



Import Status of Ornamental Osteoglossiformes in the Republic of Korea

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ABSTRACT

This study investigates the importation of ornamental Osteoglossiformes into Korea from 2009 to 2024 using National Fishery Products Quality Management Service quarantine records and international databases (CITES, GBIF). A total of 175,797 individuals representing 42 species from six families were imported, with Mormyridae being the most diverse. Imports increased steadily over time, averaging 19.9 species and 6,746.0 individuals annually. Six species, led by *Osteoglossum bicirrhosum* and *Scleropages formosus*, accounted for nearly 80% of total imports. Two species—*S. formosus* (CITES Appendix I) and *Arapaima gigas* (Appendix II)—were identified as internationally threatened but are continuously traded. Imports originated from 16 countries, with Indonesia, Thailand, China, and Nigeria being major suppliers. Ecological risks are highlighted for large carnivorous species such as *A. gigas* and *Chitala ornata*, which have established invasive populations elsewhere, causing declines in native fish. Their potential establishment in Korean rivers, particularly those influenced by warm-water discharge, underscores the need for long-term monitoring and biosecurity measures.

Keywords: Biosecurity, CITES, Ecological risk, Import status, Ornamental Osteoglossiformes

Introduction

Osteoglossiformes, meaning “bony tongue” in Greek, is a relatively primitive order of teleost fishes (Greenwood & Wilson, 1998). All extant species inhabit freshwater bodies across tropical and subtropical regions worldwide (Greenwood & Wilson, 1998). Globally, Osteoglossiformes comprises 241 species in five families, and two species are listed under Cites: *Scleropages formosus* in Appendix I and *Arapaima gigas* in Appendix II (CITES, 2025; Nelson *et al.*, 2016). Most species are large (in body length) and

carnivorous, marking them highly valued in the ornamental fish market (Nelson *et al.*, 2016), and the market for large ornamental fish is rapidly expanding (França *et al.*, 2017; Garcia *et al.*, 2014).

Representative species include *A. gigas*, *Chitala ornate*, *Osteoglossum bicirrhosum*, and *S. formosus*. Species belonging to the genera *Arapaima* and *Chitala* have been reported as invasive in several countries (Camacho & Taniegra, 2021; Miranda-Chumacero *et al.*, 2012). Invasive species may cause population declines or even extinctions of native fauna through predation, competition for resources, habitat alteration (Forneck *et al.*, 2016), or the introduction of novel pathogens (Putra *et al.*, 2018). One of the major pathways for the introduction of non-native species is the global pet trade (Early *et al.*, 2016; Novák *et al.*, 2020). Freshwater organisms kept as pets for ornamental purposes have been known to escape or be intentionally or accidentally released from aquaria (Marková

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et al., 2020).

However, the 2014 non-native species list included only 15 species of Osteoglossiformes, and information on their import status or countries of origin is unavailable (Bang et al., 2014; NIE, 2021). Systematic management and assessment of ornamental fish that may pose potential biosecurity threats are required; therefore, securing baseline data on ornamental fish being imported into Korea is essential.

Accordingly, this study aims to investigate the import records of ornamental Osteoglossiformes into Korea, update the list of non-native fish species, and provide baseline data for future ecological risk assessments and biosecurity management strategies.

Case Report

To examine the import status of ornamental freshwater aquatic animals we used import/export quarantine statistics from the National Fishery Products Quality Management Service (NFQS, 2025) of Korea from 2009 to 2024 and analyzed the import status of legally confirmed imported ornamental freshwater aquatic animals. The taxonomic classification of imported Osteoglossiformes, and whether they are considered internationally threatened species, were obtained from Global Core Biodata Resource and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES, 2025; GBIF, 2025) databases.

Discussion

Status of Osteoglossiformes imports into the Republic of Korea

An analysis of ornamental Osteoglossiformes imported into Korea from 2009 to 2024 revealed that a total of 175,797 individuals representing 42 species across six families have been imported. Among the imported Osteoglossiformes, Mormyridae constituted the largest share

with 25 species (59.5%), followed by Notopteridae (eight species), Osteoglossidae (five species), Arapaimidae (two species), and Gymnarchidae and Pantodontidae (one species each) (Appendix 1). Osteoglossiformes are not recorded in the National Species List of Korea (NIBR, 2025), while the 2014 non-native species list included 15 species: six Notopteridae, five Osteoglossidae, two Arapaimidae, and one Gymnarchidae, and one Pantodontidae (Bang et al., 2014; NIE, 2021).

