

CONSERVATION STRATEGIES TOWARDS HILSA FISHERIES RESTORATION IN INDIA AND BANGLADESH

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*The present study highlights the conservation strategies for the Hilsa (*Tenualosa ilisha*) fisheries restoration in India and Bangladesh. In India, under the initiatives of NMCG (National Mission for Clean Ganga), ICAR-CIFRI works in different aspects on conservation and stock enhancement of Hilsa including conducting 15,529 awareness programs, establishing a ranching station, ranching of 1,43,053 adult Hilsa along with 3,959,700 fertilized eggs and 16900 of spawn, tagging (5079 tagged, 4.4% recovery). In Bangladesh, approximately BDT (Bangladesh Taka) 4 million was allocated for awareness activities from 2010 to 2011 to emphasize the significance of Hilsa conservation.*

Keywords: *Tenualosa ilisha*, ranching, awareness, tagging.

Introduction

Hilsa (*Tenualosa ilisha*, Hamilton 1822), is a species within the family of Dorosomatidae and the subfamily of Alosinae. Besides, more than 30 species of this family and subfamily are distributed on approximately six continents¹. Being a tropical anadromous fish, it is widely distributed from sea waters to freshwater in the habitats of South Asia including the Bay of Bengal, Arabian Sea and the Persian Gulf^{2,3}. However, its survival is threatened by anthropogenic activities such as overexploitation, pollution, and habitat destruction⁴. Hilsa depletion began in the early 1990s in India and Bangladesh, reaching alarming levels by the 2000s with Bangladesh implemented regulations in 2003-2004 under the Protection and Conservation of Fish Act, 1950, banning brooder Hilsa catch during breeding, Jhatka fishing, and imposing seasonal bans in sanctuaries^{5,6}. India introduced legislative action in 2013 under the West Bengal Inland Fisheries Act, 1984, published in *The Kolkata Gazette Extraordinary*

(No. 719 Fish/C 1/9R 3/2012) and adopted preventive measures⁷. Spawning grounds include the Hooghly River and estuary in India^{8,9} and specific sites in the Meghna River in Bangladesh^{10,11,19}. Fishing bans in both countries are enforced during critical periods to protect brooders and juveniles, with regulations on mesh sizes, gear types, and bottom trawling^{7,10}. In Bangladesh, alternative livelihood support includes rice distribution to Hilsa fishers during the ban period, benefiting over 224,000 households by 2013-2014¹⁰, while India lacks such support, leading to challenges in Hilsa conservation. Hilsa plays a crucial role in the livelihoods of millions of people across India, Bangladesh, and Myanmar, with its market valued at over US\$2 billion^{12,13}. Approximately 250 million people in the northern Bay of Bengal region rely on Hilsa fisheries for their livelihood, particularly in the Ganga, Brahmaputra, and Meghna River basins. In India's West Bengal, for example, about 0.46 million fishers depend on the Hilsa fishery, and the fish holds significant cultural importance, especially in Bengali festivals, religious ceremonies, and weddings¹⁴.

In 2021, the global Hilsa catch was approximately 0.583 million tonnes, with Bangladesh being the largest producer at 0.565 million tonnes, followed by India at 0.014

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million tonnes¹⁵. Among the primary Hilsa-producing nations, Bangladesh accounts for 76% of the total production, while Myanmar contributes 15%, India 4%, and the remaining 5% is shared by smaller producers, including Pakistan, Iraq, Thailand, Malaysia, and Kuwait¹⁶. In the Bhagirathi-Hooghly River system, Hilsa constitutes 20–25% of the total fish landings^{9,17}, while in Bangladesh, it represents 10.8% of the country's total fish production¹⁸. In the production and contribution of Hilsa fishery, Bangladesh comes first compared to the other Hilsa producing countries and it is indicated that Bangladesh has successfully maintained Hilsa fishery through their respective conservation measurement strategies. So, the present study aims to equate the conservation measurement of Hilsa taken by both India mainly in West Bengal and Bangladesh in different aspects as well as evaluate the current efforts of India led by ICAR-CIFRI under the NMCG project to conserve Hilsa fishery.

