AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Acanthicus adonis*
Common name	adonis pleco
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Siluriformes (Catfish) > Loricariidae (Armored catfishes) >
Native range	South America: Lower Tocantins River basin.
Introduced range	No data
URL	https://www.fishbase.se/summary/Acanthicus-Hypostominae.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	The taxon was introduced in 1970-1979 as an ornamental species (Cagauna, 2007)	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has no report that it is being harvested in wild already but their related species that already reported to be a major component of fish catch in the Philippine waters but the fish has very little value as food fish since the flesh tastes bitter. It may be used, however, as a source of fish meal andfor ornamental	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Suliriformes already has the invasive history, since species P. multiradiatus, P. pardalis and P. disjunctivus have been so far recorded as exotic in Mesoamerica – Puerto Rico and Mexico (8, 12); in North America: southern United States – Florida, Texas, Washington and North Carolina, as well as at Hawaii islands (10, 11, 19, 18, 20); in Philippines and south-eastern Asia: peninsular Malaysia, Singapore, Taiwan, Java and Sumatra (22). In all those recipient areas recorded so far, the aquarists were assigned responsible for their releasing into natural ecosystems and subsequent establishment (Simonović, Nikolić, and Grujić, 2014).	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate Froese and Pauly (2015)	Very high
5	2.02	What is the quality of the climate matching data?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate Froese and Pauly (2015)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	No	The taxon has no report that present outside of captivity in the RA area, but other realted species from family of Loricariidae reported. (Cagauana, 2007)	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	They were probably introduced through an intentional release and possibly fish farm escapes upstream (near Davao) between the 2002 and 2005 (Hubilla et al, 2007). Moreover, local aquarium dealers have used its local moniker -- that a janitor fish cleans up – as a selling point, wherein anecdotal reports say that the misconception might have also be a reason for the high incidence of these specimens particularly in the Marikina and Pasig rivers	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	Loricariidae species are seen proliferating in the waters of Marikina River, Lake Paitan, Nueva Ecija & Laguna de Bay (Agasen, 2005 & Chavez et al., 2006) Because of the damage to the banks of the Marikina River and fish cages in Laguna de Bay by the catfish, they have escaped into the natural waters (Joshi,	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Redescription of Acanthicus hystrix Agassiz, 1829 (Siluriformes: Loricariidae), with comments on the systematics and distribution of the genus	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	The rapid increase of this species (Suliriformes) has affected the livelihood and fishing operation of the fisherfolk which led to a decrease in marketable catch of endemic and commercial fish species due to its predominance in gill net and fish corral catch. (Chaves et al., 2006)	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Based on the findings of the study, the Suliriformes in the Agusan Marsh are considered threat to freshwater biodiversity. (Hubilla et al., 2006)	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion (FishBase 2021)	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion (FishBase 2021)	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	Bioaccumulation of coliform bacteria and heavy metals, as well as vector of parasites, has been recorded on these species. In which if eaten will lead to potential contamination and infection (Orfinger & Goodding, 2018).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This species shows impacts on displacement of local species through resource competition such as indirect food competition which reduces the food resources like aquatic insects and vegetation and direct habitat competition because of high biomass of their populations (Orfinger & Goodding, 2018).	Very high

16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This is very unlikely to happen considering the feeding guild and morphology of the taxon (Hubilla et al., 2007; Levin et al., 2008).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	These fish are protected by modified scales and by strong spines on the fins and because they show a high tolerance to low oxygen concentrations or desiccation (up to 20 hours). The latter ability can be attributed to an enlarged and vascularized stomach, which functions as an accessory respiratory organ (Jasso et al., 2013). Also, they are commonly found in shallow freshwater environments, but some members of the Family Loricariidae: Pterygoplichthys which are considered to be strictly freshwater, have already established invasive populations in inland waters with mesohaline conditions, such as in North and Central America, Asia, Caribbean islands, Pacific and Indian oceans and in South-Eastern Mexico due to their high salinity tolerance (Capps et al.,	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion. High water turbidity alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis ad primary productivity. (Hubilla et	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion (Hubilla et al., 2006)	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Not applicable	No record found that the species can be a host of infectious disease.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Not applicable	No record found that the species can be a host of infectious disease.	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	From Froese and Pauly (2015): “Max length: 20.6 cm SL male/unsexed; [Fisch-Muller 2003]”	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	The taxon was collected from medium-velocity rivers no more than two meters deep near the river banks (Chavez, et al., 2006)	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	The foraging activities of different-sized Pterygoplichthys had potentially strong negative effects on the number of catfish eggs and first-feeding fry. Therefore, these invasive alien fish pose a risk to the native aquatic resources [of Thailand] (Chaichana et al., 2013) Pterygoplichthys species are also generally herbivores, and large populations can significantly alter the energy budget of a water body by reducing the amount of energy available to other herbivores, such as aquatic insects and other arthropods (Kottelat et al 1993); Fuller 1998; Nico and Martin 2001). Reductions in the population of the arthropods will lead to reduced populations of other animals that feed on arthropods (Inger and Chin 2002; Page	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	No reports found	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This taxon feeds primarily on benthic algae, detritus, various plant matter, worms, insect larvae, fish eggs and other bottom-dwellers which do not fall under threatened or protected status in the RA area. (IUCN, 2010)	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Food competition by the said taxa, in which it reduces the food resources such as aquatic insects and vegetation in the area, can be detrimental to the native taxa (Orfinger & Goodding, 2018).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This species exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	No	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is available.	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	breeding guide plecostomus/number of minimum eggs	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	janotor fish propagation/plecostomus prpgatoion	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	The RA Area has a lot of reported tributarries that can be a way of dispersal (Papa & Mamaril, 2011)	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The RA Area has a lot of reported tributarries that can be a way of dispersal (Papa & Mamaril, 2011)	Very high

37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	No reports found	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is available.	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	book-paper/after hatching they disperse/after consumiing the egg youl the young swim away/disperse	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Base on the previous questions	High
43	7.09	Is dispersal of the taxon density dependent?	Yes	Apparently a cave spawner with the male responsible for guarding and tending the eggs. Has been achieved but little information is	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	life history/density dependent	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being considered.]	Yes	Members of this taxon also have the ability to breathe air and are able to survive up to 30 h out of water (Val and De Almeida-Val, 1995). Pterygoplichthys and many other loricariids are facultative air-breathers, able to persist indefinitely in hypoxic conditions and even able to survive out of water for many hours (Graham, 1997)	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate Froese and Pauly (2015)	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	A preliminary study of the potential eradication of P. pardalis by three native Thai piscivorous species yielded interesting results. Demersal species such as H. wyckioides and O. marmorata could more effectively eliminate P. pardalis than other native species such as P. sanitwongsei. In particular, H. wyckioides was the most effective consumer of P. pardalis, as it could efficiently ingest individuals up to 10 cm in length. Pterygoplichthys pardalis longer than 10 cm can stretch out their body fins, preventing H. wyckioides from feeding on them. The potential of native fish to help control certain invasive fish species was also addressed by	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	eutrophication/tolrence depite pollution	Medium
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Not applicable	No recorded predators found in the RA Area	Medium
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Yes with the rapid change on water parameters of the RA Area (Papa et al. 2009)	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Lake Taal is close but completely isolated from Laguna de Bay and other rivers in Luzon Island where Pterygoplichthys spp. were recorded and thus may only require accidental and/or intentional vectors of introduction. As such, climate change (natural introduction) will have very little to no contributions to the introduction of such non-native fish species in Lake Taal.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Yes with the rapid change on water parameters of the RA Area (Papa & Mamaril, 2011)	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Yes with the rapid change on water parameters of the RA Area (Papa & Mamaril, 2011)	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Yes with the rapid change on water parameters of the RA Area (Papa & Mamaril, 2011)	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Yes with the rapid change on water parameters of the RA Area (Papa & Mamaril, 2011)	Very high

Statistics	
Scores	
BRA	**45.0**
BRA Outcome	**High**
BRA+CCA	**57.0**
BRA+CCA Outcome	**High**
Score partition	

A. Biogeography/Historical	**25.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**20.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*4.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**22**
Environmental	**12**
Species or population nuisance traits	**29**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.87**
BRA	**0.86**
CCA	**0.96**

Date and Time
06/04/2020 13:27:58

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Amphilophus citrinellus*
Common name	Midas cichlid
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture and ornamental
Risk assessment area	Lake Taal
Taxonomy	Actinopteri > Cichliformes > Cichlidae
Native range	Tropical America
Introduced range	South east asia includimg Philippines
URL	

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	No	The species is recently reported in Lake Taal and other inland bodies of water in the Philippines (Poniente et al, 2019; Aquilino et al, 2011)	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Introduced by the aquarium trade industry, the species escaped into the natural waters(Nico et al. 2007)	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The "black-chinned tilapia" Sarotherodon melanotheron, a native species in Africa, was reported to be competing for food and space of cultured stocks in the Laguna de Bay (Aquino et al. 2011) and in the brackish fishponds of Bulacan (Ordoñez et al. 2015; Chavez 2013; Cervantes 2013).	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The species is native to Tropical America (Poniente 2019)	Very high
5	2.02	What is the quality of the climate matching data?	High	The species is native to tropical america that have the same climatic condition in the Philippines (Poniente et al. 2019)	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Aside from the RA area the species is already present in other inland water in Philippines example is Laguna de bay (poniente et	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The species is already present in other nearby lakes (Poniente et al. 2019) Introduced by the aquarium trade industry, the species escaped into the natural waters (Nico et al. 2007).	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	Introduced by the aquarium trade industry, the species escaped into the natural waters(Nico et al. 2007) and its already present in Laguna de bay the largest lake in Phillipines (Poniente et al. 2019)	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	Reports shows the the species already estblished in South east asia including Philippines. (Adriyono et al 2021; Poniente et al.	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	The "black-chinned tilapia" Sarotherodon melanotheron, a native species in Africa, was reported to be competing for food and space of cultured stocks in the Laguna de Bay (Aquino et al. 2011) and in the brackish fishponds of Bulacan (Ordoñez et al. 2015; Chavez 2013; Cervantes 2013).	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	The "black-chinned tilapia" a native species in Africa, was reported to be competing for food and space of cultured stocks in the Laguna de Bay (Aquino et al. 2011) and in the brackish fishponds of Bulacan (Ordoñez et al. 2015; Chavez 2013; Cervantes 2013).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	No	No reports	Medium
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	The "black-chinned tilapia", a native species in Africa, was reported to be competing for food and space of cultured stocks in the Laguna de Bay (Aquino et al. 2011) and in the brackish fishponds of Bulacan (Ordoñez et al. 2015; Chavez 2013;	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	No, these fish are not dangerous to humans, but their aggressive nature might be harmful to other smaller fish species that are residents of the same aquarium. (FishBase)	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This cichlid is a native of Central America, particularly in Nicaragua and Costa Rica Freshwater; benthopelagic. Tropical; 23°C - 33°C (Ref. 7335); 15°N - 8°N	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	Very high

20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Not applicable	no record found.	Low
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	t al. 2015; Chavez 2013; Cervantes 2013). Midas cichlid, Amphilophus citrinellus, a freshwater and benthopelagic fish, has been reported to have a maximum length of 24.4 cm. According	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	Freshwater; benthopelagic. Tropical; 23°C - 33°C (Ref. 7335); 15°N - 8°N Fishbase	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). the RA area is home of endemic and native species.	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	4	They are sexually mature at 6 to 7". fishbase	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	The species is already present in other nearby lakes (Poniente et al. 2019) Introduced by the aquarium trade industry, the species escaped into the natural waters (Nico et al. 2007).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The species is already present in other nearby lakes (Poniente et al. 2019) Introduced by the aquarium trade industry, the species escaped into the natural waters (Nico et al. 2007).	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Not applicable	no data	Low
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	High

42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Spawn preferentially on the ceiling of natural caves (Ref. 38966). Deposit eggs on hard substrates, such as rocks or logs; both parents guarding the eggs and the fry for several weeks (Ref. 44091). 300-1000 eggs (Ref. 2060). FishBase	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	do available literature foe this	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Midas cichlid, Amphilophus citrinellus, a freshwater and benthopelagic fish, has been reported to have a maximum length of 24.4 cm. According to Conkel (1993), the species coloration is mostly bright orange to orange-red in adults; mature males are larger, with longer fins, and with a distinct hump on their heads. They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). This cichlid is a native of Central America, particularly in Nicaragua and Costa Rica. Introduced by the aquarium trade industry, the species escaped into the natural waters (Nico et al. 2007).	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Freshwater; benthopelagic. Tropical; 23°C - 33°C (Ref. 7335); 15°N - 8°N	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	No	There are no reports the the species are being eradicated in the wilds by any chemicals	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	Yes	The "black-chinned tilapia" Sarotherodon melanotheron, a native species in Africa, was reported to be competing for food and space of cultured stocks in the Laguna de Bay (Aquino et al. 2011) and in the brackish fishponds of Bulacan (Ordoñez et al. 2015; Chavez 2013; Cervantes 2013).	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Midas cichlid, Amphilophus citrinellus, a freshwater and benthopelagic fish, has been reported to have a maximum length of 24.4 cm. According to Conkel (1993), the species coloration is mostly bright orange to orange-red in adults; mature males are larger, with longer fins, and with a distinct hump on their heads. They are mostly found in lakes, omnivorous, eating mostly snails and small fishes; also feeds on insect larvae, worms, and other bottom-dwelling organisms (Yamamoto and Tagawa 2000). This cichlid is a native of Central America, particularly in Nicaragua and Costa Rica. Introduced by the aquarium trade industry, the species escaped into the natural waters (Nico et al. 2007).	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	High

52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Lives in box-cut canals with rocky vertical sides, crevices used for spawning and protection of the young (Ref. 5723). Found in lakes; uncommon in the rivers but will penetrate the lower river valleys where the water is slow flowing or tranquil (Ref. 7335). Omnivorous, eating mostly aufwuchs, snails and small fishes (Ref. 7335); also feeds on insect larvae, worms and other bottom-dwelling organisms (Ref. 44091). Majority of this fish has normal cryptic coloration (black, gray or brown), matching the substrate for camouflage and survival purposes. About 10 % of this species is xanthomorphic, undergoing a color metamorphosis at varying stages of growth (Ref. 7335). An experimental fish being used for	High

Statistics	
Scores	
BRA	**41.0**
BRA Outcome	**High**
BRA+CCA	**53.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**20.0**
1. Domestication/Cultivation	*2.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**21.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*7.0*
6. Reproduction	*-1.0*
7. Dispersal mechanisms	*5.0*
8. Tolerance attributes	*2.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**21**
Environmental	**13**
Species or population nuisance traits	**26**

Thresholds	
BRA	**34.5**

BRA+CCA	34.5
Confidence	
BRA+CCA	0.85
BRA	0.86
CCA	0.75

Date and Time
17/05/2022 15:03:19

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Austrolebias nigripinnis*
Common name	blackfin pearlfish
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquarium:Commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cyprinodontiformes (Rivulines, killifishes and live bearers) >
Native range	South America: Lower Paraná and Uruguay River basins.
Introduced range	USA, Philippines
URL	https://www.fishbase.se/summary/Austrolebias-nigripinnis.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Freshwater; benthopelagic; pH range: 6.0 - 7.0; dH range: 5 - 12; non-migratory. Subtropical; 18°C - 22°C https://www.fishbase.se/summary/Austrolebias-nigripinnis.html	High
5	2.02	What is the quality of the climate matching data?	High	Freshwater; benthopelagic; pH range: 6.0 - 7.0; dH range: 5 - 12; non-migratory. Subtropical; 18°C - 22°C https://www.fishbase.se/summary/Austrolebias-nigripinnis.html	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high

21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	https://www.fishbase.se/summary/Austrolebias-nigripinnis.html	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
43	7.09	Is dispersal of the taxon density dependent?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Blackfin Pearlfish (Austrolebias nigripinnis) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, April 2011 Revised, July 2017 Web Version, 7/5/2018	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.fishbase.se/summary/Austrolebias-nigripinnis.html	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Not applicable	no data	Medium
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High

Statistics	
Scores	
BRA	**43.0**
BRA Outcome	**High**
BRA+CCA	**55.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**19.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*1.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**24.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*7.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**16**
Environmental	**16**
Species or population nuisance traits	**27**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.83**

BRA	0.83
CCA	0.79

Date and Time
02/04/2020 07:59:16

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Balantiocheilos melanopterus*
Common name	tricolour sharkminnow
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquarium trade
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Mekong and Chao Phraya basins, Malay Peninsula, Sumatra and Borneo. Becoming rare or extinct
Introduced range	Canada, Spain, USA, Philippines
URL	https://www.fishbase.se/summary/Balantiocheilos-melanopterus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 12. Tropical; 22°C - 28°C https://www.fishbase.se/summary/Balantiocheilos-	Very high
5	2.02	What is the quality of the climate matching data?	High	Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 12. Tropical; 22°C - 28°C https://www.fishbase.se/summary/Balantiocheilos-	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High

21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Max length : 35.0 cm SL male/unsexed	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 12. Tropical; 22°C - 28°C https://www.fishbase.se/summary/Balantiocheilos-	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Not applicable	no data	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
43	7.09	Is dispersal of the taxon density dependent?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Tricolor Sharkminnow (Balantiocheilos melanopterus) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, January 2016 Revised, March 2018 Web Version, 8/29/2018	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 12. Tropical; 22°C - 28°C https://www.fishbase.se/summary/Balantiocheilos-	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high

Statistics	
Scores	
BRA	**34.0**
BRA Outcome	**Medium**
BRA+CCA	**42.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**9.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*2.0*
B. Biology/Ecology	**25.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*7.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*6.0*
C. Climate change	**8.0**
9. Climate change	*8.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**10**
Environmental	**7**
Species or population nuisance traits	**31**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	

BRA+CCA	0.93
BRA	0.94
CCA	0.83

Date and Time
02/04/2020 07:59:30

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Barbonymus gonionotus*
Common name	silver barb
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Asia: Mekong and Chao Phraya basins, Malay Peninsula, Sumatra and Java
Introduced range	Philippines, Malaysia, India, Singapore
URL	https://www.fishbase.se/summary/Barbonymus-gonionotus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Surehkumar2014.pdf	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Surehkumar2014.pdf	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=4682&GenusName=Gymnocorymbus&SpeciesName=ternetzi&fc=102&StockCode=4900	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	High
5	2.02	What is the quality of the climate matching data?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=4682&GenusName=Gymnocorymbus&SpeciesName=ternetzi&fc=102&StockCode=4900	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	no record	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=4682&GenusName=Gymnocorymbus&SpeciesName=ternetzi&fc=102&StockCode=4900	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	http://sci-hub.tw/https://doi.org/10.1016/j.biocon.2013.04.019	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Surehkumar2014.pdf	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Surehkumar2014.pdf	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Surehkumar2014.pdf	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	https://www.fishbase.de/summary/Dawkinsia-arulius.html	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High

23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Not applicable	No data for this question	Medium
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Not applicable	no data for this question	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=11275&GenusName=Dawkinsia&SpeciesName=arulius&fc=122&StockCode=11600	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	no records	Medium
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data foe this question	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/atkore2015.pdf	Very high

49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	No change	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	No change	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	No change	https://www.fishbase.de/summary/Dawkinsia-arulius.html	High

Statistics	
Scores	
BRA	**30.0**
BRA Outcome	**Medium**
BRA+CCA	**34.0**
BRA+CCA Outcome	**Medium**
Score partition	
A. Biogeography/Historical	**24.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**6.0**
4. Undesirable (or persistence) traits	*4.0*
5. Resource exploitation	*0.0*
6. Reproduction	*-1.0*
7. Dispersal mechanisms	*0.0*
8. Tolerance attributes	*3.0*
C. Climate change	**4.0**
9. Climate change	*4.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**19**
Environmental	**8**
Species or population nuisance traits	**11**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.81**
BRA	**0.82**
CCA	**0.75**

Date and Time
02/04/2020 07:59:47

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Baryancistrus xanthellus*
Common name	golden nugget pleco
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental
Risk assessment area	Lake Taal
Taxonomy	Order - Suliriformes Family - Loricariidae
Native range	South America
Introduced range	No Data
URL	https://www.fishbase.se/summary/Baryancistrus-xanthellus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Yes, based on Py-Daniel et al., (2011) this fishes are popular in the aquarium trade	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon is the major component of fish catch in the Philippine waters but the fish has very little value as food fish since the flesh tastes bitter. It may be used, however, as a source of fish meal and for ornamental industry (Cagauan, 2007).	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	No	This taxon has no invasive histroty, although species P. multiradiatus, P. pardalis and P. disjunctivus have been so far recorded as exotic in Mesoamerica – Puerto Rico and Mexico (8, 12); in North America: southern United States – Florida, Texas, Washington and North Carolina, as well as at Hawaii islands (10, 11, 19, 18, 20); in Philippines and south-eastern Asia: peninsular Malaysia, Singapore, Taiwan, Java and Sumatra (22). In all those recipient areas recorded so far, the aquarists were assigned responsible for their releasing into natural ecosystems and subsequent establishment (Simonović, Nikolić, and Grujić, 2014).	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Low	The taxon's native range (Brazuil) has different climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	High
5	2.02	What is the quality of the climate matching data?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon was found and collected from five sites in and around the Laguna de Bay basin: Marikina River in Marikina and Pasig Cities; Pasig River in the City of Manila; Catmon Creek in Bay, Laguna; Banilad Creek in Siniloan, Laguna; and Laguna de Bay in San Pedro, Laguna (Chavez et al., 2006).	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	They were probably introduced through an intentional release and possibly fish farm escapes upstream (near Davao) between the 2002 and 2005 (Hubilla et al, 2007). Moreover, local aquarium dealers have used its local moniker -- that a janitor fish cleans up – as a selling point, wherein anecdotal reports say that the misconception might have also be a reason for the high incidence of these specimens particularly in the Marikina and Pasig rivers	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	No	There is no current report on the taxon found in close proximity. However, taxon can enter the RA intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	No	No report on the establishedment of the taxon, however related taxon P. disjunctivus and P. pardalis are also seen in Singapore waterways, with the former also found in Taiwan and the latter found as well in the canals and sewer system of Indonesia and the Red River of Northern Vietnam (Levin et al., 2008). In addition, "they have established populations and displaced indigenous fish and invertebrate communities" in Mexico, Puerto Rico and the United States (Soriano & Vallejo, Jr., 2011)	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	No	No report currently on the umpact of introduction. However, the rapid increase of similar species (Pterygloplchthys) has affected the livelihood and fishing operation of the fisherfolk which led to a decrease in marketable catch of endemic and commercial fish species due to its predominance in gill net and fish corral catch. (Chavez et al., 2006)	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	There are no current adverse impact on aquaculture but related taxon based on the findings of the study, therelated taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that related taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially	High

12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	There are no current adverse impact on aquaculture but related taxon based on the findings of the study, therelated taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that related taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	There are no current adverse impact on aquaculture but related taxon based on the findings of the study, therelated taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that related taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There is no current report on B. xanthelulus have impact or threats on human. However some related taxon has Bioaccumulation of coliform bacteria and heavy metals, as well as vector of parasites, has been recorded on related species. In which if eaten will lead to potential contamination and infection	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	Related taxon shows impacts on displacement of local species through resource competition such as indirect food competition which reduces the food resources like aquatic insects and vegetation and direct habitat competition because of high biomass of their populations (Orfinger & Goodding, 2018). But B. xanthellus has no recorded impact that affects native taxa.	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This is very unlikely to happen considering the feeding guild and morphology of the taxon (Hubilla et al., 2007; Levin et al., 2008).	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Family of these taxon has a protected and modified scales and by strong spines on the fins and because they show a high tolerance to low oxygen concentrations or desiccation (up to 20 hours). The latter ability can be attributed to an enlarged and vascularized stomach, which functions as an accessory respiratory organ (Jasso et al., 2013). Also, they are commonly found in shallow freshwater environments, but some members of the Family Loricariidae: Pterygoplichthys which are considered to be strictly freshwater, have already established invasive populations in inland waters with mesohaline conditions, such as in North and Central America, Asia, Caribbean islands, Pacific and Indian oceans and in South-Eastern Mexico due to their high salinity	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	B. xanthellus has no recorded effect on food we structure however being closely related to other plecos their burrowing behavior in river banks may contribute to water turbidity and soil erosion. High water turbidity alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity. (Hubilla et al., 2006)	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	There are no records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	There are no reports that the taxon can be a host for several parasites which are not yet recorded in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	The size range for most of the adult species in the Loricariid family is 30–50 cm, but individuals have been observed to reach 70 cm (IUCN, 2010). While the max published weight: 310.00 g (Jumawan and Seronay, 2017). Accidental release of Pterygoplichthys spp. has been documented, such as when typhoon Rosing struck the Philippines resulting in escape of the fish from commercial farms. Also, they are very common aquarium fish around the world. Nearly all of their introduced populations are caused by pet release or aquaculture escape	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	The taxon was collected from medium-velocity rivers no more than two meters deep near the river banks (Chavez, et al., 2006; Magalhaes et al, 2021)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	The only recorded effect is pollution of the water by overfeeding in an aquarium setting, however in the wilr, this is not likely to happened.	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	The taxon can maintain viable population under low density condition which is reported in the Chacamax River, Chiapas, Mexico (Capps and Flecker, 2015). However, there is no recorded established population from this species based on FishBase.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This taxon feeds primarily on benthic algae, detritus, various plant matter, worms, insect larvae, fish eggs and other bottom-dwellers which do not fall under threatened or protected status in the RA area. (IUCN, 2010).	High

27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Food competition by the said taxa, in which it reduces the food resources such as aquatic insects and vegetation in the area, can be detrimental to the native taxa (Orfinger & Goodding, 2018).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	No record shows that this taxa has parental care, however Similar taxa species exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	this taxon can likely produce viable gametes in the RA area (Jasso et al., 2013; CABI, 2015)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	There is no native taxa present in the RA area where the taxon can hybridise (Papa and Mamaril, 2011).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	The taxon mates through external fertilization, where the female deposits eggs on smooth rocks, depressions or burrows in the river bank. The eggs are then fertilized by the male. Afterwards, the eggs are guarded by one or both parents. In captivity, the most successful breedings have occurred in ponds with steep clay or mud banks. The fish dig tunnels close to the water level and the males guard the eggs until they hatch. (Jumawan et al. 2014)	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	The taxon does not depend on other taxa and or other means to complete lifecycle (Power, 2003).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	No	the spawning season which happens from March to September. Also, they exhibit extended spawning season which extends for more than 5 months during the warm rainy season (CABI, 2015)	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	Not applicable	no record found fot this question.	Medium
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	The taxon can enter the RA through natural dispersal and its success is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	No	The taxon can enter the RA through natural dispersal and its success is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	However related taxa has modified mouth allows the taxon to feed, breathe, and attach to the substrate through suction (CABI,2015).	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	In the case of an invasive species such as P. pardalis, accidental release of eggs and juveniles may result in assured higher survival rates in the wild (Jumawan et al., 2014).	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	In the case of an invasive species such as P. pardalis, accidental release of eggs and juveniles may result in assured higher survival rates in the wild (Jumawan et al., 2014).	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon are generally nocturnal and non-migratory (CABI, 2015).	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Because this taxon exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	No	This taxon can quickly migrate to reach new bodies of water, this is enabled by their ability to hold into solid substrates using their sucker mouth, beating of pelvic fins, and hooking and bracing using their studded spines of the pectoral fins (CABI, 2015)	High
43	7.09	Is dispersal of the taxon density dependent?	No	Nest distribution and relationships between nest size and shell content in the sediment suggest that nest site selection and nest size are determined by the shell availability in the sediment. (Ochi & Yanagisawa, 2001)	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Members of this taxon also have the ability to breathe air and are able to survive up to 30 h out of water (Val and De Almeida-Val, 1995). Pterygoplichthys and many other loricariids are facultative air-breathers, able to persist indefinitely in hypoxic conditions and even able to survive out of water for many hours (Graham, 1997)	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	No	no record found for B. xanthellus however related taxa can tolerate water pollution, low oxygen levels, and elevated salinity (Capps et al., 2011; Özgür et al., 2016)	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	No	no record found for B. xanthellus however on related taxa a successful eradication through human intervention was done in the Rainbow River, Florida USA (Hill and Sowards, 2015). Also, a preliminary study of the potential eradication of P. pardalis by three native Thai piscivorous species yielded interesting results. Demersal species such as H. wyckioides and O. marmorata could more effectively eliminate P. pardalis than other native species such as P. sanitwongsei. In particular, H. wyckioides was the most effective consumer of P. pardalis, as it could efficiently ingest individuals up to 10 cm in length. Pterygoplichthys pardalis longer than 10 cm can stretch out their body fins, preventing H.	High

47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	No	no record found for B. xanthellus however related taxa can is tolerant of (and likely to benefit from) eutrophication and other forms of aquatic disturbance, as evidenced by their occurrence in nutrient-rich Lake Thonotosassa and Lake Maggiore, Florida and Nong Yai Canal, East Thailand (Hoover et al., 2004; Chaichana et	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	No record found for B. xanthllus however related Taxon can tolerate elevated salinity (Capps et al., 2011).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	Based on the list of fish species present in lake Taal (Papa and Mamaril, 2011), there is none that could possibly prey on the taxon being assessed.	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Lake Taal is close but completely isolated from Laguna de Bay and other rivers in Luzon Island where Pterygoplichthys spp. were recorded and thus may only require accidental and/or intentional vectors of introduction, together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the risk of entry of this	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the risk of establishment of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	No change	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**2.0**
BRA Outcome	**Medium**
BRA+CCA	**12.0**
BRA+CCA Outcome	**Medium**
Score partition	
A. Biogeography/Historical	**4.0**
1. Domestication/Cultivation	*2.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*0.0*
B. Biology/Ecology	**-2.0**
4. Undesirable (or persistence) traits	*2.0*
5. Resource exploitation	*2.0*
6. Reproduction	*0.0*
7. Dispersal mechanisms	*-4.0*
8. Tolerance attributes	*-2.0*
C. Climate change	**10.0**
9. Climate change	*10.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*

Sectors affected	
Commercial	8
Environmental	5
Species or population nuisance traits	2

