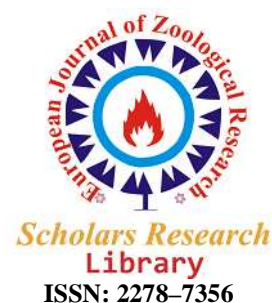




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Conservation of Fish Faunistic Diversity– An Indian Perspective

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ABSTRACT

Biodiversity loss is one of the world's most pressing crisis and there is global concern about the status of the biological resources on which almost human life depends. Conservation and sustainable utilization of natural resources are issues receiving global attention after signing the convention on biodiversity. In India, the conservation of vast and diverse aquatic resources is essential not only from the fact that, majority of resources for food still come from the wild (due to low domestication level in fisheries sector) but also to maintain ecological as well as socio-economic equilibrium. The conservation of fish diversity and aquatic resources of the country being a daunting challenge, it requires coherent efforts by integrating capture, culture fisheries and environmental programmes using the latest technological innovations and strict enforcement mechanisms of environmental laws.

INTRODUCTION

The term biodiversity is an extensive term and has got pluralistic usage in the scientific literature. This includes variety of life like plants, animals and micro-organisms, etc. that exists on the planet. The variability in life is largely governed by the genes they contain and the environment in which they live.

India is blessed with huge aquatic resources with 29,000 km of rivers, 0.3 million ha of estuaries, 0.9 million ha of back waters and lagoons, 3.15 million ha of reservations, 0.2 million ha of floodplain wetlands, 0.72 million ha of upland lakes and 2.02 million km² area of Exclusive Economic Zone (EEZ) surrounding the seas (8,129 km of coast line, which includes those of Andaman and Nicobar and Lakshadweep Islands). The seas surrounding the country, 14 major rivers, 44 medium reservoirs and innumerable small rivers and other inland water bodies provide one of the richest fish faunistic resources of the world[1]. Coastal wetlands, because of their marine biodiversity are the most productive and most diversified ecosystems of the world. These include mangroves, coral reefs, estuaries, lagoons, creeks, sea grass beds, back waters etc. The total area of coastal wetlands in India is around 40,230 sq.km. [2]. The 14 major river systems of the country sharing about 83% of the drainage possess rich diversity of commercially important species[3].

India is one of the World's twelve mega diversity countries[4]. India with its four of the 34 biodiversity global hotspots i.e., the Western Ghats, North East region, Himalayas and Nicobar Islands contributes a significant share to the world's biological resources. Among the four biodiversity hotspot regions in the country the Western Ghats possesses highest endemism of about 69% [3]. Genotoxicity studies are important not only to determine safe level of genotoxicants in water bodies but also for planning remedial measures for conservation of our rich aquatic biodiversity through comet assays[5].

Need for conservation

To - maintain ecological balance; keep ecological diversity; obtain food and natural resource; preserve the genetic material; preserve moral, religious and cultural values; preserve nativity; optimize yields by controlling efforts; resolve conflicts among stake holders.

Modes of conservation

According to the IUCN (International Union for Conservation of Nature and Natural Resources, 2008) Red List of all life forms, 16,928 species are threatened globally, and of these 1,275 species are fishes. In Asia as a whole 6,106 organisms are threatened of which 688 are finfishes. In 1989, late Dr. A.G.K. Menon of the Zoological Survey of India (ZSI) was the first who compiled a list of 21 vulnerable fishes from the Indian subcontinent [1].

Some of the species listed under threatened category by the IUCN (2012; Source: www.iucnredlist.org) Red data book includes,

- *Thunnusthynnus* – Bluefin Tuna
- *T. alalunga*(Bonnaterre, 1788)- Albacore Tuna- Near threatened
- *T. obesus*(Lowe, 1839) - BigeyeTuna- Vulnerable
- *T. albacares*(Bonnaterre, 1788) - YellowfinTuna– Near threatened
- *Carcharhinushemiodon* – Pondicherry Shark
- *Glyphisgangeticus* –GangeticShark
- *Epinephelusmarginatus* - Dusky Grouper
- *Dicentrarchuslabrax* - Sea Bass
- *Merlucciusmerluccius* Hake

All these are considered as threatened or near threatened with extinction at the regional level mainly due to overfishing. All aquatic environments are experiencing serious threats to both biodiversity and ecosystem stability. Several strategies and priorities have been proposed for this crisis as mentioned below

A) In-situ conservation

In-situ conservation is defined as “the conservation of ecosystems and natural habitats and the maintenance and recovery of viable population of species in their natural surroundings and, in the case of domesticated or cultivated species, in the surroundings where they have developed their distinctive properties” (Convention on Biological Diversity, Article 2) [3].

