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Exotic food fishes in North 24 Parganas district, West Bengal and their ecological assessment

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Abstract

Field study showed the presence of 14 exotic food fish under 7 families in the district North 24-Parganas, West Bengal, India. Among them silver carps were found to have highest abundance (10.45%) and climbing perch (Vietnam strain) have the lowest abundance (0.20%) in the total catch. This study is to determine the present status of exotic fish in the fish diversity of the district and also to contribute towards effective and responsible fishery.

Keywords: Abundance, ecological status, exotic food fish, North 24-Parganas district.

Introduction

Aquaculture is one of the fastest developing growth sectors in the world. A continuous target of the fish farmers is to maximize its production to optimize the profitability (Jakhar et al., 2011). To achieve such target, introduction of exotic fish as one of the tools has been carried out worldwide (Singh and Lakra, 2011). The mean annual production of cultured exotic freshwater finfish from 2000 to 2004 amounted to 3.6 million tons or 16% of the global aquaculture production (De Silva et al., 2009). National Bureau of Fish Genetic Resources, India has recorded more than 300 exotic fish species including 29 food fishes imported intentionally or illegally in India since nineteenth century (NBFGR, 2009; Lakra and Singh, 2007; Singh and Lakra, 2011). In West Bengal, introduction of exotic fish species into the water bodies for culture has been started since 1970s (Sinha et al., 1973). But unfortunately, indiscriminate and non-judicious introduction of exotic fish in our country has brought a wide array of problems including extirpation of indigenous fish species ultimately leading to biodiversity loss (Nyman, 1991; Biju Kumar, 2000). Their potential capacity to survive, propagate and establish in wild has been invited many ecological, socio-economic and disease problems even genetic erosion in the indigenous species (Biju Kumar, 2000).

North 24-Parganas district in West Bengal, India is endowed with vast open water resources covering 31872.19 ha including impounded freshwater area of 26007.75 ha. During 2014-15 the inland fish production of

this district was 194380 tons covering 13.51% of the state inland production holding 1st position indicating its rich fish production potentiality (Anon, 2015). Such potentiality as well as demand and supply gap for the whole state virtually creates a constant pressure among the aquaculture farmers to introduce exotic fish even unauthorized one only to avail the chance of enhanced production. In the present context freshwater exotic fish is an alarming threat to our indigenous fish species and it is important to prepare a zone wise database on their distribution or population dynamics. It is essential to frame out planning for conservation and management of endangered indigenous species as to fulfil our country's obligations under conventions on biological diversity with special reference to Articles 6 and 8 of UNEP (1992). For this reason, an attempt was made to prepare a consolidated list of freshwater exotic food fish species available in North 24-Parganas district, West Bengal along with their present utility status in order to facilitate further studies to determine the impact of exotic fish fauna on the local indigenous fish diversity.

Materials and methods

The study on the qualitative and quantitative abundance of exotic fish species in North 24-Parganas district (23°15´2´´ and 22°11´6´´ N / 89°5´ and 88°20´ E) was conducted during 2012-2015. Among the five Sub-divisions in the district namely Bidhannagar, Barrackpur, Barasat, Basirhat and Bangaon, three (Barasat, Basirhat and Bangaon) were selected for field study as the most of the fisher folk community live in these areas (Dandapat and Islam, 2009). Studies were made on some selected wetlands under culture in those areas. The specimens were collected during harvesting of fish using various types of fishing gears such as 'Khapla jal' (cast nets), 'Phansh jal' (gill nets), 'Tana jal', 'Ber jal' (drag nets) and other local contrivances. Collected fish samples were preserved in 8% Formalin for detail examination and identified following Jayaram (1981, 1999), Talwar and Jhingran (1991), Datta et al., (2006). Besides information collected from local fish markets and fishermen was also considered for tabulation. For quantitative analysis the formula of abundance index (AI) was applied after Bhakta and Bandyopadhyay (2007) as follows:
Abundance index (AI) in percent (%) = [No. of individuals of the species caught at each study site / No. of all species caught at that site] X 100.