Examining the data by year, the average number of species imported per year was 19.9 ± 2.9 . Since imports were confirmed in 2009, the number of species has continuously increased, except for a slight decrease between 2018 and 2019 (Fig. 1A). The average number of individuals imported per year was $6,746.0 \pm 2,400.9$, and except in 2021, annual imports never exceeded 10,000 individuals (Fig. 1B). Large-bodied species were previously sold only in aquarium shops, but with the growing popularity of online media and e-commerce, their potential market appears to be expanding (Magalhães et al., 2017).

A total of 16 countries exported ornamental Osteoglossiformes to Korea: Indonesia, Congo, Thailand, China, Nigeria, Germany, Singapore, Taiwan, Guinea, Malaysia, Colombia, Peru, India, Japan, Kenya, and Vietnam (Appendix 1). Among these countries, Indonesia accounted for the largest number of species exported (20), followed by Congo (18), Thailand (17), China and Nigeria (15), and Germany (14). Collectively, these top five countries accounted for more than 30% of all imported species (Fig. 2A). By the number of individuals imported, Indonesia led with 64,008 (36.4%), followed by Thailand with 42,236 (24.0%), China with 24,872 (14.1%), and Nigeria with 10,750 (6.1%); collectively, these four countries accounted for 80.6% of all imported individuals (Fig. 2B).

Major species

Among imported Osteoglossiformes, *O. bicirrhosum* recorded the highest number of imports (66,921 individuals; 38.1%), followed by *Chitala chitala* (22,763; 12.9%),

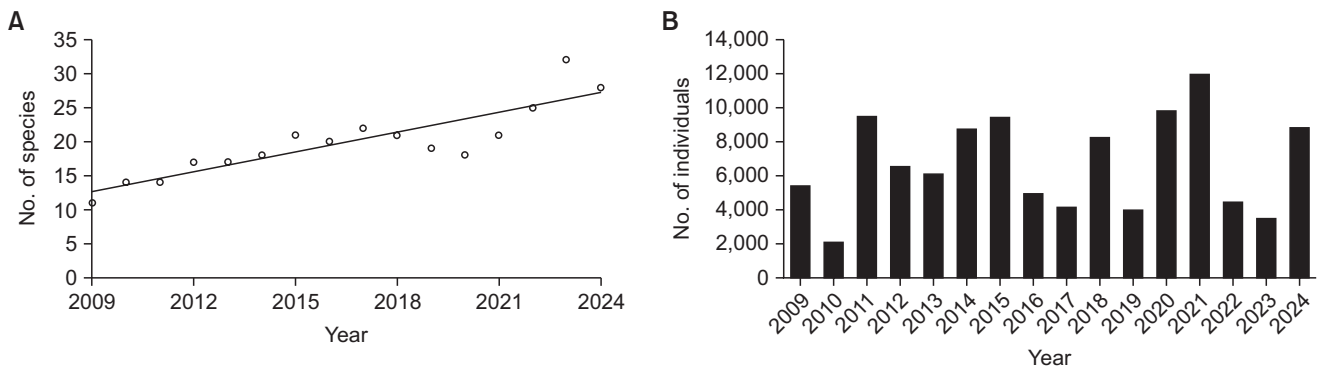


Fig. 1. Annual import status of ornamental Osteoglossiformes. (A) Number of species, (B) number of individuals.

