantidae	*Microctenopoma fasciolatum*		MV	LT	No	None	L	0	DD	
3	40	Cichlidae	*Acarichthys heckelii*		LV	MT	Yes	None	L	35	DD	
3	41	Cichlidae	*Altolamprologus calvus*		LV	MT	No	None	L	0	DD	
3	42	Cichlidae	*Altolamprologus compressiceps*		LV	MT	No	None	L	0	DD	
3	43	Cichlidae	*Amatitlania nigrofasciata*		LV	MT	Yes	Yes	M	144		
3	44	Cichlidae	*Amatitlania sajica*		LV	MT	No	None	L	12	DD	DD

3	45	Cichlidae	*Amphilophus labiatus*		LV	HT	Yes	Yes	M	96	DD	
3	46	Cichlidae	*Amphilophus zaliosus*		MV	LT	No	None	L	5	DD	DD
3	47	Cichlidae	*Andinoacara coeruleopunctatus*		LV	LT	No	None	L	0	DD	
3	48	Cichlidae	*Andinoacara rivulatus*		LV	MT	Yes	None	L	0	DD	DD
3	49	Lepisosteidae	*Atractosteus spatula*	Alligator gar	HV	LT	Yes	Yes	M	60	DD	
3	50	Iguanodectidae	*Bryconops affinis*	Orangefin tetra	LV	LT	No	None	L	10	DD	DD
3	51	Cyprinidae	*Dawkinsia assimilis*		LV	LT	No	None	L	0	DD	DD
3	52	Cyprinidae	*Desmopuntius rhomboocellatus*		LV	LT	No	None	L	0	DD	DD
3	53	Cyprinidae	*Eirmotus octozona*		LV	LT	No	None	L	0	DD	DD
3	54	Cyprinidae	*Garra flavatra*		LV	LT	No	None	L	0	DD	DD
3	55	Cyprinidae	*Garra rufa*	Red garra	LV	LT	No	None	L	20		
3	56	Lepisosteidae	*Lepisosteus osseus*		HV	LT	Yes	None	L	20	DD	
3	57	Lepisosteidae	*Lepisosteus platostomus*	Shortnose gar	HV	LT	Yes	None	L	10		
3	58	Lepisosteidae	*Lepisosteus platyrhincus*		HV	LT	Yes	None	L	0		
3	59	Cyprinidae	*Oreichthys crenuchoides*		MV	LT	No	None	L	0	DD	DD
3	60	Pangasiidae	*Pangasianodon hypophthalmus*	Striped catfish	HV	MT	Yes	Yes	H	180	DD	
3	61	Cyprinidae	*Pethia padamya*		LV	HT	Yes	None	L	14	DD	DD
3	62	Cyprinidae	*Pethia stoliczkana*		LV	LT	No	None	L	0	DD	DD
3	63	Cichlidae	*Spathodus marlieri*		MV	LT	No	None	L	10	DD	DD
3	64	Cichlidae	*Steatocranus casuarius*	Lionhead cichlid	LV	MT	No	None	L	12	DD	
3	65	Cichlidae	*Steatocranus gibbiceps*		MV	LT	No	None	L	10	DD	DD
3	66	Cichlidae	*Steatocranus tinanti*		MV	LT	No	None	L	10	DD	DD
3	67	Cichlidae	*Taeniacara candidi*		MV	LT	No	None	L	5	DD	DD
3	68	Cichlidae	*Teleogramma brichardi*		MV	LT	No	None	L	0	DD	DD
3	69	Cichlidae	*Telmatochromis bifrenatus*		LV	LT	Yes	None	L	6	DD	DD
3	70	Cichlidae	*Telmatochromis dhonti*		MV	LT	No	None	L	5	DD	DD
3	71	Cichlidae	*Thorichthys aureus*	Blue flash	MV	LT	No	None	L	5	DD	DD
3	72	Cichlidae	*Thorichthys helleri*		MV	LT	No	None	L	16	DD	DD
3	73	Cichlidae	*Thorichthys maculipinnis*		MV	LT	Yes	None	L	40	DD	DD

3	74	Cichlidae	*Thorichthys meeki*	Firemouth cichlid	MV	MT	Yes	Yes	M	105	DD	
3	75	Cichlidae	*Thorichthys pasionis*	Blackgullet cichlid	MV	LT	Yes	None	L	48	DD	DD
3	76	Cichlidae	*Trichromis salvini*		LV	LT	Yes	Yes	M	60	DD	DD
3	77	Cichlidae	*Tropheops tropheops*		LV	LT	Yes	None	L	24	DD	DD
3	78	Cichlidae	*Uaru amphiacanthoides*	Uaru	MV	LT	Yes	None	L	30	DD	
3	79	Cichlidae	*Uaru fernandezyepezi*		MV	LT	No	None	L	5	DD	DD
3	80	Cichlidae	*Variabilichromis moorii*		LV	LT	No	None	L	5	DD	DD
3	81	Cichlidae	*Vieja maculicauda*	Blackbelt cichlid	MV	LT	Yes	Yes	L	24	DD	DD
3	82	Cichlidae	*Vieja melanurus*	Redhead cichlid	MV	LT	Yes	None	M	60	DD	
3	83	Cichlidae	*Xenotilapia bathyphila*		MV	LT	No	None	L	4	DD	DD
3	84	Cichlidae	*Xenotilapia flavipinnis*	Yellow Sand Cichlid	MV	LT	No	None	L	8	DD	DD
3	85	Cichlidae	*Xenotilapia melanogenys*		MV	LT	No	None	L	4	DD	DD
3	86	Cichlidae	*Xenotilapia ornatipinnis*		MV	LT	No	None	L	4	DD	DD
3	87	Cichlidae	*Pseudetroplus maculatus*	Orange chromide	MV	LT	Yes	None	M	50	DD	DD
3	88	Cichlidae	*Pseudocrenilabrus multicolor*	Egyptian mouth-brooder	LV	LT	No	None	M	60	DD	
3	89	Cichlidae	*Pseudocrenilabrus nicholsi*		LV	LT	No	None	L	18	DD	
3	90	Cichlidae	*Pseudocrenilabrus philander*	Southern mouthbrooder	LV	LT	Yes	None	L	48		
3	91	Cichlidae	*Pseudotropheus crabro*		LV	MT	Yes	None	L	7	DD	DD
3	92	Cichlidae	*Satanoperca leucosticta*		MV	LT	No	None	L	10	DD	
3	93	Cichlidae	*Sciaenochromis ahli*	Electric blue hap	LV	MT	Yes	None	L	28	DD	
3	94	Cichlidae	*Sciaenochromis fryeri*		LV	MT	Yes	None	L	14	DD	DD
3	95	Cichlidae	*Otopharynx lithobates*		LV	HT	Yes	None	L	16	DD	DD
3	96	Cichlidae	*Otopharynx auromarginatus*	Golden-margined hap	LV	LT	No	None	L	12	DD	DD
3	97	Cichlidae	*Otopharynx tetrastigma*		LV	LT	Yes	None	L	12	DD	DD
3	98	Cichlidae	*Parachromis motaguensis*	False yellowjacket cichlid	MV	MT	Yes	Yes	M	72	DD	
3	99	Cichlidae	*Parachromis dovii*	Guapote	LV	HT	Yes	Yes	M	54		
3	100	Cichlidae	*Parachromis managuensis*	Guapote tigre	LV	HT	Yes	Yes	H	216		
3	101	Cichlidae	*Paratilapia polleni*		LV	LT	Yes	None	L	24	DD	
3	102	Cichlidae	*Geophagus tapajos*		MV	LT	Yes	None	L	7	DD	DD

3	103	Cichlidae	*Placidochromis electra*	Deep-water hap	LV	LT	Yes	None	L	12	DD	
3	104	Cichlidae	*Placidochromis milomo*	Super VC-1 hap	MV	LT	Yes	None	L	18	DD	
3	105	Cichlidae	*Placidochromis phenochilus*		MV	LT	No	None	L	0	DD	
3	106	Cichlidae	*Pseudotropheus cyaneorhabdos*		LV	HT	Yes	None	L	8	DD	
3	107	Cichlidae	*Pseudotropheus interruptus*		LV	MT	Yes	None	L	7	DD	
3	108	Cichlidae	*Pseudotropheus joanjohnsonae*	Pearl of Likoma	LV	MT	Yes	None	L	7	DD	
3	109	Cichlidae	*Pseudotropheus johannii*	Bluegray mbuna	LV	MT	Yes	None	L	21	DD	
3	110	Cichlidae	*Pseudotropheus sp. Acei*		LV	MT	No	None	L	6	DD	DD
3	111	Cichlidae	*Reganochromis calliurus*		MV	LT	No	None	L	10	DD	
3	112	Cichlidae	*Retroculus lapidifer*		MV	LT	No	None	L	12	DD	
3	113	Cichlidae	*Rocio octofasciata*	Jack Dempsey	MV	MT	Yes	Yes	M	140	DD	
3	114	Cichlidae	*Satanoperca daemon*	Threespot eartheater	MV	LT	No	None	L	10	DD	
3	115	Cichlidae	*Petenia splendida*	Bay snook	LV	MT	Yes	None	L	0	DD	

Data deficiencies

Data deficiencies were prevalent in the risk assessments, with all species missing some proportion of information necessary to accurately complete the questionnaire. The minimum data deficiencies identified were in the *Jordanella floridae* risk assessment, with three questions/sub-questions (5.77%) incomplete, and the maximum data deficiencies identified were in risk assessment of *Toxotes siamensis* with 27 questions/sub-questions (51.92%) incomplete (Table 6, Appendix 1- 3).

Data deficiencies by category

The SARDI tool methodology indicates risk level is considered unreliable when a risk assessment category (Release Likelihood, Invasion Likelihood, Consequence) has >30% of queries listed as data deficient. A total of 401 species (89.71%) of the 447 assessed species had a high data deficiency score (>30%) in at least one category, resulting in low confidence in risk assessment level (Table 6, Appendix 1- 3). Questions within the Invasion Likelihood category were the main driver of deficiencies, with 398 species (89.04%) data deficient in this category (Table 6, Appendix 1- 3). An additional three species were highly data deficient due to >30% of questions in the Consequence category unanswered (*Nothobranchius korthausae, Nothobranchius palmqvisti,* and *Maylandia estherae*).

Data deficiencies by overall

The alternative data deficiency method indicates risk level is considered unreliable when the overall data deficiency score across all questions/sub-questions is >30%. Using the alternative data deficiency methods, a total of 240 species (53.69%) of the 447 assessed species had a high data deficiency score (>30%) resulting in low confidence in risk assessment level (Table 6, Appendix 1- 3).

