

FISHERIES OF THE RIVER GANGA: PRESENT VS PAST

BASANTA KUMAR DAS^{a*}, ARCHISMAN RAY^a, THANGJAM NIRUPADA CHANU^a,
RAJU BAITHA^a AND SUPRITI BAYEN^a

The riverine system plays a vital role in Indian society and is recognized in large scale in irrigation, potable water, transportation, electricity as well as provides livelihoods for a large number of people. The riverine resources also provide fundamental ecological services, support the health of ecosystem and influence fish production for fisheries. Diversified fisheries have been evolved in Indian River System including cold water fisheries, estuarine fisheries and flood-plain fisheries. Highly scattered and isolated nature of fishing, wide range of landing areas, diversification in operation of fishing gears, migratory fishers and unorganized marketing system make the system more difficult for management. The targeted fishery is multigear-multispecies fishery and open access to all and makes more difficulties for sustainable exploitation and management.

The Ganga river basin is one of the most populated areas and is considered to be the largest groundwater depository on the earth. The Indo-Gangetic plains covers several hundred kilometres covering states like Uttar Pradesh, Bihar and West Bengal, ultimately joining the Bay of Bengal. The Ganga river fisheries are the major part of inland capture fisheries sector including small scale and artisanal fisheries. The Gangetic basins itself harbour the total 522 endemic species which is around 11% from India¹. From fisheries point of view, Ganga is the one of the important source to sustain livelihood for million fishers inhabiting on its bank. The impact of environmental aberrations impaired the ecology and fisheries of river Ganga² and causative factors as well as problems are major concern at present. Therefore, assessment of fish and

fisheries of river Ganga is immediate need to address for restoration and effective conservation planning.

Fish Biodiversity

The inhabitants in ecosystem act as a bio-indicator as their habitat alteration indicates the susceptible changes and possible impact on ecology. The modification in aquatic environment affects the whole food web from microorganism to higher vertebrate. Thus, systemic and periodic evaluation of aquatic biodiversity of the larger river system is essential for implementation of effective and sustainable conservation strategies. The river Ganga supports vast fisheries resources and significantly contributes in national economic as well as to the riparian communities. The status of fish diversity in the Ganges has been assessed by several researchers in the last few decades with varying reports. Hamilton reported the first document on Gangetic fish diversity with a total of 260 fish species³. Francis Day⁴ documented 1340 fishes belong to 342 genera in which most of the fishes are in accordance with the River Ganges from India. Subsequently, Menon (1974)⁵ reported 207 fish species from upper Ganga stretch to Hooghly-Matlah estuary. Later, the investigation on the fish fauna of the Ganga river basin was carried out with 266 fish species from the entire Gangetic basin and out of which 158 are freshwater and 108 marine species⁶. More than 140 commercially important fishes were categorized and documented by Vass et al.,⁷. In the recent years, the distribution along with detail description of 143 fish species (belonging 72 genera and 32 families) was documented by Sarkar et al.,⁸ highlighting on freshwater zone of the river Ganga. However, re-exploration of diversity and distribution pattern of fish fauna was recently reported by Das et al.,⁹ with a total of 190 fish species (182 indigenous and 8exotics) belonging to 133 genera, 62 families and 23 orders

^a National Mission for Clean Ganga Laboratory, ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata - 700120.