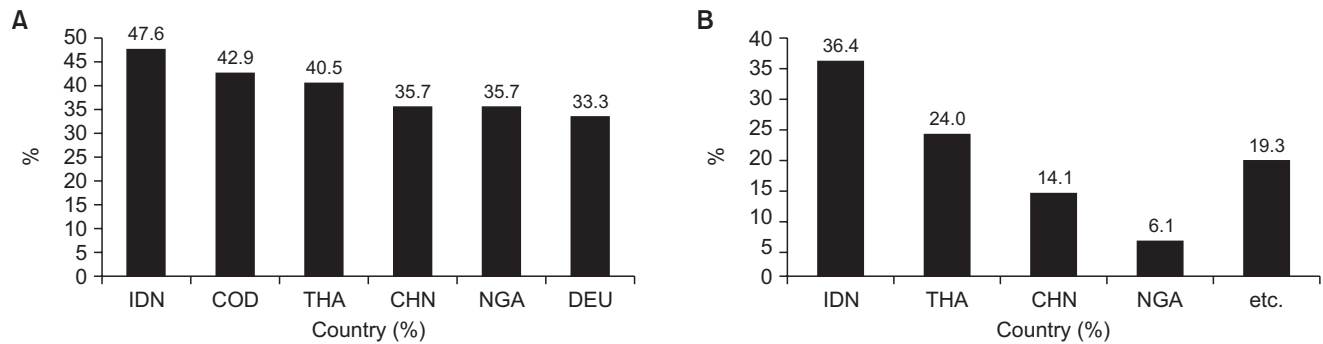


Fig. 2. Major importing countries of ornamental Osteoglossiformes. (A) Percentage of species, (B) percentage of individuals. IDN, Indonesia; COD, Democratic Republic of the Congo; THA, Thailand; CHN, China; NGA, Nigeria; DEU, Germany.



Fig. 3. Major imported species of ornamental Osteoglossiformes. Photos licensed under CC BY-NC 4.0 via GBIF: (A) *Osteoglossum bicirrhosum* (Tong, 2021); (B) *Scleropages formosus* (Han, 2022); (C) *Chitala chitala* (Leela123_nunna, 2022); (D) *Chitala ornata* (Wingedg2, 2017).

Chitala ornata (15,512; 8.8%), *S. formosus* (13,869; 7.9%), *Gnathonemus petersii* (10,344; 5.9%), and *Mormyrus longirostris* (10,256; 5.8%). These six species together accounted for 79.4% of the total imported individuals (Fig. 3, Appendix 1) (Han, 2022; Leela123_nunna, 2022; Tong, 2021; Wingedg2, 2017). Two of the imported species (4.7%) were identified as internationally threatened under CITES (Appendix 1). *S. formosus* has been continuously imported since 2009 despite being listed in CITES Appendix I, which includes species threatened with extinction for which international commercial trade is generally prohibited. *A. gigas* has also been continuously imported since 2010 and is listed in Appendix II, which covers species not necessarily currently threatened with extinction but whose trade must be regulated to prevent unsustainable exploitation. Under the CITES permitting system, Appendix I specimens may be traded only under exceptional, non-commercial circumstances and require both export and import permits, whereas Appendix II specimens re-

quire an export permit (or re-export certificate) issued by the exporting country following verification of legal acquisition and a non-detriment finding (CITES, 2025).

In the ornamental trade of large fish species, *O. bicirrhosum* and *S. formosus* are highly popular among collectors, not only for their size (up to 90 cm or more), varied coloration, shiny scales, and other external traits, but also because they are regarded as symbols of luck and wealth, which contributes to their high market value (Yue *et al.*, 2020).

Ecological risk

Among the Osteoglossiformes, which are mostly carnivorous and large-bodied, the imported species *A. gigas* and *C. ornata* have already been reported as invasive in certain countries (Camacho & Taniegra, 2021; Miranda-Chumacero *et al.*, 2012).

A. gigas, known as the pirarucu, is the largest and most iconic freshwater fish of the South American Amazon,

and can reach up to 4 m in length and 200 kg in weight (Castello *et al.*, 2009; Hrbek *et al.*, 2005; U.S. Fish & Wildlife Service, 2022). It has been heavily exploited as a food source over a long period and is currently listed under CITES Appendix II (CITES, 2025; Hrbek *et al.*, 2007). While climate constraints (minimum lethal temperature, 16°C) may limit the establishment and spread of *A. gigas*, its populations have been confirmed in Peru and Bolivia following its introduction to these regions. In northern Bolivia, declines in native fish populations, including many species of high commercial value, have been reported (Van Damme, 2006). *C. ornata* is also native to the Mekong and Chao Phraya river basins in Southeast Asia and is a large predatory species reaching up to 1 m in length (U.S. Fish & Wildlife Service, 2017). In Laguna de Bay, Philippines, a typhoon in 2009 led to the escape of numerous animals from aquaculture facilities. After this event, *C. ornata* rapidly spread and reached approximately 40% of the total catch within two years, causing severe damage to both native and farmed fish species (U.S. Fish & Wildlife Service, 2017).