Thresholds	
BRA	34.5
BRA+CCA	34.5
Confidence	
BRA+CCA	0.75
BRA	0.74
CCA	0.75

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AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Carassius auratus*
Common name	goldfish
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquarium:Commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	central Asia and China
Introduced range	Many parts of Asia including Philippines
URL	https://www.fishbase.se/summary/Carassius-auratus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Many different varities of goldfish have been produced, through selective breeding for a wide variety of colours and fin shapes. These fish usually revert to olive-bronze wild colouration and normal fin shapes if released from captivity (McDowall, 2000).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species (CABI, 2019)	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete example is the Carassius gibelio, which is considered to be invasive in Europe and North America and currently imposing adverse effects in the country's native species (CABI,	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate. FishBase	High
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent (Southeast Asia) where the taxon is native (CABI, 2019)	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	No date	Low
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Such as in Teller Lake, Colorado wherein it is now posing risks to the entire ecosystem of the lake and the native fish species. Also, in Lake Errie of the west end of Lake Ontario (Ontario Invading Species Awareness Program, 2019)	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	" The passage of cyanobacteria through the goldfish intestine stimulates cyanobacterial growth, which may result in algal blooms occurring. The bottom-sucking feeding methods of goldfish can also contribute towards algal blooms by re-suspending nutrients, which makes them available to algae (Morgan & Beatty, 2004). Goldfish have also been known to prey upon the eggs, larvae and adult of native fishes (Morgan & Beatty, 2004), as well as increasing water turbidity and depleting aquatic vegetation	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Goldfish is known to prey upon the eggs, larvae and adult of native fishes (Morgan & Beatty, 2004), as well as increasing water turbidity and depleting aquatic vegetation (Richardson et al.,	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	In 1994, this taxon has been considered by the state fish and game comision of California a danger to angling in Crystal Lake (The Atlantic, 2019)	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	In 1994, this taxon has been considered by the state fish and game comision of California a danger to angling in Crystal Lake (The Atlantic, 2019)	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	Since this species can stimulate algal blooms which can realease toxins that can contaminate drinking water which can poison humans (IUCNGSID, 2019).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon eat snails, small insects, fish eggs and young fish, making this species a competitor with and predator of native fish. Also, they stir up mud and other matter when they feed, which increases the cloudiness of the water and affects the growth of aquatic plants and lastly, it can carry diseases such as koi herpesvirus that can harm local fish populations (Ontario Invading	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	Considering their feeding habits, wherein this taxon consumes eggs and larvae of other fishes, and the fact that there are already records that it has predated and competed with threatended species (CABI, 2019; Ontario Invading Species Awareness	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has a high adaptability to different environmental conditions making them a habitat generalist. Also, they are capable of securing and ingesting a wide range of food and they are long lived (CABI, 2019)	Very high

18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Considering their feeding habits, wherein this taxon consumes eggs and larvae of other fishes, small fishes, crustaceans and insects and their ability to stimulate algal blooms which can affect other species, as well as in increasing water turbidity which can deplete aquatic vegetation (IUCNGSID, 2019)	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon can potentially cause major impact to the aquaculture services of the RA area due to its physiological characteristics.	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon can carry diseases such as the koi herpesvirus that can harm local fish populations (Ontario Invading Species Awareness Program, 2019)	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Ths taxon can reach a large body size, having a maximum length of 48 cm (Fish Base,2019)	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	They can only live in rivers, lakes, ponds, lagoons and ditches with stagnant or slow-flowing water (IUCNGSID, 2019)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	The passage of cyanobacteria through the goldfish intestine stimulates cyanobacterial growth, which may result in algal blooms occurring. The bottom-sucking feeding methods of goldfish can also contribute towards algal blooms by re-suspending nutrients, which makes them available to algae (Morgan & Beatty, 2004). Goldfish have also been known to prey upon the eggs, larvae and adult of native fishes (Morgan & Beatty, 2004), as well as increasing water turbidity and depleting aquatic vegetation	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	This taxon has a high adaptability to different environmental conditions making them a habitat generalist. Also, they are capable of securing and ingesting a wide range of food and they are long lived (CABI, 2019)	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Considering their feeding habits, wherein this taxon consumes eggs and larvae of other fishes, and the fact that there are already records that it has predated and competed with threatended species (CABI, 2019; Ontario Invading Species Awareness	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	The bottom-sucking feeding methods of goldfish can cause algal blooms by re-suspending nutrients, which makes them available to algae and is harmful to other fishes (Morgan & Beatty, 2004).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just deposit their eggs to vegetations or any surface (Fish Base, 2019)	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (Fish Base, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	There are already records of different hybrid forms of this taxon (IUCNGSID, 2019)	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	This taxon only requires a substrate where they can lay their eggs and mature (Fish Base, 2019)	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Spawning occurs in shallow water amongst weeds, and up to several hundred thousand small eggs (1-2mm diameter) are laid at once (McDowall, 2000). Individual fish can spawn 3-10 lots of eggs at intervals of 8-10 days. Cold water during winter is essential for proper ova development (FishBase, 2004).	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity at 1-2 years old (Fish Base, 2019)	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2019)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2019)	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Since this taxon attahes their eggs to substares, it is possible for it to be dispersed by water currents (Fish Base, 2019)	Very high

39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Since this taxon attahes their eggs to substares, it is possible for it to be dispersed by water currents (Fish Base, 2019)	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (Fish Base, 2019)	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon does not exhibit parental care and it attaches its eggs to substares and after hatching the larvae it is possible for it to be dispersed by water currents making it available for preadation and dispersion of other animals (Fish Base, 2019)	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area are prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions making them a habitat generalist makes their dispersal rapid	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive out of water for more than 3 hours (Caring Pets, 2019)	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Water pH: 6.5-8.5, Temperature: 0°C - 41°C, Ammonia [unionised] (mg/l): <0.1, Dissolved oxygen (mg/l) >5.0, Hydrogen sulphide (mg/l) <0.002, Nitrate (mg/l) <3.0 and Salinity: >15	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	In Crystal Lake, California, the state fish and game commission used a chemical that temporary paralyzes the gills all fihshes which enabled them to separate the taxon from other species when they float in the waters. Also, in the Vasse River in Western Australia, they performed an intensive capture effort prior to spawning and also the use of gill and seine nets, and	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions and their capability to stay out of water for long periods of time, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area (CABI, 2019)	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	The maximum recorded salinity that this taxon can survive is 17 ppt (Ref. 39171), but above 15 ppt is already harmful to them (Fish Base,2019; CABI, 2019)	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that they can survive a wide range of environmental conditions and their fitness to counter act environmental tolerances, the risk of establishment of the taxon increases.	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their fitness to counter act environmental tolerances, the risk of entry through accidental release from aquarium and would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**53.0**
BRA Outcome	**High**
BRA+CCA	**65.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**24.0**
1. Domestication/Cultivation	*4.0*

2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**29.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*7.0*
6. Reproduction	*4.0*
7. Dispersal mechanisms	*4.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**21**
Environmental	**17**
Species or population nuisance traits	**32**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.87**
BRA	**0.88**
CCA	**0.79**

Date and Time
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AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Carassius carassius*
Common name	crucian carp
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquarium
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Eurasia: North, Baltic, White, Barents, Black and Caspian Sea basins; Aegean Sea basin only in
Introduced range	Philippines, Thailand, China, Singapore etc.
URL	https://www.fishbase.se/summary/Carassius-carassius.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is farmed mainly in Asia and Eastern Europe. In China, Taiwan and Belarus, it produced more than 1,500 tons in 2002 and in Japan, Uzbekistan and Republic of Korea it produced more than 100 tonnes (FAO, 2009).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species, for reacreational fishing and food (CABI, 2020)	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete example is the Carassius gibelio, which is considered to be invasive in Europe and North America and currently imposing adverse effects in the country's native species (CABI,	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	This taxon's native range (Eurasia) has a temperate climate, while the RA area has a tropical climate (CABI, 2020; FishBase, 2019; U.S. Fish and Wildlife Service, 2014)	Very high
5	2.02	What is the quality of the climate matching data?	High	Climatic Data from CABI, Fish Base and U.S. Fish and Wildlife Service were used to generate climate analysis.	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market (Wild Gold Fish) where importation and sale of this taxon is highly abundant (Fish Base, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	no record	Medium
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	No	This taxon has not been considered as invasive. In United States,this taxon has lived in the lagoons and parks of Chicago, however reports indicates that this population was not established and eventually died out (CABI, 2019; Texas Invasive Sepcies	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no records for this taxon to pose human threaths.	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	As this taxon is known to increases water turbidity affecting aquatic community, compete with native species for food and space which can dispalce native species (U.S. Fish and Wildlife	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This taxon is unlikely to preadate or prasite threathened taxa in the RA area.	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has a high adaptability to different environmental conditions making them a habitat generalist. Also, this taxon has an exceptional hypoxia and anoxia tolerance (CABI, 2020).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	As this taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon can potentially cause major impact to the aquaculture services of the RA area due to its physiological and morphological characteristics.	High

20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon is a known carrier of spring viraemia virus of carps (U.S. Fish and Wildlife Service, 2014)	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can grow up to 64 cm (Fishbase, 2019)	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon usally occur in shallow ponds, lakes rich in vegetation and slow moving rivers (FishBase, 2019)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	According to U.S. Fish and Wildlife Service (2014) This taxon is known to increases water turbidity which can cause habitat degradation.	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	There are no evidence of established populations of the organism persisting at low density .	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This taxon is usally abundant in the absence of other fish species and it does not occur in waters with rich ichthyofauna and abundant predatory species (U.S. Fish and Wildlife Service, 2014).	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	As this taxon is known to feed on plankton, benthic invertebrates and plant materials which can be exploited at the expense of native species (Fish Base, 2019)	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just deposit their eggs to aquatic weeds which serves as a substarata(FAO, 2009)	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (Fish Base, 2019; FAO, 2009; CABI,	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	The records only shows that it can only hybridize with other carp species such as the gold fish and prucian carp (U.S. Fish and Wildlife Service, 2014)	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	This taxon only requires a substrate where they can lay their eggs and mature (FAO, 2019)	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon can spawn 130000-250000 per female from May-June and hatches after 4-8 days (Fish Base, 2019).	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity at 1.5 years old (CABI, 2020)	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	One	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019; CABI, 2020)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Since this taxon attahes their eggs to substares, it is possible for it to be dispersed by water currents (FAO, 2009)	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Since this taxon attahes their eggs to substares, it is possible for it to be dispersed by water currents (FAO, 2009)	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (Fish Base, 2019; CABI, 2020)	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon does not exhibit parental care and it attaches its eggs to substares and after hatching the larvae it is possible for it to be dispersed by water currents making it available for preadation and dispersion of other animals (Fish Base, 2019)	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area are prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions (hypoxia and anoxia) making them a habitat generalist makes their dispersal rapid (CABI,2020).	High

43	7.09	Is dispersal of the taxon density dependent?	Not applicable	no record	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive hypoxic and anoxic environments for several months (CABI, 2020)	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tollerant on high summer temperatures (up to 35°C), organic pollutants and very low oxygen levels in the water during winter and summer (U.S. Fish and Wildlife Service, 2014).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no record	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions and their capability to stay out of water for long periods of time, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area (CABI, 2020)	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	The maximum recorded salinity that this taxon can survive is 17 ppt, but above 15 ppt is already harmful to them (Fish Base,2019; CABI, 2020)	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that they can survive a wide range of environmental conditions and their fitness to counter act environmental tolerances, the risk of establishment of the taxon increases.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their fitness to counter act environmental tolerances, the risk of entry through accidental release from aquarium and would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**33.0**
BRA Outcome	**Medium**
BRA+CCA	**45.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**14.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*8.0*
B. Biology/Ecology	**19.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*

6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**14**
Environmental	**10**
Species or population nuisance traits	**25**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**
BRA	**0.87**
CCA	**0.75**

Date and Time
03/05/2021 00:52:52

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Channa micropeltes*
Common name	Indonesian snakehead
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental and Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Anabantiformes (Gouramies, snakeheads) > Channidae
Native range	Cambodia, Indonesia, Laos, Malaysia, Thailand, Viet Nam
Introduced range	Philippines, Singapore, USA, China, Guam, Indonesia, Madagascar, New caledonia
URL	https://www.fishbase.se/summary/Channa-micropeltes.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
5	2.02	What is the quality of the climate matching data?	High	based on the koppen climate matching the native range ang the introduced range have almost the climatic condition	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	The taxon were used for aquaculture and allowed to be consumed by people.	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Not applicable	No concrete data for this question (lack of reference)	Low
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	file:///C:/Users/User/Desktop/papa%20et.al..pdf	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	The taxon is considered as a food fish with high aquaculture value and commands a good price in the market (Joshi 2016)	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Not applicable	Lack of eveidence and literatue for this question	Low
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	consider as monster fish in most of the ornamental industry due to its potential in becoming big	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Not applicable	Lack of data to support this question	Low
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	parent usually guard there newly hatched eggs from predator until it becomes ready.	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	for verification	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Not applicable	Lack of data to support this question	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Yes	for verification	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	for verification	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	for verification	Medium
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	4	for verification	Medium
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	deliberate release	Medium
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	the taxon have no ablity to attached itself into any kinds of subtrates	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	for verification	Low
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	the type of reproduction of the taxon have posibilities to carry out their juveniles by flowing water or can move between bodies of water	Medium
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	for verification	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	since the parent guard there eggs this would not possible	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
43	7.09	Is dispersal of the taxon density dependent?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Medium
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	file:///C:/Users/User/Desktop/papa%20et.al..pdf	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	for verification	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Widespread. Found in canals, creeks, swamps, ponds, shallow areas of lakes	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	file:///C:/Users/User/Desktop/papa%20et.al..pdf	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
C. Climate change					
9. Climate change					

50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high

Statistics	
Scores	
BRA	**50.0**
BRA Outcome	**High**
BRA+CCA	**62.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**24.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**26.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*7.0*
6. Reproduction	*4.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**21**
Environmental	**16**
Species or population nuisance traits	**30**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.77**
BRA	**0.77**
CCA	**0.79**

Date and Time
14/04/2019 00:36:41

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Cichla temensis*
Common name	speckled pavon
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquarium
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	outh America: Amazon River basin in the Negro and Uatumã River drainages; Orinoco River basin
Introduced range	Venezuela, USA
URL	https://www.fishbase.se/summary/Cichla-temensis.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Tropical; 27°C - 29°C https://www.fishbase.se/summary/Cichla-temensis.html	High
5	2.02	What is the quality of the climate matching data?	High	Tropical; 27°C - 29°C https://www.fishbase.se/summary/Cichla-temensis.html	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Not applicable	no data	Medium
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High

21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Max length : 99.0 cm TL male/unsexed; FishBase 2020	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	no data	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
43	7.09	Is dispersal of the taxon density dependent?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Speckled Pavon (Cichla temensis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, June 2019 Web Version, 5/1/2020	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.fishbase.se/summary/Cichla-temensis.html	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high

Statistics	
Scores	
BRA	**40.0**
BRA Outcome	**High**
BRA+CCA	**48.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**18.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*10.0*
B. Biology/Ecology	**22.0**
4. Undesirable (or persistence) traits	*5.0*
5. Resource exploitation	*7.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*6.0*
C. Climate change	**8.0**
9. Climate change	*8.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**19**
Environmental	**8**
Species or population nuisance traits	**28**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.82**

BRA	0.82
CCA	0.88

Date and Time
02/04/2020 08:00:46

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Cichlasoma bimaculatum*
Common name	black acara
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquarium
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	South America: Orinoco River basin, in the Caroni in River Venezuela; Guianas, from the Essequibo
Introduced range	South America
URL	https://www.fishbase.se/summary/Cichlasoma-bimaculatum.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Tropical; 16°C - 24°C; https://www.fishbase.se/summary/Cichlasoma-bimaculatum.html	High
5	2.02	What is the quality of the climate matching data?	High	Tropical; 16°C - 24°C; https://www.fishbase.se/summary/Cichlasoma-bimaculatum.html	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	https://www.fishbase.se/summary/Cichlasoma-bimaculatum.html	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High

22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Max length : 12.3 cm SL male/unsexed; https://www.fishbase.se/summary/Cichlasoma-bimaculatum.html	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.fishbase.se/summary/Cichlasoma-bimaculatum.html	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	no data	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
43	7.09	Is dispersal of the taxon density dependent?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High

46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	No	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Black Acara (Cichlasoma bimaculatum) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2011 Revised, August 2014 and January 2018 Web Version, 4/5/2018	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High

Statistics	
Scores	
BRA	**29.0**
BRA Outcome	**Medium**
BRA+CCA	**37.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**14.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*6.0*
B. Biology/Ecology	**15.0**
4. Undesirable (or persistence) traits	*3.0*
5. Resource exploitation	*5.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*2.0*
C. Climate change	**8.0**
9. Climate change	*8.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**13**
Environmental	**8**
Species or population nuisance traits	**23**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.79**
BRA	**0.80**
CCA	**0.75**

Date and Time

02/04/2020 07:58:57

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Cirrhinus cirrhosus*
Common name	Mrigal carp
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture, Aquarium
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Asia: native to large rivers in the Indian subcontinent
Introduced range	Philippines, Singapore, Japan, India, Malaysia etc.
URL	https://www.fishbase.se/summary/Cirrhinus-cirrhosus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is farmed mainly in Asia and Eastern Europe. In China, Taiwan and Belarus, it produced more than 1,500 tons in 2002 and in Japan, Uzbekistan and Republic of Korea it produced more than 100 tonnes (FAO, 2009).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species, for reacreational fishing and food (CABI, 2020)	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete example is the Carassius gibelio, which is considered to be invasive in Europe and North America and currently imposing adverse effects in the country's native species (CABI,	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	This taxon's native range (Eurasia) has a temperate climate, while the RA area has a tropical climate (CABI, 2020; FishBase, 2019; U.S. Fish and Wildlife Service, 2014)	High
5	2.02	What is the quality of the climate matching data?	High	Climatic Data from CABI, Fish Base and U.S. Fish and Wildlife Service were used to generate climate analysis.	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market (Wild Gold Fish) where importation and sale of this taxon is highly abundant (Fish Base, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	Not Applicable	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	No	This taxon has not been considered as invasive. In United States,this taxon has lived in the lagoons and parks of Chicago, however reports indicates that this population was not established and eventually died out (CABI, 2019; Texas Invasive Sepcies	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	"This taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)"	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no records for this taxon to pose human threaths.	Medium
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	As this taxon is known to increases water turbidity affecting aquatic community, compete with native species for food and space which can dispalce native species (U.S. Fish and Wildlife	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This taxon is unlikely to preadate or prasite threathened taxa in the RA area.	Medium
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has a high adaptability to different environmental conditions making them a habitat generalist. Also, this taxon has an exceptional hypoxia and anoxia tolerance (CABI, 2020).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	As this taxon is known to increases turbidity affecting aquatic community, compete with native species, can hybridize with other carp species, and is a carrier of spring viraemia virus (U.S. Fish and Wildlife Service, 2014)	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon can potentially cause major impact to the aquaculture services of the RA area due to its physiological and morphological characteristics.	High

20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon is a known carrier of spring viraemia virus of carps (U.S. Fish and Wildlife Service, 2014)	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can grow up to 64 cm (Fishbase, 2019)	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon usally occur in shallow ponds, lakes rich in vegetation and slow moving rivers (FishBase, 2019)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	According to U.S. Fish and Wildlife Service (2014) This taxon is known to increases water turbidity which can cause habitat degradation.	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	There are no evidence of established populations of the organism persisting at low density .	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This taxon is usally abundant in the absence of other fish species and it does not occur in waters with rich ichthyofauna and abundant predatory species (U.S. Fish and Wildlife Service, 2014).	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	As this taxon is known to feed on plankton, benthic invertebrates and plant materials which can be exploited at the expense of native species (Fish Base, 2019)	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just deposit their eggs to aquatic weeds which serves as a substarata(FAO, 2009)	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (Fish Base, 2019; FAO, 2009; CABI,	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	The records only shows that it can only hybridize with other carp species such as the gold fish and prucian carp (U.S. Fish and Wildlife Service, 2014)	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Medium
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	This taxon only requires a substrate where they can lay their eggs and mature (FAO, 2019)	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon can spawn 130000-250000 per female from May-June and hatches after 4-8 days (Fish Base, 2019).	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity at 1.5 years old (CABI, 2020)	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	One	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019; CABI, 2020)	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Since this taxon attahes their eggs to substares, it is possible for it to be dispersed by water currents (FAO, 2009)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Since this taxon attahes their eggs to substares, it is possible for it to be dispersed by water currents (FAO, 2009)	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (Fish Base, 2019; CABI, 2020)	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	This taxon does not have migratory characteristics (Fish Base, 2019; CABI, 2020)	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area are prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions (hypoxia and anoxia) making them a habitat generalist makes their dispersal rapid (CABI,2020).	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	High

8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive hypoxic and anoxic environments for several months (CABI, 2020)	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tollerant on high summer temperatures (up to 35°C), organic pollutants and very low oxygen levels in the water during winter and summer (U.S. Fish and Wildlife Service, 2014).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	No	There are no records on control measures for this taxon (CABI,2020)	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions and their capability to stay out of water for long periods of time, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area (CABI, 2020)	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	The maximum recorded salinity that this taxon can survive is 17 ppt, but above 15 ppt is already harmful to them (Fish Base,2019; CABI, 2020)	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that they can survive a wide range of environmental conditions and their fitness to counter act environmental tolerances, the risk of establishment of the taxon increases.	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their fitness to counter act environmental tolerances, the risk of entry through accidental release from aquarium and would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	Very high

Statistics	
Scores	
BRA	**34.0**
BRA Outcome	**Medium**
BRA+CCA	**46.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**14.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*8.0*
B. Biology/Ecology	**20.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*6.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**14**

Environmental	10
Species or population nuisance traits	26

Thresholds	
BRA	34.5
BRA+CCA	34.5
Confidence	
BRA+CCA	0.86
BRA	0.85
CCA	0.96

Date and Time
02/04/2020 08:00:01

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Clarias batrachus*
Common name	Philippine catfish
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Aquaculture and Ornamental
Risk assessment area	Lake Taal
Taxonomy	Order - Suliriformes Family - Clariidae
Native range	Indonesia
Introduced range	Philippines, Papua New Guinea, Japan, Guam, USA, Taiwan, Hongkong, China
URL	https://www.fishbase.se/summary/Clarias-batrachus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	The taxon has been successfully cultured or cultivated in many tropical countries in Southeast Asia, such as in Thailand, Sri Lanka, India and Bangladesh (CABI, 2010).	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species (CABI, 2010)	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete example is the Clarias gariepinus, which is considered to be highly invasive in Singapore and currently imposing adverse effects in the country's native species (Ng et al.,	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate.	High
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent (Southeast Asia) where the taxon is native (CABI, 2010)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon can be found in many lakes, irrigation canals and rivers in the RA area (CABI, 2010)	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon could be introduced through ornamental and aquaculture pathways and natural disasters like flooding (CABI,	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	The taxon has been widely cultured in Taiwan and Hawaii since it was introduced 100 years ago (Na-Nakorn & Brummett, 2009).	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon has already affected Philippines, Taiwan, Singapore and many Southeast Asian and American (Florida) countries wherein they displaced the local wild fish species (CABI, 2010). Also, this taxon has already caused the transmission of enteric septicemia (ESC) caused by the bacterium Edwadsiella ictaluri	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	In Florida fish farmers has already been implementing control measures to prevent the entry of this taxa on their fish cages in the ponds for aquaculture because it preys on their fish stocks (CABI, 2010).	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	This taxon has been recorded as one of the most invasive and harmful non-native species in the Gulf of Mexico ecosystem	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	In many countries, this species has already caused major socio-economic impacts wherein it affects the livelihood of the community as it displaces many native and more economically important fish species as they eat large amounts of fish stocks together with crustaceans and other invertebrates (CABI, 2010;	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has already been recorded to be infected by pathogenic bacteria, namely Aeromonas hydrophila, Escherichia coli, Vibrio cholera and Vibrio Parahaemolyticus that could pose a serius threat to human health (Chandrakala & Geethalakshmi, 2016)	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	Considering their feeding habits, wherein this taxon consumes eggs and larvae of other fishes, small fishes, crustaceans and insects and sometimes plants (Danoff-Burg, 2003).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	Considering their feeding habits, wherein this taxon consumes eggs and larvae of other fishes, small fishes, crustaceans and insects and sometimes plants (Danoff-Burg, 2003).	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon is a "hardy fish which can thrive where many other fish struggle to survive. In addition to lakes and rivers, they can be found in brackish waters or warm, stagnant, often hypoxic waters such as muddy ponds, canals, ditches, swamps and flooded prairies. They can remain dormant through periods of drought and go several months without eating" (Danoff-Burg, 2003, para. 13).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	Considering their feeding habits, wherein this taxon consumes eggs and larvae of other fishes, small fishes, crustaceans (invertebrates) and insects and sometimes plants (Danoff-Burg,	High

19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon has a record of carrying a dieses called enteric septicemia (ESC) caused by the bacterium Edwadsiella ictaluri which can infect other fish species present in the RA area including those fish in farms that produces fish for human food consumption (Danoff-Burg, 2003). Moreover, this taxon has been recorded to displace many native species because of their compulsive and opportunistic feeding habits, high fecundity and	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	Yes	This taxon has already been recorded to be infected by pathogenic bacteria, namely Aeromonas hydrophila, Escherichia coli, Vibrio cholera and Vibrio Parahaemolyticus that could pose a serius threat to human health (Chandrakala & Geethalakshmi, 2016)	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon has already been recorded to be infected by pathogenic bacteria, namely Aeromonas hydrophila, Escherichia coli, Vibrio cholera and Vibrio Parahaemolyticus that could pose a serius threat to human health (Chandrakala & Geethalakshmi, 2016)	Medium
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can achieve a maximum body size of 47.0 cm (FishBase, 2018)	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon is a "hardy fish which can thrive where many other fish struggle to survive. In addition to lakes and rivers, they can be found in brackish waters or warm, stagnant, often hypoxic waters such as muddy ponds, canals, ditches, swamps and flooded prairies" (Danoff-Burg, 2003, para. 13).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon has been recorded to displace many native species because of their compulsive and opportunistic feeding habits, high fecundity and its ability for land migration (CABI, 2010). Also, during spawning periods this taxa dig holes in order to make nests in mud of rivers and dikes which can affect the water quality and ultimately the habitat of native species (FishBase, 2018; Danoff-	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	This taxon can remain dormant up to long periods of drought by burrowing into mud and also, can survive without eating for several months (Danoff-Burg, 2003).	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Considering the feeding habits of this taxon, wherein it consumes eggs and larvae of other fishes, small fishes, crustaceans and other invertebrates which can be a native taxa (Danoff-Burg,	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	Organic debris are only 7% of their food consumption which is not detrimental to the native taxa (Sakhare & Chalak, 2014)	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	This taxon's parental care lasts only up to 24 hours following the hatching, after so, the frys are now independent and are no longer protected by their parents (Rainey, 2018).	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	This taxon is cultivated mostly in tropical/warm countries such as the RA area itself. (CABI, 2010).	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has been hybridized with many native species in other countries such as the hybrid of Clarias gariepinus and H. longifilis in Africa and Clarias macrocephalus and Clarias gariepinus hybrid in Asia (Na-Nakorn & Brummett, 2009).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Not applicable	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Low
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon mostly spawn during rainy seasons, wherein the water level in the body of water such as in river rises, thus this taxon needs to excavate in submerged mud area of the river to spawn their eggs and create a nest to protect them from water currents	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon has multiple spawning cycles and are highly fecund. They can produce an average of 8,000 offspring per spawning process which can only take 20 hours (Rainey, 2018).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	The taxon reaches its reproductive maturity 1 year after its conception (Danoff-Burg, 2003).	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	One potential pathway is aquarium released (intentional or unintentional) since this taxon has been used for ornamental purposes. Also, this taxon has the ability to "walk" or migrate on land by the help of their pectoral fins, especially after heavy rainfall (typhoon or storm) making its introduction easier into the RA area if accidentally released during natural calamities (Danoff-Burg, 2003; CABI, 2010; Rainey, 2018).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because this taxon has the ability to "walk" or migrate on land by the help of their pectoral fins, especially after heavy rainfall (typhoon or storm) thus, making its introduction easier into the RA area (Danoff-Burg, 2003; CABI, 2010; Rainey, 2018).	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata, although they mostly sessile but they only lie stationary in muddy substrates. (Danoff-Burg, 2003; CABI, 2010; Rainey, 2018).	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	This taxon's egg are very sensitive to environmental disturbances which gives them a very low survival on this stage of development (Rainey, 2018).	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	This taxon's egg are very sensitive to environmental disturbances which gives them a very low survival on this stage of development (Rainey, 2018).	High

40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	During 1968 this taxon has accomplished long distance migration via interconnected canals or by land in South Florida wherein they were able to establish their population and became invasive	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Because during these stages they are highly protected by their parents and they are highly sensitive (Rainey, 2018).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area are prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its abilities such as migrating on land and can live even with a very low oxygen level (Danoff-Burg, 2003; CABI, 2010; Rainey, 2018), thus the dispersal of this taxon can be rapid weather it is intentionally or accidentally released.	High
43	7.09	Is dispersal of the taxon density dependent?	Yes	This taxon has a record on their behavior that they participate in mass migration especially to newly flooded low lands (Rainey,	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can stay out of water up to 31 hours because they have an accessory breathing organ (ABO) which enables them to breathe atmospheric oxygen (Chandra, & Banerjee, 2013)	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Temperature: 20-26°C; pH: 6-9; Ammonia (unionized) >3.42; Ammonia (ionized) >15.78; Nitrite: >35.60 (CABI, 2010). Also, thrives on hypoxic waters such as canals and muddy ponds (Danoff-Burg, 2003)	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	In Clarias gariepinus, their morphological development was greatly affected upon exposure to chemicals such as cadmium and copper which causes reduction of pigmentation, NaPCP and malathion which causes yolk sac edema and chromium and malathion which causes deformation of the notochord in fish exposed to (Jansenn & Nguyen, 2002).	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Since the taxon has the ability to migrate on land and can live even with a very low oxygen level, this taxon can tolerate and benefit from natural calamities such as typhoon and flood which can cause their dispersal and introduction (Danoff-Burg, 2003; CABI, 2010; Rainey, 2018).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	On the study of Clarias batrachus Linnaeus and Clarias macrocephalus Gunther, it was found that they can survive in marine waters, however too much salinity level would be fatal to	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	Yes	This taxon's predators include large reptiles such as crocodiles, birds like fish eagles and their number 1 predator - humans which consumes them for food (Rainey, 2018),	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Since the RA area and the taxon's native range has both tropical climate (CABI, 2010) the risk of establishment of this taxon would most likely increase.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As this taxon abilities to counter act the climatic conditions such as typhoons and storms through their ability of migrating on land and breathing through their accessory breathing organ makes their dispersal increase.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**49.0**
BRA Outcome	**High**
BRA+CCA	**61.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**26.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**23.0**