Materials and Methods

Study Area and Data Collection: The conservation of Hilsa is the main agenda of the current study. The sites of the present study were downstream and upstream of the Farakka Barrage mainly Farakka (Lat-24.813288 E; Long-87.916962 N), Murshidabad district and Godakhali (Lat-22.39993 E; Long-88.13511 N), South 24 PGS. The conservation measures adopted in India and Bangladesh for the conservation of Hilsa are being compared here. Data was collected from both primary and secondary sources, comprising government reports, scientific literature, and field surveys.

Establishment of Ranching Station : One of the critical conservation strategies is ranching to enhance the populations of migratory species like Hilsa at the middle stretch of River Ganga, in response ICAR-CIFRI, under the NMCG project established the ranching station at Farakka. Ranching was carried out as a key conservation technique, with efforts focused 5-10 km upstream of the Farakka Barrage. Several key criteria are needed to select the sites, including less transportation stress, easy river water access, electricity, less human interference, and flood protection. These factors led to the strategic placement of the ranching station approximately 200 meters upstream of the Farakka Barrage. Circular tanks, 5000 litre, and 1000 litre equipped at ranching station for smaller-scale activities, and fixed aeration to ensure vigorous water flow and maintain optimal oxygen levels. Furthermore, a water pump is installed to ensure a constant water supply from the river, while a mechanized FRP boat is used to release the fish into the river.

Ranching of Adult Hilsa and Fertilized Eggs:

Ranching of Hilsa was conducted at Farakka ranching station where the captured Hilsa through experimental fishing transported from downstream of Farakka Barrage in a “plastic gamla” by providing enough amount oxygen through a battery-fixed aerator as well as agitating by hand also and additionally, through artificial breeding of Hilsa in Farakka and Godakhali by both dry and wet stripping method fertilized eggs of Hilsa from Godakhali (using oxygen polythene bags) was also transferred by both road and rail to upstream of the Farakka Barrage and ranched 5-10 km upstream using mechanized boats.

Awareness about Hilsa Conservation: Extensive awareness programs were conducted from 2021 to 2024 about Hilsa conservation under the NMCG project by ICAR-CIFRI, across various states of India, including, West Bengal, Jharkhand, and Bihar. In the awareness program, the team of ICAR-CIFRI tried to provide sustainable knowledge of the Hilsa fishery like, not capturing the juvenile and matured Hilsa, spreading the knowledge of sustainable fishing practices such as the use of appropriate mesh-sized (>90 mm) net, encouraging the fishers to report tagged Hilsa, follow the legislative rules etc.

Tagging of Adult Hilsa: Due to anadromous, Hilsa travels from saline to fresh water for breeding purposes and vice-versa movement is also seen for the maturation of the species. After the Farakka barrage functionally operated, the upward movement of Hilsa up to Prayagraj was completely prohibited. As a result, Hilsa stock started depleting from the upper region of Ganga river beyond the Farakka barrage. In this context, ICAR-CIFRI, under the NMCG project, starts an initiative to reestablish of study the migratory pattern of Hilsa in the upstream of Farakka barrage in the River Ganga. To locate its movement ICAR-CIFRI, under the NMCG project, starts tagging with a T-Bar Floy Tag, where each T-Bar Floy Tag is embedded with “CIFRI” followed by a specific serial number.

Ban Periods in India and Bangladesh Considering Hilsa Conservation: During spawning season, fish move in shoals towards breeding grounds following the lunar phases. To facilitate spawning, all types of fish catching are banned in the Hilsa sanctuaries from June to August and October to December every year' Fishing of Hilsa is prohibited within 5 square kilometre of the Farakka Barrage round the year to protect the Hilsa species and facilitate brooders spawning in the area' Regulation on fishing for 3 to 4 days prior and after of the lunar phases on Full Moon and New Moon phases from August to October and January to March would protect the brood fishes to breed freely. There should be a strict ban on capturing juveniles to conserve the Hilsa fishery. Eventually, a strict

vigil is required by the law enforcing authority to control the wanton destruction of Hilsa juveniles^{19,7}.