These large carnivorous species have few natural predators in recipient habitats. By competing with or directly preying on native fish, they can contribute to declines in native fish populations. The primary pathway for the introduction of such non-native species is the international pet trade (Early *et al.*, 2016; Novák *et al.*, 2020), and freshwater animals kept for ornamental purposes have been known to escape or be intentionally/accidentally released from aquaria (Marková *et al.*, 2020). In Korea, the presence of the gastropods *Melanoides tuberculata* and *Mieniplotia scabra*—popular in the ornamental trade as “clean-up” organisms that help control algae and organic matter and capable of parthenogenetic reproduction—has recently been confirmed in the Jukdang Stream (Park *et al.*, 2024; Park *et al.*, 2025). These species have a high potential to establish in rivers and lakes within tropical and subtropical regions; in Korea, they may also establish in rivers sections influenced by warm-water discharge, underscoring the need for long-term monitoring (Park *et al.*, 2024).

Author Contributions

Conceptualization: YP. Data curation: YP, DC, MJ. Formal analysis: YP. Funding acquisition: YC. Writing – original draft: YP, YC. Writing – review & editing: YP, YC.

Conflict of Interest

Youngho Cho is an editorial board members of the journal, but was not involved in the review process of this manuscript. Otherwise, the authors declare that they have no competing interests.

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References

- Bang, S., Jeon, D., Oh, I., Choi, S., and Jung, S. (2014). Research on long-term management strategies for invasive species. Ministry Environment.
- Camacho, M.V.C., and Taniegra, R. (2021). Spatio-temporal distribution of the invasive Knifefish *Chitala ornata* (Gray, 1831) in Laguna De Bay, Philippines. *Asian Journal of Conservation Biology*, 10, 249–257. <https://doi.org/10.53562/ajcb.65732>
- Castello, L., Viana, J.P., Watkins, G., Pinedo-Vasquez, M., and Luzadis, V.A. (2009). Lessons from integrating fishers of arapaima in small-scale fisheries management at the Mami-raupá Reserve, Amazon. *Environmental Management*, 43, 197–209. <https://doi.org/10.1007/s00267-008-9220-5>
- Convention on International Trade in Endangered Species of wild Fauna and Flora (CITES). (2025). *Checklist of CITES species*. Retrieved Dec 14, 2025 from <https://checklist.cites.org/#/en>.
- Early, R., Bradley, B.A., Dukes, J.S., Lawler, J.J., Olden, J.D., Blumenthal, D.M., *et al.* (2016). Global threats from invasive alien species in the twenty-first century and national response capacities. *Nature Communications*, 7, 12485. <https://doi.org/10.1038/ncomms12485>
- Forneck, S.C., Dutra, F.M., Zacarkim, C.E., and Cunico, A.M. (2016). Invasion risks by non-native freshwater fishes due to aquaculture activity in a Neotropical stream. *Hydrobiologia*, 773, 193–205. <https://doi.org/10.1007/s10750-016-2699-5>
- França, E.J., de Almeida, C.A.C., de Almeida Neto, M.S., Rangel, E.S., Magalhães, A.L.B., El-Deir, A.C.A., *et al.* (2017). Novelty on the market, novelty in the environment: the invasion of non-native fish jaguar guapote (Perciformes) in northeastern Brazil. *Neotropical Biology and Conservation*, 12, 12–18.
- Garcia, D.A.Z., Almeida, F.S., Silva e Souza, Â.T., Britton, J.R., and Orsi, M.L. (2014). Invasion characteristics of *Pterygoplichthys ambrosettii* (Holmberg, 1893) in the lower Paranapanema River, Brazil. *Journal of Applied Ichthyology*, 30, 1041–1044. <https://doi.org/10.1111/jai.12468>
- Global Biodiversity Information Facility (GBIF). (2025). *Free and open access to biodiversity data*. Retrieved Dec 14, 2025 from <https://www.gbif.org/>.
- Greenwood, P.H., and Wilson, M.V. (1998). Bonytongues & their allies. In J.R. Paxton, and W.N. Eschmeyer (Eds.), *Encyclopedia of fishes* (pp. 81–84). Academic Press.
- Han. (2022). *Scleropages formosus* (Müller & Schlegel, 1840). *Global Biodiversity Information Facility*. Retrieved Jul 28, 2025 from <https://www.gbif.org/occurrence/4076035571>.
- Hrbek, T., Crossa, M., and Farias, I.P. (2007). Conservation strategies for *Arapaima gigas* (Schinz, 1822) and the Amazonian várzea ecosystem. *Brazilian Journal of Biology*, 67(4 Suppl), 909–917. <https://doi.org/10.1590/s1519-69842007000500015>
- Hrbek, T., Farias, I.P., Crossa, M., Sampaio, I., Porto, J.I.R., and