Results and discussion

With the pace of national scenario fish introductions in North 24-Parganas district have been increasing considerably during last few decades due to interaction with various other changes in socio economic perspective such as gradual increasing protein demand, thrust for rise in fish productivity, globalization of aquaculture trade and biological control etc. As a result 14 exotic fish species under 7 families were identified in the district during study. The scientific, common and local name of the species, together with their systematic position, purpose of introduction, present utility status and abundance index are described in Table 1.

Out of recorded 14 exotic fish species in the district, 6 were legally introduced fish (Silver carp, Grass carp, Common carp, Mossambique tilapia, Gaint gouramy and Java punti), whereas rest 8 species (Big head carp, Black carp, Mud carp, Nilotica tilapia, African magur, Red bellied pacu, Sutchi Pangas exotic climbing perch) are unauthorized invaded species.

Table 1. List of exotic fish species recorded from the North 24-Parganas district, West Bengal along with their present utility and ecological status (*fish species having illegal and unauthorized entry/culture).

Common name	Local name	Scientific name	Family	Purpose	Present utility status	Ecological status in relation to feeding habit	Abund-ance index (%)
Silver carp	Silver carp	*Hypophthalmicthys molitrix*	Cyprinidae	Food fish	Mainly food fish	Plankton feeder	10.45 ± 4.57
Grass carp	Glass carp/ Gheso rui	*Ctenopharyngodon idella*	Cyprinidae	Food fish and clearance of aquatic weeds	Mainly food fish and grazing aquatic weeds	Herbivorous	4.40 ± 1.72
Common carp	Cyprinus/ American rui	*Cyprinus carpio* var *communis*	Cyprinidae	Food fish	Mainly food fish but also controls snails, worms	Omnivorous	4.64 ± 1.92
Big head carp*	Big head / Bigred	*Aristicthys nobilis*	Cyprinidae	Food fish	Mainly food fish	Plankton feeder	3.03 ± 1.09
Black carp/ Snail carp*	Black carp	*Mylopharyngodon piceus*	Cyprinidae	Food fish and molluscs control	Controls molluscs from culture ponds in addition of being food fish	Omnivorous	0.93 ± 0.50
Mud carp*	-	*Mylopharyngodon idella*	Cyprinidae	Food fish	Mainly food fish	Omnivorous	0.34 ± 0.25
Mossambiq ue tilapia	Telapia	*Oreochromis mossambicus*	Cichlidae	Food fish and aquatic weeds control	Mainly food fish. Also controls algae	Omnivorous	1.75 ± 0.74
Nilotica tilapia*	Nilontica	*Oreochomis niloticus*	Cichlidae	Food fish and aquatic weeds control	Mainly food fish. Also controls algae	Omnivorous	4.73 ± 1.99
Giant gouramy	Gorami	*Osphronemus goramy*	Osphronem-idae	Ornament-al fish	Mainly ornamental fish but also edible as small food fish	Omnivorous	0.52 ± 0.32
Java punti	Japani punti	*Puntius javanicus*	Cyprinidae	Food fish	Mainly food fish	Planktivor-ous	1.19 ± 0.61
Red bellied pacu*	Rupchanda	*Piaractus brachypomus*	Serrasal-midae	Ornament-al fish	Mainly food fish but treated as ornamental fish at fry and early fingerling stage	Omnivorous	1.64 ± 0.77

African magur*	Hybrid magur	*Clarias gariepinus*	Clariidae	Food fish	Mainly food fish	Carnivorous	0.58 ± 0.52
Sutchi pangas*	Pangas	*Pangasianodon hypophthalmus*	Pangasiidae	Food fish and ornament-al fish	Mainly food fish but treated as ornamental fish upto fingerling stage	Omnivorous	2.03 ± 0.69
Exotic climbing perch*	Thai koi/ Hybrid koi	*Anabas testudineus*	Anabantidae	Food fish	Mainly food fish	Omnivorous	1.58 ± 0.78
	Vietnam koi/Hybrid koi						0.20 ± 0.15

