



Original Research Article

Diversity of Exotic Fishes in Navegaonbandh Reservoir With Reference to Negative Impact of *Anabas* (Anabantidae) on Biodiversity

G.T.Paliwal^{1*} and S.V.Bhandarkar²

¹Department of Zoology, S. S. Jaiswal College, Arjuni/Mor, Dist. Gondia, 441 701, MS, India

²Department of Zoology, M. B. Patel College, Deori, Dist. Gondia, 441 901, MS, India

*Corresponding author

A B S T R A C T

Keywords

Freshwater ecosystem, exotic fish, *Anabas tetudineus*, *Xenochrophis piscator*, Conservation.

Fishes as Keystone species determine the abundance and distribution of ecosystem biodiversity representing indicators of water quality and ecosystem health. The biodiversity of freshwater ecosystem is depleting alarmingly due to the introduction of exotic species and anthropogenic activities. The transfer of exotic fishes brought problems. Invasion of exotics lead competition with indigenous species for food, habitat, introduce new parasite, diseases, production of hybrids and may prey upon them. Invasion may affect the biodiversity as well as socio-economic aspect of humans that depend on aquatic ecosystems. In the present article authors documented the diversity of exotic fishes with special reference to exotic climbing perch *Anabus testudineus* and its negative impact on checkered keel back water snake *Xenochrophis piscator* in lentic ecosystem in Navegaon National Park, Maharashtra.

Introduction

Exotic Species: According to Kottelat and Whitten (1996), the exotic or introduced species is any species accidentally or intentionally released or transported by man outside its present range. Synonyms of exotic include: 'alien', 'non-native', 'non-indigenous' and 'introduced'. A species can be introduced outside its natural range but still within its country of origin and so be native to that country. Such species are called 'translocated' species. The term 'invasive' has no standard definition, but is generally taken to mean more than just establishment. It usually indicates an exotic

species that spreads well beyond its place of introduction and is also often taken to indicate a species that poses a threat to ecosystems, habitats or native species (Richardson et al., 2000a, Shine et al., 2000).

Environmental Impact: In many parts of the world introduction of exotic species of fish may be to improve the local fishery potential, sport fishing and for aquarium keeping or controlling of unwanted organisms like mosquitoes. But transfer of fishes may lead various problems like

introducing new disease and parasites and may compete with indigenous fishes for habitat and food etc. resulting into the removal of native species and loss of healthy environment of ecosystem and ultimately impacts on biodiversity such as ecosystem destabilization, reduced biodiversity, reduced or eliminated keystone species, loss of habitats (Bomford,2008).

Conservation Need: Rapid increase of human population depends mostly on aquatic resources in general and fishes in particular. Due to the fast growing ability of exotic fishes introduces in natural waters causing loss of aquatic biodiversity, without proper conservation measures and management considering the negative impact of exotic fishes we can't preserve the niche of biotic elements. The need of protection of existing indigenous fish stock is by protecting particular ecosystem manners. Avoidance of introducing exotic species is essential for healthy ecosystem. The water harboring endangered fish fauna must be protected. Knowledge of the species and communities reveal crucial facts necessary to the management of ecosystem and habitats. Identification, listing and prioritization of species and their conservation status are one of the important tasks in conservation and sustainable utilization of natural resources receiving global attention (Lakra et al., 2010).

In the present investigation, the diversity of exotic species were reported in Navegaonbandh Reservoir in Navegaon National Park and the negative impact of a exotic species, *Anabas* on the reptilian biodiversity is discussed through the report.

Materials and Methods

Study Site: Navegaonbandh Reservoir or Lake is situated in Navegaon National Park

located at 20° 45' to 21o 2' North Latitude and 80° 5' to 80o 15' East longitude representing the lentic system. It is an important IBA, harbors harpetofauna and niche for variety of organisms.

Methodology: Fishes were collected from the reservoir with the help of fisherman. Fishes were preserved in 4% Formalin, identified following the keys of Mishra (1959), Qureshi and Qureshi (1983), Talwar and Jhingran (1991) and Day (1994). The sightings of kills of water snake were photographed.

Results and Discussion

In the present investigation, 51 fish species were recorded belonging to 17 different families and grouped under 06 orders (Paliwal, 2013). Out of the total 51 species, 05 were found to be exotic species (Table1). Exotic fish species are commonly introduced for scientific, ornamental or recreational purposes (Bomford 2003, Canonico et al., 2005). For example, Tilapia (Family Cichlidae), have been intentionally dispersed worldwide for the biological control of aquatic weeds and insects, as baitfish for certain capture fisheries, for aquarium and as a food fish (Canonico et al., 2005). Lakra et al., (2010) compiled 120 freshwater threatened fish species towards conservation assessment and management plans. During the last several decades, over 300 species of exotic fishes have been brought into India for experimental aquaculture, sport fishing, mosquito control and aquarium keeping (Bijukumar, 2000). The mosquito fish Gombusia and Guppy introduced to India may also have had negative impact on aquatic biodiversity (Rinne, 1995). Considering the negative impact of mosquito fish, the famous ichthyologist Myers (1965) labeled this species as 'Fish destroyer'.