- Meyer, A. (2005). Population genetic analysis of *Arapaima gigas*, one of the largest freshwater fishes of the Amazon basin: implications for its conservation. *Animal Conservation*, 8, 297–308. <https://doi.org/10.1017/S1367943005002210>
- Leela123_nunna. (2022). *Chitala chitala* (Hamilton, 1822). *Global Biodiversity Information Facility*. Retrieved Jul 28, 2025 from <https://www.gbif.org/occurrence/4075757654>.
- Magalhães, A.L.B., Orsi, M.L., Pelicice, F.M., Azevedo-Santos, V.M., Vitule, J.R.S., Lima-Junior, D.P., et al. (2017). Small size today, aquarium dumping tomorrow: sales of juvenile non-native large fish as an important threat in Brazil. *Neotropical Ichthyology*, 15, e170033. <https://doi.org/10.1590/1982-0224-20170033>
- Marková, J., Jerikho, R., Wardiatno, Y., Kamal, M.M., Magalhães, A.L.B., Bohatá, L., et al. (2020). Conservation paradox of giant arapaima *Arapaima gigas* (Schinz, 1822) (Pisces: Arapaimidae): endangered in its native range in Brazil and invasive in Indonesia. *Knowledge & Management of Aquatic Ecosystems*, 421, 47. <https://doi.org/10.1051/kmae/2020039>
- Miranda-Chumacero, G., Wallace, R., Calderón, H., Calderón, G., Willink, P., Guerrero, M., et al. (2012). Distribution of arapaima (*Arapaima gigas*) (Pisces: Arapaimatidae) in Bolivia: implications in the control and management of a non-native population. *BioInvasions Records*, 1, 129–138. <https://doi.org/10.3391/BIR.2012.1.2.09>
- National Fishery Products Quality Management Service (NFQS). (2025). *Import (export) quarantine statistics*. Retrieved Dec 11, 2025 from <https://www.nfqs.go.kr/hpmg/data/actionExportQuarantineStatisticsForm.do?menuId=M0000225>.
- National Institute of Biological Resources (NIBR). (2025). *The biodiversity of the Korean Peninsula*. Retrieved Dec 14, 2025 from <https://species.nibr.go.kr/nibrStats/statDownPage.do?artNo=1839>.
- National Institute of Ecology (NIE). (2021). Manual of nationwide survey of non-native species in Korea. NIE.
- Nelson, J.S., Grande, T., and Wilson, M.V.H. (2016). *Fishes of the world*. 5th ed. John Wiley & Sons.
- Novák, J., Kalous, L., and Patoka, J. (2020). Modern ornamental aquaculture in Europe: early history of freshwater fish imports. *Reviews in Aquaculture*, 12, 2042–2060. <https://doi.org/10.1111/raq.12421>
- Park, Y., Eum, S.J., Cho, Y., Jeon, Y., Jun, Y., Hwang, I., et al. (2024). First record of the invasive alien mollusk *Melanoides tuberculata* (Müller, 1774) (Gastropoda, Thiaridae) in South Korea. *Korean Journal of Ecology and Environment*, 57, 162–168. <https://doi.org/10.11614/KSL.2024.57.3.162>
- Park, Y., Eum, S.J., Cho, Y., Kwon, S.J., Hwang, I., Bae, H., et al. (2025). First record of the invasive mollusk *Mieniplotia scabra* in South Korea. *Proceedings of the National Institute of Ecology of the Republic of Korea*, 6, 50–55. <https://doi.org/10.22920/PNIE.2025.6.1.50>
- Putra, M.D., Bláha, M., Wardiatno, Y., Krisanti, M., Yonvitner, Jerikho, R., et al. (2018). *Procambarus clarkii* (Girard, 1852) and crayfish plague as new threats for biodiversity in Indonesia. *Aquatic Conservation: Marine and Freshwater Ecosystems*, 28, 1434–1440. <https://doi.org/10.1002/aqc.2970>
- Tong, C. (2021). *Osteoglossum bicirrhosum* (Cuvier, 1829). *Global Biodiversity Information Facility*. Retrieved Jul 28, 2025 from <https://www.gbif.org/occurrence/3112739947>.
- U.S. Fish & Wildlife Service. (2017). *Ecological risk screening summary - Clown knifefish (Chitala ornata)*. Retrieved Jul 28, 2025 from <https://www.fws.gov/media/ecological-risk-screening-summary-clown-knifefish-chitala-ornata-high-risk>.
- U.S. Fish & Wildlife Service. (2022). *Ecological risk screening summary - Arapaima (Arapaima gigas)*. Retrieved Jul 28, 2025 from <https://www.fws.gov/media/ecological-risk-screening-summary-arapaima-arapaima-gigas-uncertain-risk>.
- Van Damme, P.A. (2006). [Proposal for a fisheries management and development strategy and project for the Northern Amazon region]. *Propuesta enviada a la FAO*, 63. Bolivian.
- Wingedg2. (2017). *Chitala ornata* (Gray, 1831). *Global Biodiversity Information Facility*. Retrieved Jul 28, 2025 from <https://www.gbif.org/occurrence/4431130656>.
- Yue, G.H., Chang, A., Yuzer, A., and Suwanto, A. (2020). Current knowledge on the biology and aquaculture of the endangered Asian arowana. *Reviews in Fisheries Science & Aquaculture*, 28, 193–210. <https://doi.org/10.1080/23308249.2019.1697641>

