



Introduced Freshwater Fishes in the Philippines: An Assessment and Recommendations

Rafael D. Guerrero III, Ph.D.

Introduced or exotic fishes are those that have been imported from other countries for food, recreation and other purposes. Many introduced fishes have become invasive or harmful for causing ecological damage, economic loss and even human injury.

Based on a study of existing records and observations, 60 freshwater fishes were found to have been introduced into the Philippines from various countries since 1905 for various reasons such as for aquaculture (44% of the fishes), ornamental purpose (42%), recreational fishing (7%) and mosquito control (7%). Many other fishes are believed to have been introduced without permit from the Bureau of Fisheries and Aquatic Resources (BFAR) and remain undocumented. In the evaluation of the introduced fishes, 48 (80% of the fishes) were found to be beneficial or non-harmful, 8 (13%) were invasive and 4 (7%) are considered as potentially invasive species.

NAST Bulletin No. 7

Published by the **National Academy of Science and Technology, Philippines (NAST PHL)**
A contribution from the Agricultural Sciences Division of NAST PHL.

About the Author:

Dr. Guerrero is an Academician of the National Academy of Science and Technology (Philippines) and a Professorial Lecturer at the University of the Philippines Los Banos, School of Environmental Science and Management. He holds a PhD in Fisheries Management from Auburn University, Alabama, USA. He is the former Executive Director of the Philippine Council for Aquatic and Marine Research and Development of the Department of Science and Technology. For further information, please contact NAST PHL: secretariat@nast.ph; www.nast.ph.



Of the 30 fishes introduced for aquaculture (food), 27 (90%) have been beneficial and only three (10%) have become invasive. Nineteen (62%) fishes have become established by successfully breeding in open waters (rivers and lakes) while three others have been artificially bred for culture. Eight (28%) of the introduced fishes have not become established because of their inability to spawn in the wild.

Among the introduced freshwater fishes that have significantly contributed to food fish production in the country are the cultured tilapias

(mainly, the Nile tilapia), carps (particularly the common carp and bighead carp) and the catfishes (African catfish and striped catfish) (Figure 1). According to the Bureau of Agricultural Statistics, such fishes supplied 299,512 metric tons of the total farmed fish produce of the country with a value of over 20 billion pesos in 2013 (Table 1). From freshwater inland waters, the introduced fishes (tilapia, carps, mudfish, Thai catfish and gouramis) contributed 88,216 metric tons with a value of more than 5.4 billion pesos for the same year.