* Corresponding author: basantakumard@gmail.com

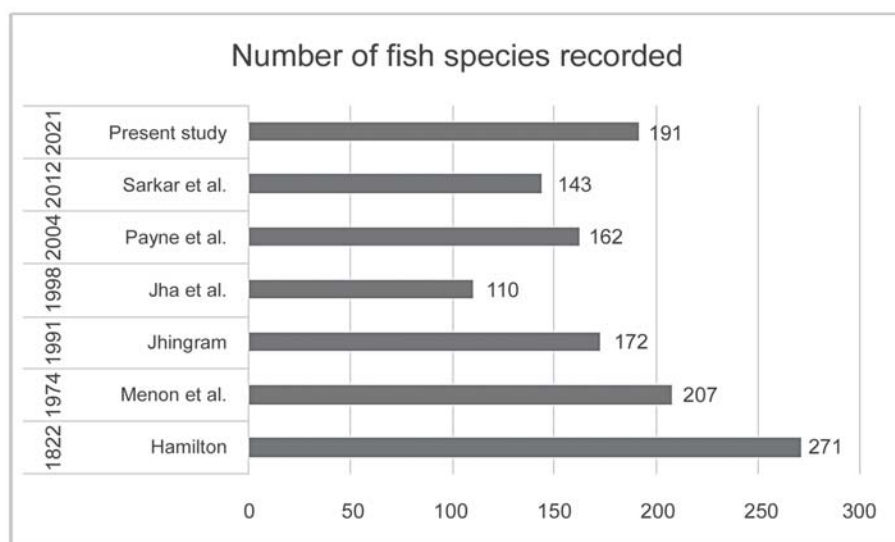


Fig. 1 Fish diversity in Ganga River

from upper Ganga (Harsil) to the Hooghly estuary (Fraserganj) during 2016-2019.

Cyprinidae was found to be the most well represented and commercially important species richness family (28 spp., 14.28%) comprising of carps and minnows in all the freshwater section. Other important families were Danionidae (19 spp., 9.69%), Sisoridae (10 spp., 5.10%) and Bagridae (9 spp., 4.59%) respectively. The assessment also revealed that the river supports significant quantity of food fish (60.84%), followed by ornamental fish (35.44%) and sports fish (3.70%). Further studies indicate, 55.78% of the fish species are exclusively freshwater inhabitants whereas, 15.26% are distributed worldwide inhabiting freshwater, brackishwater and marinewater including 17 families and 26 genera. Subsequently, only 18.94% of the species found to the brackishwater and marinewater habitat (24 families and 34 genera) and 10% belongs to both freshwater and brackishwater zone, representing 14 families and 15 genera. Mahaseer (*Tor putitora*) and Snow trout (*Schizothorax richardsonii*), considered as keystone species were reported from hilly stretch of the river Ganga. The distribution of commercially important fish fauna initiates below Haridwar at Anupshahar (Jhingran and Ghosh, 1978). *C. soborna* (18.01%) and *Tenulosa ilisha* (17.78%) showed higher dominance in assemblage pattern followed by *Setipinna phasa* (16.37%), *Odontamblyopus rubicundus* (12.80%) and *Otolithoides pama* (7.06%) in freshwater tidal zone (Das et al., 2021). Juvenile fish stock of commercially important species like *Polynemusparadiseus* and *Otolithoides pama* are declining day by day as often caught by bagnet in the estuarine zone. Introduction of exotic fish species in river become a

major threat to indigenous fishes. Problems are associated as alteration of habitat, modification in genetic level through hybridization, competition for space and food, increase of risk in diseases. Eight different exotics (viz. *Ctenopharyngodon idella*, *Hypophthalmichthys molitrix*, *Hypophthalmichthys nobilis*, *Cyprinus carpio* var. *communis*, *C. carpio* var. *specularis*, *Oreochromis niloticus*, *Clarias gariepinus* and *Pterygoplichthys disjunctivus*) were recorded belonging to 7 genera, 5 families and 3 orders from the entire freshwater zone. Though, common

carp and Tilapia have created a commercial importance in Prayagraj to Buxar stretch.