4. Undesirable (or persistence) traits	*12.0*
5. Resource exploitation	*5.0*
6. Reproduction	*3.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*2.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**23**
Environmental	**17**
Species or population nuisance traits	**28**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.74**
BRA	**0.73**
CCA	**0.75**

Date and Time
24/02/2019 23:47:24

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Colossoma macropomum*
Common name	cachama
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquarium
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Characiformes (Characins) > Serrasalmidae (Piranhas and pacus)
Native range	South America: Amazon and Orinoco basins as wild form; pisciculture form largely distributed in
Introduced range	Asia, including Philippines
URL	https://www.fishbase.se/summary/Colossoma-macropomum.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Tropical; 22°C - 28°C https://www.fishbase.se/summary/Colossoma-macropomum.html	Very high
5	2.02	What is the quality of the climate matching data?	High	Tropical; 22°C - 28°C https://www.fishbase.se/summary/Colossoma-macropomum.html	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Freshwater; benthopelagic; pH range: 5.0 - 7.8; dH range: ? - 20; potamodromous (Ref. 51243); depth range 5 - ? m. Tropical; 22°C - 28°C (Ref. 1672); 15°S - 35°S	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High

21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Max length : 108 cm TL male/unsexed	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.fishbase.se/summary/Colossoma-macropomum.html	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	https://www.fishbase.se/summary/Colossoma-macropomum.html	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Not applicable	no data	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	no data	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
43	7.09	Is dispersal of the taxon density dependent?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	Very high
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Tambaquí (Colossoma macropomum) Ecological Risk Screening Summary U.S. Fish and Wildlife Service, August 2012 Revised, October 2016 Web Version, 6/18/2018	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.fishbase.se/summary/Colossoma-macropomum.html	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high

Statistics	
Scores	
BRA	**33.0**
BRA Outcome	**Medium**
BRA+CCA	**39.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**12.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*6.0*
B. Biology/Ecology	**21.0**
4. Undesirable (or persistence) traits	*5.0*
5. Resource exploitation	*5.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*6.0*
C. Climate change	**6.0**
9. Climate change	*6.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**11**
Environmental	**9**
Species or population nuisance traits	**24**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**

BRA	0.86
CCA	0.83

Date and Time
02/04/2020 08:00:13

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Coptodon zillii*
Common name	redbelly tilapia
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	Africa and Eurasia: South Morocco, Sahara, Niger-Benue system, rivers Senegal, Sassandra,
Introduced range	Asia, Philippines
URL	https://www.fishbase.se/summary/Coptodon-zillii.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	"This taxon is the second most important farmed fish in the Philippines produced in ponds, cages, and pens (Guerrero, 2019)."	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon has been introduced worldwide for aquaculture/farming and as food source (CABI, 2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following varieties of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The taxon's native range and the RA area both has a tropical climate (CABI, 2020; FishBase, 2020).	Very high
5	2.02	What is the quality of the climate matching data?	High	This taxon prefer tropical environments with water temperatures of 25-30ºC, and optimal temperatures of 20-32ºC. (CABI, 2020).	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon has been established in the following countries worldwide: Antigua, Ethiopia, Guam, Iraq, Israel, Japan, Jordan, Kenya, Madagascar, Mauritius, Mexico, New Caledonia, Saudi Arabia, Tanzania, Thailand, Turkey, and Uganda (U.S. Fish and Wildlife Service, 2019).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	High

13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture because of its commercial importance, which improved the economic status of the introduced range (CABI,2020).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has records of being infected by a wide range of diseases and parasites such as: Acanthogyrus tilapiae, Euclinostomum heterostomum, Posthodiplostomum sp., Amirthalingamia macracantha, Cichildogyrus tilapiae, Polyacanthorhynchus kenyensis, Cichlidogyrus amphoratus, Cichlidogyrus digitatus, Cichlidogyrus yanni, Argulus sp., Porrocaecum sp., and Strigeidae sp. (U.S. Fish and Wildlife	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality, specially it tolerates the high salinities waters and even surviving marine conditions (CABI, 2020; U.S. Fish and Wildlife Service, 2019).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal. Papa & Mamaril 2011	Very high
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon has records of being infected by a wide range of diseases and parasites such as: Acanthogyrus tilapiae, Euclinostomum heterostomum, Posthodiplostomum sp., Amirthalingamia macracantha, Cichildogyrus tilapiae, Polyacanthorhynchus kenyensis, Cichlidogyrus amphoratus, Cichlidogyrus digitatus, Cichlidogyrus yanni, Argulus sp., Porrocaecum sp., and Strigeidae sp. (U.S. Fish and Wildlife	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 40 cm (U.S. Fish and Wildlife Service, 2019).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality, specially it tolerates the high salinities waters and even surviving marine conditions (CABI, 2020; U.S. Fish and Wildlife Service, 2019).	Very high

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for native aquatic species.	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	no record	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	Sinice this taxon is herbivorous, wherein, the adults mainly feeds on leaves and stems of underwater plants as well as algae and vegetative detritus (FishBase, 2019).	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites (USGS, 2020).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Although this taxon is a substrate spawner, both parents form pairs to protect the young, eggs and larvae are usually guarded in a pit dug in the mud (FishBase, 2020).	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires a substrate and nesting sites in order for the egss to mature (FishBase, 2019; CABI, 2020).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing upto 6000 eggs per spawn which hatches within 96 hours after spawning, and juveniles swim freely about 4-6 days after (FishBase, 2019; CABI, 2020).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	Not applicable	There are no records about this taxon's age of maturity.	Medium
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxon's commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020).	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020).	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Since this taxon can tolerate and adapt to differen water conditions such as from freshwater to marine waters, this taxon can move between water bodies (CABI, 2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Since this taxon can tolerate and adapt to differen water conditions such as from freshwater to marine waters, this taxon can move between water bodies (CABI, 2020).	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	This taxon has records of migrating in long distances as they escaped from aquaculture farms during loading-harvesting or via containment failures or when the cold temperatures set in, they migrate to deeper waters (IUCNGSID, 2020; Smithsonian Marine	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	No	Since the eggs of the toaxon are adhessivley laid directly on the substrate within the excavated nest in which it is guarded by its parents it is unlikey that it will be disperesed by other taxon (CABI, 2020).	Very high
43	7.09	Is dispersal of the taxon density dependent?	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records about this taxon's density dependence.	Low
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Not applicable	There are no records about this.	Low
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	This taxon is tolerant of a range of conditions such as Ammonium (mg/l): 0.02-0.5, Dissolved oxygen: 5-20, Salinity (part per thousand) 35-40, Water pH (pH): 6-9 and Temperature: 10.5 - 36°C (U.S. Fish and Wildlife Service, 2019; CABI, 2020).	Very high

47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	In Florida, the Freshwater and Game Commission used retenone to eradicate this taxon (CABI, 2020).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate a wide range of salinity from 35 to 40 ppt (CABI, 2020).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Channa striata can be a predator of this taxon which is present in the RA area (CABI, 2020).	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) which would increase the taxon's rate of dispersal and since they have the ability to survive the cilamatic conditions of a tropical waters, the following negative impacts might also happen in the RA area: In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) which would increase the taxon's rate of dispersal and since they have the ability to survive the cilamatic conditions of a tropical waters, the following negative impacts might also happen in the RA area: In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) which would increase the taxon's rate of dispersal and since they have the ability to survive the cilamatic conditions of a tropical waters, the following negative impacts might also happen in the RA area: In Salton Sea, California, this taxon have caused in the decline of population of desert pupfish (Cyprinodon macularius). In Florida, it has records of being highly aggressive; which makes it a serious threat to native aquatic plants and to fish that rely on plants for cover, foraging, or spawning sites In Hyco Reservoir, North Carolina, this taxon has eliminated all aquatic macrophytes from the reservoir, together with the decline of native species (USGS, 2020). Further more, According to U.S. Fish and Wildlife Service (2019) this taxon can alter ecosystems processes (e.g. nutrient cycling, disturbance, productivity, etc.) and ecosystem services (e.g. waste decomposition, water supply, soil regeneration and protection) and habitat destruction for	High

Statistics	
Scores	
BRA	**43.0**
BRA Outcome	**High**
BRA+CCA	**55.0**
BRA+CCA Outcome	**High**

Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**21.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*4.0*
8. Tolerance attributes	*3.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**18**
Environmental	**12**
Species or population nuisance traits	**31**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.82**
BRA	**0.83**
CCA	**0.75**

Date and Time
03/05/2021 00:53:05

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Ctenopharyngodon idella*
Common name	grass carp
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Xenocyprididae (East Asian minnows)
Native range	Eastern China and Russia
Introduced range	Central and South East Asia
URL	https://www.fishbase.se/summary/Ctenopharyngodon-idella.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	In western Europe and USA, grass carp has been used as a biological weed control agent for which it has been introduced. In India, grass carp is one of the species used in the so-called composite culture of Indian major carp and Chinese carp. In other countries they eventually became an important aquaculture species, being farmed commercially (CABI, 2019).	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for commercial fisheries and is also valued as a game fish for anglers in other countries such as Poland and Czech Republic due to its size and peculiar feeding habits (CABI, 2019).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which having its impacts in the Mississippi River and surrounding waters (USDA, 2019)	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate. (FishBase 2020)	Very high
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent where the taxon is native (CABI, 2019)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to used as a food source (NACA, 2013)	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to used as a food source (NACA, 2013)	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which having its impacts in the Mississippi River and surrounding waters (USDA, 2019)	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Overstocking of grass carp cause a large influx of nutrients derived from the carp faeces and a fast or substantial decrease of macrophytes in lakes and ponds and as a results it reduces the spawning sites for other fishes, phytoplankton blooms, a decrease in the invertebrate numbers and diversity, disruption of macroinvertebrate food base and consequent reduction in centrarchid biomass in a reservoir and prevention of spawning	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	The taxon caused changes in water quality in lakes as a result of drastic reduction of macrophytes by the grass carp include a decrease in dissolved oxygen and increase in carbon dioxide levels such as in a lake in Yugoslavia, and increase in Kjeldahl nitrogen and significant decrease in pH in a lake in Florida (CABI ,2019).	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	The introduction of the taxon in many countries has generally resulted in a positive economic impact due to increase in aquaculture production and fisheries production in inland waters	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of the taxon in many countries has generally resulted in a positive economic impact due to increase in aquaculture production and fisheries production in inland waters.	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no records of the taxon posing risk to human health. Fishbase 2020	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	Since this taxon only eats aquatic plants/vegetation (IUCNGSID, 2019)	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	Since this taxon only eats aquatic plants/vegetation (IUCNGSID, 2019)	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	The taxon is highly adaptable and tolerant, which may explain its widespread and successful introductions (CABI, 2019)	Very high

18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Overstocking of grass carp cause a large influx of nutrients derived from the carp faeces and a fast or substantial decrease of macrophytes in lakes and ponds and as a results it reduces the spawning sites for other fishes, phytoplankton blooms, a decrease in the invertebrate numbers and diversity, disruption of macroinvertebrate food base and consequent reduction in centrarchid biomass in a reservoir and prevention of spawning	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	The introduction of the taxon in many countries has generally resulted in a positive economic impact due to increase in aquaculture production and fisheries production in inland waters	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal (Papa & Mamaril, 2011).	Very high
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon can carry diseases such as viral viruses (rhabdoviruses & herpesviruses), bacterial deseases (flexibacter &Aeromonas) and fungal deseases (Behrmann-Godel, 2015).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 150 cm (Fish Base,2019).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	During spawning, this taxon migrate long distances to seek turbulent waters to spawn (IUCNGSID, 2019).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	Overstocking of grass carp cause a large influx of nutrients derived from the carp faeces and a fast or substantial decrease of macrophytes in lakes and ponds and as a results it reduces the spawning sites for other fishes, phytoplankton blooms, a decrease in the invertebrate numbers and diversity, disruption of macroinvertebrate food base and consequent reduction in centrarchid biomass in a reservoir and prevention of spawning	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	The viablity of this taxon is influence by stocking density and size/age at stocking (CABI, 2019).	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	Since this taxon only eats aquatic plants/vegetation (IUCNGSID, 2019)	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Overstocking of grass carp cause a large influx of nutrients derived from the carp faeces and a fast or substantial decrease of macrophytes in lakes and ponds and as a results it reduces the spawning sites for other fishes, phytoplankton blooms, a decrease in the invertebrate numbers and diversity, disruption of macroinvertebrate food base and consequent reduction in centrarchid biomass in a reservoir and prevention of spawning	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just spawn their eggs, left to drift downstream and are very much dependant on adequate oxygen flow, that is why usually they require long river streches of turbulent rising waters (IUCNGSID, 2019).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (IUCNGSID, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	There are already records of different hybrid forms of this taxon (CABI, 2019)	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Yes	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	The taxon just spawn their eggs, left to drift downstream and are very much dependant on adequate oxygen flow, that is why usually they require long river streches of turbulent rising waters (IUCNGSID, 2019).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	The taxon have a huge reproductive capacity with females producing 500,000-700,000 eggs and over 1,000,000 eggs in its native range (IUCNGSID, 2019).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 3-5 years old (CABI, 2019)	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	The taxon can enter the RA area through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape. (IUCNGSID, 2019).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture pathway could bring this taxon in close proximity to one or more protected areas.	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (CABI, 2019)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Since this taxon spawn their eggs in high water velocities, it is possible for it to be dispersed by water currents (IUCNGSID, 2019).	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Since this taxon spawn their eggs in high water velocities, it is possible for it to be dispersed by water currents (IUCNGSID, 2019).	High

40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	This taxon migrates to spawn (IUCNGSID, 2019).	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon spawn their eggs in high water velocities, it is possible for it to be dispersed by water currents, making it available for preadation and dispersion of other animals	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets and in aquaculture farms can be rapidly disperesed, knowing also the fact that they are tolerant to changes in environmetal conditions (CABI, 2019).	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive out of water for a long time (Anglersnet.co.uk, 2019).	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions may inhabit temperatures of 0-33° C, oxygen levels as low as 0.5 ppm, and salinities as great as 10 ppt, although it is reported as capable of tolerating much greater salinities (IUCNGSID, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	"In Michigan, the introduction of sterile males or monosex tetraploids could be an effective measure taken to reduce the reproductive success of grass carp (Status and Strategy for Grass Carp Management, 2019)."	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions it can benefit from environmental/human distrubances (CABI, 2019).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate salinities as great as 10 ppt, although it is reported as capable of tolerating much greater salinities (IUCNGSID, 2019).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from commercial fish farms would most likely increase the entry of this	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to spawn in high water volocity would most likely increase the dispersal of this taxon.	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to spawn in high water volocity would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Lower	According to CABI (2019), this taxon is environmentally safe, damage to native and introduced fisheries would be minimal, harmful effect of weed removal by fish would be much less than by herbicide or mechanical means.	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Lower	According to CABI (2019), this taxon is environmentally safe, damage to native and introduced fisheries would be minimal, harmful effect of weed removal by fish would be much less than by herbicide or mechanical means.	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Lower	According to CABI (2019), this taxon is environmentally safe, damage to native and introduced fisheries would be minimal, harmful effect of weed removal by fish would be much less than by herbicide or mechanical means.	Very high

Statistics	
Scores	
BRA	**39.0**
BRA Outcome	**High**
BRA+CCA	**39.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**17.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*10.0*
B. Biology/Ecology	**22.0**
4. Undesirable (or persistence) traits	*6.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*5.0*
8. Tolerance attributes	*7.0*
C. Climate change	**0.0**
9. Climate change	*0.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**

4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**13**
Environmental	**-1**
Species or population nuisance traits	**32**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.87**
BRA	**0.86**
CCA	**0.96**

Date and Time
03/05/2021 00:53:16

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Cyprinus carpio*
Common name	common carp
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Europe to Asia: Black, Caspian and Aral Sea basins.
Introduced range	Introduced throughout the world
URL	https://www.fishbase.se/summary/Cyprinus-carpio.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	In China, this taxon has been cultivated for human consumption for 3000 years and in 1997 more than 250 000 tonnes of carp for human consumption were produced (IUCNGSID, 2019).	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	At least 80 species of this taxon are harvested as a fishery resource today, and many of them are now exploited as a source of protein around the world. The production of C. Carpio is the second highest farmed fish production in the world, specially in Asia. Also, this taxon are important in aquarium culture industry, including ornamental varieties known as \"koi\" in china	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which are causing now negative impacts in the Mississippi River and surrounding waters (USDA, 2019).	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical to subtropical climate. FishBase 2020	Very high
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent where the taxon is native (CABI, 2019).	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source and also for ornametnal purposes (NACA, 2013).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source and also for ornametnal purposes (NACA, 2013).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which are now having its negative impacts in the Mississippi River and surrounding waters (USDA, 2019).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon destroys the spawning substrata, consumes eggs of native species and competes with species having similar feeding habit causing the decline of the populations of native species	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon destroys the spawning substrata, consumes eggs of native species and competes with species having similar feeding habit causing the decline of the populations of native species. Also, (CABI, 2019).	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	By stirring up river substrate and reducing aquatic vegetation, this taxon can make waterways unattractive and can render the water unsuitable for swimming or for drinking by livestock (IUCNGSID, 2019).	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture which improved the economic status of the introduced range (CABI,2019).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no records of the taxon posing risk to human health.FishBase 2020	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon has a record of preying on macroinvertebrates and on the eggs of native fish species, which can drive native species extinction (IUCNGSID, 2019).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon has a record of preying on macroinvertebrates and on the eggs of native fish species, which can drive native species extinction (IUCNGSID, 2019).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon can still grow on eutrophic waters and has the ability to tolerate adverse environmental conditions (CABI, 2019).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	This taxon destroys the spawning substrata, consumes eggs of native species and competes with species having similar feeding habit causing the decline of the populations of native species	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	By stirring up river substrate and reducing aquatic vegetation, this taxon can make waterways unattractive and can render the water unsuitable for swimming or for drinking by livestock (IUCNGSID, 2019).	High

20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal. (Papa & Mamaramil, 2011)	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon can carry diseases such as viral viruses (rhabdoviruses & herpesviruses), bacterial deseases (flexibacter &Aeromonas) and fungal deseases (Behrmann-Godel, 2015).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 120 cm (Fish Base,2019).	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon inhabits only still or slowly flowing waters (IUCNGSID, 2019).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments during feeding which results in increased siltation and bioturbidity reducing water quality and degrading aquatic habitats (IUCNGSID, 2019).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	Low
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	This taxon destroys the spawning substrata, consumes eggs of native species and competes with species having similar feeding habit causing the decline of the populations of native species, that is why they are likely to consume thereatened or protected native taxa in the RA area (CABI, 2019).	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	This increase nutrients in the water colum by sediment resuspension and by excretion (IUCNGSID, 2019).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just spawn their eggs and it attaches to substratum (IUCNGSID, 2019).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (IUCNGSID, 2019)	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (IUCNGSID, 2019)	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires a substrata for their eggs, specifically floodplains, slow flowing pools, and other shallow habitats with dense macrophyte covers (IUCNGSID, 2019).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	The taxon have a huge reproductive capacity with females producing up to 100,000 - 300,000 eggs (IUCNGSID, 2019).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity at 1 years old (IUCNGSID, 2019).	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture and ornamental pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (CABI, 2019)	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Since this taxon migrates to spawn and they attaches their eggs on subtrata, the eggs of this taxon could be taken by water currents (IUCNGSID, 2019).	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Since this taxon migrates to spawn and they attaches their eggs on subtrata, the eggs of this taxon could be taken by water currents (IUCNGSID, 2019).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	This taxon migrates to suitable backwaters and flooded meadows to spawn (FishBase, 2019).	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon migrates to spawn and they attaches their eggs on subtrata, the eggs of this taxon could be taken by water currents (IUCNGSID, 2019).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial ornamental markets and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive out of water for a long time (Anglersnet.co.uk, 2019).	High

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions such as pH range of 7.0 to 7.5, temperature of 3°C to 32°C, Carbon Dioxide (mg/l): <10 preferred, <20 tolerated and salinity: <1 preferred, <5 tolerated (CABI, 2019 & IUCNGSID, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	In USA, rotenone, a non-selective natural chemical that is relatively safe is used to control the taxon. Also, bio-control of carp using the Spring Viraemia of Carp Virus (SVCV) (Rhabdovirus carpio), fatal gene technology, inducible sterility gene and Integrated Pest Management has been used (IUCNGSID, 2019).	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions it can benefit from environmental/human distrubances (CABI, 2019).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate relatively high salinities. They are known to survive brackish water of up to 17 500 mg L–1 salinity (IUCNGSID, 2019).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to still grow on eutrophic waters and to tolerate adverse environmental conditions, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	The ability of this taxon to still grow on eutrophic waters and to tolerate adverse environmental conditions, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon, the risk of establishment of the taxon increases.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their migratory behavior would most likely increase the dispersal of this taxon.	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon has the ability can stir up bottom sediments during feeding which results in increased siltation and bioturbidity reducing water quality and degrading aquatic habitats (IUCNGSID, 2019).	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since this taxon has the ability can stir up bottom sediments during feeding which results in increased siltation and bioturbidity reducing water quality and degrading aquatic habitats and they destroys spawning substrata, consumes eggs of native species and competes with species having similar feeding habit causing the decline of the populations of native species (IUCNGSID, 2019).	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Since this taxon has the ability to stir up bottom sediments during feeding which results in increased siltation and bioturbidity reducing water quality and degrading aquatic habitats, they can make waterways unattractive and can render the water unsuitable for swimming or for drinking by livestock in the RA area.	Very high

Statistics	
Scores	
BRA	**48.0**
BRA Outcome	**High**
BRA+CCA	**60.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**21.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**27.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*5.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*5.0*
8. Tolerance attributes	*7.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*

Sectors affected	
Commercial	17
Environmental	17
Species or population nuisance traits	31

Thresholds	
BRA	34.5
BRA+CCA	34.5
Confidence	
BRA+CCA	0.86
BRA	0.86
CCA	0.83

Date and Time
03/05/2021 00:53:29

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Gambusia affinis*
Common name	western mosquitofish
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	aquarium: commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cyprinodontiformes (Rivulines, killifishes and live bearers) >
Native range	North and Central America:
Introduced range	Laos, Malaysia, Thailand, VietNam, Philippines stc.
URL	https://www.fishbase.se/summary/Gambusia-affinis.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is regarded as a mosquito-control agent, that is why it has been stocked routinely and indiscriminately in temperate and tropical areas around the world resulting in a wide distribution, making them the most widespread freshwater fish in the world	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets or aquarium species and as a mosquito-control agent (CABI, 2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Once concerete example is the Poecilia latipinna which already have records of invasion and its associated negative impacts. According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native ranges obtained a high score in the climate matching using the Climatch application.	Very high
5	2.02	What is the quality of the climate matching data?	High	Data from Climatch were used to facilitate the climate analysis.	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon is regarded as a mosquito-control agent, that is why it has been stocked routinely and indiscriminately in temperate and tropical areas around the world resulting in a wide distribution, making them the most widespread freshwater fish in the world	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. This taxon may negatively affect fish populations, specially small fishes through predation and competition. Altough regarded as a mosquito-control agent, in some habitats, there are records that this taxon has displaced some native fish species which is considered as more efficient in mosquito control. Also, it caused the displacement or decline of populations of federally endangered and threatened species such as in Nevada and Arizona, it reduced the number of Railroad Valley springfish (Crenichthys baileyi) and the Sonoran topminnow (Poeciliopsis occidentalis) respectively. Moreover, mosquitofish are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. This taxon may negatively affect fish populations, specially small fishes through predation and competition. Altough regarded as a mosquito-control agent, in some habitats, there are records that this taxon has displaced some native fish species which is considered as more efficient in mosquito control. Also, it caused the displacement or decline of populations of federally endangered and threatened species such as in Nevada and Arizona, it reduced the number of Railroad Valley springfish (Crenichthys baileyi) and the Sonoran topminnow (Poeciliopsis occidentalis) respectively. Moreover, mosquitofish are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers	Very high

12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. This taxon may negatively affect fish populations, specially small fishes through predation and competition. Altough regarded as a mosquito-control agent, in some habitats, there are records that this taxon has displaced some native fish species which is considered as more efficient in mosquito control. Also, it caused the displacement or decline of populations of federally endangered and threatened species such as in Nevada and Arizona, it reduced the number of Railroad Valley springfish (Crenichthys baileyi) and the Sonoran topminnow (Poeciliopsis occidentalis) respectively. Moreover, mosquitofish are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	This taxon is a very popular ornamental fish and live feed for large fishes commercially sold in per stores, which gave fish pet traders income (CABI, 2020).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has records of being an intermediate host of nematodes of genus Falcaustra which typically infest reptile or amphibian hosts (Smithsonian Institution, 2020).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. Also, it caused the displacement or decline of populations of federally endangered and threatened species in some introduced areas, Moreover, they are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers (USGS, 2020; CABI, 2020; U.S. Fish and	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. Also, it caused the displacement or decline of populations of federally endangered and threatened species in some introduced areas, Moreover, they are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers (USGS, 2020; CABI, 2020; U.S. Fish and	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Compared to other species, this taxon is more tolerant of pollution. It tolerates waters with low dissolved oxygen levels, high salinities (including twice that of sea water) and temperatures of up to 42°C for short periods (U.S. Fish and	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. This taxon may negatively affect fish populations, specially small fishes through predation and competition. Altough regarded as a mosquito-control agent, in some habitats, there are records that this taxon has displaced some native fish species which is considered as more efficient in mosquito control. Also, it caused the displacement or decline of populations of federally endangered and threatened species such as in Nevada and Arizona, it reduced the number of Railroad Valley springfish (Crenichthys baileyi) and the Sonoran topminnow (Poeciliopsis occidentalis) respectively. Moreover, mosquitofish are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. This taxon may negatively affect fish populations, specially small fishes through predation and competition. Altough regarded as a mosquito-control agent, in some habitats, there are records that this taxon has displaced some native fish species which is considered as more efficient in mosquito control. Also, it caused the displacement or decline of populations of federally endangered and threatened species such as in Nevada and Arizona, it reduced the number of Railroad Valley springfish (Crenichthys baileyi) and the Sonoran topminnow (Poeciliopsis occidentalis) respectively. Moreover, mosquitofish are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes, and it can also induce algal blooms when they eat the zooplankton grazers	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon has records of being an intermediate host of nematodes of genus Falcaustra which typically infest reptile or amphibian hosts (Smithsonian Institution, 2020).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Ths taxon can only reach a body size, having a maximum length of 4 cm (Fish Base, 2019).	High

23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon commonly inhabit lower reaches of streams, where they inhabit brackish, standing to slow-flowing water (IUCNGSID, 2020).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can induce algal blooms when they eat the zooplankton grazers (USGS, 2020; CABI, 2020; U.S. Fish and Wildlife Service, 2017).	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	This taxon require a high density of refuges to maintain populations at or near their asymptotic density (USGS, 2020).	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Among Poecillids species, this taxon have had the greatest ecological impact so far. It is due to their aggressiveness and predatory behavior. Also, it caused the displacement or decline of populations of federally endangered and threatened species in some introduced areas, Moreover, they are known to prey on eggs, larvae, juveniles and even adults of smaller species of various fishes (USGS, 2020; CABI, 2020; U.S. Fish and Wildlife	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	This organism can compete with food source of native species as they consume plants and algal matter, periphyton, aquatic invertebrates and mosquito larvae/pupae (CABI, 2020).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they are live bearing fishes (CABI, 2020).	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable them to produce a viable gametes (Fish Base, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has record of interbreeding with Gambusia heterochir (U.S. Fish and Wildlife Service, 2017).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	There are no requirments for this taxon being dependent on the other taxon since they are livebearers (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon produces broods of 1-300 youngs after 21-28 days of gestation (U.S. Fish and Wildlife Service, 2017).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity in 1 month (Smithsonian Institution, 2020).	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	One	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019)	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since this taxon is a livebearer fish (CABI, 2020).	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (CABI 2020, IUCNGSID, 2020).	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon does not exhibit parental care, it makes the broods available for preadation and dispersion by other animals (CABI, 2020).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area is prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions making them a habitat generalist makes their dispersal rapid	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records that this taxon is density dependent in terms of dispersal.	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records that this taxon is density dependent in terms of dispersal.	Low

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Water pH: 6-8, Temperature: 12°C - 42°C, and Salinity: <16 ppt (optimum) (CABI, 2020; IUCNGSID, 2020).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	There are record that this taxon was chemically controlled using retenone (IUCNGSID, 2020; CABI, 2020).	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	As this taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats and to give birth to live offspring, and they grow in fast rates, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Since this taxon is a hardy species, it can survive high salinities which includes as much as twice that of sea water (IUCNGSID, 2020).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Micropterus salmoides can predate this taxon in the RA area (Guerrero, 2014).	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that this taxon can survive a wide range of environmental conditions,(they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, and they grow in fast rates), the risk of establishment of the taxon increases (CABI , 2020).	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) together with their ability to survive a wide range of environmental conditions (temperature, salinity,low oxygen level, disturbed habitats and etc.) the risk of entry through accidental release from aquarium would most likely increase the dispersal of this taxon.	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**45.0**
BRA Outcome	**High**
BRA+CCA	**57.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**21.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**24.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*7.0*
6. Reproduction	*4.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*

6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**17**
Environmental	**17**
Species or population nuisance traits	**28**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**
BRA	**0.85**
CCA	**0.83**

