

RESEARCH ARTICLE

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Utilization and Conservation of Fisheries Resources of the ChalanBeel, Bangladesh

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ABSTRACT:

In Bangladesh, Chalanbeel is the store house of different types of fish and fisheries resources. But now-a-days fish and fisheries items are depleting day by day. The present study was conducted for the proper utilization and conservation of fisheries resources of the ChalanBeel.

Keywords: Fisheries Resources, conservation, utilization, ChalanBeel, Bangladesh.

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I. INTRODUCTION

The Chalanbeel in Bangladesh lies between 24.23° north latitude and 89.05 to 89.18° east longitude. It is the largest wetland in Bangladesh (Galib et al. 2009a). The Chalanbeel is a large

drainage system. This vast drainage network endows rich diversity of fisheries items providing livelihood for large number of people living in remote areas of Chalanbeel.

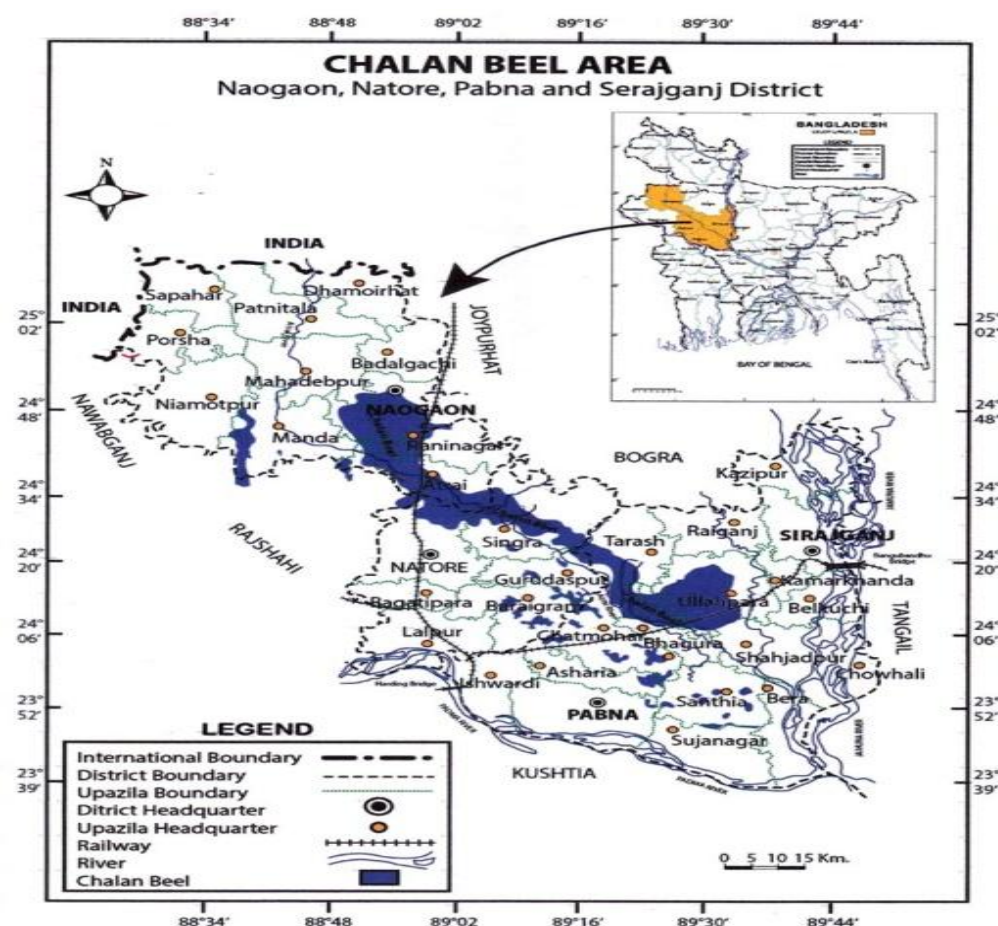


Figure 1: The location map of Chalanbeel.

Biodiversity probably is the most boring issue in news and public media now-a-days. The emphatic conversation with this affair among people is going on from United Nations to more or less all countries. The very consciousness and awareness about environment in the world-has drawn considerable attention to this matter.