This conservation method works through the integration of knowledge on fish and habitat diversity, habitat utilization, life history traits as well as human interference and other socio-economic issues[5]. In the case of marine ecosystems, In-situ conservation is carried out by declaring the particular areas as a Marine Protected Areas (MPAs) by designating them as National Parks or Wild life Sanctuaries or Biosphere Reserves. Marine Protected Areas not only protects the depleted, threatened, rare or endangered species and populations, but also their habitats. In India, there are four important National Marine Parks, three important Marine Sanctuaries and four important Biosphere Reserves to protect marine ecosystems with their resources[1].

Important Marine Protected Areas of India

| Sl.No. | Name | Year of Establishment | Area | Location |
|------------------------------|---|-----------------------|------------------------|-------------------------------------|
| Marine National Parks | | | | |
| 1 | Gulf of Kachchh National Marine Park | 1980 | 400 km ² | Okha to Jodia, Gujarat coast |
| 2 | Gulf of Mannar National Marine Park | 1986 | 623 ha | Rameswaram to Tuticorin, Tamil Nadu |
| 3 | Wandoor Mahatma Gandhi National Marine Park | 1983 | 281.50 km ² | South Andaman |
| 4 | Rani Jhansi Marine National Park | 1996 | 256.14 km ² | Andaman |
| Marine Sanctuaries | | | | |
| 5 | BhitarkanikaGahirmatha Sanctuary | 1997 | 1,435 km ² | Odisha |
| 6 | Malvan Marine Sanctuary | 1987 | 29.12 km ² | Maharashtra |
| 7 | Gulf of Kachchh Marine Sanctuary | 1980 | 295.03 km ² | Gujarat |
| Biosphere Reserves | | | | |
| 8 | Sunderbans | 1989 | 9630 km ² | West Bengal |
| 9 | Gulf of Mannar | 1989 | 10,500 km ² | Tamil Nadu |
| 10 | Great Nicobar | 1989 | 885 km ² | Andaman and Nicobar Islands |
| 11 | Kachchh | 2008 | 12,454 km ² | Gujarat |

B) Ex-situ conservation

In this technique the species are conserved outside their natural habitats either perpetuating the population in genetic resource center or in the form of gene pools, gamete storage, germplasm banks. As in the case of a variety of animals, rapid freezing of gametes to ultralow temperatures found successful in the case of fishes also. Storage of fish milt, eggs, and embryos without loss of viability is of considerable value in conservation as well as in the sustaining of aquaculture. The very advantages of cryopreservation includes, i) Development of gene bank for conservation of endangered fish genetic resources ii) Availability of gametes all the year round for seasonal brooders iii) Facilitates easy transportation of germplasm over a geographical area iv) Helps in selection and hybridization programme.

In India, NBFGR is the primary organization carrying out fish sperm cryopreservation for long term gene banking, and it requires species specific protocols, so far, it has developed for 27 species (3). Inadequate milt production or asynchronization in maturity of two sexes being an issue for induced breeding in several cultivable species, cryopreserved sperm can be effectively utilized to overcome from such milt related problems.

Due to large size, large amount of yolk and tough chorion with a low permeability coefficient, egg and embryo cryopreservation of teleosts and crustacean have not met with success anywhere till now. In this regard fish cell lines, embryonic stem cells and germ cells from Indian fishes and cloning technology need to be developed for long term storage of fish eggs and embryos [3].

C) Live gene banks

Live gene banks contribute to delisting of threatened species by captive breeding and restocking in species-specific recovery programmes. NBFGR has established a live gene bank at Lucknow holding species of high conservation significance and with the objectives of a) Collection of threatened, endangered, and rare fish species and management of their stocks under farm conditions. b) Study of growth, maturity, survival, and adaptability of these species in controlled conditions, and c) Study of the life history traits of the threatened species as a tool for *in-situ* and *ex-situ* conservation [3].