Many of them like *Aistichthys nobilis, Oreochromis niloticus, Clarias gariepinus, Mylopharyngodon pieceus, Pangasianodon hypophthalmus*,*Mylopharyngodon Idella, Piaractus brachypomus* and, Thai and Vietnam strain of *Anabas testudineus* have been surreptitiously smuggled through border and being cultivated (Singh and Lakra, 2011). Among them 6 fish species (Silver carp, Big head carp, Grass carp, Common carp, Nilotica tilapia and Pangas) are widely cultured for commercial purpose. Besides that the culture potential of Thai and Vietnam strains of *A. testudineus* is also developing in the district by substituting its indigenous variety for their quick growth pattern (Datta and Ghosh, 2015). In the district, 5 exotic species (Grass carp, Common carp, Black carp, Mossambique tilapia and Nilotica tilapia) are in use of various biological control in natural water bodies beside being cultivated as food fish and 3 fishes (Gaint gourami, Red bellied pacu and Sutchi Pangas) have potent ornamental values and popular in aquarium trade also in the district. Rest 6 fish species (Silver carp, Big head carp, Mud carp, Java punti, Exotic climbing perch and African magur) are solely food fish for their fast growth (Table 1).

Among the exotic fish species in the district, silver carp and common carp were introduced in the composite fish culture system to increase yields through better utilization of vacant trophic niches. Grass carp was also an important species used in aquaculture to develop productivity beside to control weeds in natural water bodies. Big head carp and two species of tilapia (*O. mossambicus* and *O. niloticus*) are now deliberately stocked in water bodies and widely cultured in all over the district to enhance production. In addition, culture of monosex form of tilapia (all male *O. niloticus*) is now getting its demand to the fish farmers of the district as a food fish having higher growth rate. This target fish form is also invading into the district through trans-border route and being cultivated without any biological and public health hazards assessment. Java punti have also led to the development of a high yielding purpose as an alternative species in composite fish culture technology. The ornamental fish trade in West Bengal is dominated by many exotic fish varieties introduced from different parts of the world. Giant gourami, red bellied pacu and sutchi pangas found in North 24-Parganas district are mainly ornamental fishes but among them pacu and pangas are predominantly used as food fish. National Fisheries Development Board (NFDB) and State Fisheries Department are also encouraging the culture of sutchi pangas

through their subsidized scheme for enhancing aquatic productivity. Among the catfishes, the African magur was clandestinely introduced into the state of West Bengal particularly in this border district from Bangladesh possibly during 1994 (Shivakumar, 2004; Singh and Lakra, 2011). Once this catfish was popularly known as so called "Hybrid magur" or "Thai magur" in the district but now they are popularized as "China magur". During the last decade this highly carnivorous catfish was largely cultivated in the district mainly in small ponds, bheries and cemented cisterns (Dwivedi et al., 2004) but now its abundance is very low. Although its culture is declared as unauthorized by the Union Agricultural Ministry, Government of India as well as State Fisheries Department but still the species is bred artificially through inducing agents and its seeds are available in Basirhat, Hasnabad and Naihati region of the district. After being culture for 2-4 months, its production has been exported to mainly Delhi, Haryana, Punjab, Bihar and even to foreign country like Nepal. Hybrid catfish (cross between *C. gariepinus* and *C. macrocephalus*) are a fast growing variety and its seed is being produced in hatcheries in the neighbour country (Baruah et al., 1999; Khan et al., 2000) and then also smuggled into this district. Culture of African magur or hybrid magur was very popular in Basirhat and Rajarhat region of this district even few years back owing to their fast growth and has been very inexpensive as the recycled chicken and slaughterhouse wastes are generally used in their culture practices (Singh and Lakra, 2011). But now its culture potentiality has gradually been declined as the consumer preference for this fish species is getting low. Another catfish, *P. sutchi*, has been spreading throughout the district for its rapid growth and popularity in aquarium trade. Similarly exotic strains of climbing perch (*A. testudineous*) having bigger size and fast growth rate, have been introduced in the culture ponds of the district (Hasan et al., 2010; Datta and Ghosh, 2015). These anabantid variety, popularly known as Thai koi or Vietnam koi or hybrid koi to the fish farmers, are possibly entered into the district from Thailand via Bangladesh through trans-border route since 2010. Culture and breeding of red-bellied pacu was also unauthorizedly started in North 24-Parganas possibly from 2001 and some of the fish farmers of the district are in practice to its culture in ponds (Lakra et al., 2008; Chatterjee and Mazumdar, 2009). Most surprisingly, sucker mouth armoured catfish (*Pterygoplichthys* sp.; family: Loricariidae) predominantly ornamental fish enters into the natural waters of this district probably accidentally. This aquarium pet also recorded in the market as very low cost food fish in one local fish market of Bangaon during survey though very rare.