Table 6. Summary data deficiency table indicating data deficiencies by category using the SARDI method and by overall using the alternate method. The total count and proportion of species with a high level of data deficiencies (>30%), the maximum, minimum, and average data deficiency within each category and overall, and the total number of species with low confidence in risk assessment level due to high data deficiencies (>30%) in any of the three risk assessment categories or overall are also reported.

Category: data deficiencies in the three risk assessment categories questions (*Release Likelihood* questions 1- 8; *Invasion Likelihood* questions 9- 24; *Consequence* questions 27- 40); **Overall:** data deficiencies across all questions/sub-questions; **DD species:** the total number and proportion of species with data deficiencies >30%; **Maximum**: the highest data deficiency recorded; **Minimum**: the lowest data deficiency recorded; **Average:** the most typical answer calculated by dividing the sum of data deficiencies in that category or overall by the number of species; **Low confidence:** total number of species with low confidence in risk assessment results due to [a]at least one category with data deficiencies >30%, or [b]data deficiencies >30% across all questions/sub-questions.

	Category						Overall	
	Release likelihood		Invasion likelihood		Consequence			
DD species	1	0.22%	398	89.04%	71	15.88%	240	53.69%
Maximum	40.00%		69.23%		43.75%		51.92%	
Minimum	0.00%		7.69%		6.25%		5.77%	
Average	16.29%		42.33%		19.95%		30.44%	
Low confidence	401[a]		89.71%[a]				240[b]	53.69%[b]

Discussion

Risk assessment tool

The SARDI tool is well positioned to be used for risk assessing greylisted species. Questions on known trade value and volume, domestication traits, and deliberate release characteristics enable assessment of ornamental species specifically, while exclusion of questions regarding importation and quarantine focuses the assessment on species known to already be traded within Australia. However, the tool does not allow for rapid risk assessment, and in many cases the elapsed time was orders of magnitude higher than the allotted 3.25hrs due to the complexity of terminology and data gathered. In addition, the considerable proportion of low-risk species resulting from these risk assessments is not congruent with posteriori knowledge. Although exhibiting key invasive traits, or a history of impacts and establishments internationally, several posteriori perceived higher risk species were grouped with species unlikely to successfully invade or impact Australian freshwater ecosystems. Recalibration of the high/moderate/low risk levels to ensure such perceived higher risk species are distinguished would be difficult given their proximity in score to perceived lower risk species. Such adjustments may instead artificially inflate scores and result in truly low risk species being incorrectly determined as moderate or high risk. Instead, it is likely that features of the tool result in underscoring. Firstly, the tool is not wholly appropriate for an Australian-wide assessment due to the divergent Climatch interpretation method used (Q11) and the inability to account for the broad temperature ranges in Australia (Q13). Secondly, the tool overlooks key information that may increase the level of risk a species poses in Australia by excluding invasive range climate (Q11), the potential for hybridisation with non-indigenous species (Q34), and the inability for future proofing in regard to climate change. Improvements regarding these are discussed below.

Climatch interpretation

Climatch is considered one of the key factors driving likelihood of invasion and is scored as such with a maximum of 5 points available (Q11). With a wide range of climate types in Australia (Kottek et al. 2006), there is a greater likelihood of suitable climate occurring within Australia similar to non-indigenous species' reproductive and habitat requirements. However, the SARDI tool interpretation of Climatch results removes this predisposition as it differs substantially from the Climatch manual. While the Climatch manual assesses whether the species can establish anywhere within Australia, the SARDI tool assesses how broadly the species is likely to establish given that they are already in Australia. This interpretation resulted in a considerable proportion of species assessed as low climate match despite widespread high-risk areas, particularly in tropical northern Australia where numerous iconic wetlands of international importance are located (Kingsford et al. 2021) This region has historically recorded numerous non-indigenous fish establishments (Garcia-Diaz et al. 2018) and is considered at particular risk of future invasion by ornamental species (Ebner et al. 2020). Recent successful establishment of the greylist species jaguar cichlid (*P. managuensis*) and incursions of the greylist species peacock bass (*Cichla* sp.) in tropical northern Queensland (Holmes et al. 2020; Catchment Solutions 2019) further highlight the susceptibility of this region to invasion by ornamental species. The current Climatch interpretation prioritises broad establishment over the potential for high impact within a restricted area. This is contrary to the conservation of imperilled freshwater fish species with restricted ranges, as a number inhabit tropical northern Australia (Lintermans et al. 2020). Given that the calculation of the final risk is weighted in such a way that small dissimilarities in answers may result in sizeable differences between the final risk level, it is likely that re-assessment using the Climatch manual interpretation will lead to alterations in risk level. These will likely meet the posteriori expectations. This was observed during the comparative risk assessments where Climatch manual interpretation used by one assessor resulted in higher risk levels determined that better aligned with

invasive understanding. Given the climate limitations, the SARDI tool may be more useful for regional assessments rather than continent-wide, as this will focus the assessment to specific climate types and remove the Climatch predisposition.

Future Proofing

The risk assessment process has considered the risk and consequence of invasion under present day conditions. This has resulted in exclusion of the influence of global climate change on invasive characteristics and altered climate suitability. Within Australia, air temperatures are warming faster than the global average and accelerating, with a 0.708'C increase in air temperature over the period 1980–2009 compared to 1910–1939 (Lough and Hobday 2011). Rainfall is becoming more extreme, as are significant weather events, all of which impact Australian freshwater habitats (John et al. 2022). While Climatch is necessarily based on historical climate records, it does not consider Australian climate under near- and longer-term future climate conditions. As a result, invasion likelihood comparisons in this rapid risk assessment process may not reflect future invasive risk. Use of the Biodiversity Climate Change Virtual Laboratory (2022) species distribution models (or similar) in replacement of the Climatch model may be a suitable alternative, given its ability to project species distributions under future climatic conditions. Internationally, risk assessments accounted for the inability of future proofing by identifying target regions that were representative of future climates (Britton et al. 2010). This enabled present and future climate suitability to be determined while still using Climatch (Britton et al. 2010). While this may be difficult on a continental scale, regional assessment using such predictive target regions is appropriate.

Broad temperature range

The use of the SARDI tool for continent-wide assessments of risk is also limited by the diverse climate conditions throughout Australia. With vastly different temperature ranges in northern and southern Australia, particularly regarding thermal minimums, assessment of a species' temperature tolerance becomes biased in one direction. High temperature tolerance was one of seven sub questions under environmental versatility (Q13), and while warmer temperatures are likely to enable a species to inhabit the warmer tropical regions of northern Australia, it is not an appropriate metric for invasion in cooler southern regions of Australia. As such, species with low temperature preference may be scored low for this question despite potential invasive likelihood in the southern states. While part of this is accounted for by being one of seven sub-questions for environmental versatility, presence of three or more of these sub-questions were necessary to be considered environmentally versatile. In addition, accidental release was scored with cooler temperatures considered for containment outdoors (Q5). Given that the calculation of the final risk is weighted in such a way that small dissimilarities in answers may result in sizeable differences between the final risk level, it is likely that re-assessment using cooler or warmer temperatures as a guide for environmental versatility and accidental release will lead to alterations in risk level. Given these thermal limitations, the SARDI tool may be more useful for regional assessments rather than continent-wide, as this will focus the assessment to specific temperature bands.

Invasive range

Identification of climates within Australia where the species reproductive tolerance is suited were based on native range (Q11). However, several assessed species have climate plasticity, with their invasive range encompassing climates absent within their native range. This increases the likelihood of suitable climates within Australia being present and thereby increases invasive likelihood and risk. The limitations of this question to encompass strictly native range disregards such plasticity, and including invasive range climates would more accurately reflect invasive likelihood.

Non-indigenous hybridisation

Assessment of consequences regarding hybridisation were limited to interspecific, i.e. with native species in the same Family (Q34). However, such limitations overlook the potential for hybridisation with same-Family non-indigenous species established within Australia. While hybridisation may result in deleterious traits, there remains potential for hybrid vigour, where hybrid offspring possess greater fitness over its parents which may lead to invasive superiority (Facon et al. 2005). Multiple non-indigenous hybridisations in Australia have resulted in an increased invasive risk. The hybridisation of invasive tilapia species in Australia (*Oreochromis mossambicus* x *Oreochromis niloticus* and/or *Oreochromis honorum* and/or *Oreochromis aureus*) resulted in a more invasive strain with greater cold tolerance that expands the range of potential establishment further south (Hutchison et al. 2011). Hybridisations between invasive carp (*Cyprinus carpio*) and invasive goldfish (*Carassius auratus*) may reduce the effectiveness of the Koi herpesvirus biological control agent, and development of a hybrid-specific strain may be necessary (McColl et al. 2012). Invasive range expansion of carp into the Murray Darling Basin was also determined to be a result of hybridisation between various strains of carp (*C. carpio)*, namely the Boolara, Prospect, and Yanco strains (Haynes et al. 2009). Given the prevalence of non-indigenous ornamental species occurring within Australian waters, particularly Cichlidae and Poeciliidae species (Corfield et al. 2008), and numerous reports of hybrid ornamental fish by the general public (pers. comm. Bonnie Holmes 2022), it is likely that hybridisation between greylisted species and established non-indigenous same-Family species post-release will occur. Expansion of this question (Q34) to incorporate information on non-indigenous establishments within Australia and potential hybridisation will allow for consideration of hybrid vigour.

While the SARDI tool is useful in assessing ornamental species within Australia, improvements to the tool by further customising it to account for the broad climate and temperature ranges in Australia as well as incorporating information on non-indigenous species invasive range will aid in assessing invasion likelihood and consequences.

Data deficiencies

Low confidence in determined risk level due to high proportions of data deficiencies was a key feature of the risk assessments. This is reflective of the general paucity of information available on ornamental species in both scientific and grey literature, particularly regarding basic biology and reproduction. Given a precautionary principle was not applied, and data deficiencies were largely scored as if a negative response, data deficiencies may result in underscoring contrary to true risk. It is thus important that the prevalence of data deficiencies be taken into account when considering the determined risk score.