For community study of flora and fauna, species diversity is a function of the number of different species, the number of individuals per species, and the total number of individuals of all species present in that community at a definite time period (Southwick 1979). Beel is the landscape ecosystems of water and the processes have dominated the formation and characteristics, which are largely controlled by water. During the rainy season there is an accumulation of animal dung rotating vegetation and other materials became the nutrients for the living organism of the water bodies. During the earlier stages of flooding these nutrients combined with river bone silts carrying minerals supports rapid growth of plants, insect's, fish and other forms of aquatic life (Rahman, 1989). The monsoon inundated flood plain as a seasonal-habitat plays the most important role in the continuation and sustenance of a large number of prawn species (Ali, 1991).

Bangladesh is blessed with an abundance of inland water bodies filled with a diversity of aquatic species. At present Bangladesh supports 430 sp. of mollusks (Hossain, 2004). Biodiversity decreasing in Chalanbeel area day by day. A few years ago fisheries items are available in Chalanbeel area. Some species of fishes are endangered or threatened.

Fisheries items diversity is a part of biodiversity. It deals with annelids, arthropods, mollusks, amphibian and reptiles. During last the last decades or so the wild life of the different parts of Bangladesh has been studied by different workers (Hussain 1974), 1996; Islam and Islam 1997; Sarkar and Sarker 1988; Rahman 1995; Das 1964; Khan 1985; 1987; Hussain and Rahman 1978; Khan 1995, 1996, 1998, Chakma 1995; Jahan 1995; Jaman 1996; Khanam 1978; Akter 1997; Mannan et al., 1998). A literature survey shows that no recent work has been done on the fisheries species diversity.

II. METHODOLOGY

Random survey was made throughout the beel area during the years July 2011-June 2014. The study was based on direct observation with the help of the local inhabitants. The fisheries items were collected with the help of fishermen and retailers. Fisheries species were also collected from the landing center near by the Chalanbeel. The arrangement of families and orders was based primarily on Berg (1940) with modification based

on recent taxonomic accounts. The local Bengali names were also given.

III. RESULT

Causes of depletion offish species in the ChalanBeel

In the past, the ChalanBeel was rich in fish species. But with the want only interfere of nature and people this beel is going to lose its heritage. And hence, it has come under a criticism regarding the depletion of fish species in the ChalanBeel. The cause of reduction of fish resources have been identified based on information given by the interviewers, by exchanging views of experienced persons and observation of registers which are mentioned below:

High population density, extreme poverty and unemployment: Bangladesh is one of the world's densely populated countries with a population of more than 170 million. Majority of the people of the country are still living under poverty line and without permanent job. Besides more than 80% of the population of the country are living in rural areas and somehow depends upon various natural resources which often lead over exploitation of plant and animal products for their survival and income. Still now, most of the people (85%) of the ChalanBeel areas depend on the actual bed resources which are strongly concerned with degradation and unsustainable use of various water body and beel areas.

Habitat loss, degradation and fragmentation: Biodiversity is strongly associated with intact ecosystems and natural landscape, however transformation of land use patterns, expansion of agricultural lands, change in cropping patterns, introduction of high yielding varieties (HYV), urbanization, expansion of road networks, unplanned embankments and other man-made factors have caused immense damage of habitats in all ecosystems. The following are some underlying factors related to this issue:

- Shifting cultivation
- Encroachment urbanization
- Land use change and agricultural expansion
- Commercial fish cultivation in pond of the ChalanBeel.

Environmental pollution and degradation: One of the biggest threats to biodiversity in Bangladesh is pollution of air, soil and water. Water is the greatest victim of toxic agro-chemicals (i.e. chemical fertilizer, insecticides), industrial effluents that are causing depletion aquatic resources and riparian natural resources.

i. Over extraction of water for agriculture, domestic and industrial use: Excessive use of water and reclamation of land for agricultural

purpose (irrigation) resulted, shrinkage of spawning and feeding grounds for fish species, in the ChalanBeel area.

