

Small indigenous freshwater fish species of India: Significance, conservation and utilisation

Sarkar, U.K., Lakra, W.S.

National Bureau of Fish Genetic Resources, Canal Ring Road, P.O. Dilkusha, Lucknow -226002, U.P, Email: usarkar1@rediffmail.com

In India 2,319 species of finfish have been recorded as per the database developed by NBFGR of which 838 from freshwater, 113 brackishwater and 1,368 from marine environment. Small indigenous freshwater fish species (SIF) are defined as fishes which grow to the size of 25-30 cm in mature or adult stage of their life cycle. They inhabit in rivers and tributaries, floodplains, ponds and tanks, lakes, beels, streams, lowland areas, wetlands and paddy fields. Although rural population depend highly on indigenous species of fish for nutrition in many parts of India, very little attention has been paid on their role in aquaculture enhancement, nutrition, processing, biology, captive breeding, livelihood security and conservation needs. Consequently, many small indigenous fishes have become threatened and endangered due to pollution, over exploitation coupled with habitat destruction, water abstraction, siltation, channel fragmentation, diseases and introduction of exotic varieties. In order to achieve sustainable utilisation, appropriate planning for conservation and management strategies are of utmost importance. This article addresses the untapped potential of the small indigenous fishes of India and challenging issues for sustaining biodiversity, management, aquaculture, nutrition and livelihood security and highlights the future priorities.

Diversity of SIF's, status and importance

In India, out of 765 native freshwater fish species documented by NBFGR, about 450 may be categorized as small indigenous freshwater fish species. The maximum diversity of the SIF's has been recorded from the North East region followed by Western Ghat and Central India. Based on the assessment of NBFGR, of about 450 SIF's in India about 23% (104 species) are highly important as food and other local significance and also play a significant role in aquarium trade and in providing local livelihood security. Again, of the 104 species, about 62 species have been categorized as food fish while 42 species as ornamental value.

Small indigenous fishes traditionally occupy an unenviable position and an inseparable link in the life, livelihood, health and the general well being of the rural mass, especially the poor. It has been reported that some species such as mola (*A. mola*), dhela (*O. cotio cotio*), darkina (*E. danricus*) and kaski (*C. soborna*) contain high amount of vitamin A and other micronutrients and minerals (Thilsted et al., 1997). Studies in Bangladesh and Cambodia showed that small fish species make up 50- 80% of all fish eaten during the production season. Two species from the genus *Esomus* (*E. danricus*, *E. longimanus*) are rich in high iron content (Thilsted 2010). Review of literature shows that research efforts on the information on the status of small indigenous fishes and potential utilisation in India is very limited. Small

scale aquaculture of *A. mola*, *Puntius sophore*, *Osteobrama cotio*, *Cirrhinus reba*, *Labeo bata*, *Gudusia chapra* alongwith Indian major carps have been reported (Ayyappan and Jena 2003, Roos et al 2003, Jena et al., 2008). Successful captive breeding of several SIF's have been reported under National Agricultural Technology Project (NATP) -NBFGR projects (Singh and Kapoor 2004) and also by several workers (Sarkar et al., 2009). Recent trend on pattern, and abundance of SIF's of the Ganga basin and associated protected areas have been studied by NBFGR (unpublished data) and the results shows that the minnows (*Chela* sp., *Rasbora* sp. *Amblypharyngodon* sp., and *Salmophasia* sp.), barbs (*Puntius* sp.), scheilbids (*A. coila* and *Eutropichthys* sp.), clupeids (*Goniolosa manmina* and *G. chapra*) and bagrids (*H. menoda* and *Mystus* sp.) were the dominating groups of fishes (Figure 1).

Potential cultivable indigenous small fishes

Among SIF's, many species are cultivable with high demand, cultivable and can be introduced as a candidate species in freshwater aquaculture system. These are *Amblypharyngodon mola*, *A. microlepis*, *Notopterus notopterus*, *Puntius sarana*, *Labeo bata*, *Puntius ticto*, *Cirrhinus reba*, *Salmostoma bacaila*, *Nandus nandus*, *Anabas testudineus*, *Esomus danricus*, *Puntius chola*, *P. sarana*, *Glossogobius giuris*, *Danio devario*, and *Chanda nama* etc. Other potential species for aquaculture diversification includes *Labeo gonius*, *L. bata*, *Labeo boggut*, *L. dussumeri*, *L. fimbriatus*, *Barbodes carnaticus*, *Puntius pulchellus*, *P. kolus*, *P. sarana* and *Cirrhinus cirrhosa*. Some of these species are being cultured at minimum scale, mostly based on wild seed collection. The air-breathing and non air-breeding species, *Channa marulius*, *C. striatus*, *C. punctatus*, *C. gachua*, *Channa bleheri*, *C. aurantimaculata*, *C. stewartii* have not been taken up for the aquaculture at large scale. With the technology available for seed production and culture of air breeding (*Clarius batrachus*, *Heteropnustes fossilis*), non air breeding cat fish (*Mystus seenghala*, *Mystus aor*, *Horabagrus brachysoma*, *Notopterus notopterus*, *Ompok pabda*, *O. pabo*, *Ailia coila*), farming needed to be popularized and expanded. Research and policy support for domestication of potential cultivable food and ornamental indigenous fishes as well as value added products from aquatic organisms is also required.