Date and Time
03/05/2021 00:52:08

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Hypophthalmichthys molitrix*
Common name	silver carp
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	commercial; aquaculture: commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Xenocyprididae (East Asian minnows)
Native range	Native to most major Pacific dainages of East Asia from Amur to Xi Jiang, China
Introduced range	Taiwan, Japan, Israel, Malaysia, Philippines etc
URL	https://www.fishbase.se/summary/Hypophthalmichthys-molitrix.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon have been introduced around the world for aquaculture purposes and also for controlling excessive growth of phytoplankton in natural waters (IUCNGSID, 2019).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for human consumption (IUCNGSID, 2019).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which having its impacts in the Mississippi River and surrounding waters (USDA, 2019)	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate.	High
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent where the taxon is native (IUCNGSID, 2019)	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (NACA, 2013)	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019)	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to used as a food source (NACA, 2013)	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which having its impacts in the Mississippi River and surrounding waters (USDA, 2019)	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon have the potential to reduce native diversity by being a competitor with some native fishes for food source, for instance, gizzard shad, that also rely on plankton for food, altering the food web . Also, this taxon have also been found to carry and transmit the disease Salmonella typhimurium (IUCNGSID & USGS, 2019).	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon have the potential to reduce native diversity by being a competitor with some native fishes for food source, for instance, gizzard shad, that also rely on plankton for food, altering the food web . Also, this taxon have also been found to carry and transmit the disease Salmonella typhimurium (IUCNGSID & USGS, 2019).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	In USA, this taxon a pose considerable hazards to fishermen and waterskiers, due to the ability of this taxon to jump up to six feet high out of the water causing damage by landing in boats and causing human injuries. Also, people in some states of America such as western Kentucky, Missouri, and Illinois try to prevent this taxon beacuse it destroys the sport and commercial fisheries, and endangering recreational boaters and water skiers (CABI,2019).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	In USA, this taxon a pose considerable hazards to fishermen and waterskiers, due to the ability of this taxon to jump up to six feet high out of the water causing damage by landing in boats and causing human injuries. Also, people in some states of America such as western Kentucky, Missouri, and Illinois try to prevent this taxon beacuse it destroys the sport and commercial fisheries, and endangering recreational boaters and water skiers (CABI,2019).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon have been found to carry and transmit the disease Salmonella typhimurium which can infect humans (IUCNGSID,	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	According to Stone et al. (2000) this taxon feeds only zooplankton, along with larger phytoplankton, making them filter feeders using their fine, comb-like gill rakers to strain tiny animals and large algae from the water, that is why they are less likely to smother on or more native taxa (IUCNGSID, 2019).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	According to Stone et al. (2000) this taxon feeds only zooplankton, along with larger phytoplankton, making them filter feeders using their fine, comb-like gill rakers to strain tiny animals and large algae from the water, that is why there are no protected taxa that this taxon would parasite (IUCNGSID, 2019).	Very high

17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon can tolerate extreme water temperatures and highly turbid waters and can therefore be cultured in many areas (CABI, 2019).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Thus they compete with the populations of native species that rely on plankton for food. These include all larval fishes, some adult fishes, and	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	In USA, this taxon a pose considerable hazards to fishermen and waterskiers, due to the ability of this taxon to jump up to six feet high out of the water causing damage by landing in boats and causing human injuries. Also, people in some states of America such as western Kentucky, Missouri, and Illinois try to prevent this taxon beacuse it destroys the sport and commercial fisheries, and endangering recreational boaters and water skiers (CABI,2019).	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	Very high
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon have been found to carry and transmit the disease Salmonella typhimurium which can infect humans (IUCNGSID, 2019).	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 105 cm (Fish Base,2019).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon inhabits lakes, rivers and reservoirs and they normally dwell in the upper layer of the water column and prefers high fertility water with abundant natural food.Also, according to Stone et al. (2000) this taxon is native to large rivers and will not spawn in still waters or small streams (IUCNGSID, 2019).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	This taxon has been used extensively in the management of inland waters which resulted in the prevention of intense blooms of phytoplankton particularly blue-green algae, and the increase in biomass of zoobenthos especially chironomids (CABI, 2019)	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This taxon only competes with some native fishes for food source, for instance, gizzard shad, that also rely on plankton for food, altering the food web, that is why they are less likely to consume thereatened or protected native taxa in the RA area (IUCNGSID,	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	This taxon have the potential to reduce native diversity by being a competitor with some native fishes for food source, for instance, gizzard shad, that also rely on plankton for food, altering the food web (IUCNGSID & USGS, 2019).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just spawn their eggs after migration (IUCNGSID, 2019).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (IUCNGSID, 2019).	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has been reported to be capable of hybridizing in the wild (CABI, 2019).	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires bodies of water with some current for eggs to float and develop properly (IUCNGSID, 2019).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	The taxon have a huge reproductive capacity with females producing up to 5,400 eggs (IUCNGSID, 2019).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	This taxon reaches the age of maturity at 2-4 years old (USGS, 2019).	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture pathway could bring this taxon in close proximity to one or more protected areas.	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (CABI, 2019).	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	This taxon requires bodies of water with some current for eggs to float and develop properly, making it possible for the taxon to be dispersed by water currents (IUCNGSID, 2019).	Very high

39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	This taxon requires bodies of water with some current for eggs to float and develop properly, making it possible for the taxon to be dispersed by water currents (IUCNGSID, 2019).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	This taxon is known to migrate to their communal spawning grounds during spring flooding (IUCNGSID, 2019).	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	This taxon requires bodies of water with some current for eggs to float and develop properly, making it possible for the taxon to be dispersed by water currents and by other animals (IUCNGSID,	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this taxon (CABI, 2019).	Very high
43	7.09	Is dispersal of the taxon density dependent?	Yes	This taxon prefer to spawn in small groups of 15 to 25 fish (IUCNGSID, 2019).	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive out of water for a long time (Anglersnet.co.uk, 2019).	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon can tolerate salinities up to 12 ppt and low dissolved oxygen (3mg/L) (USGS, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	There are no records about their eradication through chemical, biological and other agents.	Low
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions it can benefit from environmental/human distrubances (CABI, 2019).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate up to 12 ppt of salinity (USGS, 2019).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from commercial fish farms would most likely increase the entry of this	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that they can survive a wide range of environmental conditions, the risk of establishment of the taxon increases.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their migratory behavior would most likely increase the dispersal of this taxon.	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Making them a competetor with the populations of native species that rely on plankton for food which include all larval fishes, some adult fishes,	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Lower	This taxon has been used extensively in the management of inland waters which resulted in the prevention of intense blooms of phytoplankton particularly blue-green algae, and the increase in biomass of zoobenthos especially chironomids (CABI, 2019).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	In USA, this taxon a pose considerable hazards to fishermen and waterskiers, due to the ability of this taxon to jump up to six feet high out of the water causing damage by landing in boats and causing human injuries. Also, people in some states of America such as western Kentucky, Missouri, and Illinois try to prevent this taxon beacuse it destroys the sport and commercial fisheries, and endangering recreational boaters and water skiers (CABI,2019).	Very high

Statistics	
Scores	
BRA	**49.0**
BRA Outcome	**High**
BRA+CCA	**57.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**25.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**24.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*2.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*6.0*
8. Tolerance attributes	*8.0*
C. Climate change	**8.0**
9. Climate change	*8.0*

Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**21**
Environmental	**7**
Species or population nuisance traits	**34**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.88**
BRA	**0.88**
CCA	**0.88**

Date and Time
03/05/2021 00:53:42

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Hypophthalmichthys nobilis*
Common name	bighead carp
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Fisheries: highly commercial; aquaculture: commercial; aquarium: public aquariums
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Xenocyprididae (East Asian minnows)
Native range	Asia:China
Introduced range	Introduced to numerous countries and has achieved a near global distribution.
URL	https://www.fishbase.se/summary/Hypophthalmichthys-nobilis.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	The taxon have reportedly become well established in the Missouri River and their proportion in the commercial harvest has increased since 1990. This taxon are now found within or along the borders of at least 23 states in the USA and are reportedly growing in number in many midwestern rivers (CABI, 2019).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for commercial fisheries and according to Stone et al. (2000) "In worldwide aquaculture, Aristichthys nobilis ranks fourth in production (2.8 billion pounds in 1995)" (IUCNGSID, 2019).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which having its impacts in the Mississippi River and surrounding waters (USDA, 2019)	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate.	High
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent where the taxon is native (CABI, 2019)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (NACA, 2013)	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to used as a food source (NACA, 2013)	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	One concrete examples are the bighead carp, black carp, grass carp, and silver carp which having its impacts in the Mississippi River and surrounding waters (USDA, 2019)	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Making them a competetor with the populations of native species that rely on plankton for food which include all larval fishes, some adult fishes,	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Making them a competetor with the populations of native species that rely on plankton for food which include all larval fishes, some adult fishes,	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	The introduction of this taxon gave an additional source of cheap and much needed protein for the improvement of human nutrition in many countries.Also, hatcheries and growout farms of this taxon provided jobs that help upgrade the standard of living of the workers and their families (CABI, 2019).	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon gave an additional source of cheap and much needed protein for the improvement of human nutrition in many countries.Also, hatcheries and growout farms of this taxon provided jobs that help upgrade the standard of living of the workers and their families (CABI, 2019).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no records of the taxon posing risk to human health.	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	According to Stone et al. (2000) this taxon feeds only zooplankton, along with larger phytoplankton, making them filter feeders using their fine, comb-like gill rakers to strain tiny animals and large algae from the water, that is why they are less likely to smother on or more native taxa (IUCNGSID, 2019).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	According to Stone et al. (2000) this taxon feeds only zooplankton, along with larger phytoplankton, making them filter feeders using their fine, comb-like gill rakers to strain tiny animals and large algae from the water, that is why there are no protected taxa that this taxon would parasite (IUCNGSID, 2019).	Very high

17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon can tolerate extreme water temperatures and highly turbid waters and can therefore be cultured in many areas. (CABI, 2019).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Thus they compete with the populations of native species that rely on plankton for food. These include all larval fishes, some adult fishes, and	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	The introduction of the taxon in many countries has generally resulted in a positive economic impact due to increase in aquaculture production and fisheries production in inland waters	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon can carry diseases such as Pseudomonas fluorescens, Pseudomonas putida, Salmonella enterica, Lepeophtheirus salmonis (salmon louse) and Caligus rogercresseyi (Sea louse) (Purdue Asian Carp Pathogen Report, 2014)	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 146 cm (Fish Base,2019).	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon inhabits lakes, rivers and reservoirs and they normally dwell in the upper layer of the water column and prefers high fertility water with abundant natural food.Also, according to Stone et al. (2000) this taxon is native to large rivers and will not spawn in still waters or small streams (IUCNGSID, 2019).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	This taxon has been used extensively in the management of inland waters which resulted in the prevention of intense blooms of phytoplankton particularly blue-green algae, and the increase in biomass of zoobenthos especially chironomids (CABI, 2019)	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	Low
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	According to Stone et al. (2000) this taxon feeds only zooplankton, along with larger phytoplankton, making them filter feeders using their fine, comb-like gill rakers to strain tiny animals and large algae from the water, that is why they are less likely to consume thereatened or protected native taxa in the RA	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Thus they compete with the populations of native species that rely on plankton for food. These include all larval fishes, some adult fishes, and	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they just spawn their eggs after migration (IUCNGSID, 2019).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (IUCNGSID, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has been reported to be capable of hybridizing in the wild (CABI, 2019).	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon is a semi-migratory fish, its broodstock migrate from lakes to rivers, until it reaches the spawning ground in the upper reaches of the major rivers in its native range. Also, they reuquire flowing water and changes in water level as an environmental stimuli for natural spawning (IUCNGSID, 2019).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	The taxon have a huge reproductive capacity with females producing up to 100,000 eggs (IUCNGSID, 2019).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	This taxon reaches the age of maturity at 2-3 years old (Nico et al., 2019)	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	Accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape (IUCNGSID, 2019)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (CABI, 2019)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	This taxon is a semi-migratory fish and flowing water and changes in water level are essential environmental stimuli for natural spawning , making it possible for the taxon to be dispersed by water currents (IUCNGSID, 2019).	Very high

39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	This taxon is a semi-migratory fish and flowing water and changes in water level are important environmental stimuli for natural spawning , making it possible for the taxon to be dispersed by water currents (IUCNGSID, 2019).	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	This taxon is a semi-migratory fish, its broodstock migrate from lakes to rivers, until it reaches the spawning ground in the upper reaches of the major rivers in its native range (IUCNGSID, 2019).	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	This taxon is a semi-migratory fish and flowing water and changes in water level are important environmental stimuli for natural spawning , making it possible for the eggs to be dispersed by other animals (IUCNGSID, 2019).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this taxon (CABI, 2019).	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	This taxon can survive out of water for a long time (Anglersnet.co.uk, 2019).	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions such as temperatures of 0.5-38°C, oxygen levels of 6 -12 mg/l and hardness of 300 -500 mg/l of Calcium Carbonate (CABI, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	There are no records about their eradication through chemical, biological and other agents.	Low
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions it can benefit from environmental/human distrubances (CABI, 2019).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	This taxon can only tolerate low salinity levels (Nico et al., 2019).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Based on fish species present in the RA area (Papa & Mamaril, 2011) there is no predator that can preadate the taxon in the RA	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from commercial fish farms would most likely increase the entry of this	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that they can survive a wide range of environmental conditions, the risk of establishment of the taxon increases.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their migratory behavior would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	This taxon are known to consume large amounts of zooplankton, blue-green algae, and insect larvae and adults, they have the potential to deplete zooplankton populations. Making them a competetor with the populations of native species that rely on plankton for food which include all larval fishes, some adult fishes,	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Lower	This taxon has been used extensively in the management of inland waters which resulted in the prevention of intense blooms of phytoplankton particularly blue-green algae, and the increase in biomass of zoobenthos especially chironomids (CABI, 2019).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Lower	The introduction of this taxon gave an additional source of cheap and much needed protein for the improvement of human nutrition in many countries.Also, hatcheries and growout farms of this taxon provided jobs that help upgrade the standard of living of the workers and their families (CABI, 2019).	Very high

Statistics	
Scores	
BRA	**35.0**
BRA Outcome	**High**
BRA+CCA	**39.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**17.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*10.0*
B. Biology/Ecology	**18.0**
4. Undesirable (or persistence) traits	*5.0*
5. Resource exploitation	*2.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*5.0*
8. Tolerance attributes	*5.0*
C. Climate change	**4.0**
9. Climate change	*4.0*

Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**13**
Environmental	**2**
Species or population nuisance traits	**29**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**
BRA	**0.85**
CCA	**0.88**

Date and Time
03/05/2021 00:53:59

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Micropterus floridanus*
Common name	Florida largemouth bass
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Centrarchiformes (Basses) > Centrarchidae (Sunfishes)
Native range	North America: Florida, USA.
Introduced range	
URL	https://www.fishbase.se/summary/Micropterus-floridanus.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Medium
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	Subtropical https://www.fishbase.se/summary/Micropterus-floridanus.html	High
5	2.02	What is the quality of the climate matching data?	Medium	Subtropical https://www.fishbase.se/summary/Micropterus-floridanus.html	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high

21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
43	7.09	Is dispersal of the taxon density dependent?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	No	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Largemouth Bass (Micropterus floridanus) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, February 2019 Web Version, 8/26/2019	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Medium
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High

Statistics	
Scores	
BRA	**31.5**
BRA Outcome	**Medium**
BRA+CCA	**39.5**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**12.5**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*4.5*
B. Biology/Ecology	**19.0**
4. Undesirable (or persistence) traits	*6.0*
5. Resource exploitation	*5.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*4.0*
C. Climate change	**8.0**
9. Climate change	*8.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**14**
Environmental	**9**
Species or population nuisance traits	**24**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.80**

BRA	0.81
CCA	0.71

Date and Time
02/04/2020 08:00:29

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Misgurnus anguillicaudatus*
Common name	oriental weatherfish
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Fisheries: commercial; aquaculture: commercial; aquarium: commercial; bait
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cobitidae (Longfin loaches)
Native range	Native to Siberia
Introduced range	Philippines, USA, Italy, Peru, Germany etc.
URL	https://www.fishbase.se/summary/Misgurnus-anguillicaudatus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	http://www.scielo.br/pdf/alb/v23n3/alb_aop_230302.pdf	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	http://www.scielo.br/pdf/alb/v23n3/alb_aop_230302.pdf	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	http://www.scielo.br/pdf/alb/v23n3/alb_aop_230302.pdf	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	High
5	2.02	What is the quality of the climate matching data?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=12276&GenusName=Pangio&SpeciesName=kuhlii&fc=127&StockCode=12603	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	https://www.fishbase.de/summary/Pangio-kuhlii.html	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	https://www.fishbase.de/Diseases/DiseasesList.php?ID=12276&StockCode=12603	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	https://www.fishbase.de/Diseases/DiseasesList.php?ID=12276&StockCode=12603	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=12276&GenusName=Pangio&SpeciesName=kuhlii&fc=127&StockCode=12603	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	http://animal-world.com/encyclo/fresh/loaches/KuhliLoach.php#Breeding%20/%20Reproduction	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	http://animal-world.com/encyclo/fresh/loaches/KuhliLoach.php#Breeding%20/%20Reproduction	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=12276&GenusName=Pangio&SpeciesName=kuhlii&fc=127&StockCode=12603	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=12276&GenusName=Pangio&SpeciesName=kuhlii&fc=127&StockCode=12603	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=12276&GenusName=Pangio&SpeciesName=kuhlii&fc=127&StockCode=12603	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	http://animal-world.com/encyclo/fresh/loaches/KuhliLoach.php#Breeding%20/%20Reproduction	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/Gomez%20et%20al%202011.pdf	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Not applicable	no data for this question	Medium
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	https://www.fishbase.de/summary/Pangio-kuhlii.html	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Not applicable	no data for this question	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	no data for this question	Medium
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	https://www.fishbase.de/summary/Pangio-kuhlii.html	Medium
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	No records	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	Medium
C. Climate change					
9. Climate change					

50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	https://www.fishbase.de/summary/Pangio-kuhlii.html	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	No change	https://www.fishbase.de/summary/Pangio-kuhlii.html	High

Statistics	
Scores	
BRA	**29.0**
BRA Outcome	**Medium**
BRA+CCA	**35.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**17.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*9.0*
B. Biology/Ecology	**12.0**
4. Undesirable (or persistence) traits	*5.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*1.0*
C. Climate change	**6.0**
9. Climate change	*6.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**15**
Environmental	**3**
Species or population nuisance traits	**23**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.75**
BRA	**0.76**
CCA	**0.75**

Date and Time
02/04/2020 07:57:36

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Oreochromis aureus*
Common name	blue tilapia
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	
Risk assessment area	Lake Taal
Taxonomy	
Native range	
Introduced range	
URL	

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is a productive and tolerant species that has been introduced worldwide for aquaculture/farming, angling, and the control of aquatic vegetation (GSID, 2020).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon is a productive and tolerant species that has been introduced worldwide for aquaculture/farming, angling, and the control of aquatic vegetation (GSID, 2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following subspecies of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	This taxon is cold tolerant but prefers a tropical climate, the temperatures ranges from 8-30°C and tolerating up to 41°C (CABI,2020; FishBAse, 2019).	Very high
5	2.02	What is the quality of the climate matching data?	High	This taxon is cold tolerant but prefers a tropical climate, the temperatures ranges from 8-30°C and tolerating up to 41°C which is the climate in the RA area (CABI,2020; FishBAse, 2019).	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon has been established in different parts of the Unitited States, namely: Arizona, California, Florida, Nevada, North Carolina, and Texas. This taxon has been considered the most widespread foreign fish in Florida for more than a decade (U.S. Fish and Wildlife Service, 2011).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture because of its commercial importance, which improved the economic status of the introduced range (CABI,2020).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea) which could pose threaths to human (CABI, 2020).	Very high

15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality (CABI, 2020).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are many viruses that are associated with this taxa, examples are: betanodavirus, tilapia larvae encephalitis virus (TELV) and tilapia lake virus disease (TiLV) (Jansen et al., 2018).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 50.8 cm (IUCNGSID,2020).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality. It is usually found in estuarine habitats, lakes, water courses, warm ponds, dam reservoirs and in open water, among vegetation and stones (CABI,	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Considiring that this taxon competes with native fishes for food, spawning area, and space, and exhibits aggressive behaviour. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	As this taxon feeds primarily on phytoplankton and epiphytic algae, insects, zooplankton, vascular plants, and larval and juvenile fishes (IUCNGSID, 2020).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This taxon are maternal mouthbrooders. When a female lays her eggs in a nest prepared by the male. Then the male fertilizes the eggs, afterwhich the female picks up the eggs and incubates them in her mouth (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires nesting sites in order for the egss to be fertilized before the female can incubate them in their mouth (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing of upto 2000 eggs which hatches 3 days after fertilization (CABI, 2020).	High

34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 5-6 months (IUCNGSID, 2020).	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020)	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Since the eggs are protected by the mother until it hatches and even when the fry are free-swimming they will return to the mouth of the female for protection (CABI,2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	There are no records about this taxon's migratory behaviour.	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	As this taxon lives in shallow waters in which can easily be targeted and in return they can be predated by birds (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records about this taxon's density dependence.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	"This taxon is tolerant of a range of conditions such as Ammonium (mg/l): 0.02 - 0.5, Dissolved oxygen (mg/l): 3 optimum, Salinity (part per thousand) 29-45, Water pH (pH): 3.7 - 11 and 8-30°C and tolerating up to 41°C (CABI, 2020)."	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being considered.]	Yes	For biological control, the predatory fish Morone saxatilis X Morone chrysops, Sciaenops ocellatus, Channa striata, Megalops cyprinoides, Nile perch, Hemichromis fasciatus, and Cichlasoma managuens was usedto reduce wild spawning among tilapia hybrids in aquaculture growout ponds.For the physical control, in Brunner Island, Pennsylvania a condenser was used to cool the down the water until it became lethal to the taxon (IUCNGSID,	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	Due to their ability to survive in a wide range of environmental conditions specialy in tropical countries (RA area) it can benefit from environmental/human distrubances (CABI, 2020).	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions specialy in tropical countries (RA area) it can benefit from environmental/human distrubances (CABI, 2020).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate a wide range of salinity from 29 to 45 ppt (CABI, 2020).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Channa striata can be a predator if this taxon which is present in the RA area (CABI, 2020).	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High

53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, there is a chance that these diseases may be introduced in the RA area also (CABI, 2020; USGS, 2020; IUCNGSID, 2020).	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, there is a chance that these diseases may be introduced in the RA area also (CABI, 2020; USGS, 2020; IUCNGSID, 2020).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, there is a chance that these diseases may be introduced in the RA area also (CABI, 2020; USGS, 2020; IUCNGSID, 2020).	Very high

Statistics	
Scores	
BRA	**45.0**
BRA Outcome	**High**
BRA+CCA	**57.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**23.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*7.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*0.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**19**
Environmental	**17**
Species or population nuisance traits	**28**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.92**
BRA	**0.92**
CCA	**0.88**

Date and Time
05/07/2020 22:34:09

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Oreochromis mossambicus*
Common name	Mozambique tilapia
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	High aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	Africa
Introduced range	Elswhere including th philippines
URL	https://www.fishbase.se/summary/Oreochromis-mossambicus.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon was the first tilapia to be widely distributed as a farmed fish.For example in Java (1930s) where it rapidly spread and it was farmed and became a popular food across Indonesia	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon has been introduced worldwide for aquaculture/farming, food source, angling, and control agent for insects and aquatic vegetation (USGS, 2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following subspecies of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	This taxon is usually seen in warm, weedy pools of sluggish stream, canals, and ponds, it occurs at temperatures ranging from 10º to 42º C. which is simillar to the tropical climate of the RA area (CABI,2020; FAO, 2003).	Very high
5	2.02	What is the quality of the climate matching data?	High	This taxon is usually seen in warm, weedy pools of sluggish stream, canals, and ponds, it occurs at temperatures ranging from 8º to 42º C. which is simillar to the tropical climate of the RA area (CABI,2020; FAO, 2003).	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon has been established in seven states in USA: Arizona, California, Colorado, Florida, Hawaii, Idaho, and Texas.This taxon is suspected as a threat to native species such as striped mullet Mugil cephalus in Hawaii (USGS, 2020).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture because of its commercial importance, which improved the economic status of the introduced range (CABI,2020).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea) which could pose threaths to human (CABI, 2020).	Very high

15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality, specially it tolerates the high salinities waters and it is considered as a 'pioneer' species, which means that they can thrive in disturbed habitats, opportunistically migrating and reproducing. (CABI, 2020; IUCNGSID, 2020).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius)	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are many viruses that are associated with this taxa, examples are: betanodavirus, tilapia larvae encephalitis virus (TELV) and tilapia lake virus disease (TiLV) (Jansen et al., 2018).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 40 cm (IUCNGSID,2020).	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality, specially it tolerates the high salinities waters and it is considered as a 'pioneer' species, which means that they can thrive in disturbed habitats, opportunistically migrating and reproducing (CABI, 2020; IUCNGSID, 2020).	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Considiring that this taxon affects native fishes through competition for food and/or space, or through secondary effects. It is generally considered to be pests, in Hawai'i, this species threathens native species such as the striped mullet (Mugil cephalus). Also, in Salton Sea area, this taxon has been considered as a major factor in the decline of the desert pupfish (Cyprinodon macularius). This taxon is also considered as near-exclusive carnivor with individuals preying on small fish and invertebrates (IUCNGSID, 2020; USGS, 2020; Smithsonian Marine	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	As this taxon feeds primarily on phytoplankton and epiphytic algae, insects, zooplankton, vascular plants, and larval and juvenile fishes (IUCNGSID, 2020).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This taxon are maternal mouthbrooders. When a female lays her eggs in a nest prepared by the male. Then the male fertilizes the eggs, afterwhich the female picks up the eggs and incubates them in her mouth (CABI, 2020).	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires nesting sites in order for the egss to be fertilized before the female can incubate them in their mouth (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing of upto 1,780 eggs which hatches 3 days after fertilization (CABI, 2020).	Very high

34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 5-6 months (IUCNGSID, 2020).	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020)	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Since the eggs are protected by the mother until it hatches and even when the fry are free-swimming they will return to the mouth of the female for protection (CABI,2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	This taxon has records of migrating in long distances as they escaped from aquaculture farms during loading-harvesting or via containment failures or when the cold temperatures set in, they migrate to deeper waters (IUCNGSID, 2020; Smithsonian Marine	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	As this taxon lives in shallow waters in which can easily be targeted and in return they can be predated by birds with their eggs being dispersed (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records about this taxon's density dependence.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records about this taxon's density dependence.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions such as Ammonium (mg/l): <0.01, Dissolved oxygen (mg/l): 4-7 optimum, Salinity (part per thousand) 35-40, Water pH (pH): 6-8 and Temperature: 8-42°C (FAO, 2020; CABI, 2020).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	They can be eradicated through intensive fishing to prevent overpopulations from affecting native populations (IUCNGSID, 2020).	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions specialy in tropical countries (RA area) it can benefit from environmental/human distrubances (CABI, 2020).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate a wide range of salinity from 35 to 40 ppt (CABI, 2020).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Channa striata can be a predator of this taxon which is present in the RA area (CABI, 2020).	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	Very high

53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea), there is a chance that these deseases may be introduced in the RA area also (CABI, 2020; USGS, 2020;	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea), there is a chance that these deseases may be introduced in the RA area also (CABI, 2020; USGS, 2020;	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea), there is a chance that these deseases may be introduced in the RA area also (CABI, 2020; USGS, 2020;	High

Statistics	
Scores	
BRA	**45.0**
BRA Outcome	**High**
BRA+CCA	**57.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**23.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*7.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**18**
Environmental	**17**
Species or population nuisance traits	**28**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.88**
BRA	**0.88**
CCA	**0.88**

Date and Time
05/07/2020 22:47:57

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Oreochromis niloticus*
Common name	Nile tilapia
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Hihgly aquacuture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	Africa
Introduced range	Elswhere including the Philippines
URL	https://www.fishbase.se/summary/Oreochromis-niloticus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is considered to be the second most intensively farmed species in the world. In China, it produces almost half of the worlds' tilapia supply (IUCNGSID, 2020; CABI,2020)	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon is a very important fish in aquaculture, it harvested for its protein source which in return gives income to people. It is also used as a laboratory model and for sport fishing (IUCNGSID, 2020; CABI,2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following subspecies of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate (CABI,2020; FishBAse, 2019)	Very high
5	2.02	What is the quality of the climate matching data?	High	The RA area belongs to the same part of the continent where the taxon is native (CABI, 2020, FishBase, 2019).	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon is the third most farmed fish in the world after carps and salmonids and it accounts for 4% of global aquaculture production. It is currently mass produced in Asia (China, Thailand and etc.) and it has already established populations in many tropical to subtropical countries. In United States this taxon is already established in the lakes and rivers of Mississippi, Florida and Georgia (FAO,2020; CABI,2020).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture which improved the economic status of the introduced range (CABI,2019).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					

14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	Records in Malaysia shows that the cancer risk calculations due to consumption of Tilapia exceeded the USEPA's acceptable risk level for cadmium (2.1 × 10-6) and nickel (7.3 × 10-4). In this case, cadmium can adversely affect organisms at relatively low level exposure and can affect liver, testis, nervous system, kidney, spleen and bone marrow of humans (Alam et al., 2016).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species (USGS, 2020).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species (USGS, 2020).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species (USGS, 2020).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon has a hardy nature and has a wide range of trophic and ecological adaptations. Its adaptive life history characteristics enabled this taxon to occupy many different tropical and sub-tropical freshwater niches (CABI, 2020).	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	Very high
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are many viruses that are associated with this taxa, examples are: betanodavirus, tilapia larvae encephalitis virus (TELV) and tilapia lake virus disease (TiLV) (Jansen et al., 2018).	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 60 cm (Fish Base,2019).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon can live in a wide range of water velocity (Tsadik & Bart 2007).	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Knowing that this taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	Since this taxon is omnivorous it feeds on phytoplankton, periphyton, aquatic plants, small invertebrates, benthic fauna, and detritus materials (IUCNGSID,2020)	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This taxon are maternal mouthbrooders. When a female lays her eggs in a nest prepared by the male. Then the male fertilizes the eggs, afterwhich the female picks up the eggs and incubates them in her mouth (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires nesting sites in order for the egss to be fertilized before the female can incubate them in their mouth (CABI, 2020).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing about 1 000 to 1 500 eggs per spawn (IUCNGSID, 2019).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 5-6 months (IUCNGSID, 2020).	High
7. Dispersal mechanisms					

35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Since the eggs are protected by the mother until it hatches and even when the fry are free-swimming they will return to the mouth of the female for protection (CABI,2020).	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	There are no records about this taxon's migratory behaviour.	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	As this taxon lives in shallow waters in which can easily be targeted and in return they can be predated by birds (CABI, 2020).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records about this taxon's density dependence.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records about this taxon's density dependence.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions such as amonia (mg/l) <0.1, temperature of 25°C to 30°C, Carbon Dioxide (mg/l): <20 tollerated and salinity (ppm): <1 preferred, <8 tolerated (CABI, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	In Palau a programme to remove tilapia from the country was succesful using a chemical called Rotenone, which was applied directly to 5 infested sites (IUCNGSID, 2020).	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions specialy in tropical countries (RA area) it can benefit from environmental/human distrubances (CABI, 2020).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	This taxon is the least salt tolerant among the other Oreochromis species (Md, 2008).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Clarias gariepinus can be a predator if this taxon which is present in the RA area (CABI, 2020).	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high

54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high

Statistics	
Scores	
BRA	**37.0**
BRA Outcome	**High**
BRA+CCA	**49.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**21.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**16.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*5.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*-1.0*
8. Tolerance attributes	*1.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**17**
Environmental	**17**
Species or population nuisance traits	**20**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.87**
BRA	**0.87**
CCA	**0.88**