The use of an alternative data deficiency method contrary to the SARDI method resulted in considerably fewer risk assessment results determined as unreliable (SARDI method: 401 species (89.71%), alternative method: 240 species (53.69%)). However, this alternate method is not reflective of the risk assessments, and caution is given for reliance on overall data deficiencies rather than categorical data deficiencies. A lack of understanding in one category should serve as the basis for result reliability, as invasiveness of non-indigenous species in Australia is reliant on success in all three invasion categories (i.e., release, establishment, and consequence). Failure in one stage of invasion will result in a lower invasive score. For example, while *Maylandia estherae* has a high likelihood of being released (90%) and a moderate likelihood of being invasive (40%), the low consequences (20%) resulted in a moderate risk score (72). However, 31% of questions/sub-questions in this low scoring consequence category were unanswerable. Using the SARDI data deficiency method, this indicates low confidence that *M. estherae's* true consequences are accurately reflected in the risk assessment answers. Therefore there is low confidence in the moderate risk level determined for *M. estherae* as

additional information to answer these data deficient questions may result in an altered consequence score. In contrast, the alternate data deficiency method would consider the moderate risk score as reliable given the data deficiencies were low across all questions (27% overall). This overlooks the necessity for a comprehensive understanding of all three categories to determine risk level, contrary to the SARDI tool developed.

Evidence of impacts

Minimal research is available on the studied impacts of non-indigenous ornamental invasions. A number of species considered invasive internationally, particularly more recent introductions, have no reports on whether measurable impact is evident. Clear evidence of impacts from a species introduction is difficult to demonstrate when overlaid with numerous pressures exerted on freshwater systems. While it is likely some non-indigenous species have minimal impacts on receiving ecosystems, the potential for currently unreported costs as well as impacts obscured by anthropogenic pressures may result in such species being underscored. Several queries in the Consequence category (Q25, 27, 29, 38, 39, and 40) regarding demonstrated impact provided significant weighting; however, lack of impact was scored as if no impact was reported due to no precautionary principle used. While these answers were not scored as data deficient, it must be considered that no evidence does not equate to no impact. Additional research in this area may lead to significant alterations to risk level, given that the calculation of the final risk is weighted in such a way that small dissimilarities in answers may result in sizeable differences.

Future research opportunities

The use of non-peer reviewed sources in these assessments, including hobbyist websites and magazines, expanded data availability and highlights the discrepancies between industry and scientific pools of knowledge. There is a vital need for collaborations with industry to tap into this information. It is anticipated that the prevalent data deficiencies indicated within this document will be used as a guide for future ornamental research priorities and facilitate industry collaborations. The addition of new research findings will aid in better understanding the risk assessed species pose and will also likely alter the risk assessment results.

Conclusion

The rapid risk assessment of 447 greylisted non-indigenous species in the Australian freshwater ornamental industry determined 400 species are low risk, 35 species are moderate risk, and 12 species are high risk. This was evaluated by reviewing information relating to their release likelihood, invasion likelihood, and resulting consequences. Low confidence due to unacceptable levels of data deficiencies were a key feature of the risk assessments, with >30% of questions/sub-questions unanswerable in at least one category for 401 species, and overall for 240 species. This is likely due to the tool not being wholly appropriate for an Australian-wide assessment and key characteristics excluded from the tool queries that may influence the risk score determined. Additionally, several posteriori perceived higher risk species were grouped with species unlikely to successfully invade or impact Australian freshwater ecosystems. Improvements to the risk assessment tool are recommended to ensure posteriori expectations are met and the tool is suitable for Australia-wide assessments. Firstly, re-assessment of Climatch using the Climatch manual interpretation is necessary to ensure heightened impact in restricted ranges is considered. Secondly, accounting for the broad temperature ranges in Australia by focusing on regional rather than continent-wide assessments will improve accuracy. Third, including the climate within a species invasive range will ensure to account for climate plasticity. Fourth, future proofing the risk assessments by accounting for future climatic conditions will ensure altered climate suitability is acknowledged. Finally, considering the potential for hybridisation with same-Family non-indigenous species will consider hybrid vigour.

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Appendices

Appendix 1

Data deficiencies identified for each of the 227 rapid risk assessments completed by risk assessor 1, indicating where information was not available to fully answer the question posed.

C: question category as per risk assessment format (*Release Likelihood* questions 1- 8; *Invasion Likelihood* questions 9- 24; *Consequence* questions 27- 40); **Q#**: question number listed in the risk assessments; **Question**: summarised questions from the risk assessments; **RA#**: risk assessment number C1 – 220 as shorthand for full scientific name (not consecutively but rather grouped by Family) (refer to Table 3 for species codes) with data deficiencies indicated binomially (1: deficient, blank: not deficient); **Total DD**: proportion of information considered data deficient in the three question categories (Release likelihood, Invasion likelihood, Consequence) and total data deficiencies across the three categories (Overall) with data deficiencies greater than acceptable (>30%) indicated in yellow.

			RA#																							
C	**Q#**	**Question**	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	1	2	3	4	5	6	7	8	9	10	11	12	13	48	14
Release likelihood	**1**	**Trade volume**																									
	2	**Trade value**																									
	3	**Deliberate release**																									
	4	**Accidental release**																									
	5	**Adhesion**		1							1	1				1	1	1	1	1	1		1	1	1	1	1
	6	**Fecundity**		1					1			1				1	1	1			1	1	1	1	1		
	6	**Aggression**								1			1	1			1		1	1		1		1		1	
	6	**Size**																									
	7	**Compliance- deliberate**																									
	8	**Compliance- accidental**																									
Invasion likelihood	**9**	**Domestication**		1	1	1		1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	10	**Established**																									
	11	**Climatch**																									
	12	**Climate types**																									
	13	**Dessication**	1	1	1		1	1	1	1	1	1		1	1	1	1	1		1	1	1		1	1	1	1
	13	**Food items**	1																	1							
	13	**Water quality**	1		1					1		1	1	1	1		1			1	1	1	1	1	1	1	1

Invasion likelihood	13	Oxygen depletion			1				1			1				1	1			1	1	1	1	1	1		1
	13	Temperate range							1											1				1			
	13	Euryhaline																									
	13	Habitat variability																									
	14	Native range	1	1	1			1	1	1										1	1	1	1	1	1		1
	15	Invasive relatives																									
	16	Predation avoidance																									
	17	Predator-free																									
	18	Parental care										1				1	1	1	1	1	1		1	1		1	
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism										1				1	1	1	1	1	1		1	1		1	
	21	Reproductive habitat								1		1						1		1	1		1	1			
	22	Fecundity		1					1			1					1	1		1	1	1	1	1	1		
	22	Batch spawning	1	1		1			1		1	1				1	1	1		1	1	1	1	1	1	1	1
	22	Serial spawning	1	1		1			1		1	1				1	1	1		1	1	1	1	1			1
	22	Extended spawning	1	1		1			1	1	1	1					1			1	1		1	1			
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time																									
	24	Disturbance										1						1		1	1						
Consequence	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk										1															
	29	Impact- compete																									
	30	Micropredation				1														1			1	1			
	31	Prey + predator-free																									
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items																		1							
	34	Hybridise																									
	35	Dispersal																									
	36	Migration	1	1			1	1	1			1								1				1			
	37	Control measures	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									

	40	**Impact- social**																								
Total DD	**Release Likelihood (%)**		0	20	0	0	0	0	10	10	10	20	10	10	0	20	30	20	20	20	20	20	20	30	20	20	10
	Invasion Likelihood (%)		35	35	27	23	12	19	42	31	23	50	12	19	19	35	46	42	19	65	58	38	50	58	35	31	35
	Consequence (%)		19	13	13	19	19	19	19	13	13	25	13	13	13	13	13	13	13	31	13	13	19	25	13	13	13
	Overall (%)		23	25	17	17	12	15	29	21	17	37	12	15	13	25	33	29	17	46	37	27	35	42	25	23	23

			RA#																								
C	**Q#**	**Question**	15	16	17	50	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38
Release likelihood	**1**	**Trade volume**																									
	2	**Trade value**																									
	3	**Deliberate release**																									
	4	**Accidental release**																									
	5	**Adhesion**	1	1	1		1	1	1	1	1				1	1	1	1	1		1	1				1	
	6	**Fecundity**	1	1	1		1		1	1	1				1	1			1			1					
	6	**Aggression**			1				1	1	1							1	1				1				
	6	**Size**																									
	7	**Compliance- deliberate**																									
	8	**Compliance- accidental**																									
Invasion likelihood	**9**	**Domestication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	10	**Established**																									
	11	**Climatch**																									
	12	**Climate types**																									
	13	**Dessication**	1	1	1	1	1	1				1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	13	**Food items**																	1				1				
	13	**Water quality**		1	1		1	1				1	1	1	1	1	1	1	1	1	1		1				
	13	**Oxygen depletion**			1	1											1	1	1	1	1		1	1	1	1	1
	13	**Temperate range**	1		1				1	1	1							1	1				1	1			
	13	**Euryhaline**																									
	13	**Habitat variability**																									
	14	**Native range**	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1		1	1		1		
	15	**Invasive relatives**																									
	16	**Predation avoidance**																									
	17	**Predator-free**																									

Invasion likelihood	18	Parental care	1		1				1	1	1				1				1	1	1		1		1		1
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism	1		1		1		1	1	1				1	1	1		1	1	1	1	1	1		1	
	21	Reproductive habitat							1	1	1				1		1	1	1	1	1	1	1	1	1	1	
	22	Fecundity	1	1	1		1		1	1	1				1	1			1			1					
	22	Batch spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Serial spawning	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
	22	Extended spawning			1	1		1				1			1	1	1		1			1	1	1	1	1	
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time				1	1		1	1	1				1	1											
	24	Disturbance				1		1								1					1		1				
Consequence	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk															1	1									
	29	Impact- compete																									
	30	Micropredation	1				1								1	1			1				1	1			
	31	Prey + predator-free																	1				1	1			
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items														1			1				1	1			
	34	Hybridise																									
	35	Dispersal																									
	36	Migration				1						1			1	1			1		1	1	1	1			
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total DD	Release Likelihood (%)		20	20	30	0	20	10	30	30	30	0	0	0	20	20	10	20	30	0	10	20	10	0	0	10	0
	Invasion Likelihood (%)		42	35	54	38	42	38	46	46	46	35	31	31	54	46	35	42	62	46	42	42	62	42	42	38	31
	Consequence (%)		19	13	13	19	19	13	13	13	13	19	13	13	25	31	13	19	44	13	19	19	38	38	13	13	13
	Overall (%)		31	25	37	25	31	25	33	33	33	23	19	19	38	37	23	31	50	27	29	31	44	33	25	25	19