Threats

Freshwater aquatic environments are experiencing serious threats to both biodiversity and ecosystem stability and many strategies and priorities have been proposed to solve this crisis. The major threats to the SIF's are as: loss of natural

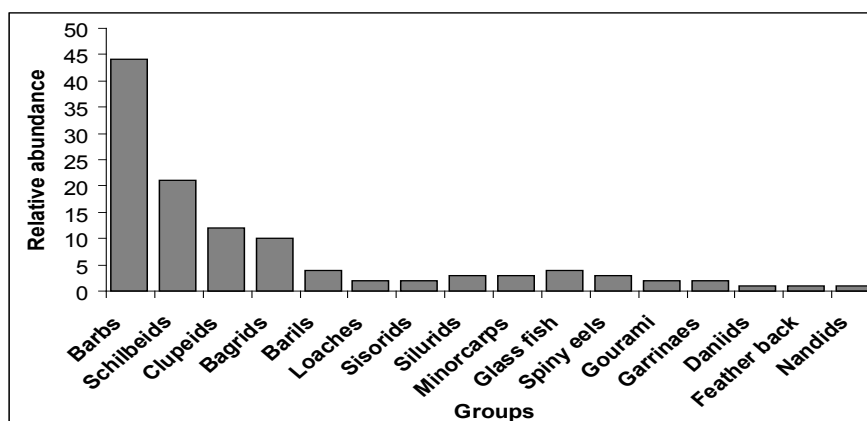
habitats, use of small mesh sized gears, dewatering, use of insecticides and pesticides, industrial and domestic pollution, siltation of water bodies, invasion of exotics and disease.

Conservation and management

Knowledge of indigenous fish species and communities reveal crucial facts necessary to the arrangement of ecosystem and habitats as well as to the identification of important genomes and genes. Out of 104 important SIF's documented by NBFGR, Lucknow, 6 species have been listed under endangered and 16 species under vulnerable category. However, Management of small indigenous fish is still a virgin area of enormous importance as of now and therefore requires a lot of dedicated approach to thrash out problems and issues relating to their promotion and conservation. The conservation of SIF is essential to maintain ecological/nutritional and socio-economic equilibrium. The NBFGR has taken considerable efforts under various research programmes. The following suggestions and strategies may be adopted for the conservation and enhancement of SIF's;

- More research and extension work on low cost small indigenous species culture, diversification, up-scaling of breeding and its role in nutrition and livelihood at different regional scale to be strengthened including its auto stocking possibility to hatchery production.
- Environmental flow requirement of all rivers systems to be worked out and the enact policy that ensure minimum environmental flow.
- It is essential to ban indiscriminate and destructive fishing practices to protect the young and juvenile fish. Catching should also be regulated to conserve the brood stocks of SIF and other fish species.
- Urgent need to develop repositories of genetic resources including registered germplasm accessions, accessions of genetic stocks discovered/ varieties discovered.
- Existing laws and regulations should be enforced properly to protect fish from destructive fishing.

Figure 1 . Pattern of relative abundance of SIF groups in Ganga basin (2007-2009).



- Conservation and enhancement of existing gene pools of native fish and SIF's in floodplains, natural depressions, rivers and other related water bodies through establishment and maintenance of fish sanctuaries on fishing areas.
- Public awareness of the necessity of conservation of indigenous fish diversity and wise management of habitats needs to be created through mass media.
- Strengthen studies on nutrient analysis, processing and therapeutic properties of SIF's. Economic valuation provide a means for measuring and comparing the various benefits of fisheries and aquatic resource and their ecosystem and can be a powerful tool to aid and improve their wise use and management.
- Policy document and develop Institutional mechanisms to promote culture, consumption and conservation of SIF's.
- Avoidance of introduction of exotic species unless completely justifies and supported by fool proof environment impact assessment.

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