Date and Time
05/07/2020 23:15:02

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Oreochromis niloticus x O. urolepis*
Common name	Nila tilapia x wami tilapia
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	
Introduced range	
URL	

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is considered to be the second most intensively farmed species in the world. In China, it produces almost half of the worlds' tilapia supply (IUCNGSID, 2020; CABI,2020)	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon is a very important fish in aquaculture, it harvested for its protein source which in return gives income to people. It is also used as a laboratory model and for sport fishing (IUCNGSID, 2020; CABI,2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following subspecies of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate (CABI,2020; FishBAse, 2019)	High
5	2.02	What is the quality of the climate matching data?	High	The RA area and the taxon's native range has both tropical climate (CABI,2020; FishBAse, 2019)	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	This taxon is the third most farmed fish in the world after carps and salmonids and it accounts for 4% of global aquaculture production. It is currently mass produced in Asia (China, Thailand and etc.) and it has already established populations in many tropical to subtropical countries. In United States this taxon is already established in the lakes and rivers of Mississippi, Florida and Georgia (FAO,2020; CABI,2020).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	The introduction of this taxon has resulted in a significant development of aquaculture which improved the economic status of the introduced range (CABI,2019).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Records in Malaysia shows that the cancer risk calculations due to consumption of Tilapia exceeded the USEPA's acceptable risk level for cadmium (2.1 × 10-6) and nickel (7.3 × 10-4). In this case, cadmium can adversely affect organisms at relatively low level exposure and can affect liver, testis, nervous system, kidney, spleen and bone marrow of humans (Alam et al., 2016).	Very high

B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species (USGS, 2020).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species (USGS, 2020).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species (USGS, 2020).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are many viruses that are associated with this taxa, examples are: betanodavirus, tilapia larvae encephalitis virus (TELV) and tilapia lake virus disease (TiLV) (Jansen et al., 2018).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 60 cm (Fish Base,2019).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon can live in a wide range of water velocity (Tsadik & Bart 2007).	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Knowing that this taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	Since this taxon is omnivorous it feeds on phytoplankton, periphyton, aquatic plants, small invertebrates, benthic fauna, and detritus materials (IUCNGSID,2020)	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This taxon are maternal mouthbrooders. When a female lays her eggs in a nest prepared by the male. Then the male fertilizes the eggs, afterwhich the female picks up the eggs and incubates them in her mouth (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Medium

32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires nesting sites in order for the egss to be fertilized before the female can incubate them in their mouth (CABI, 2020).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing about 1 000 to 1 500 eggs per spawn (IUCNGSID, 2019).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 5-6 months (IUCNGSID, 2020).	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Since the eggs are protected by the mother until it hatches and even when the fry are free-swimming they will return to the mouth of the female for protection (CABI,2020).	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	There are no records about this taxon's migratory behaviour.	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	As this taxon lives in shallow waters in which can easily be targeted and in return they can be predated by birds (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	no record	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	no record	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions such as amonia (mg/l) <0.1, temperature of 25°C to 30°C, Carbon Dioxide (mg/l): <20 tollerated and salinity (ppm): <1 preferred, <8 tolerated (CABI, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	In Palau a programme to remove tilapia from the country was succesful using a chemical called Rotenone, which was applied directly to 5 infested sites (IUCNGSID, 2020).	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions specialy in tropical countries (RA area) it can benefit from environmental/human distrubances (CABI, 2020).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	This taxon is the least salt tolerant among the other Oreochromis species (Md, 2008).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	Clarias gariepinus can be a predator if this taxon which is present in the RA area (CABI, 2020).	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High

53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high

Statistics	
Scores	
BRA	**40.0**
BRA Outcome	**High**
BRA+CCA	**52.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**21.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**19.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*5.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*0.0*
8. Tolerance attributes	*3.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**22**
Environmental	**13**
Species or population nuisance traits	**23**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.89**
BRA	**0.89**
CCA	**0.88**

Date and Time
05/07/2020 22:58:33

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Oreochromis urolepis*
Common name	wami tilapia
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	Africa
Introduced range	Elswhere including the Philippines
URL	https://www.fishbase.se/summary/Oreochromis-urolepis.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	"This taxon is the second most important farmed fish in the Philippines produced in ponds, cages, and pens (Guerrero, 2019)."	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon has been introduced worldwide for aquaculture/farming, food source, angling, and control agent for insects and aquatic vegetation (U.S. Fish and Wildlife Service,	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following subspecies of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The taxon's native range has the same tropical climate with the RA area (U.S. Fish and Wildlife Service, 2011).	Very high
5	2.02	What is the quality of the climate matching data?	High	The taxon's native range has the same tropical climate with the RA area (U.S. Fish and Wildlife Service, 2011).	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	"This taxon is the second most important farmed fish in the Philippines produced in ponds, cages, and pens (Guerrero, 2019)."	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture because of its commercial importance, which improved the economic status of the introduced range (CABI,2020).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					

14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea) which could pose threaths to human (CABI, 2020).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has a hardy nature and has a wide range of trophic and ecological adaptations. Its adaptive life history characteristics enabled this taxon to occupy many different tropical and sub-tropical freshwater niches (CABI, 2020).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. In Nevada and Arizona, the introduction of this taxon has casued the decline and dispalcemet of endangered Moapa Dace, Moapa White and the Redspotted Sunfish (IUCNGSID,2020; USGS, 2020).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are many viruses that are associated with this taxa, examples are: betanodavirus, tilapia larvae encephalitis virus (TELV) and tilapia lake virus disease (TiLV) (Jansen et al., 2018).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 44 cm (IUCNGSID,2020).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality, specially it tolerates the high salinities waters and it is considered as a 'pioneer' species, which means that they can thrive in disturbed habitats, opportunistically migrating and reproducing (CABI, 2020; IUCNGSID, 2020).	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020).	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Knowing that this taxon has a record of preying on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	As this taxon feeds primarily on phytoplankton and epiphytic algae, insects, zooplankton, vascular plants, and larval and juvenile fishes (IUCNGSID, 2020).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This taxon are maternal mouthbrooders. When a female lays her eggs in a nest prepared by the male. Then the male fertilizes the eggs, afterwhich the female picks up the eggs and incubates them in her mouth (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	Very high

30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Medium
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires nesting sites in order for the egss to be fertilized before the female can incubate them in their mouth (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing of upto 1,780 eggs which hatches 3 days after fertilization (CABI, 2020).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 5-6 months (IUCNGSID, 2020).	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020)	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Since the eggs are protected by the mother until it hatches and even when the fry are free-swimming they will return to the mouth of the female for protection (CABI,2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	There are no records about the migration of this taxon.	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	As this taxon lives in shallow waters in which can easily be targeted and in return they can be predated by birds with their eggs being dispersed (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records about this taxon's density dependence.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records about this taxon's density dependence.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon is tolerant of a range of conditions such as Ammonium (mg/l): <0.01, Dissolved oxygen (mg/l): 4-7 optimum, Salinity (part per thousand) 35-40, Water pH (pH): 6-8 and Temperature: 8-42°C (FAO, 2020; CABI, 2020).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	They can be eradicated through intensive fishing to prevent overpopulations from affecting native populations (IUCNGSID, 2020).	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	In Palau a programme to remove tilapia from the country was succesful using a chemical called Rotenone, which was applied directly to 5 infested sites (IUCNGSID, 2020).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate a wide range of salinity from 35 to 40 ppt (CABI, 2020).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Channa striata can be a predator of this taxon which is present in the RA area (CABI, 2020).	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the	High

53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Not applicable	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Not applicable	Since this taxon is known to reproduce at a rapid rate, which in return overcrowds and causes competition pressures on native fishes. Also, they are known to prey on amphibians and juveniles of other fish species which leads to species dispalcement and eventually to the loss of biodiversity, genetic erosion and greater susceptibility to disease for native species. Moreover, they can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020; IUCNGSID,2020; USGS, 2020).	Very high

Statistics	
Scores	
BRA	**42.0**
BRA Outcome	**High**
BRA+CCA	**50.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**21.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**21.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*7.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*-1.0*
8. Tolerance attributes	*4.0*
C. Climate change	**8.0**
9. Climate change	*8.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**15**
Environmental	**15**
Species or population nuisance traits	**25**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.86**
BRA	**0.86**
CCA	**0.88**

Date and Time
05/07/2020 23:37:12

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Osphronemus goramy*
Common name	giant gourami
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Fisheries: commercial; aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Anabantiformes (Gouramies, snakeheads) > Osphronemidae
Native range	Asia: probably limited to Sumatra, Borneo, Java, the Malay Peninsula, Thailand and Indochina
Introduced range	China, Ca,bodia, Philippines, ialy, Colombia, india, etc
URL	https://www.fishbase.se/summary/Osphronemus-goramy.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Freshwater; brackish; benthopelagic; pH range: 6.5 - 8.0; dH range: ? - 25; depth range 10 - ? m. Tropical; 20°C - 30°C. https://www.fishbase.se/summary/Osphronemus-goramy.html	Very high
5	2.02	What is the quality of the climate matching data?	High	Freshwater; brackish; benthopelagic; pH range: 6.5 - 8.0; dH range: ? - 25; depth range 10 - ? m. Tropical; 20°C - 30°C. https://www.fishbase.se/summary/Osphronemus-goramy.html	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Asia: probably limited to Sumatra, Borneo, Java, the Malay Peninsula, Thailand and Indochina (Mekong basin). Has been introduced to several countries for aquaculture purposes. Apparently absent in Sarawak and presence in Sabah may be due to relatively late introductions.	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Freshwater; brackish; benthopelagic; pH range: 6.5 - 8.0; dH range: ? - 25; depth range 10 - ? m. Tropical; 20°C - 30°C. https://www.fishbase.se/summary/Osphronemus-goramy.html	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	Medium
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High

22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Max length : 70.0 cm SL male/unsexed; fishbase.se/summary/Osphronemus-goramy.html	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	No	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	https://www.fishbase.se/Reproduction/FishReproSummary.php?ID=498&GenusName=Osphronemus&SpeciesName=goramy&fc=429&StockCode=514	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	no data	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Not applicable	no data	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Not applicable	no data	Low
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
43	7.09	Is dispersal of the taxon density dependent?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Freshwater; brackish; benthopelagic; pH range: 6.5 - 8.0; dH range: ? - 25; depth range 10 - ? m. Tropical; 20°C - 30°C	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	No	do data	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	http://www.fao.org/fishery/culturedspecies/Osphronemus_goramy/en	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.fishbase.se/summary/Osphronemus-goramy.html	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Not applicable	no data	Medium

C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High

Statistics	
Scores	
BRA	**47.0**
BRA Outcome	**High**
BRA+CCA	**53.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**23.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*1.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**24.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*5.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*4.0*
8. Tolerance attributes	*6.0*
C. Climate change	**6.0**
9. Climate change	*6.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**18**
Environmental	**10**
Species or population nuisance traits	**29**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.77**
BRA	**0.78**
CCA	**0.75**

Date and Time
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AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Pangasianodon hypophthalmus*
Common name	striped catfish
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Fisheries: commercial; aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Siluriformes (Catfish) > Pangasiidae (Shark catfishes)
Native range	Asia: Mekong, Chao Phraya, and Maeklong basins
Introduced range	Introduced into additional river basins for aquaculture. Philippines, Thailand, Singapore etc.
URL	https://www.fishbase.se/summary/Pangasianodon-hypophthalmus.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Justification: This species was reported in 1988 from a Florida creek that drains into the Hillsborough River near Tampa (Shafland et al. 2008, as Platytropius siamensis), and from a non-specific location circa 1999 (P. Shafland, personal communication).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Justification: All life stages of P. hypophthalmus are intensively harvested with legal (hooks and lines, trawls, seines, gill nets, set nets, and traps), and illegal and unsustainable (poisons, explosives, electro-shocking and barrages) fishing techniques. (So, et al., 2006) Farming of the striped catfish, Pangasianodon hypophthalmus, is a major aquaculture activity in Bangladesh, particularly in the district of Mymensingh. (Ali, et al., 2012)	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The taxon have insavie races, varieties, subtaxa or congeners like the Pangasianodon gigas (Mekong Giant Catfish), whic is considere a problematic invasive species. (Hogan, Z. 2011)	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	the climatic range (tropical) and temperature (22°C - 26°C) of the taxon match the Tropical climate of the RA area. (FishBase , n.d.)	High
5	2.02	What is the quality of the climate matching data?	High	The climatic range (tropical) and temperature (22°C - 26°C) of the taxon match the Tropical climate of the RA area. (FishBase,	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Pangasius have not been introduced for aquaculture outside tropical regions of Asia, although they are available as an ornamental species for the aquarium trade in many countries.	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The Asian catfish, Pangasianodon hypophthalmus, commonly known as pangasius, has achieved impressive success as a commercial aquaculture species. Its production levels and distribution in global markets are now similar to that of other established top-tier aquaculture species such as tilapia, shrimp and salmon. While global markets for the latter species matured over the past 20 years, pangasius aquaculture has developed impressively within the last decade. (The Fish Site, 2010)	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	flooding (accidental) and ornamental reasons (intentional) (Fishbase, n.d.)	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Aquaculture introductions have taken place to several other Asian countries including Bangladesh, China, India, Indonesia, Malaysia and Myanmar. (Food and Agriculture Organization, 2010)	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Pangas farming with the rapid expansation and intesification, have raised environmental problems as a great concern in recent years. The mitigation of all the negative aspects is also essential for ensuring the better culture practices. (Anka, I.Z. 2013)	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Overexploitation, habitat degradation, and changes in water quality and flow are the major threats to the species. (Vidthayanon, C. & Hogan, Z. 2011).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	It has potential to mature and breed naturally in wild and hence escapee fish may colonise and form feral populations in different agro-climatic conditions impacting the ecosystem and in turn affecting the biodiversity. (Lakra and Singh, 2010)	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	In India, the breeding of local P. pangasius, which has a similar spawning period which will be overlapped by P. hypophthalmus in case of its establishment in the wild. The presence of similar numbers of chromosomes in both the species (2n=60) may facilitate hybridisation leading to genetic pollution which in turn could dilute the gene pool of local P. pangasius whose population has declined critically (Sarkar et al. 2006).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					

14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	An adult could safely eat between 3.4 and 166 kg of rejected pangasius fillet each day for his or her entire life without having any adverse effects from contamination with pesticides. With regard to preservatives and antibiotics, an adult could eat between 0.6 and 303 kg of pangasius fillet each day before reaching the critical toxic level. These amounts are so absurdly high that it can be safely assumed that nobody would ever come near to reaching the critical toxic level. It can therefore be concluded that the pangasius actually on sale on the European market is totally safe for human consumption. (Murk et al., 2018)	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	In Cambodia, mature fish populations are in decline. Future plans to dam the Mekong could disrupt the species life cycle because the species is migratory and appears to rely on flow or water quality to facilitate migrations, cue spawning, and aid in the dispersal of young fish. (Vidthayanon, C. & Hogan, Z. 2011).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	There are no reports that the taxa would parasitise threatend or protected taxa in the RA area.	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	No	The climate match was medium in southern Florida and southern Texas. The rest of the contiguous U.S. showed low climate match. (Sanders et al. 2014; 16 climate variables; Euclidean Distance)	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	There are no reports that the taxon is likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area.	Medium
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	There no reports that the taxon is likely to exert adverse impacts on ecosystem services in the RA area.	Medium
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area.	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	There are no reports that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area.	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can grow up to 130 cm (4.3 ft) in length and 44 Kg body weight (U.S. Fish and Wildlife Service, 2011)	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	There are no reports that the taxon is capable of sustaining itself in a range of water velocity conditions.	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	In Cambodia, mature fish populations are in decline. Future plans to dam the Mekong could disrupt the species life cycle because the species is migratory and appears to rely on flow or water quality to facilitate migrations, cue spawning, and aid in the dispersal of young fish. (Vidthayanon, C. & Hogan, Z. 2011).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	There are no reports that the taxon is likely to maintain a viable population even when present in low densities.	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	There are no reports that taxon is likely to consume threatened or protected native taxa in the RA area.	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	The species is a large, fecund, relatively slow growing catfish. It is an omnivore, feeding primarily on algae, plants, zooplankton, insects, fruits, crustaceans, and fish. (Vidthayanon, C. & Hogan,	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit parental care, after hatching, the larvae are dispersed by river currents making them vulnerable to predation and natural mortality ("Pangasius Aquaculture", 2010)	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	This taxon has records of being breed in lakes or rivers producing viable gametes ("Pangasius Farming", 2015)	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	Pangasius djambal and Pangasianodon hypophthalmus has a record of being hybridize or crossbred mainly to increase their reproduction (Gustiano, 2004)	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Yes	Pangasius nasutus is the first record of an hermaphroditic catfish wherein a testicular zone producing spermatozoa was found in a paired ovary-appearing gonad (Rodriguez et al., 2011)	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon is migratory, they migrate upstream to spawn during late spring and summer months ("Pangasius sanitwongsei", n.d.; FishBase, n.d.)	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Females of this taxon can produce up to 80,000 eggs/kg and can spawn several times ("Pangasius Farming", 2015)	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	The age of sexual maturity of this taxon is between 3-3.5 years ("Pangasius Farming", 2015)	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	One potential pathway is aquarium released, which can be intentional because of it can grow up to 100'' (250cm) and up to 300 kg in weight ("Pangasius sanitwongsei", n.d.) (or unintentional especially after heavy rainfall (typhoon or storm) making its introduction easier into the RA area if accidentally	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of its migratory behavior the taxon can travel closer to the proximity of protected areas after being unintentionally or intentionally released ("Pangasius sanitwongsei", n.d.).	High

37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	They have no morphological structure that can facilitate their attaching to hard substrata (FishBase , n.d.)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	This taxon is migratory, they migrate upstream to spawn during late spring and summer months ("Pangasius sanitwongsei", n.d.; FishBase, n.d.) In china there is a recorded migration of this taxon towards the upper Mekong-Lancangjiang River during breeding season (Yang, et al. 2019) Also, Pangasius krempfi is capable of long distances migration from mekong river passing through vietnam and cambodia until they reach southern Laos (Hogan et	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	This taxon is migratory, they migrate upstream to spawn during late spring and summer months ("Pangasius sanitwongsei", n.d.; FishBase, n.d.) In china there is a recorded migration of this taxon towards the upper Mekong-Lancangjiang River during breeding season (Yang, et al. 2019) Also, Pangasius krempfi is capable of long distances migration from mekong river passing through vietnam and cambodia until they reach southern Laos (Hogan et	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	This taxon is migratory, they migrate upstream to spawn during late spring and summer months ("Pangasius sanitwongsei", n.d.; FishBase, n.d.) In china there is a recorded migration of this taxon towards the upper Mekong-Lancangjiang River during breeding season (Yang, et al. 2019). Also, Pangasius krempfi is capable of long distances migration from mekong river passing through vietnam and cambodia until they reach southern Laos (Hogan et	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Because of the taxon's migratory behavior and having no parental care, after hatching, the larvae are dispersed by river currents making them vulnerable to predation and dispersion of other animals ("Pangasius Aquaculture", 2010)	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	No	There are no available data or records of their rapid dispersal.	Medium
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no documented evidence of the organism spreading out or dispersing when its population density increases.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no data or recorded evidence that this taxon is able to withstand being out of water for extended periods	Medium
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	This taxon can live in salt concentrations of around 0.7% - 1% and alum water (PH >5) which can be tolerated at temperatures of around 30°C ("Pangasius Farming", 2015).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	There are no documented evidence of susceptibility of the organism.	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	In case of natural disasters like flood and unintentionally released into the wild, this taxon can grow upto their maximum length and weight which is restricted if they are confined in aquariums "Pangasius sanitwongsei", n.d.)	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	The taxon can only tolerate salinities up to 15 ppt, exceeding this level (20 ppt) and (25 ppt) would cause 100% mortality (Ajay et al., 2017)	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	Based on the list of fish species present in lake Taal (Papa and Mamaril, 2011), there is none that could possibly prey on the taxon being assessed.	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Since the RA area and the taxon's native range has both tropical climate (FishBase, n.d.) the risk of establishment of this taxon would most likely increase.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their migration ability the risk of dispersal would most likely increase the entry of this taxon.	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	Very high

55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**42.0**
BRA Outcome	**High**
BRA+CCA	**54.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**26.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**16.0**
4. Undesirable (or persistence) traits	*2.0*
5. Resource exploitation	*2.0*
6. Reproduction	*3.0*
7. Dispersal mechanisms	*5.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**22**
Environmental	**10**
Species or population nuisance traits	**28**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.88**
BRA	**0.88**
CCA	**0.88**

Date and Time
06/04/2020 12:52:36

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Pangasius sanitwongsei*
Common name	giant pangasius
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Fisheries: commercial; aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Siluriformes (Catfish) > Pangasiidae (Shark catfishes)
Native range	Asia: Chao Phraya and Mekong basins.
Introduced range	
URL	https://www.fishbase.se/summary/Pangasius-sanitwongsei.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	Tropical; 25°N - 9°N https://www.fishbase.se/summary/Pangasius-sanitwongsei.html	High
5	2.02	What is the quality of the climate matching data?	High	Tropical; 25°N - 9°N https://www.fishbase.se/summary/Pangasius-sanitwongsei.html	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	https://www.fishbase.se/summary/Pangasius-sanitwongsei.html Freshwater; benthopelagic; potamodromous	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Not applicable	no data	Medium
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High

21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	Max length : 300 cm SL male/unsexed; https://www.fishbase.se/summary/Pangasius-sanitwongsei.html	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Not applicable	no data	Medium
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	no data	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
43	7.09	Is dispersal of the taxon density dependent?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High

45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology Rey Donne S. Papa1*and Augustus C. Mamaril Sr.	High

Statistics	
Scores	
BRA	**46.0**
BRA Outcome	**High**
BRA+CCA	**58.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**24.0**
4. Undesirable (or persistence) traits	*8.0*
5. Resource exploitation	*5.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*6.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**19**
Environmental	**16**
Species or population nuisance traits	**30**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	

BRA+CCA	0.76
BRA	0.77
CCA	0.75

Date and Time
02/04/2020 07:58:23

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Parachromis managuensis*
Common name	jaguar guapote
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental and Aquaculture
Risk assessment area	Lake Taal
Taxonomy	
Native range	
Introduced range	
URL	

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	https://www.britannica.com/science/Koppen-climate-classification#ref284655	High
5	2.02	What is the quality of the climate matching data?	High	https://www.britannica.com/science/Koppen-climate-classification#ref284655	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	Answer in Q6 is YES	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	potential pest to human https://www.fishbase.de/summary/Parachromis-managuensis.html	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	https://www.fishbase.de/popdyn/PopCharList.php?ID=4684&GenusName=Parachromis&SpeciesName=managuensis&fc=349	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Not applicable	No evidence	Low
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4684&GenusName=Parachromis&SpeciesName=managuensis&fc=349&StockCode=4902	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	No evidence	Low
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Not applicable	No evidence	Low
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	Based on the previous questions	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	No evidence	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/mendoza2015.pdf	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High

51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High

Statistics	
Scores	
BRA	**46.0**
BRA Outcome	**High**
BRA+CCA	**58.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**15.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*9.0*
B. Biology/Ecology	**31.0**
4. Undesirable (or persistence) traits	*12.0*
5. Resource exploitation	*7.0*
6. Reproduction	*3.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*7.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**15**
Environmental	**15**
Species or population nuisance traits	**33**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.84**
BRA	**0.84**
CCA	**0.88**

Date and Time
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AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Pethia conchonius*
Common name	rosy barb
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	aquarium: highly commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Asia: Afghanistan, Pakistan, India, Nepal, and Bangladesh
Introduced range	Introduced worldwide and now very popular with aquarists.
URL	https://www.fishbase.se/summary/Pethia-conchonius.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	Subtropical; 18°C - 22°C https://www.fishbase.se/summary/Pethia-conchonius.html	High
5	2.02	What is the quality of the climate matching data?	Medium	Subtropical; 18°C - 22°C https://www.fishbase.se/summary/Pethia-conchonius.html	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	https://www.fishbase.se/summary/Pethia-conchonius.html	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	https://www.fishbase.se/summary/Pethia-conchonius.html	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High

22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Max length : 14.0 cm TL male/unsexed; https://www.fishbase.se/summary/Pethia-conchonius.html	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	Freshwater; benthopelagic; pH range: 6.0 - 8.0; dH range: 5 - 19. Subtropical; 18°C - 22°C	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Not applicable	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Medium
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Not applicable	no data	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
43	7.09	Is dispersal of the taxon density dependent?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High

46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Giant Pangasius (Pangasius sanitwongsei) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, April 2012 Revised, September 2018 Web Version, 9/14/2020	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.fishbase.se/summary/Pethia-conchonius.html	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology	High

Statistics	
Scores	
BRA	**29.0**
BRA Outcome	**Medium**
BRA+CCA	**39.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**12.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*6.0*
B. Biology/Ecology	**17.0**
4. Undesirable (or persistence) traits	*4.0*
5. Resource exploitation	*5.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*0.0*
8. Tolerance attributes	*6.0*
C. Climate change	**10.0**
9. Climate change	*10.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**14**
Environmental	**9**
Species or population nuisance traits	**20**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.79**
BRA	**0.78**
CCA	**0.88**

Date and Time

02/04/2020 07:58:42

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Piaractus brachypomus*
Common name	pirapitinga
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Oranamental
Risk assessment area	Lake Taal
Taxonomy	Order - Cypriniformes Family - Serrasalmidae
Native range	Amazon and Orinoco River
Introduced range	Philippines, Papua New Guinea, China, Taiwan, Peru, Malaysia, Indonesia, Myanmar, Cambodia
URL	https://www.fishbase.se/summary/Piaractus-brachypomus.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	Medium
5	2.02	What is the quality of the climate matching data?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	Medium
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	answer to Q6 was yes	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	Medium
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Valladao%202016.pdf	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	https://www.fishbase.de/Diseases/DiseasesList.php?ID=5808&StockCode=6104	Medium
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/franceschini2013.pdf	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/franceschini2013.pdf	Medium
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	High

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	Medium
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	Medium
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/franceschini2013.pdf	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	Medium
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=5808&GenusName=Piaractus&SpeciesName=brachypomus&fc=686&StockCode=6104	Medium
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Not applicable	No data for this question	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Not applicable	no data for this question	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	base on previous questions	High
43	7.09	Is dispersal of the taxon density dependent?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	https://www.fishbase.de/summary/Piaractus-brachypomus.html	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data for this question	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Mutia%20et%20al%202018.pdf	High
C. Climate change					
9. Climate change					

50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Very high

Statistics	
Scores	
BRA	**53.0**
BRA Outcome	**High**
BRA+CCA	**65.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**24.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**29.0**
4. Undesirable (or persistence) traits	*12.0*
5. Resource exploitation	*7.0*
6. Reproduction	*4.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**21**
Environmental	**16**
Species or population nuisance traits	**32**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.71**
BRA	**0.70**
CCA	**0.75**

Date and Time
20/04/2019 18:57:13

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Poecilia latipinna*
Common name	sailfin molly
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquarium: highly commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cyprinodontiformes (Rivulines, killifishes and live bearers) >
Native range	North America
Introduced range	Introduced to many countries. Several countries report adverse ecological impact after introduction
URL	https://www.fishbase.se/summary/Poecilia-latipinna.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	In Australia, this taxon has been domisticated as a commercial aquarium ornamental fish species. Annually, the volume of fish sold in Australlia is between 500,000 and 1,000,000 fish (CABI,	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species (CABI, 2020)	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	This taxon has already been interbreed with many ornamental species creating hybrids, such as hybrids of P. latipinna X P. velifera, which are commonly available in the ornamental trade	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon's native range has both tropical climate.	High
5	2.02	What is the quality of the climate matching data?	High	Data from Climatch were used to facilitate the climate analysis.	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon has been established in the Al-Hammar Marsh in Iraq , in the estuaries in the Gulf of Oman and in Wadi Haneefah stream, Riyadh, Saudi Arabia since 2003 (CABI, 2020).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	This taxon is a very popular ornamental fish which gave fish pet treaders income (CABI, 2020).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	There are records that this taxon was infected by the following: haploplorid trematode, Saccocoelioides sogandaresi, Iridovirus, Chloriridovirus, Lymphocystivirus and and Ranavirus which could post threat to human health (U.S. Fish & Wildlife Service, 2011).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high

16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	There are no records of protected taxa that this taxon can predate or parasite.	Medium
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates (CABI , 2020).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are records that this taxon was infected by the following: haploplorid trematode, Saccocoelioides sogandaresi, Iridovirus, Chloriridovirus, Lymphocystivirus and and Ranavirus which could post threat to human health (U.S. Fish & Wildlife Service, 2011).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Ths taxon can only reach a large body size, having a maximum length of 15 cm (Fish Base, 2019).	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon can only inhabits lentic or slow flowing lotic environments (CABI, 2020).	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	There are no records that the organism's mode of existence results in habitat degredation.	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	There are no records of established populations of the organism persisting at low density.	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This organism is predominantly herbivorous, they only consume plants and algal matter and also periphyton. But it also consume aquatic invertebrates including mosquito larvae/pupae (CABI,	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	This organism can compete with food source of native species as they consume plants and algal matter, periphyton, aquatic invertebrates and mosquito larvae/pupae (CABI, 2020).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they are live bearing fishes (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable them to produce a viable gametes (Fish Base, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has already been interbreed with many ornamental species creating hybrids, such as hybrids of P. latipinna X P. velifera, which are commonly available in the ornamental trade	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Medium
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	There are no requirments for this taxon being dependent on the other taxon (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon produces broods of 10 to between 100-300 young, females may give birth on multiple occasions throughout the year, approximately eight to 10 weeks apart, depending upon environmental conditions (CABI, 2020).	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity within 1 year (CABI, 2020).	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2019)	Very high

36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2019)	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since this taxon is a livebearer and it only inhabits lentic or slow flowing lotic environments; which means that if they are dispersed in a rapidly flowing or highly variable lotic environments, it may inhibit the species establishment or	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (U.S. Fish & Wildlife Service, 2011).	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon does not exhibit parental care, making the broods available for preadation and dispersion of other animals (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area are prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions making them a habitat generalist makes their dispersal rapid	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records of that this taxon is density dependent in terms of dispersal.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Water pH: 7-8.5, Temperature: 6°C - 40°C, Dissolved oxygen (mg/l) >1, and Salinity: >95 (CABI, 2020).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	There are no records of this taxa being eradicated in the wilds using chemical, biological, or other agents/means.	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	As this taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats and to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area (CABI, 2020).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can survive is 90 ppt (CABI, 2020).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Micropterus salmoides can predate this taxon in the RA area (Guerrero, 2014).	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that this taxon can survive a wide range of environmental conditions,(they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates), the risk of establishment of the taxon increases (CABI ,	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) together with their ability to survive a wide range of environmental conditions (temperature, salinity,low oxygen level, disturbed habitats and etc.) the risk of entry through accidental release from aquarium would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species in the area.	High