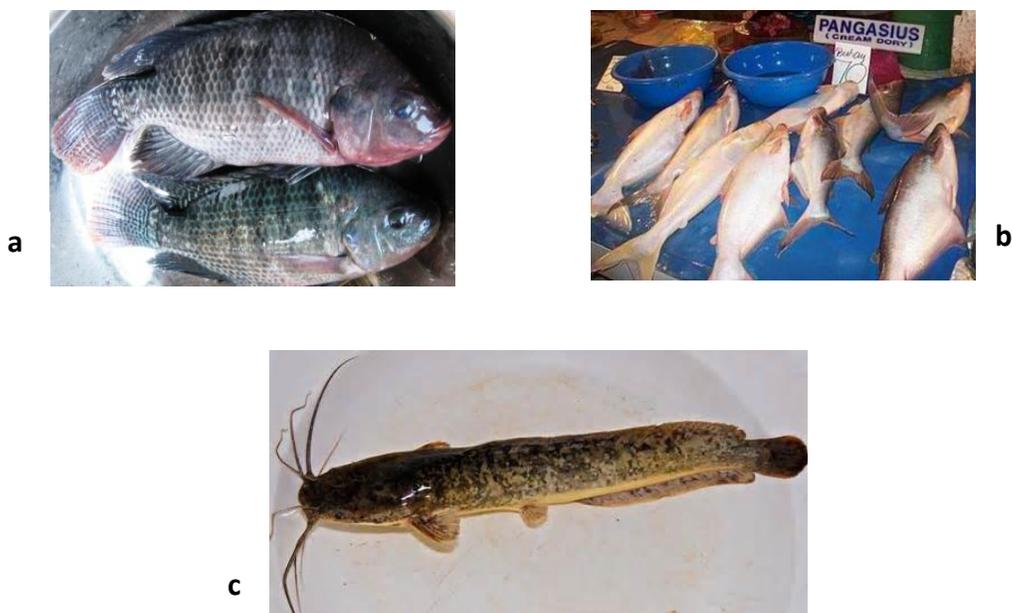


Figure 1. Introduced fishes that have contributed to food production in the Philippines: (a) tilapia (*Oreochromis niloticus*); (b) pangasius (*Pangasiodon hypophthalmus*); and (c) African catfish (*Clarias gariepinus*). Sources of photos: (a) from Academician Evelyn Mae Tecson Mendoza; (b) from <http://philaquaculture.blogspot.com/2010/11/some-notes-on-development-of-pangasius.html> and (c) from <http://www.aquaportail.com/aquabdd/photos/clarias-gariepinus.jpg>

Table 1. Economic contribution of some cultured introduced freshwater fishes*

Fishes	Volume (metric tons)	Value (thousand pesos)
Nile tilapia	268,507	19,188,202
Bighead carp	18,251	611,900
Catfishes	3,754	358,735
Total	299,512	20,158,837

*BAS (2014)



Figure 2. Introduced fishes which have become invasive. (a) clown knife fish; (b) janitor fish; (c) jaguar guapote. Sources of photos: (a) and (b) from author; (c) from http://www.gnsi.org/sites/default/files/imagecache/gallery_main/profile/sample/Jaguar%20Guapote%203in.jpg

The three fishes introduced for aquaculture in the country that have become invasive are the mudfish (*Channa striata*), the Thai catfish (*Clarias batrachus*) and the rice paddy eel (*Monopterus albus*).

The mudfish is considered a pest in freshwater ponds for being predaceous on cultured fish like the Nile tilapia. The *C. batrachus* has ecologically displaced the indigenous catfish (*Clarias macrocephalus*) in Laguna de Bay and other water bodies where it was introduced. The *M. albus* is reported to be infesting rice paddies in the Cagayan Valley by burrowing into the dikes and causing water loss.

Of the 22 fishes introduced for the aquarium trade, 12 (54%) are considered beneficial or non-invasive while six (27%) have become invasive upon escaping accidentally or intentionally into open waters from commercial and/or private keepers, and four (18%) others are regarded as potentially invasive. The six invasive fishes are the “janitor fish” (*Pterygoplichthys disjunctivus* and *P. pardalis*), the “jaguar guapote” (*Parachromis managuensis*), the “clown knife

fish” (*Chitala ornata*) the giant snakehead (*Channa micropeltes*), and the black-chin tilapia (*Sarotherodon melanotheron*). Of the six, only the “janitor fish” and the “clown knife fish” have been authorized by the BFAR.

The *P. disjunctivus*, as a nuisance fish, has caused economic losses for fisher folk using gill nets and fish corrals in Laguna de Bay and Agusan Marsh by reducing their fish catch. On the other hand, the burrowing habit of the *P. pardalis* has eroded the banks of the Marikina River, a tributary of Laguna de Bay. The piscivorous *P. managuensis* has predated on and competed for the niche occupied by native fishes in Lake Taal in Batangas. The *C. ornata*, believed to have escaped into Laguna de Bay after a flooding event brought about by Typhoon Ondoy in 2009, is now wrecking havoc on the milkfish and Nile tilapia industries of the lake. Fortunately, the invasiveness of the *C. micropeltes*, now present in the Pantabangan Reservoir in Nueva Ecija, and the *S. melanotheron* first observed in Laguna de Bay but has now spread to the brackishwater ponds of Bulacan is still not very serious.