However, the threat to biodiversity due to introduction of exotic fish species may be considered as second only to that of habitat destruction (Raghubanshi et al., 2005). Our result as analyzed on the feeding status of the exotic fish fauna recorded in the district (Table 1) also supports the fact that the exotic fish species can cause loss of fish diversity including species extinctions by competing with the local indigenous fish species at a particular trophic niche in the ecosystem and diet overlapping (Bhakta and Bandyopadhyay, 2007). Thus for effective and responsible fishery, knowledge about the habitat and biological aspects of the introduced fish particularly on their food and feeding habit is essential.

Percentage contribution of exotic fish in the total catch of sampling showed a wide range of abundance with highest value to silver carp (10.45%) and lowest to sucker mouth armoured catfish (0.20%) during study

(Table 1). Variation in their abundance in the district was found as follows: Silver carp> Nilotica tilapia> Common carp> Grass carp> Big head carp> Sutchi pangas> Mossambique tilapia> Red bellied pacu> Exotic climbing perch (Thai strain)> Java punti> Black carp> African magur> Giant gourami> Mud carp> Exotic climbing perch (Vietnam strain)> (Table 1). Such variation not only implies their degree of adaptability in the environment and contribution in the aquaculture productivity through better utilization of trophic niches but their abundance at the same time can gear up the diversity loss of indigenous species by choice (Dwivedi et al., 2004; Bhakta and Bandyopadhyay, 2007).

Conclusion

The exotic fish species compete with the local indigenous species for food, habitat, and can cause genetic degradation. They even prey upon the local fish species and introduce new parasites and diseases, and ultimately score as potential risk for fish diversity loss (Biju Kumar, 2000; Bhakta and Bandyopadhayay, 2008). Saha et al., (2006) reported 277 fish species are available in the North 24-Parganas district out of which 54 are threatened. Thus the present database of the study on the exotic fish diversity in North 24-Parganas district can be compared against past and future information to determine their range of contribution towards fish diversity loss over time as well as to motivate the fish farmers of the district for responsible fishery.

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References

Anon (2015). Hand book of fisheries statistics 2014-2015. Department of Fisheries, Government of West Bengal. Pp. 112.

Baruah, U.K., Bhagowati, A.K. and Goswmi, U.C. (1999). Culture of hybrid magur (*Clarias garieoinus* X *C. macrocephalus*) in Assam. *Indian Journal of Fisheries.* 46(3): 265-272.

Bhakta, J.N. and Bandyopadhyay, P.K. (2007). Exotic fish biodiversity in Churni River of West Bengal, India. *Electronic J. Biol.* 3(1): 13-17.

Bhakta, J.N. and Bandyopadhyay, P.K. (2008). Fish diversity in freshwater perennial water bodies in East Midnapore district of West Bengal, India. *Int. J. Environ. Res.* 2(3): 255-260.

Biju Kumar, A. (2000). Exotic fishes and freshwater fishdiversity. *Zoos' Print Journal.* 15(11): 363-367. Chatterjee,

N.R. and Mazumdar, B. (2009). Induced breeding of pacu (*Piaractus brachypomus*) in captivity with pituitary extract. *Aquaculture Asia.* 14(2): 23.