			RA#																								
C	Q#	Question	44	47	41	39	42	43	49	40	45	46	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
Release likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion		1		1	1	1	1	1		1	1			1	1	1	1	1	1	1	1	1	1		1
	6	Fecundity		1		1	1		1	1		1	1			1	1	1	1	1	1	1	1		1		1
	6	Aggression											1			1						1					
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
Invasion likelihood	9	Domestication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	10	Established																									
	11	Climatch																									
	12	Climate types																									
	13	Dessication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1
	13	Food items														1	1					1					
	13	Water quality								1	1	1	1	1		1					1	1				1	1
	13	Oxygen depletion	1		1	1	1	1	1	1	1	1	1		1	1					1	1	1				1
	13	Temperate range											1														
	13	Euryhaline																									
	13	Habitat variability																									
	14	Native range	1	1	1		1	1	1	1			1	1	1			1		1	1	1		1		1	1
	15	Invasive relatives																									
	16	Predation avoidance																									
	17	Predator-free																									
	18	Parental care					1			1	1	1	1			1		1	1		1	1			1		1
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism			1	1	1		1	1	1	1	1		1	1		1	1	1	1	1		1	1	1	1
	21	Reproductive habitat				1	1			1		1	1			1	1	1	1		1	1	1			1	
	22	Fecundity		1		1	1		1	1		1	1			1	1	1	1	1	1	1	1		1		1
	22	Batch spawning	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	
	22	Serial spawning	1	1	1	1	1		1	1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	

	22	Extended spawning	1	1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1	1	1			1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time													1			1		1						1		
	24	Disturbance	1	1		1		1		1					1	1			1	1		1	1					1
Consequence	25	Impact- wild																										
	26	Impact- farm																										
	27	Impact- ecosystem																										
	28	Human health risk																										
	29	Impact- compete																										
	30	Micropredation													1	1				1	1							
	31	Prey + predator-free													1	1					1							
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items													1	1					1							
	34	Hybridise																										
	35	Dispersal																										
	36	Migration		1	1	1			1	1	1	1		1	1	1					1	1						1
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																										
	39	Impact- icon spp																										
	40	Impact- social																										
Total DD	Release Likelihood (%)		0	20	0	20	20	10	20	20	0	20	30	0	0	30	20	20	20	20	20	30	20	10	20	0%	20%
	Invasion Likelihood (%)		38	38	38	46	50	35	38	58	38	50	58	35	35	58	38	50	46	46	54	62	38	27	35	46%	42%
	Consequence (%)		13	19	19	19	13	13	19	19	19	19	13	19	19	38	31	13	13	13	25	38	13	13	13	13%	19%
	Overall (%)		23	29	25	33	33	23	29	38	25	35	38	23	23	46	33	33	31	31	38	48	27	19	25	27%	31%

			RA#																									
C	Q#	Question	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	86	87	88	89	90	91
Release likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion				1	1	1		1		1	1	1	1			1				1	1	1	1	1	1
	6	Fecundity	1	1	1	1	1	1		1		1	1	1	1			1				1	1	1	1		

	6	Aggression					1	1		1				1	1			1					1		1	1	1
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
Invasion likelihood	9	Domestication	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1			1	1	1	1	1	1
	10	Established																									
	11	Climatch																									
	12	Climate types																									
	13	Dessication	1	1	1	1	1	1	1	1		1	1	1			1	1	1	1	1	1	1	1	1		1
	13	Food items																1					1		1		
	13	Water quality		1	1						1	1	1	1			1	1	1				1	1	1	1	1
	13	Oxygen depletion	1	1	1	1				1		1	1	1				1	1				1	1		1	
	13	Temperate range																1					1				1
	13	Euryhaline																									
	13	Habitat variability																									
	14	Native range	1	1			1	1		1		1						1	1	1		1			1	1	1
	15	Invasive relatives																									
	16	Predation avoidance																									
	17	Predator-free																									
	18	Parental care			1		1	1		1		1	1			1		1						1			
	19	Maturity plasticity	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism			1	1	1	1		1		1	1	1		1	1	1		1	1	1		1			1
	21	Reproductive habitat				1	1	1		1		1	1	1	1			1				1	1		1		1
	22	Fecundity	1	1	1	1	1	1		1		1	1	1	1			1				1	1	1	1		
	22	Batch spawning			1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Serial spawning		1	1	1	1	1	1	1		1	1	1	1			1	1	1	1	1	1	1	1	1	1
	22	Extended spawning	1	1	1	1	1	1	1	1		1	1	1	1	1		1	1			1	1	1	1	1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time					1	1		1						1						1	1	1	1	1	1
	24	Disturbance	1	1	1	1	1	1	1			1	1		1			1			1	1	1	1			1
Consequenc	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk												1	1												

Consequence	29	Impact- compete																								
	30	Micropredation			1							1							1					1		1		1
	31	Prey + predator-free										1												1		1		1
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items																	1					1		1		
	34	Hybridise																										
	35	Dispersal																										
	36	Migration	1	1	1	1		1		1		1	1						1					1	1			1
	37	Control measures	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																										
	39	Impact- icon spp																										
	40	Impact- social																										
Total DD	Release Likelihood (%)		10	10	10	20	30	30	0	30	0	20	20	30	30	0	0	30	0	0	0	20	30	20	30	20	20
	Invasion Likelihood (%)		35	42	50	46	54	54	31	54	8	58	54	46	35	31	27	65	38	27	27	50	58	54	50	38	54
	Consequence (%)		19	19	25	19	13	19	13	19	6	31	19	19	19	13	13	31	13	13	13	13	38	19	31	13	31
	Overall (%)		25	29	35	33	37	38	19	38	6	42	37	35	29	19	17	48	23	17	17	33	46	37	40	27	40

			RA#																				
C	Q#	Question	92	93	94	95	96	97	98	101	100	102	103	104	105	106	107	108	109	110	111	112	113
Release likelihood	1	Trade volume																					
	2	Trade value																					
	3	Deliberate release																					
	4	Accidental release																					
	5	Adhesion		1			1	1	1	1	1		1			1	1	1	1	1	1	1	
	6	Fecundity		1				1	1	1	1				1			1		1	1		
	6	Aggression	1			1			1														1
	6	Size																					
	7	Compliance- deliberate																					
	8	Compliance- accidental																					
	9	Domestication	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
	10	Established																					
	11	Climatch																					
	12	Climate types																					

Invasion likelihood	**13**	**Dessication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**							1													
	13	**Water quality**	1			1	1	1	1				1		1	1	1	1	1		1		1
	13	**Oxygen depletion**	1			1	1	1	1	1	1												
	13	**Temperate range**						1	1														
	13	**Euryhaline**																					
	13	**Habitat variability**																					
	14	**Native range**		1			1	1	1	1	1	1		1	1	1		1	1				
	15	**Invasive relatives**																					
	16	**Predation avoidance**																					
	17	**Predator-free**																					
	18	**Parental care**		1				1	1	1	1									1	1		
	19	**Maturity plasticity**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**		1		1		1	1	1	1	1	1		1		1		1	1	1	1	1
	21	**Reproductive habitat**	1				1	1	1	1								1		1			
	22	**Fecundity**		1				1	1	1	1				1			1		1	1		
	22	**Batch spawning**		1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
	22	**Serial spawning**		1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
	22	**Extended spawning**		1				1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	**Generation time**		1					1	1	1	1	1					1	1			1	
	24	**Disturbance**				1	1	1	1	1			1	1	1	1	1		1	1			1
Consequence	**25**	**Impact- wild**																					
	26	**Impact- farm**																					
	27	**Impact- ecosystem**																					
	28	**Human health risk**																					
	29	**Impact- compete**																					
	30	**Micropredation**							1										1				
	31	**Prey + predator-free**							1														
	32	**Parasite records**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	**Food items**							1														
	34	**Hybridise**																					
	35	**Dispersal**																					
	36	**Migration**			1	1	1		1	1	1	1	1		1		1	1	1	1	1	1	1

	37	**Control measures**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	**Impact- economic**																				
	39	**Impact- icon spp**																				
	40	**Impact- social**																				
Total DD	**Release Likelihood (%)**		10	20	0	10	10	20	30	20	20	0	10	0	10	10	10	20	10	20	20	10	10
	Invasion Likelihood (%)		27	46	15	38	42	62	69	58	50	38	42	31	46	38	38	46	35	46	42	35	38
	Consequence (%)		13	13	19	19	19	13	38	19	19	19	19	13	19	13	19	19	25	19	19	19	19
	Overall (%)		19	31	13	27	29	38	52	38	35	25	29	19	31	25	27	33	27	33	31	25	27

			RA#																			
C	**Q#**	**Question**	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133
Release likelihood	**1**	**Trade volume**																				
	2	**Trade value**																				
	3	**Deliberate release**																				
	4	**Accidental release**																				
	5	**Adhesion**	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1
	6	**Fecundity**		1		1		1		1		1	1	1	1	1			1	1	1	1
	6	**Aggression**																				
	6	**Size**																				
	7	**Compliance- deliberate**																				
	8	**Compliance- accidental**																				
Invasion likelihood	**9**	**Domestication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	10	**Established**																				
	11	**Climatch**																				
	12	**Climate types**																				
	13	**Dessication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**																				
	13	**Water quality**	1	1		1	1			1		1				1			1	1	1	1
	13	**Oxygen depletion**		1		1	1	1	1		1				1	1		1	1	1		1
	13	**Temperate range**																				
	13	**Euryhaline**																				
	13	**Habitat variability**																				
	14	**Native range**		1	1		1			1	1	1		1	1	1		1		1		1

Invasion likelihood	**15**	**Invasive relatives**																			
	16	**Predation avoidance**																			
	17	**Predator-free**																			
	18	**Parental care**				1	1			1			1		1			1	1	1		
	19	**Maturity plasticity**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**	1	1	1	1	1			1	1		1		1	1	1	1	1	1	1	
	21	**Reproductive habitat**		1		1				1		1	1	1	1					1		
	22	**Fecundity**		1		1		1		1		1	1	1	1	1			1	1	1	1
	22	**Batch spawning**	1	1	1	1	1	1		1		1	1	1	1	1	1		1	1	1	1
	22	**Serial spawning**	1	1	1	1	1	1		1		1	1	1	1	1	1		1	1	1	1
	22	**Extended spawning**	1	1	1	1	1	1		1		1	1	1	1	1	1		1	1	1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	**Generation time**										1	1		1	1		1				
	24	**Disturbance**	1	1		1	1	1		1						1	1	1		1	1	1
Consequence	**25**	**Impact- wild**																				
	26	**Impact- farm**																				
	27	**Impact- ecosystem**																				
	28	**Human health risk**																				
	29	**Impact- compete**																				
	30	**Micropredation**				1					1	1				1					1	1
	31	**Prey + predator-free**																				
	32	**Parasite records**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	**Food items**																				
	34	**Hybridise**																				
	35	**Dispersal**																				
	36	**Migration**	1		1		1	1	1	1		1		1	1					1	1	1
	37	**Control measures**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	**Impact- economic**																				
	39	**Impact- icon spp**																				
	40	**Impact- social**																				
Total DD	**Release Likelihood (%)**		10	10	10	20	10	20	10	20	10	10	20	20	20	20	10	10	20	20	20	20
	Invasion Likelihood (%)		38	54	35	54	50	38	19	54	27	46	46	38	54	54	35	38	46	58	42	46
	Consequence (%)		19	13	19	19	19	19	19	19	19	25	13	19	19	19	13	13	13	19	25	25
	Overall (%)		27	33	25	37	33	29	17	37	21	33	31	29	37	37	23	25	31	38	33	35