D) Tissue banking

This is a speedy mode of storing the biological material for longer durations, it does not require any species-specific protocols and can be used to retrieve genetic information and genetic manipulation studies later. As per NBFGR data, nearly 13000 tissue accessions of fresh water and marine fish species collected from mainland and inland ecosystems are maintained in tissue bank [5].

E) Captive breeding

These programmes have become the major tool used to replenish the declining populations especially the threatened species in their natural habitat and simultaneously to supplement as well as enhance yields of wild species. The techniques developed by NBFGR for captive breeding and larval rearing of some non - conventional Indian ichthyofauna have shown remarkable success [5].

F) Aqua ranching

This technique is developed for enhancement of resources by stocking open waters with seeds of desirable aquatic species and providing them with appropriate artificial shelters for enabling the organisms to guard themselves against natural hazards, so that they could reach a size where predation and juvenile mortality are much reduced. This technique is used to enhance the depleting resources of lakes, streams, estuaries and even seas [6].

G) Biomass Conservation

This implies the preservation of entire population. This can be achieved by demarcating those areas as protected areas. This type of conservation will be extremely important in slowing the rate of species extinction [6].

H) Concept of State Fish

An innovative approach to fish conservation by declaring a State Fish for each of the states was adopted for the first time in the country by NBFGR in 2006 [3]. In compliance with this concept 16 states of the country became partners with NBFGR in developing strategies for conservation and enhancement of their selected State Fish in order to achieve the real time conservation success. These states have been provided with an action plan and technical backstopping for improved management of State Fish [7].

NBFGFR took initiative in identifying, in the inland zone of the nation, the outstanding prime fish species of importance state wise and accordingly listed them as State Fish[7].

List of State fish

| S.No. | State | Common name | Scientific name |
|-------|-------------------|--------------------|--------------------------------------|
| 1 | Andhra Pradesh | Snake head murrel | <i>Channa striatus</i> |
| 2 | Kerala | Karimeen | <i>Etroplus suratensis</i> |
| 3 | Karnataka | Carnatic carp | <i>Puntius carnaticus</i> |
| 4 | Orissa | Mahanadi mahaseer | <i>Tor mahanadicus</i> |
| 5 | West Bengal | Hilsa | <i>Tenulosailisha</i> |
| 6 | Arunachal Pradesh | Golden mahaseer | <i>Tor putitora</i> |
| 7 | Bihar | Magur | <i>Clarias batrachus</i> |
| 8 | Haryana | Kalbasu | <i>Labeo calbasu</i> |
| 9 | Himachal Pradesh | Golden mahaseer | <i>Tor putitora</i> |
| 10 | Jammu & Kashmir | Golden mahaseer | <i>Tor putitora</i> |
| 11 | Manipur | Pengba | <i>Osteobramabelangri</i> |
| 12 | Mizoram | Nghavang | <i>Semiplotus modestus</i> |
| 13 | Nagaland | Chocolate mahaseer | <i>Neolissocheilus hexagonolepis</i> |
| 14 | Tripura | Pabda | <i>Ompok bimaculatus</i> |
| 15 | Uttar Pradesh | Chital | <i>Chitala chitala</i> |
| 16 | Uttarakhand | Golden mahaseer | <i>Tor putitora</i> |

I) Translocation

Translocation, as a conservation means, follows stripping of wild fish, fertilizing the eggs in the field, releasing back the adults in to the donor water body and introduction of the species into new water bodies as fertilized eggs, as yolk-sac larvae or juveniles in order to generate self-sustaining population in case the original populations go extinct[6].

J) Control of Exotic fishes

Indiscriminate introduction of exotic fishes may exterminate the native ichthyofauna. While introducing an exotic species, it is imperative to screen the biology, genetics of the candidate species and its possible impact on native species in natural environment so as to bring down the devastating ecological and economic consequences if any, aftermath the alien species introduction [6].