Dandapat, D. and Islam, S. (2009). A study of production, productivity and profitability of fisheries in the district of North 24-Parganas, West Bengal. *J. Business and Economic Issues.* 1(1): 92-101.

Datta, M. K. And Ghosh, S. (2015). A review of the farming of indigenous and Thai varieties of *Anabas testudineus* in West Bengal and Bangladesh. *Fishing Chimes.* 35(4): 16-30.

Datta, M.K. and Nandeesha, M.C. (2006). Pacu (*Piaractus brachyomus*), an acid water loving exotic finfish, enter Indian aquaculture scene. *Fishing Chimes.* 26(6): 10-12.

De Silva, S.S., Nguyen, T.T.T., Turchini, G.M., Amarasinghe, U.S. and Abery, N.W.

(2009). Alien species in aquaculture and biodiversity: a paradox in food production. *Ambio.* 38: 24–28.

Dwivedi, S.N., Bhaumik, U., Paria, T., Saha, S.K. and Mitra, A. (2004). Aided invasion of exotic catfishes towards Indian Aquaculture. *Fishing Chimes.* 24(1): 106-109.

Hasan, M., Ahammad, A.K.S. and Khan, M.M.R. (2010). A preliminary investigation into the production of Thai Koi (*Anabas testudineus*) reared in nylon hapas in Bangladesh. *Bangladesh Research Publications Journal.* 4(1): 15-23.

Jayaram, K.C. (1981). Freshwater fishes of India handbook. Zoological Survey of India, Calcutta, India.

Jayaram, K.C. (1999). The freshwater fishes of the Indian region. Narendra Publishing House, New Delhi, India.

Jakhar, J.K., Satyanarayana, Y. and Bairwa, M.K. (2011). Prebiotics in aquaculture. *Fishing Chimes.* 31(5): 53-55.

Khan, R.M., Mollah, A.M.F., Ahmad, U.G. (2000). Mass production of hybrid magur and its culture production in Bangladesh. *Aquaculture Research.* 31 (5): 467-472.

Lakra, W.S. and Singh, A.K. (2007). Fish introduction in Indian waters. *Fishing Chimes,* 27(1): 30-34.

Lakra, W.S., Singh, A.K. and Ayyappan, S. (2008). Fish Introduction in India: Status, Potential and Challenges. Narendra Publishing House, New Delhi, India.

NBFGR (2009). Ecological impacts of exotic fish species in India. Singh, A.K. and Lakra, W.S. (eds.). National Bureau of Fish Genetic Resources, Lucknow, India. Pp. 14.

Nyman, L. (1991). Conservation of freshwater fish. Protection of biodiversity and genetic variability in aquatic ecosystem. Fisheries Development Series 56, Swedmar & WWF, Sweden, 38.

Raghubanshi, A.S., Rai, L.C., Gaur, J.P. and Singh, J.S. (2005). Invasive alien species and biodiversity in India. *Current Science.* 88(4): 539-540.

Saha, S., Das, P., Bhaumik, U., Paria, T., Qureshi, T.A. and Monahar, S. (2006). The status of fish diversity in North 24-Parganas district of West Bengal. *Environ. and Ecol.* 24(4): 1075-1078.

Shivakumar, M. (2004). Contending with the banned but farmer popular Thai Magur (African catfish) *Clarias gariepinus*. *Fishing Chimes.* 24(1): 125-126.

Singh, A.K. and Lakra, W.S. (2011). Risk and benefit assessment of alien fish species of the aquaculture and aquarium trade into India. *Reviews in Aquaculture.* 3: 3-18.

Sinha, V.R.P., Vijaya Gupta, M., Banerjee, M. And Kumar, D. (1973). Composite fish culture at Kalyani, West Bengal. *J. Inland Fish. Soc.* 5: 201-206.

Talwar, P.K. and Jhingran, A.G. (1991). Inland fishes of India and adjacent countries. Oxford & IBH Publishing Co., New Delhi, India.

UNEP (1992). Global biodiversity strategy: Guidelines for action to save, study, and use Earth's biotic wealth sustainably and equitably. Washington DC.