			RA#																		
C	Q#	Question	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153
Release likelihood	1	Trade volume																				
	2	Trade value																				
	3	Deliberate release																				
	4	Accidental release																				
	5	Adhesion	1	1	1	1	1	1		1	1		1	1					1	1	1	
	6	Fecundity	1	1	1				1					1		1	1	1	1	1	1	
	6	Aggression											1			1	1	1	1	1	1	
	6	Size																				
	7	Compliance- deliberate																				
	8	Compliance- accidental																				
Invasion likelihood	9	Domestication	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
	10	Established																				
	11	Climatch																				
	12	Climate types																				
	13	Dessication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	Food items		1		1													1	1		
	13	Water quality	1	1	1		1					1		1	1	1	1	1	1	1	1	
	13	Oxygen depletion	1	1	1		1		1		1	1			1	1	1	1	1	1	1	1
	13	Temperate range						1											1			
	13	Euryhaline																				
	13	Habitat variability																				
	14	Native range		1	1		1	1		1	1		1				1	1				
	15	Invasive relatives																				
	16	Predation avoidance																				
	17	Predator-free																				
	18	Parental care			1		1						1	1					1			
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism	1	1	1	1	1	1	1	1	1	1	1	1					1			
	21	Reproductive habitat												1	1				1	1		1
	22	Fecundity	1	1	1				1					1		1	1	1	1	1	1	
	22	Batch spawning	1	1	1	1	1	1	1		1	1	1	1	1				1	1	1	
	22	Serial spawning	1	1	1	1	1	1	1		1		1	1	1				1		1	

	22	Extended spawning	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1		1	
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time	1					1														
	24	Disturbance	1		1		1	1	1	1		1				1	1				1	
Consequence	25	Impact- wild																				
	26	Impact- farm																				
	27	Impact- ecosystem																				
	28	Human health risk						1														
	29	Impact- compete																				
	30	Micropredation	1	1	1	1	1	1	1			1							1	1		1
	31	Prey + predator-free																	1			
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items				1	1	1		1		1			1				1	1		
	34	Hybridise																				
	35	Dispersal																				
	36	Migration	1	1	1	1	1	1	1				1			1	1	1	1	1		
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																				
	39	Impact- icon spp																				
	40	Impact- social																				
Total DD	Release Likelihood (%)		20	20	20	10	10	10	10	10	10	0	20	20	0	20	20	20	30	30	30	0
	Invasion Likelihood (%)		50	50	54	35	50	46	42	23	38	38	35	46	38	35	38	35	58	38	42	23
	Consequence (%)		25	25	25	31	31	38	25	19	13	25	19	13	19	19	19	19	38	31	13	19
	Overall (%)		37	37	38	29	37	37	31	19	25	27	27	31	25	27	29	27	46	35	31	17

			RA#																			
C	Q#	Question	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173
Release likelihood	1	Trade volume																				
	2	Trade value																				
	3	Deliberate release																				
	4	Accidental release																				
	5	Adhesion	1			1		1	1	1			1	1		1	1	1		1	1	1
	6	Fecundity	1		1	1	1	1	1	1			1	1	1	1	1	1				

	6	**Aggression**	1			1		1		1	1										1	1
	6	**Size**																				
	7	**Compliance- deliberate**																				
	8	**Compliance- accidental**																				
Invasion likelihood	**9**	**Domestication**	1		1	1	1	1	1	1			1	1	1	1	1	1			1	1
	10	**Established**																				
	11	**Climatch**																				
	12	**Climate types**																				
	13	**Dessication**	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1
	13	**Food items**	1			1		1			1											
	13	**Water quality**				1		1	1	1	1		1		1				1		1	1
	13	**Oxygen depletion**	1			1		1	1	1	1		1		1		1	1	1		1	
	13	**Temperate range**	1					1														1
	13	**Euryhaline**																				
	13	**Habitat variability**																				
	14	**Native range**							1					1		1			1			
	15	**Invasive relatives**																				
	16	**Predation avoidance**																				
	17	**Predator-free**																				
	18	**Parental care**															1				1	1
	19	**Maturity plasticity**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**															1				1	1
	21	**Reproductive habitat**	1																		1	
	22	**Fecundity**	1		1	1	1	1	1	1			1	1	1	1	1	1				
	22	**Batch spawning**	1		1	1		1	1	1			1	1	1	1	1	1	1	1	1	1
	22	**Serial spawning**	1		1	1	1	1	1				1	1	1	1	1	1	1	1		1
	22	**Extended spawning**	1			1		1	1	1			1	1	1	1	1	1		1		1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	**Generation time**								1						1						
	24	**Disturbance**	1			1					1	1		1	1		1	1		1	1	
Consequenc	**25**	**Impact- wild**																				
	26	**Impact- farm**																				
	27	**Impact- ecosystem**																				
	28	**Human health risk**																				

Consequence	29	Impact- compete																			
	30	Micropredation	1			1	1	1	1		1	1	1	1	1							
	31	Prey + predator-free	1			1																
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items	1			1		1			1			1								
	34	Hybridise																				
	35	Dispersal																				
	36	Migration					1		1	1		1		1	1	1	1				1	
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																				
	39	Impact- icon spp																				
	40	Impact- social																				
Total DD	Release Likelihood (%)		30	0	10	30	10	30	20	30	10	0	20	20	10	20	20	20	0	10	20	20
	Invasion Likelihood (%)		50	12	27	46	23	46	42	38	27	15	38	35	42	38	38	46	31	27	42	42
	Consequence (%)		31	13	13	31	25	25	25	19	25	25	19	31	25	19	19	13	13	13	19	13
	Overall (%)		40	10	19	38	21	37	33	31	23	15	29	31	31	29	29	31	19	19	31	29

			RA#																			
C	Q#	Question	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193
Release likelihood	1	Trade volume																				
	2	Trade value																				
	3	Deliberate release																				
	4	Accidental release																				
	5	Adhesion									1	1		1	1	1	1	1		1		
	6	Fecundity	1									1	1	1					1		1	1
	6	Aggression		1	1		1	1	1	1		1	1		1	1	1		1	1	1	1
	6	Size																				
	7	Compliance- deliberate																				
	8	Compliance- accidental																				
	9	Domestication	1			1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1
	10	Established																				
	11	Climatch																				
	12	Climate types																				

Invasion likelihood	13	Dessication	1								1	1	1	1	1	1	1	1	1	1	1
	13	Food items					1	1		1		1				1						1
	13	Water quality		1	1	1	1	1	1	1	1				1	1	1			1	1	1
	13	Oxygen depletion		1	1	1	1	1	1	1		1				1	1	1		1		1
	13	Temperate range																				
	13	Euryhaline																				
	13	Habitat variability																				
	14	Native range	1						1	1	1					1					1	
	15	Invasive relatives																				
	16	Predation avoidance																				
	17	Predator-free																				
	18	Parental care	1																1		1	
	19	Maturity plasticity	1								1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism	1	1	1					1			1	1				1	1		1	
	21	Reproductive habitat										1									1	1
	22	Fecundity	1									1	1	1					1		1	1
	22	Batch spawning	1	1	1		1	1	1	1	1	1	1	1		1	1	1	1	1	1	1
	22	Serial spawning	1								1	1	1	1		1	1	1	1		1	1
	22	Extended spawning	1	1	1		1	1	1	1	1	1	1	1		1	1	1			1	1
	22	Embryonic diapause	1								1	1	1	1	1	1	1	1		1	1	1
	23	Generation time																		1	1	1
	24	Disturbance									1					1	1			1	1	1
Consequence	25	Impact- wild																				
	26	Impact- farm																				
	27	Impact- ecosystem																				
	28	Human health risk																				
	29	Impact- compete																				
	30	Micropredation					1	1		1		1				1		1				1
	31	Prey + predator-free					1	1		1		1				1						1
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items					1	1		1		1				1						1
	34	Hybridise																				
	35	Dispersal																				
	36	Migration	1								1			1				1				

	37	**Control measures**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	**Impact- economic**																			
	39	**Impact- icon spp**																			
	40	**Impact- social**																			
Total DD	**Release Likelihood (%)**		10	10	10	0	10	10	10	10	10	30	20	20	20	20	20	10	20	20	20	20
	Invasion Likelihood (%)		42	19	19	12	23	23	23	31	38	42	35	35	19	46	38	31	31	35	58	54
	Consequence (%)		19	13	13	13	31	31	13	31	19	31	13	19	13	31	13	25	13	13	13	31
	Overall (%)		29	15	15	10	23	23	17	27	27	37	25	27	17	37	27	25	23	25	37	40

			RA#																		
C	**Q#**	**Question**	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	212	213	214
Release likelihood	**1**	**Trade volume**																				
	2	**Trade value**																				
	3	**Deliberate release**																				
	4	**Accidental release**																				
	5	**Adhesion**	1	1	1	1	1	1			1		1	1	1	1	1	1	1	1	1	1
	6	**Fecundity**		1			1	1	1		1		1	1		1		1	1	1		1
	6	**Aggression**		1			1							1	1	1		1		1	1	
	6	**Size**																				
	7	**Compliance- deliberate**																				
	8	**Compliance- accidental**																				
Invasion likelihood	**9**	**Domestication**	1		1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
	10	**Established**																				
	11	**Climatch**																				
	12	**Climate types**																				
	13	**Dessication**	1	1	1	1	1	1	1	1	1	1	1							1	1	1
	13	**Food items**											1	1				1	1			
	13	**Water quality**	1	1	1		1	1			1		1	1	1	1		1	1	1	1	1
	13	**Oxygen depletion**	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1
	13	**Temperate range**					1											1			1	
	13	**Euryhaline**																				
	13	**Habitat variability**																				
	14	**Native range**						1					1	1		1	1	1		1		1