Department of Fisheries in Bangladesh has imposed a ban on catching, transporting, and selling jatka (juvenile of Hilsa) from November to June and brood Hilsa during the full moon of autumn (October). Catching Hilsa has therefore been banned for two months (March to April) in every sanctuary except Andharmink (November to January)^{20,6}.

Results and Discussion

In order to conserve Hilsa, ICAR-CIFRI, Under the NMCG project has been taking and doing some strategic initiatives like ranching of adult Hilsa, ranching of fertilized eggs through artificial breeding, extensive awareness programs and tagging.

Ranching of Adult Hilsa and Hilsa Seeds at Upstream of Farakka Barrage: In the initiative of ICAR-CIFRI, under the NMCG project, adult Hilsa was ranched at Hilsa Ranching Station, Farakka, Murshidabad District, West Bengal, India. In the last four years, a total of 14,3053 adult Hilsa have ranched at upstream of the Farakka barrage. In 2022, the highest number of adult Hilsa have ranched with 4400 per month followed by 3568 per month in 2024, 2211 per month in 2023 and 1030 per month in 2021 (Fig. 1).

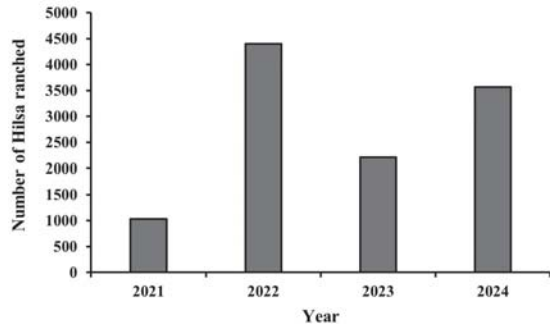


Fig. 1: Average adult Hilsa ranched in each month of each year.

To enhance the Hilsa population, artificial breeding was performed through both dry and wet stripping

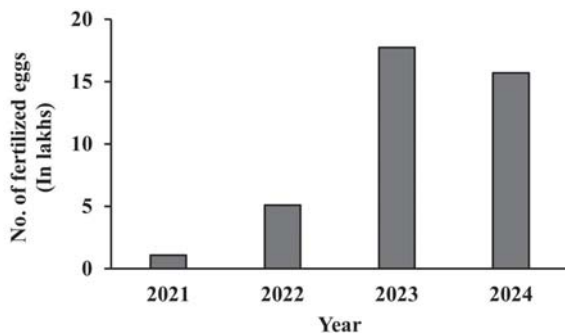


Fig. 2: Total no. of fertilized eggs was ranched from 2021 to 2024.

methods. In 2023, the highest number of fertilized eggs, 17.75 lakhs (Fig. 2), was ranched, followed by 15.68 lakhs in 2024, 5.09 lakhs in 2022, and 1.07 lakhs in 2021. A total of 16900 spawn was also ranched upstream of the Farakka barrage to ensure the stock enhancement in the middle stretch of the River Ganga.

Awareness Program to Support Hilsa Conservation:

In 2021, 140 awareness programmes were conducted, engaging 215 participants followed by 210 awareness programmes with 4643 participants in 2022, 150 awareness programmes with 2439 participants in 2023, and 116 awareness programmes with 1232 participants in 2024 (Fig. 3). However, the awareness programmes conducted on key topics like appropriate mesh sizes, do not catch juvenile and mature Hilsa, maintaining the legislative rules of Government, environmental issues such as pollution and the importance of fish tagging. Through awareness programmes, it was recorded that the kind of challenges faced by the fishers like, lack of government-issued identity cards, inadequate alternative livelihoods, and conflicts over fishing areas.