54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**41.0**
BRA Outcome	**High**
BRA+CCA	**53.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**19.0**
4. Undesirable (or persistence) traits	*6.0*
5. Resource exploitation	*2.0*
6. Reproduction	*4.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**19**
Environmental	**11**
Species or population nuisance traits	**30**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.86**
BRA	**0.87**
CCA	**0.79**

Date and Time
05/07/2020 23:59:52

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Poecilia reticulata*
Common name	guppy
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental and Pest control
Risk assessment area	Lake Taal
Taxonomy	Order - Cyprinodontiformes Family - Poeciliidae
Native range	Brazil, Guyana, Venezuela
Introduced range	Philippines, Zambia, Malaysia, Japan, Guam, Jamaica, Spain
URL	https://www.fishbase.se/summary/Poecilia-reticulata.html

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/perdikaris2016.pdf	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	https://bigladdersoftware.com/epx/docs/8-3/auxiliary-programs/koppen-climate-classification.html	High
5	2.02	What is the quality of the climate matching data?	High	https://bigladdersoftware.com/epx/docs/8-3/auxiliary-programs/koppen-climate-classification.html	Medium
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	Based on Q6 answer	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/lindholm2005.pdf	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	Medium
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	Medium
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	Medium
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	Medium
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Listed as harmless in FishBase (2015). No evidence of risks to human health	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Riehl, R. and H.A. Baensch, 1991. Aquarien Atlas. Band. 1. Melle: Mergus, Verlag für Natur-und Heimtierkunde, Germany. 992 p	Medium
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	https://www.fishbase.de/Ecology/FishEcologySummary.php?StockCode=3424&GenusName=Poecilia&SpeciesName=reticulata	Medium
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	https://www.fishbase.de/Ecology/FishEcologySummary.php?StockCode=3424&GenusName=Poecilia&SpeciesName=reticulata	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	https://www.fishbase.de/Diseases/DiseasesList.php?ID=3228&StockCode=3424	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	Listed as harmless in FishBase (2015).	Medium
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.fishbase.de/Ecology/FishEcologySummary.php?StockCode=3424&GenusName=Poecilia&SpeciesName=reticulata	High

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=3228&GenusName=Poecilia&SpeciesName=reticulata&fc=216&StockCode=3424	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/onikura2011.pdf	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Not applicable	No evidence	Low
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	https://www.fishbase.de/Ecology/FishEcologySummary.php?StockCode=3424&GenusName=Poecilia&SpeciesName=reticulata	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	the type of reproduction of the taxon is llivebrearing	Medium
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Guerrero%20III%202014.pdf	Medium
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Not applicable	No evidence	Medium
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Yes	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=3228&GenusName=Poecilia&SpeciesName=reticulata&fc=216&StockCode=3424	Medium
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	The taxon are livebrearing	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Able, K.W., 1984. Cyprinodontiformes: development. p. 362-368. In American Society of Ichthyologists and Herpetologists. Ontogeny and systematics of fishes, based on an international symposium dedicated to the memory of E.H. Ahlstrom, 15-18 August 1983, La Jolla, California. Spec. Publ. Am. Soc. Ichthyol.	Medium
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	https://www.fishbase.de/Reproduction/MaturityList.php?ID=3228&GenusName=Poecilia&SpeciesName=reticulata&fc=216	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=3228&GenusName=Poecilia&SpeciesName=reticulata&fc=216&StockCode=3424	Medium
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=3228&GenusName=Poecilia&SpeciesName=reticulata&fc=216&StockCode=3424	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	Low
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	The taxon are produce juveniles in there reproduction	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	https://www.fishbase.de/summary/Poecilia-reticulata.html	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Not applicable	No evidence for this question	Low
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	The taxon are produce juveniles in there reproduction	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	based on the previous questions	High
43	7.09	Is dispersal of the taxon density dependent?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	https://www.fishbase.de/Ecology/FishEcologySummary.php?StockCode=3424&GenusName=Poecilia&SpeciesName=reticulata	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	No reported predators in the RA area (https://www.fishbase.de/TrophicEco/PredatorList.php?ID=3228&GenusName=Poecilia&SpeciesName=reticulata)	High
C. Climate change					
9. Climate change					

50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	Medium
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High

Statistics	
Scores	
BRA	**41.0**
BRA Outcome	**High**
BRA+CCA	**53.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**15.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*9.0*
B. Biology/Ecology	**26.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*2.0*
6. Reproduction	*5.0*
7. Dispersal mechanisms	*4.0*
8. Tolerance attributes	*5.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**15**
Environmental	**10**
Species or population nuisance traits	**33**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.62**
BRA	**0.62**
CCA	**0.63**

Date and Time
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AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Poecilia sphenops*
Common name	molly
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquarium: highly commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cyprinodontiformes (Rivulines, killifishes and live bearers) >
Native range	Central and South America
Introduced range	Japan, Indonesia, Malaysia, Philippines atc.
URL	https://www.fishbase.se/summary/Poecilia-sphenops.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is already locally established in the warm waters of Montana, Nevada, Puerto Rico and it is being mass-produced in the Far East and Eastern Europe. However, most of the mollies available that are available in the aquarium trade today are selectively bred and are often hybrids, they usually came from the three original species (P. latipinna, P. sphenops, P. velifera) (CABI, 2020; U.S. Fish and Wildlife Service, 2019).	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species (CABI, 2020).	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Once concerete example is the Poecilia latipinna which already have records of invasion and its associated negative impacts. According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon’s native range has both tropical climate.	Very high
5	2.02	What is the quality of the climate matching data?	High	Data from Climatch were used to facilitate the climate analysis.	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon is already locally established in the warm waters of Montana, Nevada, Puerto Rico and it is being mass-produced in the Far East and Eastern Europe. However, most of the mollies available that are available in the aquarium trade today are selectively bred and are often hybrids, they usually came from the three original species (P. latipinna, P. sphenops, P. velifera) (CABI, 2020; U.S. Fish and Wildlife Service, 2019).	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon is considered as a threath to Moapa dace (Moapa coriacea) and the White River springfish (Crenichthys baileyi) which are both endangered species and also a potential threat to other native fishes in the Pahranagat Valley, Nevada. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020; U.S. Fish and Wildlife Service, 2019).	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon is considered as a threath to Moapa dace (Moapa coriacea) and the White River springfish (Crenichthys baileyi) which are both endangered species and also a potential threat to other native fishes in the Pahranagat Valley, Nevada. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020; U.S. Fish and Wildlife Service, 2019).	Very high

12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	This taxon is considered as a threath to Moapa dace (Moapa coriacea) and the White River springfish (Crenichthys baileyi) which are both endangered species and also a potential threat to other native fishes in the Pahranagat Valley, Nevada. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020; U.S. Fish and Wildlife Service, 2019).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	This taxon is a very popular ornamental fish which gave fish pet treaders income (CABI, 2020).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon is a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020).	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon is considered as a threath to Moapa dace (Moapa coriacea) and the White River springfish (Crenichthys baileyi) which are both endangered species and also a potential threat to other native fishes in the Pahranagat Valley, Nevada. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020; U.S. Fish and Wildlife Service, 2019).	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This organism feeds on worms, crustaceans, insects, plant matter. (FishBase, 2019).	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates (CABI , 2020).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon is considered as a threath to Moapa dace (Moapa coriacea) and the White River springfish (Crenichthys baileyi) which are both endangered species and also a potential threat to other native fishes in the Pahranagat Valley, Nevada. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020; U.S. Fish and Wildlife Service, 2019).	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon is considered as a threath to Moapa dace (Moapa coriacea) and the White River springfish (Crenichthys baileyi) which are both endangered species and also a potential threat to other native fishes in the Pahranagat Valley, Nevada. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020; U.S. Fish and Wildlife Service, 2019).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon is a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Ths taxon can only reach a large body size, having a maximum length of 7.5 cm (Fish Base, 2019).	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon inhabits in a wide range of habitats, from clear mountain streams to turbid slow moving water bodies at low elevations, commonly without significant aquatic vegetation	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	There are no records that the organism's mode of existence results in habitat degredation.	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	The huge reproductive rate of this taxon can lead to rapid expansion of small founder populations with a doubling time of less than 15 months and then expand into surrounding areas (CABI, 2020).	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This organism feeds on worms, crustaceans, insects, plant matter. (FishBase, 2019).	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	This organism can compete with food source of native species as they consume plants and algal matter, periphyton, aquatic invertebrates (CABI, 2020).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they are live bearing fishes (CABI, 2020).	High

29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable them to produce a viable gametes (Fish Base, 2019)	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has already been interbreed with many ornamental species creating hybrids, such as hybrids of P. latipinna X P. velifera, which are commonly available in the ornamental trade	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	There are no requirments for this taxon being dependent on the other taxon since they are livebearers (CABI, 2020).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon produces broods of 10-140 youngs, females produce 2-3 generations per year, depending upon the environmental conditions (CABI, 2020).	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	This taxon reaches the age of maturity within 10-20 weeks (CABI, 2020).	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	One	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since this taxon is a livebearer and it only inhabits lentic or slow flowing lotic environments; which means that if they are dispersed in a rapidly flowing or highly variable lotic environments, it may inhibit the species establishment or	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (FishBase, 2019).	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon does not exhibit parental care, it makes the broods available for preadation and dispersion by other animals (CABI, 2020).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area is prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions making them a habitat generalist makes their dispersal rapid	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records that this taxon is density dependent in terms of dispersal.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Water pH: 7-8.5, Temperature: 18°C - 28°C (FishBase, 2019).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	The biological control of this taxa includes the introduction of larger predatory species, however, it is only possible in small, contained water bodies and it opens the possibility of introducing further problem species (CABI, 2020).	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	As this taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats and to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area (CABI, 2020).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can survive is 45 ppt (CABI, 2020).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Micropterus salmoides can predate this taxon in the RA area (Guerrero, 2014).	Very high
C. Climate change					
9. Climate change					

50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that this taxon can survive a wide range of environmental conditions,(they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates), the risk of establishment of the taxon increases (CABI ,	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) together with their ability to survive a wide range of environmental conditions (temperature, salinity,low oxygen level, disturbed habitats and etc.) the risk of entry through accidental release from aquarium would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High

Statistics	
Scores	
BRA	**40.0**
BRA Outcome	**High**
BRA+CCA	**52.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**18.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*2.0*
6. Reproduction	*4.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**18**
Environmental	**11**
Species or population nuisance traits	**29**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**
BRA	**0.86**
CCA	**0.79**

Date and Time
06/04/2020 12:26:29

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Pterygoplichthys disjunctivus*
Common name	vermiculated sailfin catfish
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental and Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Order - Siluriformes Family - Loricariidae
Native range	South America
Introduced range	Philippines
URL	https://www.fishbase.se/summary/Pterygoplichthys-disjunctivus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	The taxon was introduced in 1970-1979 as an ornamental species in at least 17 countries in Americas, Asia and Europe. This taxon became a successful invaders because of their survival traits and had caused different socio-economic impacts (Cagauna, 2007;	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon is the major component of fish catch in the Philippine waters but the fish has very little value as food fish since the flesh tastes bitter. It may be used, however, as a source of fish meal and for ornamental industry (Cagauan, 2007).	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	This taxon already has the invasive history, since species P. multiradiatus, P. pardalis and P. disjunctivus have been so far recorded as exotic in Mesoamerica – Puerto Rico and Mexico (8, 12); in North America: southern United States – Florida, Texas, Washington and North Carolina, as well as at Hawaii islands (10, 11, 19, 18, 20); in Philippines and south-eastern Asia: peninsular Malaysia, Singapore, Taiwan, Java and Sumatra (22). In all those recipient areas recorded so far, the aquarists were assigned responsible for their releasing into natural ecosystems and subsequent establishment (Simonović, Nikolić, and Grujić, 2014).	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007	Very high
5	2.02	What is the quality of the climate matching data?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon was found and collected from five sites in and around the Laguna de Bay basin: Marikina River in Marikina and Pasig Cities; Pasig River in the City of Manila; Catmon Creek in Bay, Laguna; Banilad Creek in Siniloan, Laguna; and Laguna de Bay in San Pedro, Laguna (Chavez et al., 2006)	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	They were probably introduced through an intentional release and possibly fish farm escapes upstream (near Davao) between the 2002 and 2005 (Hubilla et al, 2007). Moreover, local aquarium dealers have used its local moniker -- that a janitor fish cleans up – as a selling point, wherein anecdotal reports say that the misconception might have also be a reason for the high incidence of these specimens particularly in the Marikina and Pasig rivers	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon can enter the RA intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Besides in the Philippines, P. disjunctivus and P. pardalis are also seen in Singapore waterways, with the former also found in Taiwan and the latter found as well in the canals and sewer system of Indonesia and the Red River of Northern Vietnam (Levin et al., 2008). In addition, "they have established populations and displaced indigenous fish and invertebrate communities" in Mexico, Puerto Rico and the United States (Soriano & Vallejo, Jr.,	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	The rapid increase of this species (PteryglopIchthys) has affected the livelihood and fishing operation of the fisherfolk which led to a decrease in marketable catch of endemic and commercial fish species due to its predominance in gill net and fish corral catch. (Chaves et al., 2006)	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	Very high

13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	Bioaccumulation of coliform bacteria and heavy metals, as well as vector of parasites, has been recorded on these species. In which if eaten will lead to potential contamination and infection (Orfinger & Goodding, 2018).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon shows impacts on displacement of local species through resource competition such as indirect food competition which reduces the food resources like aquatic insects and vegetation and direct habitat competition because of high biomass of their populations (Orfinger & Goodding, 2018).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This is very unlikely to happen considering the feeding guild and morphology of the taxon (Hubilla et al., 2007; Levin et al., 2008).	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	These fish are protected by modified scales and by strong spines on the fins and because they show a high tolerance to low oxygen concentrations or desiccation (up to 20 hours). The latter ability can be attributed to an enlarged and vascularized stomach, which functions as an accessory respiratory organ (Jasso et al., 2013). Also, they are commonly found in shallow freshwater environments, but some members of the Family Loricariidae: Pterygoplichthys which are considered to be strictly freshwater, have already established invasive populations in inland waters with mesohaline conditions, such as in North and Central America, Asia, Caribbean islands, Pacific and Indian oceans and in South-Eastern Mexico due to their high salinity tolerance (Capps et al.	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion. High water turbidity alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity. (Hubilla et	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	There are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are reports that the taxon can be a host for several parasites which are not yet recorded in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	The size range for most of the adult species in the Loricariid family is 30–50 cm, but individuals have been observed to reach 70 cm (IUCN, 2010). While the max published weight: 310.00 g (Jumawan and Seronay, 2017). Accidental release of Pterygoplichthys spp. has been documented, such as when typhoon Rosing struck the Philippines resulting in escape of the fish from commercial farms. Also, they are very common aquarium fish around the world. Nearly all of their introduced populations are caused by pet release or aquaculture escape	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	The taxon was collected from medium-velocity rivers no more than two meters deep near the river banks (Chavez, et al., 2006)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	The foraging activities of different-sized Pterygoplichthys had potentially strong negative effects on the number of catfish eggs and first-feeding fry. Therefore, these invasive alien fish pose a risk to the native aquatic resources [of Thailand] (Chaichana et al., 2013) Pterygoplichthys species are also generally herbivores, and large populations can significantly alter the energy budget of a water body by reducing the amount of energy available to other herbivores, such as aquatic insects and other arthropods (Kottelat et al 1993); Fuller 1998; Nico and Martin 2001). Reductions in the population of the arthropods will lead to reduced populations of other animals that feed on arthropods (Inger and Chin 2002; Page	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	The taxon can maintain viable population under low density condition which is reported in the Chacamax River, Chiapas, Mexico (Capps and Flecker, 2015)	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	This taxon feeds primarily on benthic algae, detritus, various plant matter, worms, insect larvae, fish eggs and other bottom-dwellers which do not fall under threatened or protected status in the RA area. (IUCN, 2010)	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Food competition by the said taxa, in which it reduces the food resources such as aquatic insects and vegetation in the area, can be detrimental to the native taxa (Orfinger & Goodding, 2018).	High
6. Reproduction					

28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This species exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Due to their parental care ability this taxon can likely produce viable gametes in the RA area (Jasso et al., 2013; CABI, 2015)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	There is no native taxa present in the RA area where the taxon can hybridise (Papa and Mamaril, 2011).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	The taxon mates through external fertilization, where the female deposits eggs on smooth rocks, depressions or burrows in the river bank. The eggs are then fertilized by the male. Afterwards, the eggs are guarded by one or both parents. In captivity, the most successful breedings have occurred in ponds with steep clay or mud banks. The fish dig tunnels close to the water level and the males guard the eggs until they hatch. (Jumawan et al. 2014)	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	The taxon does not depend on other taxa and or other means to complete lifecycle (Power, 2003).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	The taxon spawn multiple times throughout the spawning season which happens from March to September. Also, they exhibit extended spawning season which extends for more than 5 months during the warm rainy season (CABI, 2015)	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	This taxon reaches sexual maturity at the age of 2 (Gibbs et al., 2017)	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	The taxon can enter the RA through natural dispersal and its succes is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA through natural dispersal and its success is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	The modified mouth allows the taxon to feed, breathe, and attach to the substrate through suction (CABI,2015).	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	In the case of an invasive species such as P. pardalis, accidental release of eggs and juveniles may result in assured higher survival rates in the wild (Jumawan et al., 2014)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Not applicable	There are no recorded evidence that larvae/fragments/seedlings enter, or are taken by, water currents.	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon are generally nocturnal and non-migratory (CABI, 2015)	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Because this taxon exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon can quickly migrate to reach new bodies of water, this is enabled by their ability to hold into solid substrates using their sucker mouth, beating of pelvic fins, and hooking and bracing using their studded spines of the pectoral fins (CABI, 2015)	High
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no documented evidence of the organism spreading out or dispersing when its population density increases.	Medium
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	Members of this taxon also have the ability to breathe air and are able to survive up to 30 h out of water (Val and De Almeida-Val, 1995). Pterygoplichthys and many other loricariids are facultative air-breathers, able to persist indefinitely in hypoxic conditions and even able to survive out of water for many hours (Graham, 1997)	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Taxon can tolerate water pollution, low oxygen levels, and elevated salinity (Capps et al., 2011; Özgür et al., 2016)	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	A successful eradication through human intervention was done in the Rainbow River, Florida USA (Hill and Sowards, 2015). Also, a preliminary study of the potential eradication of P. pardalis by three native Thai piscivorous species yielded interesting results. Demersal species such as H. wyckioides and O. marmorata could more effectively eliminate P. pardalis than other native species such as P. sanitwongsei. In particular, H. wyckioides was the most effective consumer of P. pardalis, as it could efficiently ingest individuals up to 10 cm in length. Pterygoplichthys pardalis longer than 10 cm can stretch out their body fins, preventing H. wyckioides from feeding on them. The potential of native fish to help control certain invasive fish species was also addressed by	Very high

47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Taxon is tolerant of (and likely to benefit from) eutrophication and other forms of aquatic disturbance, as evidenced by their occurrence in nutrient-rich Lake Thonotosassa and Lake Maggiore, Florida and Nong Yai Canal, East Thailand (Hoover et al., 2004; Chaichana et al., 2011).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Taxon can tolerate elevated salinity (Capps et al., 2011).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	Based on the list of fish species present in lake Taal (Papa and Mamaril, 2011), there is none that could possibly prey on the taxon being assessed.	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Lake Taal is close but completely isolated from Laguna de Bay and other rivers in Luzon Island where Pterygoplichthys spp. were recorded and thus may only require accidental and/or intentional vectors of introduction, together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the risk of entry of this	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the risk of establishment of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	High

Statistics	
Scores	
BRA	**54.0**
BRA Outcome	**High**
BRA+CCA	**66.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**26.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**28.0**
4. Undesirable (or persistence) traits	*9.0*
5. Resource exploitation	*7.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*3.0*
8. Tolerance attributes	*7.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*

Sectors affected	
Commercial	23
Environmental	17
Species or population nuisance traits	33

Thresholds	
BRA	34.5
BRA+CCA	34.5
Confidence	
BRA+CCA	0.80
BRA	0.81
CCA	0.75

Date and Time
25/02/2019 13:00:52

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Pterygoplichthys gibbiceps*
Common name	leopard pleco
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	aquarium: commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Siluriformes (Catfish) > Loricariidae (Armored catfishes) >
Native range	South America
Introduced range	Spain
URL	https://www.fishbase.se/summary/Pterygoplichthys-gibbiceps.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	The taxon was introduced in 1970-1979 as an ornamental species in at least 17 countries in Americas, Asia and Europe. This taxon became a successful invaders because of their survival traits and had caused different socio-economic impacts (Cagauna, 2007;	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon is the major component of fish catch in the Philippine waters but the fish has very little value as food fish since the flesh tastes bitter. It may be used, however, as a source of fish meal and for ornamental industry (Cagauan, 2007).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	This taxon already has the invasive history, since species P. multiradiatus, P. pardalis and P. disjunctivus have been so far recorded as exotic in Mesoamerica – Puerto Rico and Mexico (8, 12); in North America: southern United States – Florida, Texas, Washington and North Carolina, as well as at Hawaii islands (10, 11, 19, 18, 20); in Philippines and south-eastern Asia: peninsular Malaysia, Singapore, Taiwan, Java and Sumatra (22). In all those recipient areas recorded so far, the aquarists were assigned responsible for their releasing into natural ecosystems and subsequent establishment (Simonović, Nikolić, and Grujić, 2014).	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	Very high
5	2.02	What is the quality of the climate matching data?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon was found and collected from five sites in and around the Laguna de Bay basin: Marikina River in Marikina and Pasig Cities; Pasig River in the City of Manila; Catmon Creek in Bay, Laguna; Banilad Creek in Siniloan, Laguna; and Laguna de Bay in San Pedro, Laguna (Chavez et al., 2006)	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	They were probably introduced through an intentional release and possibly fish farm escapes upstream (near Davao) between the 2002 and 2005 (Hubilla et al, 2007). Moreover, local aquarium dealers have used its local moniker -- that a janitor fish cleans up – as a selling point, wherein anecdotal reports say that the misconception might have also be a reason for the high incidence of these specimens particularly in the Marikina and Pasig rivers	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon can enter the RA intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Besides in the Philippines, P. disjunctivus and P. pardalis are also seen in Singapore waterways, with the former also found in Taiwan and the latter found as well in the canals and sewer system of Indonesia and the Red River of Northern Vietnam (Levin et al., 2008). In addition, "they have established populations and displaced indigenous fish and invertebrate communities" in Mexico, Puerto Rico and the United States (Soriano & Vallejo, Jr.,	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	The rapid increase of this species (Pterygloplchthys) has affected the livelihood and fishing operation of the fisherfolk which led to a decrease in marketable catch of endemic and commercial fish species due to its predominance in gill net and fish corral catch. (Chaves et al., 2006)	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	Very high

13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity (Hubilla et al., 2006). Also, there are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	Bioaccumulation of coliform bacteria and heavy metals, as well as vector of parasites, has been recorded on these species. In which if eaten will lead to potential contamination and infection (Orfinger & Goodding, 2018).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon shows impacts on displacement of local species through resource competition such as indirect food competition which reduces the food resources like aquatic insects and vegetation and direct habitat competition because of high biomass of their populations (Orfinger & Goodding, 2018).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This is very unlikely to happen considering the feeding guild and morphology of the taxon (Hubilla et al., 2007; Levin et al., 2008).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	These fish are protected by modified scales and by strong spines on the fins and because they show a high tolerance to low oxygen concentrations or desiccation (up to 20 hours). The latter ability can be attributed to an enlarged and vascularized stomach, which functions as an accessory respiratory organ (Jasso et al., 2013). Also, they are commonly found in shallow freshwater environments, but some members of the Family Loricariidae: Pterygoplichthys which are considered to be strictly freshwater, have already established invasive populations in inland waters with mesohaline conditions, such as in North and Central America, Asia, Caribbean islands, Pacific and Indian oceans and in South-Eastern Mexico due to their high salinity tolerance (Capps et al.	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion. High water turbidity alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity. (Hubilla et	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	There are records that this taxon caused scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity, and physically inhibit other aquatic organisms specially local fishes (CABI, 2015).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	Very high
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are reports that the taxon can be a host for several parasites which are not yet recorded in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	The size range for most of the adult species in the Loricariid family is 30– 50 cm, but individuals have been observed to reach 70 cm (IUCN, 2010). While the max published weight: 310.00 g (Jumawan and Seronay, 2017). Accidental release of Pterygoplichthys spp. has been documented, such as when typhoon Rosing struck the Philippines resulting in escape of the fish from commercial farms. Also, they are very common aquarium fish around the world. Nearly all of their introduced populations are caused by pet release or aquaculture escape	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	The taxon was collected from medium-velocity rivers no more than two meters deep near the river banks (Chavez, et al., 2006)	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	The foraging activities of different-sized Pterygoplichthys had potentially strong negative effects on the number of catfish eggs and first-feeding fry. Therefore, these invasive alien fish pose a risk to the native aquatic resources [of Thailand] (Chaichana et al., 2013) Pterygoplichthys species are also generally herbivores, and large populations can significantly alter the energy budget of a water body by reducing the amount of energy available to other herbivores, such as aquatic insects and other arthropods (Kottelat et al 1993); Fuller 1998; Nico and Martin 2001). Reductions in the population of the arthropods will lead to reduced populations of other animals that feed on arthropods (Inger and Chin 2002; Page	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	The taxon can maintain viable population under low density condition which is reported in the Chacamax River, Chiapas, Mexico (Capps and Flecker, 2015)	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	This taxon feeds primarily on benthic algae, detritus, various plant matter, worms, insect larvae, fish eggs and other bottom-dwellers which do not fall under threatened or protected status in the RA area. (IUCN, 2010)	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Food competition by the said taxa, in which it reduces the food resources such as aquatic insects and vegetation in the area, can be detrimental to the native taxa (Orfinger & Goodding, 2018).	Very high
6. Reproduction					

28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This species exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Due to their parental care ability this taxon can likely produce viable gametes in the RA area (Jasso et al., 2013; CABI, 2015)	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	There is no native taxa present in the RA area where the taxon can hybridise (Papa and Mamaril, 2011).	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	The taxon mates through external fertilization, where the female deposits eggs on smooth rocks, depressions or burrows in the river bank. The eggs are then fertilized by the male. Afterwards, the eggs are guarded by one or both parents. In captivity, the most successful breedings have occurred in ponds with steep clay or mud banks. The fish dig tunnels close to the water level and the males guard the eggs until they hatch. (Jumawan et al. 2014)	Very high
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	The taxon does not depend on other taxa and or other means to complete lifecycle (Power, 2003).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	The taxon spawn multiple times throughout the spawning season which happens from March to September. Also, they exhibit extended spawning season which extends for more than 5 months during the warm rainy season (CABI, 2015)	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	This taxon reaches sexual maturity at the age of 2 (Gibbs et al., 2017)	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	One	The taxon can enter the RA through natural dispersal and its succes is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA through natural dispersal and its success is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	The modified mouth allows the taxon to feed, breathe, and attach to the substrate through suction (CABI,2015).	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	In the case of an invasive species such as P. pardalis, accidental release of eggs and juveniles may result in assured higher survival rates in the wild (Jumawan et al., 2014).	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Not applicable	There are no recorded evidence that larvae/fragments/seedlings enter, or are taken by, water currents.	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon are generally nocturnal and non-migratory (CABI, 2015)	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	Because this taxon exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon can quickly migrate to reach new bodies of water, this is enabled by their ability to hold into solid substrates using their sucker mouth, beating of pelvic fins, and hooking and bracing using their studded spines of the pectoral fins (CABI, 2015)	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no documented evidence of the organism spreading out or dispersing when its population density increases.	Very high
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	Members of this taxon also have the ability to breathe air and are able to survive up to 30 h out of water (Val and De Almeida-Val, 1995). Pterygoplichthys and many other loricariids are facultative air-breathers, able to persist indefinitely in hypoxic conditions and even able to survive out of water for many hours (Graham, 1997)	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Taxon can tolerate water pollution, low oxygen levels, and elevated salinity (Capps et al., 2011; Özgür et al., 2016)	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	A successful eradication through human intervention was done in the Rainbow River, Florida USA (Hill and Sowards, 2015). Also, a preliminary study of the potential eradication of P. pardalis by three native Thai piscivorous species yielded interesting results. Demersal species such as H. wyckioides and O. marmorata could more effectively eliminate P. pardalis than other native species such as P. sanitwongsei. In particular, H. wyckioides was the most effective consumer of P. pardalis, as it could efficiently ingest individuals up to 10 cm in length. Pterygoplichthys pardalis longer than 10 cm can stretch out their body fins, preventing H. wyckioides from feeding on them. The potential of native fish to help control certain invasive fish species was also addressed by	Very high

47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Taxon is tolerant of (and likely to benefit from) eutrophication and other forms of aquatic disturbance, as evidenced by their occurrence in nutrient-rich Lake Thonotosassa and Lake Maggiore, Florida and Nong Yai Canal, East Thailand (Hoover et al., 2004; Chaichana et al., 2011).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Taxon can tolerate elevated salinity (Capps et al., 2011).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	Based on the list of fish species present in lake Taal (Papa and Mamaril, 2011), there is none that could possibly prey on the taxon being assessed.	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Lake Taal is close but completely isolated from Laguna de Bay and other rivers in Luzon Island where Pterygoplichthys spp. were recorded and thus may only require accidental and/or intentional vectors of introduction, together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the risk of entry of this	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the risk of establishment of this taxon.	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the dispersal of this taxon.	Very high
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	Very high

Statistics	
Scores	
BRA	**54.0**
BRA Outcome	**High**
BRA+CCA	**66.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**26.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**28.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*7.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*7.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*

Sectors affected	
Commercial	22
Environmental	17
Species or population nuisance traits	33