Invasion likelihood	**15**	**Invasive relatives**																			
	16	**Predation avoidance**																			
	17	**Predator-free**																			
	18	**Parental care**									1		1								
	19	**Maturity plasticity**	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1
	20	**Hermaphrodism**		1	1		1	1	1		1	1	1			1		1				
	21	**Reproductive habitat**	1					1			1		1									1
	22	**Fecundity**		1			1	1	1		1		1	1		1		1	1	1		1
	22	**Batch spawning**	1	1	1	1	1	1	1		1		1					1	1	1	1	1
	22	**Serial spawning**	1	1	1	1	1	1	1		1		1					1	1	1	1	1
	22	**Extended spawning**	1	1			1	1	1		1		1					1	1		1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1							1	1	1
	23	**Generation time**						1			1	1	1									
	24	**Disturbance**	1	1	1		1	1					1	1	1	1	1	1		1	1	
Consequence	**25**	**Impact- wild**																				
	26	**Impact- farm**																				
	27	**Impact- ecosystem**																				
	28	**Human health risk**						1														
	29	**Impact- compete**																				
	30	**Micropredation**									1			1				1	1			
	31	**Prey + predator-free**												1				1				
	32	**Parasite records**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	**Food items**												1				1	1			
	34	**Hybridise**																				
	35	**Dispersal**																				
	36	**Migration**								1	1	1	1								1	1
	37	**Control measures**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	**Impact- economic**																				
	39	**Impact- icon spp**																				
	40	**Impact- social**																				
Total DD	**Release Likelihood (%)**		10	30	10	10	30	20	10	0	20	0	20	30	20	30	10	30	20	30	20	20
	Invasion Likelihood (%)		42	42	38	23	50	58	38	12	54	23	65	31	15	31	15	50	35	42	42	46
	Consequence (%)		13	13	13	13	13	19	13	19	25	19	19	31	13	13	13	31	25	13	19	19
	Overall (%)		27	31	25	17	35	38	25	12	38	17	42	31	15	25	13	40	29	31	31	33

			RA#					
C	**Q#**	**Question**	215	216	217	218	219	220
Release likelihood	**1**	**Trade volume**						
	2	**Trade value**						
	3	**Deliberate release**						
	4	**Accidental release**						
	5	**Adhesion**			1	1	1	1
	6	**Fecundity**	1		1	1	1	
	6	**Aggression**						1
	6	**Size**						
	7	**Compliance- deliberate**						
	8	**Compliance- accidental**						
Invasion likelihood	**9**	**Domestication**	1	1	1	1	1	1
	10	**Established**						
	11	**Climatch**						
	12	**Climate types**						
	13	**Dessication**	1	1	1	1	1	1
	13	**Food items**					1	
	13	**Water quality**	1	1	1	1	1	1
	13	**Oxygen depletion**		1	1	1	1	1
	13	**Temperate range**					1	
	13	**Euryhaline**						
	13	**Habitat variability**						
	14	**Native range**	1			1		
	15	**Invasive relatives**						
	16	**Predation avoidance**						
	17	**Predator-free**						
	18	**Parental care**	1					
	19	**Maturity plasticity**	1	1	1	1	1	1
	20	**Hermaphrodism**	1		1	1	1	
	21	**Reproductive habitat**					1	1
	22	**Fecundity**	1		1	1	1	
	22	**Batch spawning**	1		1	1	1	1

	22	Serial spawning	1		1	1	1	1
	22	Extended spawning	1	1			1	1
	22	Embryonic diapause	1	1	1	1	1	1
	23	Generation time	1			1	1	1
	24	Disturbance	1				1	1
Consequence	25	Impact- wild						
	26	Impact- farm						
	27	Impact- ecosystem						
	28	Human health risk						
	29	Impact- compete						
	30	Micropredation						
	31	Prey + predator-free						
	32	Parasite records	1	1	1	1	1	1
	33	Food items					1	
	34	Hybridise						
	35	Dispersal						
	36	Migration	1		1	1	1	1
	37	Control measures	1	1	1	1	1	1
	38	Impact- economic						
	39	Impact- icon spp						
	40	Impact- social						
Total DD	Release Likelihood (%)		10	0	20	20	20	20
	Invasion Likelihood (%)		54	27	38	46	62	46
	Consequence (%)		19	13	19	19	25	19
	Overall (%)		35	17	29	33	42	33

Appendix 2

Data deficiencies identified for each of the 115 rapid risk assessments completed by risk assessor 2, indicating where information was not available to comprehensively answer the question posed.

C: question category as per risk assessment format (*Release Likelihood* questions 1- 8; *Invasion Likelihood* questions 9- 24; *Consequence* questions 27- 40); **Q#**: question number listed in the risk assessments; **Question**: summarised questions from the risk assessments; **RA#**: risk assessment number 115 as shorthand for full scientific name (not consecutively but rather grouped by Family) (refer to Table 3 for species codes) with data deficiencies indicated binomially (1: deficient, blank: not deficient); **Total DD**: proportion of information considered data deficient in the three question categories (Release likelihood, Invasion likelihood, Consequence) and total data deficiencies across the three categories (Overall) with data deficiencies greater than acceptable (>30%) indicated in yellow.

			RA#																								
C	**Q#**	**Question**	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Release Likelihood	**1**	**Trade volume**																									
	2	**Trade value**																									
	3	**Deliberate release**																									
	4	**Accidental release**																									
	5	**Adhesion**	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	**Fecundity**	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	**Aggression**	1	1	1	1	1		1	1		1	1														
	6	**Size**		1		1		1					1														
	7	**Compliance- deliberate**																									
	8	**Compliance- accidental**																									
Invasion Likelihood	**9**	**Domestication**	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1
	10	**Established**																									
	11	**Climatch**																									
	12	**Climate types**																									
	13	**Euryhaline**											1	1	1				1	1				1	1	1	
	13	**Dessication**	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**	1		1							1	1	1	1					1					1	1	

Invasion likelihood	13	Water quality	1	1	1		1		1	1	1	1	1	1	1				1	1				1	1	1	1
	13	Habitat variability	1	1		1	1		1	1			1	1	1				1	1				1	1	1	1
	13	Oxygen depletion	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1
	13	Temperate range				1			1				1	1	1	1	1	1	1	1		1	1	1	1	1	1
	14	Native range																		1							
	15	Invasive relatives								1																	
	16	Predation avoidance			1	1								1	1		1		1	1	1		1	1			
	17	Predator-free																									
	18	Parental care																									
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	21	Reproductive habitat				1			1	1	1	1	1	1	1		1							1		1	
	22	Fecundity	1	1		1		1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Batch spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Serial spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1		1				
	22	Extended spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time		1															1								
	24	Disturbance	1	1					1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Consequence	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk																									
	29	Impact- compete																									
	30	Micropredation		1			1	1	1	1	1	1	1	1	1							1	1			1	1
	31	Prey + predator-free											1	1												1	
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items											1	1												1	
	34	Hybridise																									

Consequence	35	Dispersal																					1			
	36	Migration										1	1		1	1	1						1	1			1
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total	Release Likelihood (%)		30	40	30	40	30	30	30	10	20	20	40	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Invasion Likelihood (%)		54	50	46	54	42	35	54	54	38	54	65	69	69	46	50	46	65	69	46	35	50	62	58	62	50
	Consequence (%)		13	19	13	13	19	19	19	19	19	25	38	31	25	19	19	13	13	13	6	19	25	25	13	31	25
	TOTAL (%)		37	38	33	38	33	29	38	35	29	38	52	48	46	33	35	31	40	42	29	27	37	42	37	44	37

			RA#																								
C	Q#	Question	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
Release Likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion	1	1	1	1					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
	6	Fecundity	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1					1
	6	Aggression																		1	1				1	1	1
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
	9	Domestication	1	1	1		1	1	1	1		1	1			1	1	1	1	1	1	1	1	1	1		1
	10	Established																									
	11	Climatch																									
	12	Climate types																									
	13	Euryhaline																									

Invasion likelihood	13	Dessication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1
	13	Food items	1										1								1						1
	13	Water quality	1	1	1			1	1		1	1	1	1	1							1		1	1	1	1
	13	Habitat variability									1	1	1	1	1					1	1	1					
	13	Oxygen depletion	1	1	1		1	1	1		1	1	1	1	1	1	1	1		1	1	1				1	1
	13	Temperate range	1	1	1		1	1	1						1												
	14	Native range							1																		
	15	Invasive relatives																									
	16	Predation avoidance			1	1	1	1	1	1		1	1	1	1	1			1		1	1					
	17	Predator-free																									
	18	Parental care																									
	19	Maturity plasticity	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
	20	Hermaphrodism	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1
	21	Reproductive habitat	1		1		1	1	1	1							1					1		1			
	22	Fecundity	1	1	1	1	1	1	1					1	1			1	1	1	1	1	1	1	1	1	1
	22	Batch spawning	1	1							1	1	1	1	1	1				1	1						1
	22	Serial spawning			1	1	1	1	1									1	1	1	1				1	1	1
	22	Extended spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1	1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time																									
	24	Disturbance	1	1	1						1	1	1	1	1	1	1			1	1	1	1	1	1		1
Consequence	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk																									
	29	Impact- compete																									
	30	Micropredation	1			1	1			1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1
	31	Prey + predator-free																			1						
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Consequence	33	Food items																		1						1
	34	Hybridise																								
	35	Dispersal																								
	36	Migration	1	1			1	1	1	1							1	1			1	1	1	1	1		
	37	Control measures	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total	Release Likelihood (%)		20	20	20	20	10	10	10	0	20	20	20	20	20	20	20	20	20	30	30	20	10	10	20	10	30
	Invasion Likelihood (%)		54	46	54	31	46	46	50	27	38	46	50	46	50	38	35	35	35	46	54	42	23	31	35	31	50
	Consequence (%)		25	19	13	19	25	13	13	19	19	19	19	13	13	19	25	25	19	19	38	25	25	25	25	13	25
	TOTAL (%)		38	33	35	25	33	29	31	19	29	33	35	31	33	29	29	29	27	35	44	33	21	25	29	21	38

			RA#																								
C	Q#	Question	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
Release Likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release												1													
	4	Accidental release																									
	5	Adhesion	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Fecundity	1			1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Aggression		1		1		1		1	1	1															
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
	9	Domestication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	10	Established																									
	11	Climatch																									