Three introduced fishes for ornamental purposes which are presently still confined in private and/or commercial aquarium establishments are deemed potentially invasive because of their predatory habit, capability of spawning in tropical waters and known bio-invasive record in other countries. These fishes are the "araipama" (*Araipama gigas*), the "peacock bass" (*Cichla occularis*) and the "red-bellied piranha" (*Pygocentrus nattereri*). The *C. occularis* and *P. nattereri* have not been approved for introduction by the BFAR. Because of their potential invasiveness and possibility of escaping into open waters, such fishes should be on the "Watch List" and closely monitored.

For the mitigation of the invasive fishes now in our open freshwaters, various measures are being considered for their economic utilization for food, raw materials for value-added products, and other beneficial uses. On a positive note, the *M. albus* has surprisingly found a big market as a food commodity in other countries. According to BFAR, more than 517 million pesos worth of the fish was exported last year.

A review of the national policies and regulations on the introduction of imported live fishes showed that the required processes are adequate and in place as embodied in Fisheries Administrative Order No. 221 (series of 2003) of the Department of Agriculture implemented by the BFAR. Among the regulations are the conduct of an Import Risk Analysis prior to the issuance of a Sanitary and Phytosanitary Certificate for introduction of the fishes, their quarantine and health inspection. The BFAR is also empowered to confiscate and destroy "high risk and prohibited species" that have already entered the country without valid import permit and impose the penalties of imprisonment and fine for offenders.

RECOMMENDATIONS

In addition to strict enforcement of regulations, there is an urgent need to strengthen the monitoring, surveillance and control measures to prevent the spread of the six invasive ornamental fishes now established in some of our inland waters and to forestall the escapes of the potentially invasive species. The regular inspection and possible registration of aquarium pet shops and a massive information, education and communication campaign to stir up public awareness for responsible aquarium pet care and environmental protection are recommended.

References

Bureau of Agricultural Statistics. 2014. Fisheries Statistics of the Philippines 2008-2010. Department of Agriculture, Quezon City. 402 p.

Casal, C.M.V. 2005. Documenting the presence and impact of introduced freshwater fishes for aquaculture in the Philippines, p. 145-154 In: M.L. Cuvin-Aralar, R.S. Punongbayan, A. Santos- Borja, L.V. Castillo, E.V. Manalili and M.M. Mendoza (eds.) Proceedings of the First National Congress on Philippine Lakes. Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Los Banos, Laguna, Philippines.

FishBase. 2013. (www.fishbase.org, accessed Nov. 19, 2013)

Hubilla, M, F. Kris and J. Primavera. 2007. Janitor fish, *Pterygoplichthys disjunctivus*, in Agusan Marsh: a threat to freshwater biodiversity. Journal of Environmental Science and Management 10(1):10-23.

Juilano, R.O., R. Guerrero III and I. Ronquillo. 1989. The introduction of exotic aquatic species in the Philippines, p. 83-90 In: De Silva, S.S, (ed.) Exotic aquatic organisms in Asia. Proceedings of the Workshop on Introduction of Exotic Aquatic Organisms in Asia. Asian Fish. Soc. Spec. Publ. 3, 154 p.

Palma, A. 2013. The knifefish: an invasive fish in Laguna de Bay. Paper presented at the National Forum on the Knifefish. Taguig City University, Taguig City, Metro Manila (June 14, 2013).

Rosana, M.R., E.V. Agasen, L.S. Villanueva, J.P. Clemente, Jr., N.J. Kawit and J.J. dela Vega. 2006. Status and economic impact of *Parachromis managuensis* in Taal Lake, Philippines. Journal of Environmental Science and Management 9(2):1-19.

Acknowledgements

The Research Fellowship Grant provided by the National Academy of Science and Technology, Philippines to the author for the conduct of the study is gratefully acknowledged.

Part of this Bulletin was earlier published in Star Science, The Philippine Star, February 6, 2014.

Collage photos from:

<http://dealbreaker.com/uploads/2012/08/tilapia.jpg>

<http://upload.wikimedia.org/wikipedia/commons/9/95/Cyprius-carpio.jpg>

<http://www.iucnredlist.org/details/full/181056/0>

http://www.aquariumfish.net/images_01/clown_knifefish_130802a2_w0480.jpg

<http://walltoyou.com/5973/catfish.html>