Thresholds	
BRA	34.5
BRA+CCA	34.5
Confidence	
BRA+CCA	0.99
BRA	0.99
CCA	0.96

Date and Time
06/04/2020 13:09:14

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Pterygoplichthys multiradiatus*
Common name	Orinoco sailfin catfish
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental Industry
Risk assessment area	Lake Taal
Taxonomy	Order - Siluriformes Family - Loricariidae
Native range	South America
Introduced range	Philippines
URL	https://www.fishbase.se/summary/Pterygoplichthys-multiradiatus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	The taxon was introduced in 1970-1979 as an ornamental species (Cagauna, 2007)	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon is the major component of fish catch in the Philippine waters but the fish has very little value as food fish since the flesh tastes bitter. It may be used, however, as a source of fish meal and for ornamental industry (Cagauan, 2007).	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Pterygoplichthys already has the invasive history, since species P. multiradiatus, P. pardalis and P. disjunctivus have been so far recorded as exotic in Mesoamerica – Puerto Rico and Mexico (8, 12); in North America: southern United States – Florida, Texas, Washington and North Carolina, as well as at Hawaii islands (10, 11, 19, 18, 20); in Philippines and south-eastern Asia: peninsular Malaysia, Singapore, Taiwan, Java and Sumatra (22). In all those recipient areas recorded so far, the aquarists were assigned responsible for their releasing into natural ecosystems and subsequent establishment (Simonović, Nikolić, and Grujić, 2014).	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	High
5	2.02	What is the quality of the climate matching data?	High	The taxon's native range (Amazon) falls under the same climatic conditions in the Philippines which is a tropical climate (Peel et al., 2007)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon was found and collected from five sites in and around the Laguna de Bay basin: Marikina River in Marikina and Pasig Cities; Pasig River in the City of Manila; Catmon Creek in Bay, Laguna; Banilad Creek in Siniloan, Laguna; and Laguna de Bay in San Pedro, Laguna (Chavez et al., 2006)	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	They were probably introduced through an intentional release and possibly fish farm escapes upstream (near Davao) between the 2002 and 2005 (Hubilla et al, 2007). Moreover, local aquarium dealers have used its local moniker -- that a janitor fish cleans up – as a selling point, wherein anecdotal reports say that the misconception might have also be a reason for the high incidence of these specimens particularly in the Marikina and Pasig rivers	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon can currently be found in close proximity to the RA area due to either flooding due to weather conditions, or ornamental trade.	Medium
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Besides in the Philippines, P. disjunctivus and P. pardalis are also seen in Singapore waterways, with the former also found in Taiwan and the latter found as well in the canals and sewer system of Indonesia and the Red River of Northern Vietnam (Levin et al., 2008). In addition, "they have established populations and displaced indigenous fish and invertebrate communities" in Mexico, Puerto Rico and the United States (Soriano & Vallejo, Jr.,	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	The rapid increase of this species (Pterygloplchthys) has affected the livelihood and fishing operation of the fisherfolk which led to a decrease in marketable catch of endemic and commercial fish species due to its predominance in gill net and fish corral catch. (Chaves et al., 2006)	High
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	Based on the findings of the study, the taxon in the Agusan Marsh are considered threat to freshwater biodiversity. (Hubilla et al.,	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion (Hubilla et al., 2006)	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion (Hubilla et al., 2006)	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	Bioaccumulation of coliform bacteria and heavy metals, as well as vector of parasites, has been recorded on these species. In which if eaten will lead to potential contamination and infection (Orfinger & Goodding, 2018).	High

15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This species shows impacts on displacement of local species through resource competition such as indirect food competition which reduces the food resources like aquatic insects and vegetation and direct habitat competition because of high biomass of their populations (Orfinger & Goodding, 2018).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	This is very unlikely to happen considering the feeding guild and morphology of the taxon (Hubilla et al., 2007; Levin et al., 2008).	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	These fish are protected by modified scales and by strong spines on the fins and because they show a high tolerance to low oxygen concentrations or desiccation (up to 20 hours). The latter ability can be attributed to an enlarged and vascularized stomach, which functions as an accessory respiratory organ (Jasso et al., 2013). Also, they are commonly found in shallow freshwater environments, but some members of the Family Loricariidae: Pterygoplichthys which are considered to be strictly freshwater, have already established invasive populations in inland waters with mesohaline conditions, such as in North and Central America, Asia, Caribbean islands, Pacific and Indian oceans and in South-Eastern Mexico due to their high salinity tolerance (Capps et al.	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion. High water turbidity alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis ad primary productivity. (Hubilla et	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	Their burrowing behavior in river banks may contribute to water turbidity and soil erosion (Hubilla et al., 2006)	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017).	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are reports that the taxon can be a host for several parasites which are not yet recorded in Lake Taal (Nitta and Nagasawa, 2013; Nitta and Nagasawa, 2016; Rodríguez-Santiago et al., 2016; Cardoso et al., 2017)	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	"The size range for most of the adult species in the Loricariid family is 30–50 cm, but individuals have been observed to reach 70 cm (IUCN, 2010). While the max published weight: 310.00 g (Jumawan and Seronay, 2017). Accidental release of Pterygoplichthys spp. has been documented, such as when typhoon Rosing struck the Philippines resulting in escape of the fish from commercial farms. Also, they are very common aquarium fish around the world. Nearly all of their introduced populations are caused by pet release or aquaculture escape	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	The taxon was collected from medium-velocity rivers no more than two meters deep near the river banks (Chavez, et al., 2006)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	The foraging activities of different-sized Pterygoplichthys had potentially strong negative effects on the number of catfish eggs and first-feeding fry. Therefore, these invasive alien fish pose a risk to the native aquatic resources [of Thailand] (Chaichana et al., 2012) Pterygoplichthys species are also generally herbivores, and large populations can significantly alter the energy budget of a water body by reducing the amount of energy available to other herbivores, such as aquatic insects and other arthropods (Kottelat et al 1993); Fuller et al 1999; Nico and Martin 2001). Reductions in the population of the arthropods will lead to reduced populations of other animals that feed on arthropods (Inger and	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	The taxon can maintain viable population under low density condition which is reported in the Chacamax River, Chiapas, Mexico (Capps and Flecker, 2015)	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This taxon feeds primarily on benthic algae, detritus, various plant matter, worms, insect larvae, fish eggs and other bottom-dwellers which do not fall under threatened or protected status in the RA area. (IUCN, 2010)	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Food competition by the said taxa, in which it reduces the food resources such as aquatic insects and vegetation in the area, can be detrimental to the native taxa (Orfinger & Goodding, 2018).	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This species exhibits parental care through building nests, given that their found habitat lacks predator and exploitation (Jasso et al., 2013).	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	No	There are no reports that the taxon is likely to produce viable gametes or propagules (in the RA area).	Medium
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	There is no native taxa present in the RA area where the genus Pterygoplichtys can hybridise (Papa and Mamaril, 2011).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Yes	The taxon mates through external fertilization, where the female deposits eggs on smooth rocks, depressions or burrows in the river bank. The eggs are then fertilized by the male. Afterwards, the eggs are guarded by one or both parents. In captivity, the most successful breedings have occurred in ponds with steep clay or mud banks. The fish dig tunnels close to the water level and the males guard the eggs until they hatch. (Jumawan et al. 2014)	High

32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	The taxon does not depend on other taxa and or other means to complete lifecycle (Power, 2003).	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Catfish have a minimum of three to five spawning bouts every breeding season (Winemiller, 1989)	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	Not applicable	There are no reports of time units that the taxon requires to reach the age-at-first-reproduction.	Low
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	The taxon can enter the RA through natural dispersal and its succes is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA through natural dispersal and its success is increased because of its environmental tolerances. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities like flooding which the RA area is prone (Brändlin & Wingard 2013; CABI, 2015)	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	The modified mouth allows the taxon to feed, breathe, and attach to the substrate through suction (CABI,2015).	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	In the case of an invasive species such as P. pardalis, accidental release of eggs and juveniles may result in assured higher survival rates in the wild (Jumawan et al., 2014).	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	Book-paper/after hatching they disperse/after consuming the egg, the young swim away/disperse	Medium
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	There are no reports that the older life stages of the taxon are likely to migrate in the RA area for reproduction.	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	There are no reports that the propagules or eggs of the taxon are likely to be dispersed in the RA area by other animals	Medium
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Not applicable	There are no reports if the dispersal of the taxon along any of the pathways mentioned in the previous seven questions is likely to be rapid.	Low
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no reports if the dispersal of the taxon density is	Low
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	Members of this taxon also have the ability to breathe air and are able to survive up to 30 h out of water (Val and De Almeida-Val, 1995). Pterygoplichthys and many other loricariids are facultative air-breathers, able to persist indefinitely in hypoxic conditions and even able to survive out of water for many hours (Graham, 1997)	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Taxon can tolerate water pollution, low oxygen levels, and elevated salinity (Capps et al., 2011; Özgür et al., 2016)	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	A successful eradication through human intervention was done in the Rainbow River, Florida USA (Hill and Sowards, 2015). Also, a preliminary study of the potential eradication of P. pardalis by three native Thai piscivorous species yielded interesting results. Demersal species such as H. wyckioides and O. marmorata could more effectively eliminate P. pardalis than other native species such as P. sanitwongsei. In particular, H. wyckioides was the most effective consumer of P. pardalis, as it could efficiently ingest individuals up to 10 cm in length. Pterygoplichthys pardalis longer than 10 cm can stretch out their body fins, preventing H. wyckioides from feeding on them. The potential of native fish to help control certain invasive fish species was also addressed by	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Taxon is tolerant of (and likely to benefit from) eutrophication and other forms of aquatic disturbance, as evidenced by their occurrence in nutrient-rich Lake Thonotosassa and Lake Maggiore, Florida and Nong Yai Canal, East Thailand (Hoover et al., 2004; Chaichana et al., 2011).	High
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Taxon can tolerate elevated salinity (Capps et al., 2011).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA area?	No	Based on the list of fish species present in lake Taal (Papa and Mamaril, 2011), there is none that could possibly prey on the taxon being assessed.	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Lake Taal is close but completely isolated from Laguna de Bay and other rivers in Luzon Island where Pterygoplichthys spp. were recorded and thus may only require accidental and/or intentional vectors of introduction, together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the risk of entry of this	High

51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the risk of establishment of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of dispersal through accidental release from aquarium together with their fitness to counter act environmental disturbances, this would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since they can survive the future climatic conditions of the RA area, this taxon can cause increased scarcity of nutrient resources, alter food webs, increase turbidity and cause bank erosion due to their nest building activity which alters the amount of light that can pass down through the water column, and thus, slows down photosynthesis and primary productivity which physically inhibit other aquatic organisms specially the local fishes	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the ecosystem services and socio-economic factors of the RA area by competing on the existence of the local species which would eventually replace their existence in the RA area, thus affecting the livelihood services and the genetic diversity of the ecosystem in the area.	Medium

Statistics	
Scores	
BRA	**49.0**
BRA Outcome	**High**
BRA+CCA	**61.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**26.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*18.0*
B. Biology/Ecology	**23.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*2.0*
6. Reproduction	*3.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*7.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**22**
Environmental	**12**
Species or population nuisance traits	**33**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.70**
BRA	**0.69**
CCA	**0.71**

Date and Time
24/02/2019 20:28:49

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Puntigrus tetrazona*
Common name	Sumatra barb
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cypriniformes (Carps) > Cyprinidae (Minnows or carps) >
Native range	Asia: Sumatra and Borneo.
Introduced range	Introduced widely and has been reared in several countries in facilities for breeding aquarium fishes
URL	https://www.fishbase.se/summary/Puntigrus-tetrazona.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/eletchea2016.pdf	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Teletchea%202016.pdf	Medium
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	Medium
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	High
5	2.02	What is the quality of the climate matching data?	High	file:///C:/Users/User/Desktop/Thesis%20Ref/kottek2006.pdf	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	naswer in Q6 was YES	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	https://www.fishbase.de/Introductions/IntroductionsList.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	No	file:///C:/Users/User/Desktop/Thesis%20Ref/Xiong2015.pdf	Medium
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Ho%20Kim%202002.pdf	Medium
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Ho%20Kim%202002.pdf	Medium
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Ho%20Kim%202002.pdf	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Harlioglu%202018.pdf	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Ho%20Kim%202002.pdf	Medium
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Harlioglu%202018.pdf	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	No	https://www.fishbase.de/TrophicEco/FoodItemsList.php?vstockcode=4990&genus=Puntigrus&species=tetrazona	Medium
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Harlioglu%202018.pdf	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Ho%20Kim%202002.pdf	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Ho%20Kim%202002.pdf	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Harlioglu%202018.pdf	Medium
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High

24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	Medium
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Harlioglu%202018.pdf	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	https://www.fishbase.de/TrophicEco/FoodItemsList.php?vstockcode=4990&genus=Puntigrus&species=tetrazona	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4766&GenusName=Puntigrus&SpeciesName=tetrazona&fc=122&StockCode=4990	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Harlioglu%202018.pdf	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	2	http://animal-world.com/encyclo/fresh/cyprinids/tigerbarb.php	Medium
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	file:///C:/Users/User/Desktop/Thesis%20Ref/joshi.pdf	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Not applicable	No data for this question	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Not applicable	No data for this question	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	based on previous question	Medium
43	7.09	Is dispersal of the taxon density dependent?	Yes	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	Medium
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	https://www.fishbase.de/summary/Puntigrus-tetrazona.html	Medium
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Xiong2015.pdf	Medium
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	No data for this question	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Xiong2015.pdf	Medium
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Not applicable	No data for this question	Medium
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
C. Climate change					
9. Climate change					

50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	file:///C:/Users/User/Desktop/Thesis%20Ref/Joshi%20et%20al%202016.pdf	High

Statistics	
Scores	
BRA	**29.0**
BRA Outcome	**Medium**
BRA+CCA	**41.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**13.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*7.0*
B. Biology/Ecology	**16.0**
4. Undesirable (or persistence) traits	*9.0*
5. Resource exploitation	*2.0*
6. Reproduction	*0.0*
7. Dispersal mechanisms	*1.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**13**
Environmental	**7**
Species or population nuisance traits	**25**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.67**
BRA	**0.66**
CCA	**0.75**

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AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Sarotherodon melanotheron*
Common name	blackchin tilapia
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cichliformes (Cichlids, convict blennies) > Cichlidae (Cichlids) >
Native range	Africa
Introduced range	introduced elswhere including the Philippines
URL	https://www.fishbase.se/summary/Sarotherodon-melanotheron.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is a productive and tolerant species that has been introduced worldwide for aquaculture/farming, angling, and the control of aquatic vegetation (GSID, 2020).	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	This taxon is a productive and tolerant species that has been introduced worldwide for aquaculture/farming, angling, and the control of aquatic vegetation (GSID, 2020).	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	The following subspecies of the taxon were reported to cause adverse ecological impacts after introduction: Oreochromis niloticus baringoensis, Oreochromis niloticus cancellatus, Oreochromis niloticus eduardianus, Oreochromis niloticus filoa, Oreochromis niloticus niloticus, Oreochromis niloticus sugutae, Oreohromis niloticus tana and Oreohromis niloticus vulcani	High
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	This taxon is cold tolerant but prefers a tropical climate, the temperatures ranges from 8-30°C and tolerating up to 41°C (CABI,2020; FishBAse, 2019).	High
5	2.02	What is the quality of the climate matching data?	High	This taxon is cold tolerant but prefers a tropical climate, the temperatures ranges from 8-30°C and tolerating up to 41°C which is the climate in the RA area (CABI,2020; FishBAse, 2019).	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (CABI, 2020).	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon has been introduced in the country for farming and breeding to be used as a food source (Guerrero, 2019).	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon has been established in different parts of the Unitited States, namely: Arizona, California, Florida, Nevada, North Carolina, and Texas. This taxon has been considered the most widespread foreign fish in Florida for more than a decade (U.S. Fish and Wildlife Service, 2011).	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	The introduction of this taxon has resulted in a significant development of aquaculture because of its commercial importance, which improved the economic status of the introduced range (CABI,2020).	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon has records of being infected by a wide range of diseases and parasites, such as, Flexibacter columnaris (Bacteria), Apiosoma piscicolum, Epistylis colisarum, Trichodina sp., Trypanoplasma sp. (Protozoa), Cichlidogyrus tilapiae, Gyrodactylus cichlidarum and Neobedenia melleni (Monogenea) which could pose threaths to human (CABI, 2020).	Very high

15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality (CABI, 2020).	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	There are many viruses that are associated with this taxa, examples are: betanodavirus, tilapia larvae encephalitis virus (TELV) and tilapia lake virus disease (TiLV) (Jansen et al., 2018).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	This taxon can reach a large body size, having a maximum length of 50.8 cm (IUCNGSID,2020).	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	Yes	This taxon is considered hardy species, tolerant of a wide range of habitat conditions and water quality. It is usually found in estuarine habitats, lakes, water courses, warm ponds, dam reservoirs and in open water, among vegetation and stones (CABI,	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can stir up bottom sediments as they create nesting areas which causes siltation and bioturbidity reducing water quality and degrading aquatic habitats (CABI, 2020).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Not applicable	There are no reports of etablished population of this taxon persisting at low density.	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	Considiring that this taxon competes with native fishes for food, spawning area, and space, and exhibits aggressive behaviour. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA (USGS, 2020; IUCNGSID, 2020).	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	As this taxon feeds primarily on phytoplankton and epiphytic algae, insects, zooplankton, vascular plants, and larval and juvenile fishes (IUCNGSID, 2020).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	This taxon are maternal mouthbrooders. When a female lays her eggs in a nest prepared by the male. Then the male fertilizes the eggs, afterwhich the female picks up the eggs and incubates them in her mouth (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable it to produce a viable gametes (CABI, 2020).	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon can hybridize with its congeners and produces hybrids that are morphologically difficult to identify such as the Oreochromis niloticus x O. aureus (USGS, 2020; CABI, 2020).	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	Medium
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	This taxon requires nesting sites in order for the egss to be fertilized before the female can incubate them in their mouth (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon have a huge reproductive capacity with a female producing of upto 2000 eggs which hatches 3 days after fertilization (CABI, 2020).	Very high

34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	5	This taxon reaches the age of maturity at 5-6 months (IUCNGSID, 2020).	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	>1	Accidental introduction from aquaculture activities and intentional introduction with human intervention (USGS, 2020).	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Because of the taxons commercial importance, the aquaculture/ fish farming pathway could bring this taxon in close proximity to one or more protected areas.	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (FishBase, 2020)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since the eggs are protected by the mother until it hatches (CABI,2020)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	Since the eggs are protected by the mother until it hatches and even when the fry are free-swimming they will return to the mouth of the female for protection (CABI,2020).	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	There are no records about this taxon's migratory behaviour.	Medium
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	As this taxon lives in shallow waters in which can easily be targeted and in return they can be predated by birds (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	This taxon which is readily available in commercial markets (alive) and in aquaculture farms can be rapidly disperesed, knowing also the fact that the RA area is highly susceptable to flooding and natural calamities which could rapidly disperesed this	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records about this taxon's density dependence.	Very high
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records about this.	Medium
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	"This taxon is tolerant of a range of conditions such as Ammonium (mg/l): 0.02 - 0.5, Dissolved oxygen (mg/l): 3 optimum, Salinity (part per thousand) 29-45, Water pH (pH): 3.7 - 11 and 8-30°C and tolerating up to 41°C (CABI, 2020)."	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	For biological control, the predatory fish Morone saxatilis X Morone chrysops, Sciaenops ocellatus, Channa striata, Megalops cyprinoides, Nile perch, Hemichromis fasciatus, and Cichlasoma managuens was usedto reduce wild spawning among tilapia hybrids in aquaculture growout ponds.For the physical control, in Brunner Island, Pennsylvania a condenser was used to cool the down the water until it became lethal to the taxon (IUCNGSID,	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Due to their ability to survive in a wide range of environmental conditions specialy in tropical countries (RA area) it can benefit from environmental/human distrubances (CABI, 2020).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate a wide range of salinity from 29 to 45 ppt (CABI, 2020).	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Channa striata can be a predator if this taxon which is present in the RA area (CABI, 2020).	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) and their ability to survive the cilamatic conditions of a tropical environtment waters, the risk of entry through accidental introduction from aquaculture activities, intentional introduction with human intervention and aquarium escape would most likely increase the risk of entry of this taxon.	High

53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, there is a chance that these diseases may be introduced in the RA area also (CABI, 2020; USGS, 2020; IUCNGSID, 2020).	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, there is a chance that these diseases may be introduced in the RA area also (CABI, 2020; USGS, 2020; IUCNGSID, 2020).	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	Since this taxon mainly competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. Their introductions have caused reductions in abundance of native fishes, vegetation and even molluscs and there are reports that in some introduced areas, they have caused the lost of most and nearly all native fishes such as in the warm springs area of Nevada, USA. Morover, since this taxon has records of being infected by a wide range of diseases and parasites, there is a chance that these diseases may be introduced in the RA area also (CABI, 2020; USGS, 2020; IUCNGSID, 2020).	Very high

Statistics	
Scores	
BRA	**44.0**
BRA Outcome	**High**
BRA+CCA	**56.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**22.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**22.0**
4. Undesirable (or persistence) traits	*10.0*
5. Resource exploitation	*7.0*
6. Reproduction	*1.0*
7. Dispersal mechanisms	*0.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**19**
Environmental	**17**
Species or population nuisance traits	**27**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**
BRA	**0.85**
CCA	**0.88**

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07/07/2020 15:46:57

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Trichopodus leerii*
Common name	pearl gourami
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental
Risk assessment area	Lake Taal
Taxonomy	Order - Anabantiformes Family - Osphronemidae
Native range	South America
Introduced range	No Data
URL	https://www.fishbase.de/summary/Trichopodus-leerii

			Response	**Justification (references and/or other information)**	**Confidence**
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Fisher's Woodcat, Trachelyopterus fisheri, is not a very common species. So I was very pleased when I encountered three specimens in a shop in Amersfoort, here in the Netherlands.	Low
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Fisher's Woodcat, Trachelyopterus fisheri, is not a very common species. So I was very pleased when I encountered three specimens in a shop in Amersfoort, here in the Netherlands.	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	No	No data found	Low
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	The taxa can be located in South America which has almost similar conditions as the RA Area. (Planet Catfish, 2019)	High
5	2.02	What is the quality of the climate matching data?	Medium	The taxa can be located in South America which has almost similar conditions as the RA Area. (Planet Catfish, 2019)	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	No	Not applicable	Low
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The taxon can be introduced through aquaculture and research (Planet Catfish, 2019)	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	the taxon has been widely used in ornamental trading in Europe especially in Scotland. (Stabel, 2007)	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Not applicable	No data found	Low
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Not applicable	No data found	Low
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	No	No data found	Low
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	No data found	Low
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	The said taxon has no poisonous or significant threat to human life. (Planet Catfish, 2019)	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	They are calm and gentle like all Auchenipterids - being surface feeders - they are particularly fond of insects and their larvae but can also feed on small fish that could fit in their mouth . (Planet Catfish, 2019)	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	No data found	Low
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	No	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019)	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	No	They are calm and gentle like all Auchenipterids - being surface feeders - they are particularly fond of insects and their larvae but can also feed on small fish that could fit in their mouth . (Planet Catfish, 2019)	High
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	They are calm and gentle like all Auchenipterids - being surface feeders - they are particularly fond of insects and their larvae	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	No data found	Low
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	No data found	Low
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	Yes	adults can reach an approximate length of 11 inches and can grow more. (PlanetCatfish, 2019)	High

23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019)	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	in terms of general captive behaviour, this species doesn't resemble its congeners, but is more easily compared to the larger Auchenipterichthys and smaller ageneiosids. It's a very gentle species that glides through the water and never displays the hastiness which is so typical for other members of its genus. Moreover, the nape and the enlarged dorsal spine make it look more like an Ageneiosus or a Tetranematichthys. (Planet Catfish,	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019)	High
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	They are calm and gentle like all Auchenipterids - being surface feeders - they are particularly fond of insects and their larvae but can also feed on small fish that could fit in their mouth . (Planet Catfish, 2019)	Medium
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	They are calm and gentle like all Auchenipterids - being surface feeders - they are particularly fond of insects and their larvae but can also feed on small fish that could fit in their mouth . (Planet Catfish, 2019)	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	Has been recorded (see Reference notes below). Like other Auchenipterids these fish have internal fertilization. The bodies are wrapped around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	Medium
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	Has been recorded (see Reference notes below). Like other Auchenipterids these fish have internal fertilization. The bodies are wrapped around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	Has been recorded (see Reference notes below). Like other Auchenipterids these fish have internal fertilization. The bodies are wrapped around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	Yes	Has been recorded (see Reference notes below). Like other Auchenipterids these fish have internal fertilization. The bodies are wrapped around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	Yes	They are calm and gentle like all Auchenipterids - being surface feeders - they are particularly fond of insects and their larvae but can also feed on small fish that could fit in their mouth . (Planet Catfish, 2019)	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	No	No propagule number found. (Planet catfish, 2019)	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	Not applicable	The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable	One	One pathways of dispersal is aquarium release. (Planet catfish, 2019)	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	If released in their typical water conditions. (Planet catfish, 2019)	High
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	Yes	around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Yes	around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	around each other and to stay in position the male uses its barbels, dorsal spine and spawning tubercles. The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High

40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	because the Wood Catfish lives in Tropical climates such as the RA Area. (Planet Catfish, 2019)	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	Yes	The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
43	7.09	Is dispersal of the taxon density dependent?	No	The actual mating lasts for about 30 seconds or less. Four weeks later the female lays her eggs. The parents will neither look after their eggs, nor eat them. (Planet Catfish, 2019)	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	No data found	Low
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019)	High
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	No data found	High
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	No	No data found	Low
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	No	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019)	High
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	bigger taxa are natural enemies of these taxon. (Fishbase, 2019)	High
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Decrease	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Decrease	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Decrease	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Lower	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Lower	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Lower	The species are sensitive to water change and needs to be in their preferred water pH conditions and clean water at all times. (Planet Catfish, 2019	High

Statistics	
Scores	
BRA	**15.5**
BRA Outcome	**Medium**
BRA+CCA	**3.5**
BRA+CCA Outcome	**Medium**
Score partition	
A. Biogeography/Historical	**6.5**
1. Domestication/Cultivation	*2.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*1.5*
B. Biology/Ecology	**9.0**
4. Undesirable (or persistence) traits	*0.0*
5. Resource exploitation	*2.0*
6. Reproduction	*2.0*
7. Dispersal mechanisms	*7.0*
8. Tolerance attributes	*-2.0*
C. Climate change	**-12.0**
9. Climate change	*-12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*

5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**5**
Environmental	**-3**
Species or population nuisance traits	**7**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.63**
BRA	**0.62**
CCA	**0.75**

Date and Time
07/07/2020 15:48:46

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Trichopodus pectoralis*
Common name	snakeskin gourami
Assessor	Gilles
Risk screening context	
Reason and socio-economic benefits	Aquaculture: commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Anabantiformes (Gouramies, snakeheads) > Osphronemidae
Native range	Asia: Mekong basin in Laos, Thailand, Cambodia and Vietnam; also Chao Phraya basin
Introduced range	Introduced elsewhere and at least one country reports adverse ecological impact after introduction
URL	https://www.fishbase.se/summary/Trichopodus-pectoralis.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Responses to mass selection in a domesticated population of snakeskin gourami, Trichopodus pectoralis, Regan 1910, and confounding effects from stocking densities	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	A study by Hails and Abdullah (1982) stated that this fish species are abundant because of its economic factor as a food source. Also, numerous studies confirm that T. pectoralis are sold as ornamental and food fish in the market	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Medium	The climatch resulted in a value of 7 which is medium in terms of similarity	Very high
5	2.02	What is the quality of the climate matching data?	High	The only station from the target region is from the region of Sablayan, Occidental Mindoro, which is distant from the RA area	Very high
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Based on Labatos' (2012) study, T. pectoralis in 1 of the tributaries of Lake Taal and in nearby rivers.	Very high
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	The only recorded potential vector for T. pectoralis is uninentional through tributaries river (Labatos, 2012)	Very high
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	History of the biodiversity and limno-ecological studies on Lake Taal with notes on the current state of Philippine limnology (Papa & Mamaril, 2011)	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	Based on Fishbase, there have been records of T. pectoralis from 1950-1965 therefore have been able to establish viable population outside its native ranges	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	"It is difficult to gauge the impact this species has had on the environment [in Malaysia]. Soong (1948) maintained that this species has had no deleterious effect on other rice-field fishes, especially the climbing perch (Anabas testudineus), the snakehead (Channa striata) and catfish (Clarias spp.). However, it is certain that the indigenous Trichogaster trichopterus has been displaced, at least to some extent, since both have similar feeding habits and occupy the same niche in the paddy field ecosystem."	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	No	Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	No	Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	There are no studies implying adverse effects of T. pectoralis to aquaculture. In fact, many studies have stated how beneficial the fish species are to its economic value	High
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no studies implying adverse effects of T. pectoralis to aquaculture. In fact, many studies have stated how beneficial the fish species are for culturing due to its high quality meat, and is cultured ornamentally and as food (Fishbase)	High
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	No	There are no studies suggesting that T. pectoralis is able to supress the growth of other taxa. Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web	High
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	No	There are no studies in the RA suggesting the parasitism or predator behavior of T. pectoralis. Also, fishbase states that it feeds on aquatic plants therefore not a threat to other taxa.	High
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	There no studies suggesting the highly adaptive mechanism of T. pectoralis to different climatic and environmental conditions. In fact, a study by Setijaningsih et al. (2018) shows the optimum values of T. pectoralis at which it grows.	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	In an online invasiveness database (CABI.org) it was stated that one of the ecological impacts of T. pectoralis includes alteration of food webs. However, this is an international database and does not represent the food web of the RA area	High