Invasion likelihood	12	Climate types																									
	13	Euryhaline		1		1		1	1	1	1	1											1	1	1	1	1
	13	Dessication	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	Food items		1		1		1		1													1				
	13	Water quality		1	1	1		1	1	1	1	1	1	1		1	1	1					1	1	1		
	13	Habitat variability		1		1	1	1	1	1																	
	13	Oxygen depletion	1	1		1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1
	13	Temperate range		1	1	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1
	14	Native range					1																				
	15	Invasive relatives																									
	16	Predation avoidance																									
	17	Predator-free																									
	18	Parental care																									
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	21	Reproductive habitat		1	1	1	1	1		1	1	1	1										1	1	1	1	1
	22	Fecundity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Batch spawning	1	1	1	1	1	1	1	1	1	1	1														
	22	Serial spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Extended spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time					1																				
	24	Disturbance	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Consequence	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk																									
	29	Impact- compete																									
	30	Micropredation	1	1					1	1	1	1	1	1	1	1	1		1	1		1			1		

Consequence	31	Prey + predator-free		1																						
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items		1																						
	34	Hybridise																								
	35	Dispersal																								
	36	Migration	1	1																						
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																								
	39	Impact- icon spp																								
	40	Impact- social																								
Total	Release Likelihood (%)		20	20	10	30	10	30	20	30	30	30	20	30	20	20	20	20	20	20	20	20	20	20	20	20	20
	Invasion Likelihood (%)		42	65	50	65	54	65	58	65	58	58	54	46	35	46	46	46	42	42	42	42	58	54	54	46	50
	Consequence (%)		25	38	13	13	13	13	19	19	19	19	19	19	19	19	19	13	19	19	13	19	13	13	19	13	13
	TOTAL (%)		33	48	31	42	33	42	38	44	40	40	37	35	27	33	33	31	31	31	29	31	37	35	37	31	33

			RA#																								
C	Q#	Question	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90
Release Likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Fecundity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Aggression																									
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									

Invasion Likelihood	9	Domestication	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1		1
	10	Established																									
	11	Climatch																									
	12	Climate types																									
	13	Euryhaline	1			1	1	1	1	1	1	1		1													
	13	Dessication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1	1
	13	Food items				1			1		1			1													
	13	Water quality		1	1	1	1	1	1	1	1	1		1	1	1	1	1				1					
	13	Habitat variability			1	1	1	1	1	1	1	1		1				1									
	13	Oxygen depletion	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1				1	1	1			
	13	Temperate range		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			1	1					
	14	Native range																									
	15	Invasive relatives																									
	16	Predation avoidance								1			1														
	17	Predator-free																									
	18	Parental care																									
	19	Maturity plasticity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
	21	Reproductive habitat	1		1	1			1	1	1	1						1				1	1	1			
	22	Fecundity	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Batch spawning			1	1	1	1	1	1	1	1			1			1									
	22	Serial spawning	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Extended spawning	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time								1																	
	24	Disturbance	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									

Consequence	28	Human health risk																									
	29	Impact- compete																									
	30	Micropredation			1		1			1	1		1	1	1	1	1		1	1	1	1	1	1	1	1	1
	31	Prey + predator-free									1																
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items									1																
	34	Hybridise																									
	35	Dispersal								1																	
	36	Migration								1	1	1	1										1				
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total	Release Likelihood (%)		20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
	Invasion Likelihood (%)		46	46	58	65	58	58	62	65	65	62	38	58	50	42	46	58	35	31	38	50	38	38	35	31	35
	Consequence (%)		13	13	19	13	19	13	13	31	38	19	25	19	19	19	19	13	19	19	19	25	19	19	19	19	19
	TOTAL (%)		31	31	38	40	38	37	38	46	48	40	31	38	35	31	33	37	27	25	29	37	29	29	27	25	27

			RA#														
C	Q#	Question	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
Release Likelihood	1	Trade volume															
	2	Trade value															
	3	Deliberate release															
	4	Accidental release															
	5	Adhesion	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Fecundity		1	1	1		1		1					1		1
	6	Aggression															

	6	**Size**															
	7	**Compliance- deliberate**															
	8	**Compliance- accidental**															
Invasion Likelihood	**9**	**Domestication**	1	1	1	1	1	1	1		1		1	1		1	
	10	**Established**															
	11	**Climatch**															
	12	**Climate types**															
	13	**Euryhaline**											1				
	13	**Dessication**	1			1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**						1			1						
	13	**Water quality**						1			1		1	1		1	
	13	**Habitat variability**														1	
	13	**Oxygen depletion**		1	1			1	1		1	1			1		1
	13	**Temperate range**				1		1			1		1		1		
	14	**Native range**					1							1			
	15	**Invasive relatives**															
	16	**Predation avoidance**															
	17	**Predator-free**															
	18	**Parental care**															
	19	**Maturity plasticity**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	21	**Reproductive habitat**		1	1							1	1		1		
	22	**Fecundity**	1	1	1			1	1	1	1	1	1		1		1
	22	**Batch spawning**					1	1			1		1	1	1	1	
	22	**Serial spawning**	1	1	1	1	1	1		1	1	1	1	1	1	1	
	22	**Extended spawning**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1		1	1	1	1	1	1	1
	23	**Generation time**								1							
	24	**Disturbance**	1	1	1	1	1	1			1	1	1	1	1	1	1

Consequence	25	Impact- wild														
	26	Impact- farm														
	27	Impact- ecosystem														
	28	Human health risk														
	29	Impact- compete														
	30	Micropredation	1	1	1	1	1	1	1	1		1	1	1	1	1	1
	31	Prey + predator-free														
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items														
	34	Hybridise														
	35	Dispersal								1							
	36	Migration				1				1	1						
	37	Control measures	1	1	1	1	1	1	1	1	1	1		1	1	1	1
	38	Impact- economic															
	39	Impact- icon spp															
	40	Impact- social															
Total	Release Likelihood (%)		10	20	20	20	10	20	10	20	10	10	10	10	20	10	20
	Invasion Likelihood (%)		35	38	38	35	38	54	31	27	54	38	54	42	46	42	31
	Consequence (%)		19	19	19	25	19	19	19	31	19	19	13	19	19	19	19
	TOTAL(%)		25	29	29	29	27	37	23	27	35	27	33	29	33	29	25

Appendix 3

Data deficiencies identified for each of the 116 rapid risk assessments completed by risk assessor 3 indicating where information was not available to comprehensively answer the question posed.

C: question category as per risk assessment format (*Release Likelihood* questions 1- 8; *Invasion Likelihood* questions 9- 24; *Consequence* questions 27- 40); **Q#**: question number listed in the risk assessments; **Question**: summarised questions from the risk assessments; **RA#**: risk assessment number C7 – 115 as shorthand for full scientific name (refer to Table 3 for species codes) with data deficiencies indicated binomially (1: deficient, blank: not deficient); **Total DD**: proportion of information considered data deficient in the three question categories (Release likelihood, Invasion likelihood, Consequence) and total data deficiencies across the three categories (Overall) with data deficiencies greater than acceptable (>30%) indicated in yellow.

			RA#																							
C	**Q#**	**Question**	C7	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Release Likelihood	**1**	**Trade volume**																									
	2	**Trade value**																									
	3	**Deliberate release**																									
	4	**Accidental release**																									
	5	**Adhesion**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	**Fecundity**	1				1	1	1	1	1		1		1	1	1	1	1								
	6	**Aggression**						1				1															
	6	**Size**										1						1									
	7	**Compliance- deliberate**																									
	8	**Compliance- accidental**																									
Invasion Likelihood	**9**	**Domestication**	1	1				1	1	1					1	1	1	1		1		1	1	1	1	1	
	10	**Established**								1																	
	11	**Climatch**										1	1	1						1		1					
	12	**Climate types**								1					1												
	13	**Euryhaline**																			1						
	13	**Dessication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**																									
	13	**Water quality**	1	1	1	1						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Invasion likelihood	**13**	**Habitat variability**	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Oxygen depletion**	1	1	1	1						1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Temperate range**																									
	14	**Native range**	1																					1			
	15	**Invasive relatives**																									
	16	**Predation avoidance**																									
	17	**Predator-free**																									
	18	**Parental care**	1									1	1	1	1									1	1		1	
	19	**Maturity plasticity**	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**						1	1	1	1		1															
	21	**Reproductive habitat**	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	22	**Fecundity**	1		1	1	1	1		1	1	1	1		1	1	1	1										
	22	**Batch spawning**	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	**Serial spawning**	1		1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	**Extended spawning**	1		1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	**Generation time**																										
	24	**Disturbance**	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1			1	1	1	1	1
Consequence	**25**	**Impact- wild**																										
	26	**Impact- farm**																										
	27	**Impact- ecosystem**																										
	28	**Human health risk**																										
	29	**Impact- compete**															1	1	1									
	30	**Micropredation**	1	1	1								1	1		1	1		1	1	1	1	1	1	1	1	1	1
	31	**Prey + predator-free**								1										1								
	32	**Parasite records**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	**Food items**																										
	34	**Hybridise**					1										1											
	35	**Dispersal**						1	1	1				1										1	1	1	1	

	36	Migration		1				1	1							1		1	1			1	1	1	1	1	
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social									1																
Total DD	Release Likelihood (%)		20	10	10	10	20	30	20	20	20	30	20	10	20	20	20	30	20	10	10	10	10	10	10	10	10
	Invasion Likelihood (%)		58	31	42	42	35	46	31	54	35	46	54	46	58	50	50	50	42	46	42	42	50	54	46	50	38
	Consequence (%)		19	25	19	13	19	25	25	25	19	13	19	25	13	25	19	31	31	31	19	25	31	31	31	31	19
	Overall (%)		38	25	29	27	27	37	27	38	27	33	37	33	37	37	35	40	35	35	29	31	37	38	35	37	27