K) Sustainable fish harvest

Exploitation of fisheries resources in traditional fishing grounds need to be regulated. Brood fishes and juveniles need to be protected to maintain a sustainable stock. Net and mesh size regulations need to be strictly enforced to safe guard the juveniles. Random killing of fishes by the use of dynamiting, poisoning need to be strictly banned [6].

L) Implementation of closed seasons

The committee appointed by the Government of India has recommended a closed season for 47 days from 15th April to 31st May along the east coast and 15th June to 31st July along the west coast. All maritime State Government should be directed to strictly enforce the monsoonal ban as per the recommendations [8].

M) Habitat Restoration

Situation specific habitat restoration programmes need to be carried out based on the type of degradation that habitat undergone. For example, in case of sedimentation/ siltation, the deforestation activities need to immediately checked, coupled with massive afforestation programme in the erosion prone catchment areas. Polluted water bodies need immediate control may be by ensuring strict enforcement of rules pertaining to pollution control[6].

N) Mass awareness

It is well established that the success of biodiversity conservation would ultimately depend on the creation of mass awareness among the public regarding the various ecological, socio-economical, nutritional, cultural, aesthetic, recreational, Pharmaceutical etc., services offered to mankind. Therefore protection of dwindling diversity is thus the responsibility of every citizen.

O) Geographic Information System

The geographic information system and remote sensing tools have become very important for studying natural resources including aquatic habitats and is now being used as a tool for fisheries management and fishery resource conservation measures.

CONVENTIONS

Though Indian Fisheries Act of 1897(modified in 1956) is a land mark with regards to fisheries, but has had no remarkable impact on the conservation of fish diversity. To conserve and optimize utilization of its bio resources, India enacted the 'Biological Diversity Act' (BDA) 2002. This encompasses guidelines to address a wide range of issues related to the utilization of bio resources and information within the country as well as by other countries. The objective is to put appropriate procedures in place so that bio resources are optimally utilized while maintaining sovereignty over them [3].

Government of India created a network of Marine Protected Areas (MPAs) under Wildlife Protection Act (1972), Environmental Protection Act (1986) to protect the biodiversity and preventing exploitation of ecologically sensitive areas and Coastal Regulation Zone (CRZ) notification(1991) for prohibiting developmental activities and disposal of wastes in to coastal ecosystems.

Indian Fisheries Act, 1897 – It is considered as the mother act of fisheries in India. This act highlights the conservation aspect and banned the use of explosives and poisoning of waters for the destruction of fish[9].

Indian Wildlife (Protection) Act, 1972 – It is under this act that marine protected areas (marine national parks/ sanctuaries/ biosphere reserves) are declared to safeguard and protect the aquatic ecosystems along with their resources[9].

The Environment (Protection) Act, 1986 – It authorizes the central government to protect and improve environmental quality, control and reduce pollution from all sources and prohibit or restrict the setting and or operation of any industrial facility on environmental grounds.

The Coastal Regulation Zone (CRZ), 1991 – This notification was issued under the provision of Environment (Protection) Act, 1986 to impose restrictions on setting up and expansion of industries, operations or processes etc., within the CRZ (i.e., the coastal stretch influenced by tidal action in the landward side up to 500m from the high tide line(HTL) and the land between the low tide line(LTL) and the high tide line (HTL)[9].

Biological Diversity Act, 2002 : The main objective of this act is to protect the biological diversity of India. It provides for the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and related matters [9].

Besides these, some important legal frameworks that, directly or indirectly related to fisheries intended to conserve the resources include,

The Territorial Waters, Continental Shelf, Exclusive Economic Zone and other Maritime Zones Act, 1976 : This act was enacted to establish sovereignty over the Indian maritime zone. It paved the way for establishment of a 200 nautical mile Exclusive Economic Zone (EEZ) [9].

The Coast guard Act, 1978 : It ensures national security of maritime zones, protection of national interests in such zones and safety at sea [9].

The Maritime Zones of India Act, 1981: This act was introduced to control activities of foreign fishing vessels within Indian Maritime Zone [9].

Coastal Aquaculture Authority Act, 2005 : The main objective of this authority is to regulate aquaculture activities in coastal areas, to ensure sustainable development without causing damage to the coastal environment [9].

International Treaties and Conventions

While national legislation varies from country to country, several International conventions and treaties are relevant to coastal zone management. Countries participating in these treaties accept certain obligations, but they will also become the recipients of specific benefits[4].