The present investigation focuses on the negative impact Anabas or Climbing Perch on freshwater biodiversity especially on reptiles. Therefore the understanding biology of Climbing Perch is essential. Climbing perch, *Anabas testudineus* (Bloch, 1792) (Perciformes:Anabantidae) is known as Thai koi as in Bangladesh introduced from Thailand in 2002 (Kohinoor et al., 2010). It is light green to dark in color, covered by cycloid scales, the black spots on caudal fin. It is distributed in Asia and China, highly adapted to unfavorable environment. It has accessory respiratory organ, as the fish remain buried in mud to survive in dry season. It has strong fin spines for climbing itself over land. It feeds on mosquito larvae. The fish seed of major carps was introduced by fishermen of local Bengali community brought from West Bengal. The seed of Anabas might be mixed with major carp's seed and introduced accidentally.

Climbing Perch is known to kill some fish, waterfowl and reptile species predate on it. The sharp spines of dorsal fin becoming locked in the predator's throat or stomach (Lawrence, 1995; Miller et al., 1995; Storey et al., 2002). During study the incident was noted that the water snake, checkered keel back, *Xenochrophis piscator* mostly preyed on fishes, found to be died after preying on Climbing Perch. It is because of

sharp spines tear snakes mouth and fish attempt to escape out and results into kills of snakes immediately. It is observed that the snake can't easily engulf them due to hard spiny fin and take longer time to engulf them. Snakes always found dead at marginal area of reservoir. Due to the rate of kill of checkered keel back, commonly known as Dhonya, and considered to be a friend of farmer is decreasing gradually due to the faster the rate of multiplication of Anabas population in the reservoir in last few years. This is first report of killing of reptiles by exotic fish like Anabas in the Navegaobandh Reservoir of Navegaon National Park in Gondia district of Maharashtra.

Similar findings of impact of exotic fishes were documented on types of ecosystem in India. The introduction of Tilapia in India seem to have caused surprising impact on both freshwater and brackishwater fisheries (Trewavas, 1983). In India the introduction of *Cyprinus carpio* into Dal Lake and Loktak Lake has been reported to affect the population of indigenous *Schizothorax* & *Osteobrama belangeri* respectively. The populations of native Catla & Mahseer were depleted considerably in Govind Sagar Reservoir after the introduction of Silver carp (Menon, 1979; Molur and Walker, 1998).

Table.1 List of Exotic fishes reported in Navegaonbandh reservoir.

| S N | Common Name | Zoological Name | Introduction of Fishes and Purpose |
|-----|----------------|------------------------------------|--|
| 01 | Common Carp | <i>Cyprinus carpio</i> | From Bangkok to India (1957): Experimental culture. |
| 02 | Silver Carp | <i>Hypophthalmichthys molitrix</i> | From Hong Kong to India (1959): Experimental culture. |
| 03 | Grass Carp | <i>Ctenopharyngodon idella</i> | From Japan to India (1959): Weed control and experimental culture. |
| 04 | Tilapia | <i>Tilapia mossambica</i> | From Hong Kong to India (1952): Experimental culture. |
| 05 | Climbing perch | <i>Anabas testudineus</i> | From West Bengal to Navegaonbandh. |

Figure 1

Water snake (Checkered keel back)
Xenochrophis piscator



Figure 2

Exotic Fish (Climbing perch)
Anabus testudineus



Figure 3

Water snake (Checkered keel back)
engulfing Anabas fish



Figure 4

Anabas fish escaping by tearing of throat
of Water snake



Hitchcock (2008) recorded *Anabas* from Saibai Island of Australia for this potentially invasive noxious fish species. It is recommended that the proper management and conservation measures must be initiated in Navegaonbandh Reservoir as early as possible otherwise loss of reptilian species may increase. There must be immediate steps taken to eradicate this 'killer' fish species.

References

- Bijukumar A. (2000). Exotic fishes and Freshwater Fish Diversity. *ZOOS'PRINT JOURNAL* 15 (11): 363-367
- Bloch, M. E. (1792). *Naturgeschichte der ausländischen Fische*. Berlin. Naturg. Ausl. Fische 6: i-xii+1-126, pls 289-323.