			RA#																								
C	Q#	Question	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49
Release Likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Fecundity	1	1	1										1												
	6	Aggression																									
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
	9	Domestication		1	1	1			1		1	1	1			1	1	1	1	1		1		1		1	
	10	Established												1													1
	11	Climatch	1															1									1
	12	Climate types																									
	13	Euryhaline																									
	13	Dessication	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Invasion likelihood	**13**	**Food items**																								
	13	**Water quality**	1		1	1	1	1	1	1	1	1	1	1				1	1	1		1	1	1		1	
	13	**Habitat variability**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Oxygen depletion**	1	1	1		1	1	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	
	13	**Temperate range**																									1
	14	**Native range**						1		1		1															
	15	**Invasive relatives**																									
	16	**Predation avoidance**																									
	17	**Predator-free**																									
	18	**Parental care**	1	1	1	1									1												
	19	**Maturity plasticity**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1
	20	**Hermaphrodism**																									
	21	**Reproductive habitat**		1	1	1	1	1	1	1	1	1	1	1	1	1	1						1	1	1	1	1
	22	**Fecundity**	1	1	1		1	1						1	1												
	22	**Batch spawning**	1	1	1	1			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	**Serial spawning**	1	1	1	1			1	1	1	1	1	1		1	1	1	1	1		1	1	1	1	1	1
	22	**Extended spawning**	1	1	1	1			1	1	1	1	1	1		1	1	1	1	1		1		1	1	1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	**Generation time**		1	1																						
	24	**Disturbance**	1	1	1	1			1	1	1	1	1						1			1		1		1	
Consequence	**25**	**Impact- wild**																									
	26	**Impact- farm**																									
	27	**Impact- ecosystem**																									
	28	**Human health risk**																									
	29	**Impact- compete**																									
	30	**Micropredation**	1	1	1	1	1	1	1	1	1	1	1	1		1		1			1	1		1			
	31	**Prey + predator-free**		1	1	1		1	1	1	1			1	1					1							
	32	**Parasite records**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	**Food items**																					1				

Consequence	34	Hybridise			1																					
	35	Dispersal	1	1		1	1	1	1		1	1	1			1	1	1				1					1
	36	Migration	1	1	1		1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1	1	1	
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total DD	Release Likelihood (%)		20	20	20	10	0	10	10	10	10	10	10	10	20	10	10	10	10	10	10	10	10	10	10	10	10
	Invasion Likelihood (%)		46	54	58	46	31	35	46	46	46	50	46	46	31	35	35	35	42	38	19	42	35	46	35	46	38
	Consequence (%)		31	38	38	31	31	38	38	31	38	31	31	31	19	31	25	25	19	25	19	31	25	25	19	19	19
	Overall (%)		37	42	44	35	25	31	37	35	37	37	35	35	25	29	27	27	29	29	17	33	27	33	25	31	27

			RA#																								
C	Q#	Question	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74
Release Likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion	1	1	1	1		1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Fecundity	1	1	1		1	1	1			1		1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Aggression											1		1												
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
	9	Domestication	1	1		1	1		1	1	1	1			1	1	1	1	1	1	1	1	1	1	1		1
	10	Established			1	1																					
	11	Climatch	1					1	1				1													1	
	12	Climate types																									

Invasion likelihood	13	Euryhaline								1		1		1	1	1	1	1	1	1	1	1	1	1	1	1	
	13	Dessication	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	Food items									1													1			
	13	Water quality	1	1	1		1					1	1	1	1	1	1	1	1		1	1	1	1		1	1
	13	Habitat variability	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	Oxygen depletion	1	1	1	1	1					1	1	1	1	1	1	1	1	1		1	1	1		1	
	13	Temperate range								1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	14	Native range		1		1	1							1	1												
	15	Invasive relatives																									
	16	Predation avoidance																									
	17	Predator-free																									
	18	Parental care				1																					
	19	Maturity plasticity		1	1	1	1				1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	Hermaphrodism																									
	21	Reproductive habitat	1	1	1	1	1	1	1						1												
	22	Fecundity																									
	22	Batch spawning		1	1	1	1	1	1	1	1	1	1	1	1					1	1	1	1	1	1	1	1
	22	Serial spawning	1	1	1	1	1	1	1			1		1							1	1	1	1	1	1	1
	22	Extended spawning	1	1	1	1	1		1			1		1	1	1				1	1	1	1	1	1	1	1
	22	Embryonic diapause	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	Generation time	1																								
	24	Disturbance	1		1	1	1					1	1	1	1	1	1	1	1	1	1	1	1	1	1		
Consequence	25	Impact- wild																									
	26	Impact- farm																									
	27	Impact- ecosystem																									
	28	Human health risk																									
	29	Impact- compete																									
	30	Micropredation	1	1											1												
	31	Prey + predator-free																		1	1	1	1	1	1	1	1

Consequence	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items																								
	34	Hybridise					1																			
	35	Dispersal	1	1	1	1	1		1		1			1	1	1		1	1	1	1	1	1	1		1	
	36	Migration		1	1	1	1				1	1		1	1	1	1	1	1	1	1	1	1	1	1	1	
	37	Control measures	1	1	1	1	1	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total DD	Release Likelihood (%)		20	20	20	10	10	20	20	10	10	10	20	20	30	20	20	20	20	20	20	20	20	20	20	20	20
	Invasion Likelihood (%)		42	46	46	54	50	23	31	27	27	50	31	50	54	42	38	38	38	42	46	50	50	54	42	42	38
	Consequence (%)		25	31	25	25	31	13	13	6	19	19	13	25	31	25	19	25	25	31	31	31	31	31	25	31	19
	Overall (%)		33	37	35	37	37	19	23	17	21	33	23	37	42	33	29	31	31	35	37	38	38	40	33	35	29

			RA#																								
C	Q#	Question	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99
Release Likelihood	1	Trade volume																									
	2	Trade value																									
	3	Deliberate release																									
	4	Accidental release																									
	5	Adhesion	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	6	Fecundity	1		1				1	1	1	1	1	1	1						1	1		1	1		
	6	Aggression																									
	6	Size																									
	7	Compliance- deliberate																									
	8	Compliance- accidental																									
	9	Domestication	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1

Invasion likelihood	**10**	**Established**																								
	11	**Climatch**													1											
	12	**Climate types**																								
	13	**Euryhaline**	1	1	1	1	1	1			1	1	1	1		1			1								
	13	**Dessication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**																									
	13	**Water quality**	1		1			1	1		1	1	1	1	1	1			1	1	1	1	1	1	1	1	1
	13	**Habitat variability**	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1					1	1		
	13	**Oxygen depletion**		1	1			1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
	13	**Temperate range**	1	1	1	1	1	1	1	1	1	1	1	1	1		1		1	1	1	1	1	1	1	1	1
	14	**Native range**					1													1							
	15	**Invasive relatives**																									
	16	**Predation avoidance**																									
	17	**Predator-free**																									
	18	**Parental care**																									
	19	**Maturity plasticity**	1	1	1		1				1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**																									
	21	**Reproductive habitat**				1			1	1	1	1															
	22	**Fecundity**									1	1				1	1		1		1	1	1	1	1		
	22	**Batch spawning**	1	1	1	1	1	1	1	1	1	1	1	1		1	1		1	1	1	1	1	1	1		
	22	**Serial spawning**	1	1	1	1	1	1	1	1	1		1	1	1	1			1								
	22	**Extended spawning**	1	1	1	1	1	1	1	1	1	1	1	1	1	1				1			1	1	1	1	
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1
	23	**Generation time**																									
	24	**Disturbance**			1			1	1		1	1	1	1	1				1	1	1	1	1	1	1	1	
	25	**Impact- wild**		1																							
	26	**Impact- farm**																									
	27	**Impact- ecosystem**																									
	28	**Human health risk**																									

Consequence	29	Impact- compete																								
	30	Micropredation									1															
	31	Prey + predator-free			1			1				1			1												
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items																									
	34	Hybridise																									
	35	Dispersal				1	1	1			1	1		1			1	1			1	1	1		1		
	36	Migration	1	1	1		1	1	1	1	1	1				1	1	1			1	1	1	1	1		
	37	Control measures	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																									
	39	Impact- icon spp																									
	40	Impact- social																									
Total DD	Release Likelihood (%)		20	10	20	10	10	10	20	20	20	20	20	20	20	10	10	10	10	10	20	20	10	20	20	10	10
	Invasion Likelihood (%)		42	42	50	38	42	46	46	35	58	54	50	50	42	38	31	19	50	42	35	38	42	46	46	35	27
	Consequence (%)		19	25	25	19	25	31	19	19	31	31	13	19	19	19	25	25	13	13	25	25	25	19	25	13	13
	Overall (%)		31	31	37	27	31	35	33	27	42	40	33	35	31	27	25	19	31	27	29	31	31	33	35	23	19

			RA#															
C	Q#	Question	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115
Release Likelihood	1	Trade volume																
	2	Trade value																
	3	Deliberate release																
	4	Accidental release																
	5	Adhesion	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1
	6	Fecundity											1					
	6	Aggression																
	6	Size																
	7	Compliance- deliberate																

	8	**Compliance- accidental**																
Invasion Likelihood	**9**	**Domestication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	10	**Established**																
	11	**Climatch**																
	12	**Climate types**																
	13	**Euryhaline**							1	1	1	1	1	1	1			1
	13	**Dessication**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	13	**Food items**																1
	13	**Water quality**			1				1	1	1	1	1	1	1			1
	13	**Habitat variability**			1				1	1	1	1	1	1	1	1		1
	13	**Oxygen depletion**		1	1				1	1	1	1	1	1	1			1
	13	**Temperate range**			1	1	1	1	1	1	1	1	1	1	1	1	1	1
	14	**Native range**		1	1													
	15	**Invasive relatives**																
	16	**Predation avoidance**																
	17	**Predator-free**																
	18	**Parental care**																
	19	**Maturity plasticity**		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	20	**Hermaphrodism**																
	21	**Reproductive habitat**						1										
	22	**Fecundity**						1					1		1	1		1
	22	**Batch spawning**		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	22	**Serial spawning**			1	1	1										1	1
	22	**Extended spawning**		1	1	1	1										1	1
	22	**Embryonic diapause**	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	23	**Generation time**																
	24	**Disturbance**			1	1		1	1	1	1	1	1		1		1	1
	25	**Impact- wild**																
	26	**Impact- farm**																

Consequence	27	Impact- ecosystem																
	28	Human health risk																
	29	Impact- compete																
	30	Micropredation																
	31	Prey + predator-free																
	32	Parasite records	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	33	Food items																
	34	Hybridise																
	35	Dispersal	1	1	1									1				
	36	Migration	1		1									1				
	37	Control measures		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	38	Impact- economic																
	39	Impact- icon spp																
	40	Impact- social																
Total DD	Release Likelihood (%)		10	10	10	10	10	10	10	10	10	10	20	10	0	10	10	10
	Invasion Likelihood (%)		12	31	50	35	31	35	42	42	42	42	46	38	46	31	35	35
	Consequence (%)		19	19	25	13	13	13	13	13	13	13	13	25	13	13	13	25
	Overall (%)		13	23	35	23	21	23	27	27	27	27	31	29	27	21	23	27