ii. **Flood control measure:** Flood control measure direct impact on fish diversity in the study areas. ChalanBeel is famous for small indigenous of fish (deshichotto mash). Most of the smaller fishes do not undertake a long distance for breeding migration. They move short distances laterally into shallower water areas for breeding. Many of them live in inundated floodplains, beels, and marshes and breed in the monsoon season. It is well known that Bangladesh is singularly blessed with extensive floodplains. However the production potential of its flood land is presently severely constrained by poor natural recruitment. Various flood control and irrigation project have resulted in the habitual reduction and lowering of productive capacity and disruption of natural recruitment.

iii. **Siltation/Sedimentation:** The ChalanBeel is rapidly silting up. During the last century and a half,

it has shrunk at least 19.32 km from the southern side due to animal deposits of silt from the Ganges. Its other feeder rivers like the Burai and the Baral are also major contributing factors in reducing the size of the beel (Plate 1)

A survey carried out by the Public Works Department into drainage and silting up of the beel found that the previous area of about 108 sq km have been reduced to about 368 sq km. The remaining area had been reclaimed either for cultivation or settlement. Even in this reduced area was only 86 sq km was found under water all the year round. It was estimated that the feeder rivers had brought 6.3 million cu.m of silt a year of which 1.5 million cu.m were washed away by different drainage channels coming out of the beel but the remaining 4.8 million cu.m had been deposited annually. If distributed uniformly over the whole of 368 sq.km, it would have raised the level at the rate of 1.27 cm a year.



River Siltation



River water pollution

Plate 1: Showing the siltation and water pollution of rivers following in the ChalanBeel

Invasive alien species: A large number of exotic plants and animals have been introduced into Bangladesh for agriculture, horticulture, forestry, animal husbandry and fisheries. Also some have become escape accidentally and having adapted with local conditions proliferated profusely. Local people have nurtured some of these and some have become invasive over local flora and fauna (Mukulet *al.* 2006). Besides, replacing natural plantation with monoculture of short rotation and fast growing species have threatens the existence of local fauna as they have not adapted with this species.

For an example, the sucker mouth catfish is native to South America especially Brazil (Akhter 1995). This fish was introduced in Bangladesh from Thailand in 1980 (Rahman 2007). Though this fish was introduced for ornamental purpose but at present they have established themselves into the

different natural water bodies of Bangladesh. It was a negative impact and threat to the native fish species (Galib and Mohsin, 2011). As for example, some aquarists released large size fish in Gulshan Lake of Dhaka City from their aquarium and later the species breed and established in the Lake and currently the Lake is full of this fish (Rahman 2007). At present, this type of fish is available in the ChalanBeel.



Plate 2: *Hypostomus plecostomus* (Invasive alien species)

Absence of proper institutional arrangement frameworks and monitoring: Lack of adequate institutional or administrative frame works and suitable policies, weak implementation of existing policies, lack of integration of sectoral activities are other major threat to biodiversity in Bangladesh. Beside these, weak institutional capacities and lack of trained manpower in all disciplines dealing with biodiversity, poor coordination and cross sectoral integration, weak national information system and inadequate knowledge on ecosystem structure and function are vital reason for biodiversity losses in the country. Monitoring is particularly important in understanding the fate of ecosystems, habitats rare and endangered species.

Lack of people's awareness: Lack of biodiversity related information and knowledge automatically leads to gaps in awareness. Gaps in awareness have been identified at various levels. To start with, most people need to know that there are so many species of organisms in Bangladesh. Even the educated person, do not know that there are laws that can hunting and trade in wild animals, there are laws that protect certain species and ecosystems and that these are laws that are meant to control environmental pollution. In the study area, 88% fishermen do not know the laws. The law mostly made for the fishermen but they don't know it. This situation is not expected and quite abnormal. Fishers are whole life, wholeheartedly engaged in fishing. But it is quite absurd that they don't know the laws and regulation of fishing. For this, they are creating different types of problems. They are over fishing, destructing the fish habitat, fishing in breeding season and using banned gears.

Over fishing: Over fishing occurs when fishing activities reduce fish stocks below an acceptable level. This can occur in any type of water body from a pond to the oceans. Ultimately over fishing may lead to resource depletion in cases of subsidized fishing, low biological growth rates and critical low biomass.

The ability of the fisheries to naturally recover also depends on whether the conditions of the ecosystems are suitable for population growth. Dramatic changes in species composition may establish other equilibrium energy flows that involve other species compositions than had been present before.