Fish Production

Middle stretch of the river Ganga has always been considered as the principal fish production area from past few years¹⁰. However, significant decline in the production of major carp was evident from Prayagraj stretch of Ganga where the landing came down from 35.82/ t to 5.97/ t during the period of 1981–90 to 2016–19⁹. The annual fish landing in Prayagraj stretch was estimated by the dominance of miscellaneous group (19.09%), followed by *Cyprinus carpio* (15.50%) and *Oreochromis niloticus* (14.56%)¹¹. The impact was also observed in migration of Hilsa (*Tenulosa ilisha*), after 1980's establishment of Farakka barrage. Although, in the lower estuarine zone of the river, dominance of Clupeids has been noticed during the entire monsoon of 2017 and 2018 contributing to 27.5% and 62.2% respectively to the total fish catch. River Ganga was the source of 89.5 % of fish spawn during 1966¹⁰ and fish spawn availability from the river have indicated decreasing trend of wild IMC spawn (10%) in the period 2005-2009 in percent contribution compared to other fish stocks (90%)¹². On the other hand, considerable decline in fish seed availability have also been noticed from 78.82% (1960's) to 34.48% (2004)¹³. The fish spawn availability index has been declined from an average of 1529 ml during (1965-69) to an average of 568 ml in (2005 to 2009) in the river Ganga¹⁴. The pollution impact, over-exploitation, illegal fishing may be attributed for decrease trend in fish landing specially major carps.

Catch Trend and CPUE (Catch Per Unit Effort) Assessment

The present assessment on CPUE in river Ganga was recorded as 0.06-1.9 kg hr⁻¹ in upper stretch, 0.16-1.04 kg hr⁻¹ in middle to lower stretch and 1.30-4.39 kg hr⁻¹ in estuarine stretch respectively⁹. The yield has declined with approximately 530 million during 1971- 1975 from West Bengal stretch¹⁰. The higher range of CPUE was estimated in post monsoon season at middle stretch though a constant reduction in catch trend was observed from 1960 to 2019. A significant change in fish production and CPUE range was noticed in Bhagalpur stretch. Overall estimation across the CPUE and catch trend specify the depletion of fish stock in entire river system.

Fishing Potential

The Ganga river traverses 2525 km from Gangotri to Gangasagar and joined at Bay of Bengal. Millions of people directly or indirectly are dependent on fisheries and resources to sustain their daily livelihood and nutritional security. However, accurate estimation of active and passive fisher populations is still unknown. Jhingran and Ghosh,¹⁰ mentioned 1577 fishing villages, and out of which, 384 were important concentrations which accounted for 87% of the fishermen. Based on GSI information the total number of fishing villages in the Ganga river stretch was observed 3795 which covers five states and 47 districts. Small indigenous fishing boats are used in River Ganga like wooden built indigenous boat, plank-built boats, mechanized and non-mechanized fishing boats, operated for short trips. Sometimes small primitive type of raft or tin made fishing boats called donga are used also. Tube is mostly used for fishing in hill stream area whereas, wooden boat of large, medium and small sized were found in upper, middle, lower and estuarine stretch as well as tin made donga also used for fishing. Variation in types of fishing gear is observed at entire stretches of river Ganga. The operation depends on targeted fishing group, water depth, tidal flow, but the multispecies gear is most prevalent in middle and lower stretches of Ganga. Hook and line are the most popular technique used in hill stretches. Gillnet, dragnet, cast net hook, seine net hook & line were observed in upper and middle stretches, operated from small boat. Indigenous techniques were also used through operating traps. Several types of fishing gear were observed in the lower stretch of river Ganga. Gillnet, seine net, dragnet, cast net, lift net, set barrier, meenjaal, bag net, traps as well as hook and line were observed in West Bengal stretches. Traps like Ghuni, Chokhia, Chai, Britti, Atal etc. are quite prevalent in lower stretch of Ganga.

Conclusion

Fishing is an important livelihood and income source contributing to the economy of riparian fishing communities living on the banks of River Ganga. The study revealed various aspects of the social as well as the economic status of the fishers' community dependent on the Ganga fishery. Most of the families of this area are directly involved in fishing to maintain their livelihood. Fisheries-related activities form a major part of their total income and play a great role in their livelihood. The creation of alternative livelihood opportunities for fishers is vital for the current situation. However, declining fish catch day by day due to various reasons like climate change, pollution, irresponsible fishing, siltation, etc. have become threats to the sustainable riverine fishery. Several conservation initiatives have been initiated in the recent years by Govt. of India under different programmes. More collaborative efforts are need involving the community for sustainable utilization and biodiversity conservation. □

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