Some of which are:

Convention on International Trade in Endangered Species (CITES): This convention operates by means of import and export permits, designed to protect certain threatened species from over-exploitation. Since India became a signatory to CITES on 18th October 1976, it has provided data annually to the CITES secretariat on the trade of endangered species [4].

World Heritage Convention (WHC): India ratified the World Heritage convention in 1977 and since then five natural sites have been inscribed as areas of 'outstanding universal value'. These sites are, Kaziranga National Park, Keoladeo National Park, Manas National Park, Sunderban National Park and Nanda Devi National Park[4].

Convention on Biological Diversity (CBD): India signed this on 5th June 1992, ratified it on 18th February 1994 and brought it into force on 19th May 1994. This convention will provide a frame work for the sustainable management and conservation of India's natural resources [4].

Ramsar (Wetlands) Convention: India has been a contracted party to the Ramsar Convention since 1st February 1982. India has now six sites of important wetlands under this convention. These are Chilka Lake (Orissa), Keoladeo National Park (Rajasthan), Wular Lake (Jammu and Kashmir), Harike Lake (Punjab), Loktok Lake (Manipur) and Sambar Lake (Rajasthan)[4].

CONCLUSION

Conservation of aquatic biodiversity is important from the fact that bulk of our fish production still comes from the wild. Conservation needs must be aimed towards preserving existing biodiversity and also the evolutionary processes that foster biodiversity.

The pressure on natural habitats associated with increasing population and economic growth will continue to lead to the loss of biological diversity. Some of the harmful human impacts of aquatic biodiversity stem from ignorance, lack of understanding of the importance of aquatic biodiversity and it can be affected etc. Recognition of the scale of problem, the nature of the underlying causes, and the limited resources available to counteract powerful destructive trends will definitely lead to a best way of conserving the Biological Diversity of the aquatic ecosystems of India.

REFERENCES

- [1]Lakra, W.S., P. Das, and U.K.Sarkar. Fish Genetic Resources and their Conservation.**In:** Handbook of Fisheries and Aquaculture, *Ed.* Sharma, R.P., Verma, S.V., Kumar, A.T., Rahman, O. and Pradhan, S., ,Directorate of knowledge management in agriculture, ICAR, New Delhi. **2011.** II Edn. pp: 32-65.
- [2]ISRO, Coastal Wetlands of India, National-wide wetland mapping project, Special Applications Centre (ISRO), Ahmedabad. **1998.**pp:237.
- [3] Jena, J.K. and A.Gopalakrishnan.Fish genetic resources of India and their management-role and perspective of NBFGR.**In:** 9th Indian Fisheries Forum Souvenir (9thIFF). **2011.**pp: 56-63.
- [4] Kumar, R., M.K. Nalwa, S.K. Chakraborty and D.A. Varkey. **2008.** *Fishing chimes*,**27**(12) : 40-44.
- [5] Jena, J. K., A. Gopalakrishnan and K.K.LalHead. **2011.** *Fishing chimes*, **31**(2) : 15-18.
- [6] Rout, S.K., S.Malla, B.K. Das, R.K.Trivedi, and J.K. Sundaray. **2007.** *Fishing chimes*, **27**(5): 40-44.
- [7]Lakra, W.S. and U.K.Sarkar, **2011.** *Fishing chimes*, **31**(5) : 36-39.
- [8] Paul Raj, R., G.D. Chandrapal and U.Moza.Responsible Fisheries and Aquaculture.**In.** Handbook of Fisheries and Aquaculture, *Ed.* Sharma, R.P., Verma, S.V., Kumar, A.T., Rahman, O. and Pradhan, S., Directorate of knowledge management in agriculture, ICAR, New Delhi. **2011,**IIEdn, pp: 950-963.
- [9]Biradar, R.S. and S.Ayyappan.. Fisheries legislation. **In.** Handbook of Fisheries and Aquaculture, *Ed.* Sharma, R.P., Verma, S.V., Kumar, A.T., Rahman, O. and Pradhan, S., Directorate of knowledge management in agriculture, ICAR, New Delhi. **2011,**IIEdn,pp: 964-987.