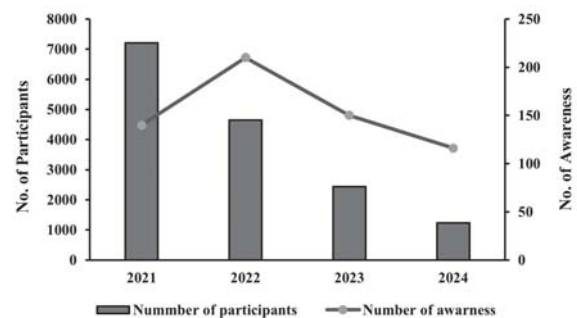


Fig. 3: Number of awareness programmes and participants from 2021 to 2024.

The Department of Fisheries (DoF), Bangladesh in collaboration with various organizations, has implemented a range of programs to raise awareness about Hilsa conservation. Activities include rallies, seminars during the jatka and brood Hilsa fishing ban periods, and the distribution of informational posters and leaflets. Additionally, district and upazila fisheries offices conduct

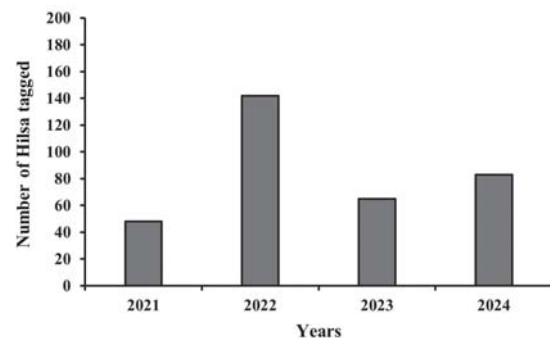


Fig. 4: Average Hilsa tagged in each month of each year.

boat rallies, road rallies, workshops, and seminars to engage fishery-dependent communities and others within sanctuary areas. During the 2010-2011 financial year, approximately BDT 4 million was allocated for these awareness activities. Furthermore, the DoF organizes talk shows and television advertisements to emphasize the significance of Hilsa conservation and the importance of compliance with related regulations^{6,18}.

Tagging of Hilsa and Recovery: In the last four years (2021-2024), a total of 5079 tagged Hilsa was released at upstream of the Farakka Barrage. In 2022, the highest number of tagged Hilsa were released with 142 per month followed by 83 per month in 2024, 65 per month in 2023 and 48 per month in 2021 (Fig. 4). However, only 4.4 % of the total Hilsa tagged was recovered at up and downstream the Farakka Barrage.

Impact of Conservation Strategies on Hilsa Fishery: Several conservation strategies of Hilsa fishery by ICAR-CIFRI under NMCG like ranching of adult Hilsa and its fertilized eggs, awareness, and tagging improved the Hilsa fishery at upstream of the Farakka Barrage with 4.4% recovery of total tagging its show that in present Hilsa now found at the upstream of the Farakka barrage and ban periods in India helped availability of brood Hilsa in the spawning grounds. In Bangladesh, BFRI (Bangladesh Fisheries Research Institute have observed an increase in the size of Hilsa in across all sanctuaries as well as larger Hilsa found in downstream of the Meghna River ²⁰.

Conclusion

In terms of Hilsa conservation, Bangladesh has found success with its strategies, including sanctuaries, seasonal bans, and livelihood support, while India confronts challenges due to limited livelihood programs, community engagement, and less economic reliance along with not following legislative regulation on Hilsa strengthened regulation, livelihood support, and increase in awareness in India, alongside transboundary collaboration, are vital. However, to conserve the Hilsa population, ICAR-CIFRI under the NMCG project, took several conservation measures including awareness programmes, establishing the ranching station, conducting artificial breeding, ranching of adult Hilsa and tagging and recovery. Through this initiative of ICAR-CIFRI under the NMCG project, the Hilsa population has been restored gradually by combining these conservation strategies in the riverine system especially upstream of Farakka Barrage with recovery of 4.4 % of total tagging in the Ganga River.

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