- Bomford M. 2008. *Risk assessment models for establishment of exotic vertebrates in Australia and New Zealand*. Invasive Animals Cooperative Research Centre, Canberra.
- Bomford, M. 2003. *Risk Assessment for the Import and Keeping of Exotic Vertebrates in Australia*, Bureau of Rural Sciences, Canberra.
- Canonico, G. C., Arthington, A., McCrary, J. K. and Thieme, M. L. 2005. The effects of introduced tilapias on native biodiversity. *Aquatic conservation, Marine and freshwater Ecosystems* 15: 463-483.
- Day F., 1994. The fishes of India, being a natural history of fishes known to inhabit the seas and fresh water of India, Burma and Ceylon. Fourth Indian Reprint, Vols. I & II. Jagmander Book Agency. New Delhi.
- Hitchcock, G. 2008. Climbing Perch (*Anabas Testudeneus*) (Perciformes: Anabantidae) on Saibai Island. Northwest Torres Strait: first Australian record of this exotic pest fish. *Memoirs of the Queensland Museum*. 52 (2): 207-2011
- Kohinoor A.H.M., Jahan D.A., Khan M.M., Ahmed S.U., Hussain MG (2010). Breeding, seed production and culture technology of koi fish. Extension Manual No.39. Bangladesh Fisheries Institute. Freshwater Station, Mymensingh. pp.16
- Kottelat, M. and T. Whitten 1996. *Freshwater Biodiversity in Asia with special Reference to Fish*. World Bank. Technical Paper No. 343, Washington, 59pp
- Lakra, W. S., Sarkar, U. K., Gopalakrishnan, A. and A. Kathirvelpandian. 2010. *Threatened Freshwater Fishes of India*. NBFGR Publ. pp.20
- Lawrence, D. 1995. Lower Fly area study. Ok-Fly social monitoring programme report No. 9. Report prepared for Ok Tedi Mining Limited. (Unisearch PNG Pty Ltd: Port Moresby).
- Menon, A. G. K. 1979. Conservation of the Ichthyofauna of India pp. 25-33. In Jhingran, A. G. and V. V. Sugnan (eds). *Conservation and Management of inland capture fisheries resources of India*.
- Miller, S., Hyslop, E., Kula, G. and Burrows, I. 1995. Status of biodiversity in PNG. Pp 67-95. In Sekhren, N. and
- Miller, S (eds) Papua New Guinea country study on biological diversity. (Department of Environment and Conservation: Waigani, Papua New Guinea).
- Misra, K.S., 1959. An aid to the identification of the common commercial fishes of India and Pakistan. *Rec. Indian Mus.* 57 (Part 1-4): 320p
- Molur, S. and S. Walker (eds) 1998. *Conservation Assessment and Management Plan (CAMP) Workshop Report on Freshwater Fishes of India*. Zoo Outreach Organisation, CBSG India, Coimbatore, 156 pp
- Myers, G. S. (1965). *Gambusia, the fish destroyer*. *Tropical Fish Hobbyist* 13:31-32; 53-54
- Paliwal G.T.2013. Observations on Aquatic and Terrestrial biodiversity at Navegaon National park, Dist. Gondia, Maharashtra. Ph.D. Thesis submitted to R.T.M. Nagpur University. Pp. 174
- Qureshi, T.A. and N.A. Qureshi 1983. *Indian Fishes*. (Classification of Indian teleosts). Published by Brij Brothers, Bhopal, M.P., pp. 224.

- Richardson, D. M., Pysek, P., Rejmanek, M., Barbour, M. G., Panetta, F. D. and West, C. J. 2000a. Naturalization and invasion of alien plants: concepts and definitions, *Diversity and Distributions* 6: 93-108.
- Rinne, J. N. 1995. The effect of introduced fishes on native fishes: Arizona, southwestern United States. In: *Protection of Aquatic Biodiversity. Proceedings of the World Fisheries congress, Theme3*, p. 149-159. Oxford and IBH Publ. Co., New Delhi, 282 p.
- Shine S., Williams, N. and Gundling, L. 2000. *A Guide to Designing Legal Institutional frameworks on Alien Invasive Species*. IUCN, Gland, Switzerland, Cambridge and Bonn (English Version), Available from IUCN Publications Services Unit. <http://www.issg.org/>
- Storey, A. W., I. D. Roderick, I. D., Smith, R. E. W. and Maie, A. Y. 2002. Spread of the introduced Climbing Pearch (*Anabas testudineus*) in the Fly River system, Papua New Guinea, with comments on possible ecological effects. *International Journal of Ecology and Environmental Sciences* 28 (2): 103-114
- Talwar P.K. and Jhingran V.G. 1991. *Inland fishes of India and adjacent countries*. I & II, Oxford & IBH Co. Pvt Ltd, New Delhi 1158 pp.
- Trewavas, E. 1983. *Tilapine fishes of the genera Sarotherodon, Oreochromis and Danakilia*. British Museum (Natural History), London.