19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	No	There are no existing studies regarding the adverse effect of T. pectoralis on the ecosystem services of the RA areaSnakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA area?	No	There are no existing studies regarding the potential hosting of T. pectoralis on endemic pests and agents in the RA area Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	A study by Dinh-Hung et al. (2022) shows how T. pectoralis is a carrier of a lethal pathogen, Streptococcus suis	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Max length : 25.0 cm TL male/unsexed; common length : 15.0 cm TL male/unsexed);published weight: 500.00 g FishBase 2020	Very high
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	Based on fishbase, this fish species are only found in sluggish/ standing waters. This statement was also used in the study by Suryaningshi et al. (2018) https://www.fishbase.se/summary/Trichopodus-pectoralis.html	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	No	There are no studies suggesting the adverse effects of T. pectoralis and its mode of existence. https://www.fishbase.se/summary/Trichopodus-pectoralis.html	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	No	No. although a study by Herder et al., 2012 mentioned that T. pectoralis are known to inhabit shallow habitats with dense vegetation, there is no evidence that mentions that the species can persist even when present in low densities https://www.fishbase.se/summary/Trichopodus-pectoralis.html	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	This fish species are recorded to feed on plants, detritus, and zooplankton (fishbase) therefore are not likely to consume threatend or protected taxa in the RA area. https://www.fishbase.se/summary/Trichopodus-pectoralis.html	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	No	No, however, studies have shown that the introduced t. Pectoralis are likely to sequester food resources that could possibly harm indigenous fishes. But in terms of this in the RA area, there are no studies that mentions this.https://www.fishbase.se/summary/Trichopodus-	High
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	Yes	Yes, according to Robison (1971), T. pectoralis exhibit parental care but female fishes take no active part in parental care, instead they remain fair from the nest and the male fishes. Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	No	No because there are no studies of reproduction of t. Pectoralis in the RA area. However, in terms of its breeding patterns, trichopodus species all follow a generally similar pattern of breeding and it its quite effective that they are sexually isolated even when breeding in the same tank.	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	No, there are no studies about hybrids of t. Pectoralis with other native taxa. Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no studies suggesting the herrmaphroditism of T. pectoralis, in fact the fish species exhibits sexual dimorphism Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	There are no records suggesting the dependence of T. pectoralis on the presence of another taxa. Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version,	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	Based on fishbase, the fecundity of T. pectoralis is at 1000 min - 10,000 max Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	Very high
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	1	Based on Panthum et al. (2021), mature sex organs can be seen in T. pectorals after a year.	Very high
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	In a study by Papa & Mamaril (2012), 2 tributaries from Taal Naujan were positive with the presence of T. pectoralis. Namely, Malbog River and Subaan River. This may mean that from the 2 tributaries, all of them may be considered as potential pathways that the T. pectoralis could probably be used in its dispersal within	Very high
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Yes. From the 2 tributaries mentioned, all of them are surrounding taal lake or the RA area. With the T. pectoralis being an introduced species and according to Papa & Mamarail' study in 2012, majority of the species that is recorded in this lake was migratory species wherein they live primarily in marine environments but frequently visit freshwater ecosystems.	Very high

37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	No, there are no evidence of the organism actively attaching itself to hard substrata. Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	High
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	No, although there are studies that are not in the RA area that mentioned that the eggs of t. Pectoralis were dispersed over the water surface (Degani, n.d.)	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	No	No. there are no studies about dispersal of t. Pectoralis as larvae in the RA area.	High
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	Yes	Most likely, yes, according to Heckman (1979), adult T. pectoralis tend to nest in shallow waters but generally prefer deep waters.	Very high
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	No. the eggs of t. Pectoralis are more likely to float on water rather than being dispersed by animals. Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be	No	Based from Santos et al ' study in the RA area and according to previous answers that mentions the tributaries, most likely the dispersal of the T. pectoralis from any of the pathways can be rapid, considering that they are found near/within the area of Lake	High
43	7.09	Is dispersal of the taxon density dependent?	No	No. There was no evidence of the species spreading out when its population increases.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	No	No. There are no studies about t. Pectoralis withstanding being out of water Snakeskin Gourami (Trichopodus pectoralis) Ecological Risk Screening Summary U.S. Fish & Wildlife Service, June 2014 Revised, December 2017 Web Version, 9/11/2019	Very high
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Yes, according to Yanagitsuru et al., 2019, t. Pectoralis is highly adapted to tolerate low pH.	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Not applicable	no data	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	No	No, . according to Ahmadi (2021), t. Pectoralis can be found occasionally in running waters as well as impounded and man made water bodies but it does not tolerate polluted watters	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	A study by Setijaningsih (2019) shows the optimal salinity level of 3 g/L for Trichopodus pectoralis which stabilizes the blood levels, preventing stress	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Not applicable	no data	Low
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	study by Tolentino et al. (2016) shows the projected increase of water in the rivers in the Philippines due to climate change. Increased water levels will allow an easier migration of this fish species.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Decrease	Based on a database by CABI, the max temperature for the reproduction of T. pectoralis is 29 degrees celsius. Because of global warming, we expect the temperature of the lake to increase therefore pose a threat to its reproduction	Very high
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	No change	There are no evidences of how future climatic conditions will affect the dispersal in the RA area. However, impact of climate change in the Philippines might affect in the future.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	No change	There are no evidences/studies that shows the effect of future climatic conditions to the potential impacts on biodiversity and ecological integrity	Very high
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Not applicable	There are no evidences/studies that shows the effect of future climatic conditions to the potential impacts on ecosystem structure	Very high
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Not applicable	There are no evidences/studies that shows the effect of future climatic conditions to the potential impacts on ecosystem structure	High

Statistics	
Scores	
BRA	**16.0**
BRA Outcome	**Medium**
BRA+CCA	**16.0**
BRA+CCA Outcome	**Medium**
Score partition	
A. Biogeography/Historical	**11.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*4.0*
3. Invasive elsewhere	*3.0*
B. Biology/Ecology	**5.0**
4. Undesirable (or persistence) traits	*3.0*
5. Resource exploitation	*0.0*
6. Reproduction	*2.0*

7. Dispersal mechanisms	*-1.0*
8. Tolerance attributes	*1.0*
C. Climate change	**0.0**
9. Climate change	*0.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**10**
Environmental	**2**
Species or population nuisance traits	**10**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.85**
BRA	**0.85**
CCA	**0.88**

Date and Time
12/02/2023 20:19:04

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Trichopodus trichopterus*
Common name	three spot gourami
Assessor	Gilles, Pavia
Risk screening context	
Reason and socio-economic benefits	Ornamental
Risk assessment area	Lake Taal
Taxonomy	
Native range	
Introduced range	
URL	

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	Yes, it was stated in fishbase that this fish species are commonly seen in the aquarium fish trade https://www.fishbase.de/Introductions/IntroductionsList.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	High
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	Yes, fishbase stated that it is marketed fresh and commonly seen in aquarium fish trade	High
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Yes, CABI labeled this fish species as invasive outside its native range https://www.fishbase.de/summary/Trichopodus-	Medium
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	Low	The climatch score only garnered a score of 1 which means the climate from its native range is completely different from the introduced range.	High
5	2.02	What is the quality of the climate matching data?	High	climatch matching was used to generate the climate analysis	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	Corpuz et al. 2016 paper Diversity and Distribution of Freshwater Fish Assemblages in Lake Taal River Systems in Batangas,	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	>1	Impacts of Introduced Freshwater Fishes in the Philippines (1905-2013): A Review and Recommendations (Guerrero 2014)	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Not applicable	Corpuz et al. 2016 paper Diversity and Distribution of Freshwater Fish Assemblages in Lake Taal River Systems in Batangas, Philippines	High
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its	Yes	Yes, it was stated in fishbase that it does have established populations in its introduced range.	High
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	Yes, CABI stated that T. trichopterus is a resource competitor for the Puntius semifasciolatus which caused its decline in China	Medium
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	There are no specific studies regarding its adverse effects on aquaculture however it was stated that it is an opportunistic carnivore that might prey on native species. (Krishnakumar et al.,	Medium
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem	No	There are no known adverse impacts to ecosystem services.	Medium
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	Yes	It was stated in CABI that the aggressivess of the male T. trichopterus may displace native species, this might affect the livelihood and sport fishing in the introduced ranges.	Medium
B. Biology/Ecology					
4. Undesirable (or persistence) traits					
14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	No	There are no known harmful effects of T. trichopterus to humans. https://www.fishbase.de/summary/Trichopodus-trichopterus.html	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	It was stated in CABI that the aggressivess of the male T. trichopterus may displace native species. https://www.fishbase.de/summary/Trichopodus-trichopterus.html.	Medium
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	There are threatened or protected taxa in the RA area based on Mutia et al. 2018 checklist that might be possible preyed by the T. trichopterus	Medium
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	Yes, CABI stated that it was able to successfully colonize outside its native range due to its high adaptability to environmental fluctuations	High
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA	Yes	Yes, CABI included that the T. trichopterus may compete for resources which alter aquatic food webs	Medium
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	Yes, CABI stated that this fish species may displace other species because of the male aggressiveness, this may cause other species used in sport fishing to be affected	High
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no endemic pathogens in the RA area that might parasitise T. trichopterus	Medium
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	No	There are no novel pests that T. trichopterus might serve as a vector for	High
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	No, fishbase recorded a max length of only 15.0 cm. https://www.fishbase.de/summary/Trichopodus-trichopterus.html	High

23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	Fishbase stated that this fish species inhabit sluggish and/or standing waters.https://www.fishbase.de/summary/Trichopodus-trichopterus.html	High
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	CABI stated that its feeding behavior (detritus) will cause resource competition which will affect the food web of the habitat.	High
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	Yes since based on a study by Urthaivat et al. (n.d.) there are no significant difference in the growth rate of T. trichopterus on different stocking densities.	Medium
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	No	Since this fish species are not carnivores, it is not likely that it consumes threatened or protected taxa in the RA area. detritus (https://www.fishbase.de/TrophicEco/DietCompoList.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893)	High
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	Yes, CABI reported a competition of resources with native taxa in China due to its feeding habits. detritus (https://www.fishbase.de/TrophicEco/DietCompoList.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893)	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	There are no studies suggesting the herrmaphroditism of T. tichopterus. https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	High
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	according to Azizan et al., (2021), T. trichopterus are eurytopic species which are tolerable to slightly acidic or slightly alkaline. Therefore, it is possible that the production of gametes can be done in this RA area since there are already evidences of its occurrence and the nature of the species being tolerable of a wide. https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	Very high
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	No	No, there are no studies of hybridization with native. https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	Low
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	No. there are no studies saying the species is hermaphroditic. https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	No information found, it is unlikely to be dependent on the presence of another taxon. https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	High
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	According to a study by (Zukal, 1983; Richter, 1988; Pethiyagoda, 1991),Trichopterus fecundity is size dependent and usually ranges from 300 for smaller females, up to maximum of 2000 to 4000 eggs for larger females, However, the year of reproduction time is not mentioned. Also according to another source in CABI, Trichopterus can reach sexual maturity at 7 cm TL and 12 to 14 weeks of age (McKinnon and Lilev, 1987)	High
34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	4	According to CABI, Trichopterus can reach sexual maturity at 7 cm TL and 12 to 14 weeks of age (McKinnon and Liley, 1987). Under favourable environmental conditions, the species exhibits a protracted breeding period, with temperature and day length being important reproductive.	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	Corpuz et al. 2016 paper Diversity and Distribution of Freshwater Fish Assemblages in Lake Taal River Systems in Batangas, Philippines. This may mean that from the tributaries mentioned, they may be considered as potential pathways that the T. trichopterus could probably be used in its dispersal within the RA	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	Yes based from the tributaries mentioned that surrounds Naujan lake or the RA area. with the T. trichopodus being an introduced species and according to Mutia et al' study in 2012, majority of the species that is recorded in this lake was migratory species wherein they live primarily in marine environments but frequently visit freshwater ecosystems. Therefore, the pathways that aid in dispersion of this species. can bring the taxon closer to protected	Medium
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	In terms of dispersal, no. but in a study it was mentioned that, fish that are infected usually exhibit what is commonly called flashing, which is actually the fish rubbing itself on a hard substrate or shaking its body in an attempt to remove the parasite	Low
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	Not applicable	No information. unlikely	High
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Not applicable	No information. unlikely	High

40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	Corpuz et al. 2016 paper Diversity and Distribution of Freshwater Fish Assemblages in Lake Taal River Systems in Batangas, Philippines. https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=	Low
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	No	No information of dispersal by other animals . https://www.fishbase.de/Reproduction/FishReproSummary.php?ID=4675&GenusName=Trichopodus&SpeciesName=trichopterus&fc=429&StockCode=4893	High
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	Base on the previous question. Corpuz et al. 2016 paper Diversity and Distribution of Freshwater Fish Assemblages in Lake Taal River Systems in Batangas, Philippines. This may mean that from the tributaries mentioned, they may be considered as potential pathways that the T. trichopterus could probably be used in its dispersal within the RA area.	Medium
43	7.09	Is dispersal of the taxon density dependent?	No	No, there are no studies of it being density dependent during dispersal.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Yes	Yes, according to CABI, T. trichopterus is highly tolerant of hypoxic conditions, as it possesses an auxiliary respiratory organ that allows it to breathe air.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Yes, according to Herder et al., 2012, the species is said to tolerate increased salinity. https://www.fishbase.de/summary/Trichopodus-trichopterus.html	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	No. there are no studies of it being controlled in the wild with chemicals. https://www.fishbase.de/summary/Trichopodus-trichopterus.html	Medium
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	Yes, according to CABI, T. trichopterus is highly tolerant of hypoxic conditions, as it possesses an auxiliary respiratory organ that allows it to breathe air.	Medium
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	Although, the percentage of salinity was not mentioned, it was said in CABI that it is able to tolerate wide ranges of water hardness, pH, temperature, salinity and dissolved oxygen conditions, also according to Herder et al., 2012, the species is	Medium
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	No	No information found. unlikely to be present	Low
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	A study by Toletino et al . (2016), shows the projected increase of water in the rivers in the Philippines due to climate change. increased water levels will allow an easier migration of the fish species.	High
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Most liklely it will increase. according to CABI, although there are conflicting reports of its minimum temperature being 18, 22 or 23°C (Axelrod et al., 1967; Degani 1989; Froese and Pauly, 2014). Anecdotal reports from aquarists/ornamental industry suggest the species can cope in temperatures as low as 18°C (Premier Pet, 2018). Therefore, the risk of entry may be high due to its ability to survive in temperatures as low as 18°C	High
52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Most lilkely it will increase. As stated in CABI, Natural dispersal and anthropogenic translocation of introduced populations of T. trichopterus are more likely to occur in areas that already contain multiple, large and/or widely distributed populations of the species. Thus, considering Mutia et al 2018' study, it was mentioned that it is present in many tributaries.	Medium
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	Connsidering that it is able to survive in low temperatures and high salinity,most lilkely its magnitude of potential impacts may be higher. According to CABI, T. trichopterus may compete with indigenous fishes for food and, during reproduction, males become aggressive and may displace indigenous fish that may possibly have an impact on biodiversity.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	Considering that it is able to survive in low temperatures and high salinity,most lilkely its magnitude of potential impacts may be higher. According to CABI, T. trichopterus may compete with indigenous fishes for food and, during reproduction, males become aggressive and may displace indigenous fish that may possibly have an impact on its ecosystem structure.	Medium
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	There are no studies of its effect on ecosystem services. But given the effect of climate change in the country it is likely to increase.	High

Statistics	
Scores	
BRA	**25.5**
BRA Outcome	**Medium**
BRA+CCA	**37.5**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**9.5**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*2.0*
3. Invasive elsewhere	*3.5*

B. Biology/Ecology	**16.0**
4. Undesirable (or persistence) traits	*7.0*
5. Resource exploitation	*2.0*
6. Reproduction	*0.0*
7. Dispersal mechanisms	*0.0*
8. Tolerance attributes	*7.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**12**
Environmental	**8**
Species or population nuisance traits	**23**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.65**
BRA	**0.65**
CCA	**0.67**

Date and Time
13/02/2023 00:07:34

AS-ISK v2

Taxon and Assessor details	
Category	Fishes and Lampreys (freshwater)
Taxon name	*Xiphophorus maculatus*
Common name	southern platyfish
Assessor	Gilles, To
Risk screening context	
Reason and socio-economic benefits	Aquarium, commercial
Risk assessment area	Lake Taal
Taxonomy	Actinopteri (ray-finned fishes) > Cyprinodontiformes (Rivulines, killifishes and live bearers) >
Native range	North and Central America
Introduced range	thailand, Philippines, Malaysia etc.
URL	https://www.fishbase.se/summary/Xiphophorus-maculatus.html

			Response	Justification (references and/or other information)	Confidence
A. Biogeography/Historical					
1. Domestication/Cultivation					
1	1.01	Has the taxon been the subject of domestication (or cultivation) for at least 20 generations?	Yes	This taxon is a popular ornamental fish which exhibits a wide range of color patterns. It has been subjected to hybridizitation by aquaculturists creating varieties of forms and colors. It is third most imported ornamental species in United States. It is mass produced in Florida fish farms for aquarium trade and in Ausrallia, it is considered as of “high” importance as an ornamental fish	Very high
2	1.02	Is the taxon harvested in the wild and likely to be sold or used in its live form?	Yes	The taxon has been harvested in the wild for ornamental purposes as pets and aquarium species (CABI, 2020).	Very high
3	1.03	Does the taxon have invasive races, varieties, sub-taxa or congeners?	Yes	Once concerete example is the Poecilia latipinna which already have records of invasion and its associated negative impacts. According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
2. Climate, distribution and introduction risk					
4	2.01	How similar are the climatic conditions of the Risk Assessment (RA) area and the taxon's native range?	High	The RA area and the taxon’s native range has both tropical climate. FishBase 2020	High
5	2.02	What is the quality of the climate matching data?	High	Data from Climatch were used to facilitate the climate analysis.	High
6	2.03	Is the taxon already present outside of captivity in the RA area?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	High
7	2.04	How many potential vectors could the taxon use to enter in the RA area?	One	The taxon could be introduced through intentional introduction with human intervention and aquarium escape.	High
8	2.05	Is the taxon currently found in close proximity to, and likely to enter into, the RA area in the near future (e.g. unintentional and intentional introductions)?	Yes	The taxon is now present in pet stores for ornamental use, such as in Cartimar Market where importation and sale of this taxon is highly abundant.	Very high
3. Invasive elsewhere					
9	3.01	Has the taxon become naturalised (established viable populations) outside its native range?	Yes	This taxon has already established populations in Asian, African, Caribbean, Oceanic, South American, and North American countries. (USGS, 2020; CABI, 2020).	Very high
10	3.02	In the taxon's introduced range, are there known adverse impacts to wild stocks or commercial taxa?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
11	3.03	In the taxon's introduced range, are there known adverse impacts to aquaculture?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
12	3.04	In the taxon's introduced range, are there known adverse impacts to ecosystem services?	Yes	According to Juliano et al. (1989), in the Philippines, this taxon competes with the native milkfish or Chanos chanos, for food. On the other hand Englund (1999) implicated that this taxon and other introduced Poeciliids (Xiphophorus hellerii and Gambusia species) is responsible for the decline of native damselflies or Megalagrion species on Oahu, Hawaii. Morover in California, this taxon caused the the decline of the desert pupfish, Cyprinodon macularius (U.S. Fish and Wildlife Service, 1983; Robins, 2014;	Very high
13	3.05	In the taxon's introduced range, are there known adverse socio-economic impacts?	No	This taxon is a very popular ornamental fish which gave fish pet traders income (CABI, 2020).	Very high
B. Biology/Ecology					
4. Undesirable (or persistence) traits					

14	4.01	Is it likely that the taxon will be poisonous or pose other risks to human health?	Yes	This taxon is a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may transferred to humans (IUCNGSID, 2020).	Very high
15	4.02	Is it likely that the taxon will smother one or more native taxa (that are not threatened or protected)?	Yes	This taxon is considered as a threath to native cyprinids and killifishes in the United States. In Nevada and Wyoming, it has been associated in the decline of native fishes and of damselflies in Hawaii. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population	Very high
16	4.03	Are there any threatened or protected taxa that the non-native taxon would parasitise in the RA area?	Yes	This taxon has record of eating eggs of native species which have caused their decline in population (IUCNGSID, 2020; CABI, 2020).	Very high
17	4.04	Is the taxon adaptable in terms of climatic and other environmental conditions, thus enhancing its potential persistence if it has invaded or could invade the RA area?	Yes	This taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates (CABI , 2020).	Very high
18	4.05	Is the taxon likely to disrupt food-web structure/function in aquatic ecosystems if it has invaded or is likely to invade the RA area?	Yes	This taxon is considered as a threath to native cyprinids and killifishes in the United States. In Nevada and Wyoming, it has been associated in the decline of native fishes and of damselflies in Hawaii. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population. In the Phillippines, according to Juliano et al. (1989), this taxon competes with the native milkfish or Chanos chanos, for food (U.S. Fish and Wildlife Service, 1983; IUCNGSID, 2020; USGS,	Very high
19	4.06	Is the taxon likely to exert adverse impacts on ecosystem services in the RA area?	Yes	This taxon is considered as a threath to native cyprinids and killifishes in the United States. In Nevada and Wyoming, it has been associated in the decline of native fishes and of damselflies in Hawaii. It eats the eggs of native fish species and It is also a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population. In the Phillippines, according to Juliano et al. (1989), this taxon competes with the native milkfish or Chanos chanos, for food (U.S. Fish and Wildlife Service, 1983; IUCNGSID, 2020; USGS,	Very high
20	4.07	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are endemic in the RA	No	There are no reports that the taxon may carry pests or infectious agents that are endemic in Lake Taal.	High
21	4.08	Is it likely that the taxon will host, and/or act as a vector for, recognised pests and infectious agents that are absent from (novel to) the RA area?	Yes	This taxon is a known carrier of trematode parasites, nematode (Camallanus cotti), and the Asian tapeworm (Bothriocephalus acheilognathi) in Hawaii , which may affect native fish species population (IUCNGSID, 2020).	Very high
22	4.09	Is it likely that the taxon will achieve a body size that will make it more likely to be released from captivity?	No	Ths taxon can only reach a large body size, having a maximum length of 6 cm (Fish Base, 2019).	High
23	4.10	Is the taxon capable of sustaining itself in a range of water velocity conditions (e.g. versatile in habitat use)?	No	This taxon inhabits slow-flowing lotic systems, such as upland and coastal reaches of rivers, and lentic systems and within these habitats it prefers structure, i.e. aquatic or emergent vegetation	Very high
24	4.11	Is it likely that the taxon's mode of existence (e.g. excretion of by-products) or behaviours (e.g. feeding) will reduce habitat quality for native taxa?	Yes	This taxon can induce algal blooms when they eat the zooplankton grazers (USGS, 2020; CABI, 2020; U.S. Fish and Wildlife Service, 2017).	Very high
25	4.12	Is the taxon likely to maintain a viable population even when present in low densities (or persisting in adverse conditions by way of a dormant form)?	Yes	The huge reproductive rate of this taxon can lead to rapid expansion of small founder populations with a doubling time of less than 15 months and then expand into surrounding areas (CABI, 2020).	Very high
5. Resource exploitation					
26	5.01	Is the taxon likely to consume threatened or protected native taxa in the RA area?	Yes	This taxon has record of eating eggs of native species which have caused their decline in population (IUCNGSID, 2020; CABI, 2020).	Very high
27	5.02	Is the taxon likely to sequester food resources (including nutrients) to the detriment of native taxa in the RA area?	Yes	This organism can compete with food source of native species as they consume plants and algal matter, periphyton, aquatic invertebrates and insects (CABI, 2020).	Very high
6. Reproduction					
28	6.01	Is the taxon likely to exhibit parental care and/or to reduce age-at-maturity in response to environmental conditions?	No	The taxon does not exhibit any parental care, they are live bearing fishes (CABI, 2020).	Very high
29	6.02	Is the taxon likely to produce viable gametes or propagules (in the RA area)?	Yes	The conditions of the RA meets the required conditions for maturation and reproduction of this taxon, which will enable them to produce a viable gametes (Fish Base, 2019)	High
30	6.03	Is the taxon likely to hybridise naturally with native taxa?	Yes	This taxon has already been interbreed with many ornamental species creating hybrids, such as hybrids of P. latipinna X P. velifera, which are commonly available in the ornamental trade	Very high
31	6.04	Is the taxon likely to be hermaphroditic or to display asexual reproduction?	No	There are no documented evidence of hermaphroditism/asexual reproduction of this species.	High
32	6.05	Is the taxon dependent on the presence of another taxon (or specific habitat features) to complete its life cycle?	No	There are no requirments for this taxon being dependent on the other taxon since they are livebearers (CABI, 2020).	Very high
33	6.06	Is the taxon known (or likely) to produce a large number of propagules or offspring within a short time span (e.g. < 1 year)?	Yes	This taxon produces broods of 20-80 youngs, after 24-30 days of gestation (FishBase, 2020).	Very high

34	6.07	How many time units (days, months, years) does the taxon require to reach the age-at-first-reproduction?	3	This taxon reaches the age of maturity within 3-4 months (CABI, 2020).	High
7. Dispersal mechanisms					
35	7.01	How many potential internal vectors/pathways could the taxon use to disperse within the RA area (with suitable habitats nearby)?	>1	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	High
36	7.02	Will any of these vectors/pathways bring the taxon in close proximity to one or more protected areas (e.g. MCZ, MPA, SSSI)?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
37	7.03	Does the taxon have a means of actively attaching itself to hard substrata (e.g. ship hulls, pilings, buoys) such that it enhances the likelihood of dispersal?	No	Their physical characteristics does not allow attachment to any substrata (Fish Base, 2019)	Very high
38	7.04	Is natural dispersal of the taxon likely to occur as eggs (for animals) or as propagules (for plants: seeds, spores) in the RA area?	No	Since this taxon is a livebearer and it only inhabits lentic or slow flowing lotic environments; which means that if they are dispersed in a rapidly flowing or highly variable lotic environments, it may inhibit the species establishment or	Very high
39	7.05	Is natural dispersal of the taxon likely to occur as larvae/juveniles (for animals) or as fragments/seedlings (for plants) in the RA area?	Yes	The taxon can enter the RA area through natural dispersal and its succes is increased because of its broad environmental tollerences. Also, it can be dispersed intentionally because of its abundant ornamental use and unintentionally through aquarium escape during natural calamities (flooding) which the RA area is prone to (CABI, 2020).	Very high
40	7.06	Are older life stages of the taxon likely to migrate in the RA area for reproduction?	No	This taxon does not have migratory characteristics (CABI 2020, IUCNGSID, 2020).	High
41	7.07	Are propagules or eggs of the taxon likely to be dispersed in the RA area by other animals?	Yes	Since this taxon does not exhibit parental care, it makes the broods available for preadation and dispersion by other animals (CABI, 2020).	Very high
42	7.08	Is dispersal of the taxon along any of the vectors/pathways mentioned in the previous seven questions (35–41; i.e. either unintentional or intentional) likely to be rapid?	Yes	This taxon which is readily available in the market for aquaculture and as pets together with the fact that the RA area is prone to natural calamities such as typhoons (Brändlin & Wingard, 2013) and its high adaptability to different environmental conditions making them a habitat generalist makes their dispersal rapid	Very high
43	7.09	Is dispersal of the taxon density dependent?	Not applicable	There are no records that this taxon is density dependent in terms of dispersal.	High
8. Tolerance attributes					
44	8.01	Is the taxon able to withstand being out of water for extended periods (e.g. minimum of one or more hours) at some stage of its life cycle?	Not applicable	There are no records.	High
45	8.02	Is the taxon tolerant of a wide range of water quality conditions relevant to that taxon? [In the Justification field, indicate the relevant water quality variable(s) being	Yes	Water pH: 7-8, Temperature: 18°C - 25°C, dH: 9-19 and Salinity: ppt <3 ppt (FishBase, 2019; CABI, 2020).	Very high
46	8.03	Can the taxon be controlled or eradicated in the wild with chemical, biological, or other agents/means?	Yes	The biological control of this taxa includes the introduction of larger predatory species, however, it is only possible in small, contained water bodies and it opens the possibility of introducing further problem species (CABI, 2020).	Very high
47	8.04	Is the taxon likely to tolerate or benefit from environmental/human disturbance?	Yes	As this taxon has wide range of environmental tolerances,they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats and to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates, it is mostlikely, that they will benefit from environmental disturbances specially flooding which is prone in the RA area (CABI, 2020).	Very high
48	8.05	Is the taxon able to tolerate salinity levels that are higher or lower than those found in its usual environment?	Yes	This taxon can tolerate high salinity levels (CABI, 2020).	Very high
49	8.06	Are there effective natural enemies (predators) of the taxon present in the RA	Yes	Micropterus salmoides can predate this taxon in the RA area (Guerrero, 2014).	Very high
C. Climate change					
9. Climate change					
50	9.01	Under the predicted future climatic conditions, are the risks of entry into the RA area posed by the taxon likely to increase, decrease or not change?	Increase	Together with the fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) the risk of entry through accidental release from aquarium would most likely increase the entry of this taxon.	Very high
51	9.02	Under the predicted future climatic conditions, are the risks of establishment posed by the taxon likely to increase, decrease or not change?	Increase	Based on their different morphological characteristics, together with the fact that this taxon can survive a wide range of environmental conditions,(they can tolerate high ranges of temperature, salinity and oxygen levels, they have the ability to colonize anthropogenically disturbed habitats, to give birth to live offspring, they can do trophic opportunism, and they grow in fast rates), the risk of establishment of the taxon increases (CABI ,	Very high

52	9.03	Under the predicted future climatic conditions, are the risks of dispersal within the RA area posed by the taxon likely to increase, decrease or not change?	Increase	As a fact that the RA area is prone to natural calamities such as typhoons and floods (Brändlin & Wingard, 2013) together with their ability to survive a wide range of environmental conditions (temperature, salinity,low oxygen level, disturbed habitats and etc.) the risk of entry through accidental release from aquarium would most likely increase the dispersal of this taxon.	High
53	9.04	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on biodiversity and/or ecological integrity/status?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High
54	9.05	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem structure and/or function?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High
55	9.06	Under the predicted future climatic conditions, what is the likely magnitude of future potential impacts on ecosystem services/socio-economic factors?	Higher	As this taxon can survive the future climatic conditions of the RA area and can establish viable population on it, it can pose a huge impact on the biodiversity and ecological status of the RA area by competing on food and nutrients of the local species and by introducing new diseases.	High

Statistics	
Scores	
BRA	**46.0**
BRA Outcome	**High**
BRA+CCA	**58.0**
BRA+CCA Outcome	**High**
Score partition	
A. Biogeography/Historical	**21.0**
1. Domestication/Cultivation	*4.0*
2. Climate, distribution and introduction risk	*3.0*
3. Invasive elsewhere	*14.0*
B. Biology/Ecology	**25.0**
4. Undesirable (or persistence) traits	*9.0*
5. Resource exploitation	*7.0*
6. Reproduction	*3.0*
7. Dispersal mechanisms	*2.0*
8. Tolerance attributes	*4.0*
C. Climate change	**12.0**
9. Climate change	*12.0*
Answered Questions	
Total	***55***
A. Biogeography/Historical	**13**
1. Domestication/Cultivation	*3*
2. Climate, distribution and introduction risk	*5*
3. Invasive elsewhere	*5*
B. Biology/Ecology	**36**
4. Undesirable (or persistence) traits	*12*
5. Resource exploitation	*2*
6. Reproduction	*7*
7. Dispersal mechanisms	*9*
8. Tolerance attributes	*6*
C. Climate change	**6**
9. Climate change	*6*
Sectors affected	
Commercial	**18**
Environmental	**17**
Species or population nuisance traits	**29**

Thresholds	
BRA	**34.5**
BRA+CCA	**34.5**
Confidence	
BRA+CCA	**0.92**
BRA	**0.93**
CCA	**0.83**

Date and Time
06/04/2020 12:36:59