Appendix 1. Import status of ornamental Osteoglossiformes list in the Republic of Korea (2009–2024)

Family	Scientific name	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Country	CITES	
Arapaimidae	<i>Arapaima gigas</i>	13	141	141	317	1,062	55	129	620	800	200	500	876	485	909	220	600	CHN, COL, THA, PER	II	
	<i>Heterotis niloticus</i>	102	84	40	387	412	320	324	324	499	443	170	457	305	259	72	417	NGA, TWN, SGP, IDN, CHN, KEN, COD, THA		
Gymnarchidae	<i>Gymnarchus niloticus</i>	7	83	43	568	258	271	126	34	34	111	300	107	146	39	39	39	NGA, TWN, DEU, IDN, CHN, THA		
Mormyridae	<i>Brevimyrus niger</i>										10							DEU		
	<i>Brienomyrus brachyistius</i>														11	9	200	NGA, DEU		
	<i>Campylomormyrus alces</i>										48							COD		
	<i>Campylomormyrus elephas</i>	4	4	70		22	80	110	120	145	129	100	100	100	100	100	100	IDN, CHN		
	<i>Campylomormyrus numenius</i>			3	4	8	10	10	10	10	10	10	10	10	10	10	10	COD		
	<i>Campylomormyrus rhyncophorus</i>									117	116	2	2	2	2	2	2	DEU, IDN, COD		
	<i>Campylomormyrus tamandua</i>									12	10	78	65	71	3	3	3	DEU, IDN, COD		
	<i>Cyphomyrus macrops</i>																	COD		
	<i>Gnathonemus petersii</i>	344	186	910	1,000	1,180	912	1,091	228	980	660	346	259	471	512	555	710	NGA, DEU, MYS, SGP, IDN, CHN, COD, THA		
	<i>Isichthys henryi</i>																	23	NGA	
	<i>Marcusenius angolensis</i>							50			50							NGA		
	<i>Marcusenius annamariae</i>														392			GIN, NGA, COD		
	<i>Marcusenius greshoffi</i>															15	63	GIN, COD		
	<i>Mormyrops anguilloides</i>																			
	<i>Mormyrops boulengeri</i>																			

Appendix 1. Continued

Family	Scientific name	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Country	CITES
	<i>Mormyrops mariae</i>															2		COD	
	<i>Mormyrus kannume</i>				5			50	150	100	132	175	175	135	145	50	150	IDN, THA	
	<i>Mormyrus longirostris</i>	10	135	570	115	663	321	508	1,310	849	931	1,157	778	1,208	905			796 NGA, DEU, SGP, IDN, COD, THA	
	<i>Mormyrus rume</i>						10								4			COD	
	<i>Mormyrus tapirus</i>					50	250	378		20		480	744	519	287	180		IDN	
	<i>Myomyrus macrodon</i>														25			IDN	
	<i>Petrocephalus christyi</i>														10			COD	
	<i>Petrocephalus simus</i>												144					NGA	
	<i>Pollimyrus isidori</i>															80		GIN, NGA	
	<i>Pollimyrus nigripinnis</i>		55													100		GIN, NGA	
Notopteridae	<i>Chitala blanci</i>	28	20		21	6	30	79	26	29	49	20	17	26	103			18 CHN, THA	
	<i>Chitala chitala</i>	1,898	1,900	2,125	2,260	2,165	1,777	1,742	1,754	795	1,078	1,074	1,016	741	1,011	925		502 NGA, DEU, IND, IDN, CHN, THA	
	<i>Chitala lopis</i>						4		118				2		5			IDN, THA	
	<i>Chitala ornata</i>	392	411	274	308	365	758	937	974	890	920	1,105	1,741	1,593	1,630	1,702	1,512	TWN, SGP, IND, IDN, CHN, THA	
	<i>Notopterus notopterus</i>	1,146	194	313	60	280	378	470	449	420	365	180		86	30			50 DEU, SGP, IND, IDN, CHN, THA	
	<i>Papyrocranus afer</i>			5		10	1	25	70	32	12		56	41	34			49 GIN, NGA, DEU, COD, THA	
	<i>Papyrocranus congoensis</i>														3			IDN	
	<i>Xenomystus nigri</i>				15	60	5	10		20			135	124				265 NGA, DEU, IDN, COD, PER	
Osteoglossidae	<i>Osteoglossum bicirrhosum</i>	3,140	3,560	5,288	4,662	3,620	2,845	4,282	4,007	4,055	4,593	4,530	4,766	4,673	4,905	4,071	3,924	TWN, DEU, MYS, IDN, CHN, COL, THA, PER	
	<i>Osteoglossum ferreirai</i>	584	177	81	22	40	377	111	41	227	182	53	4	320	25			18 TWN, SGP, JPN, CHN, COL, THA	
	<i>Scleropages formosus</i>	399	670	682	524	966	356	803	985	952	1,221	979	1,108	1,237	894	1,170	923	TWN, DEU, MYS, SGP, IDN, THA	I

Appendix 1. Continued

Family	Scientific name	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	Country	CITES
	<i>Scleropages jardinii</i>	142	452		10	252	28					1	300	20			98	MYS, SGP, IDN, CHN, THA	
	<i>Scleropages leichardti</i>				8	58	5	53	40	88								CHN, THA	
Pantodontidae	<i>Pantodon buchholzi</i>	121	155	179	615	616	285	535	170	800	334	237	102	619	187	232	411	SGP, TWN, DEU, VNM, SGP, IDN, COD	

IDN, Indonesia; COD, Democratic Republic of the Congo; THA, Thailand; CHN, China; NGA, Nigeria; DEU, Germany; SGP, Singapore; TWN, Taiwan; GIN, Guinea; MYS, Malaysia; COL, Colombia; PER, Peru; IND, India; JPN, Japan; KEN, Kenya; VNM, Vietnam.