Factors needed to enhance the fisheries resources of the ChalanBeel

Stock enhancement programmes: The standing stock of fish of the ChalanBeel is seriously depleted. An annual stock enhancement programme should be undertaken, being based on the experience of previously successful enhancement programme in the 1990s. According to Ali and Islam (1988), a number of species performed very well in flood plain stock enhancement programmes, including *Labeorohita*, *Catlacatla*, *Labeocalbasu*, *Cirrhinus mrigala*, *Chirrhinus reba* (Khorki), *Hypophthalmichthys molitrix* (Silver carp), *Cyprinus carpio* var. *communis* (Japanirui), *Cyprinus carpio* var. *specularis* (Mirror carp), *Ctenopharyngodon idellus* (Grass carp) and *Puntius sarana* (Thai sarapunti). These species can be stocked in the ChalanBeel to maintain a sustainable year-round standing biomass.

Modifying existing infrastructure to fish-friendly structures: Due to the combination of both natural and man-made factors fisheries resources from the ChalanBeel were depleting day by day. Unplanned construction of bridges, culverts, roads, sluice gates, flood control embankments etc. has disrupted the spawning, breeding and feeding migration of fish and other aquatic animals. Fish friendly migration routes should be maintained to minimize adverse impacts of fishery resources. Craig *et al.* (2004) suggested that survival of juvenile and larval fish under different hydrological conditions should be formally considered in managing and operating the sluice gates, in order to ensure optimal hydrological timing, duration and flow characteristics for attracting and ensuring the passage of those life stages.

Rational use of inorganic fertilizers and pesticides and proper management of industrial effluents: Integrated Pest Management (IPM) programmes could help minimize the environmental effects of these chemicals. Furthermore cost benefit analysis should be conducted to assess whether or not cultivation of low-input local crop varieties that require smaller quantities of pesticides and fertilizers could be used to some extent, rather than the high-yielding varieties. As a minimum, this approach could be strategically encouraged in the most sensitive water run-off areas. Primary treatment facilities for industrial effluents at the point of outlet also should be introduced.

Maintenance of minimum water depth during water extractions from critical water bodies:

Water abstraction from the beels and channel, for irrigation during the dry season should be discouraged where feasible or otherwise regulated. The complete removal of fish by dewatering during the dry season should be banned and a minimum of 1-2 m water depth should be maintained in the main basins through regulation and water transfer, where necessary.

Regulation of selective fish gears, mesh sizes and fishing de-watering: Over fishing and undersized fishing, use of illegal gear (The protection and conservation of fish Act., 1950) and indiscriminate killing of brood and fish seeds by illegal fishing gears should be stopped. Minimum mesh size regulation for different gears must be better

enforced to reduce juvenile mortality. Use of monofilament nets in any season should be strictly prohibited.

Establishment of natural beel nurseries and fish sanctuaries: In the study areas, both Singra and Gurudaspur have only one sanctuary, it contains only 2 ha areas. On the other side's no beel nursery present, the both study are (Singra and Gurudaspur). Tarash has only one beel nursery its area is 1.5 ha only. Community based fish sanctuaries should be established in important areas throughout the ChalanBeel. Some sanctuaries should be made permanent, so that, nobody can catch fish, while others should be open for catching fish in a alternative years. Plate 3 presents the view of a fish sanctuary at rainy and dry seasons.



Pull of water in rainy season

No water in dry season

Plate 3: Gur River (Singradah) fish sanctuary

Strict application of existing fisheries rules and regulation and absence of proper institutional arrangements, frameworks and monitoring: Lack of adequate institutional or administrative frameworks and suitable, policies, weak implementation of existing policies lack of integration of sectoral activities are major threats to fisheries biodiversity in Bangladesh. Beside these, weak institutional capacities and cross sectoral integration and

inadequate knowledge on ecosystem structure and function are vital reason for biodiversity loss in the country. Existing government rules and regulations for open water fisheries management are often neglected. Monitoring is particularly important in understanding the fate of ecosystems, habitats and rare and endangered species. Table 1 and Plate 4; show the monitoring activities of the administrative authority.

Table 1: Monitoring activities of the administrative authority in the ChalanBeel area

Nature of Law	Year	No. of Net Captured	Fine (Tk)	Jail (No.)	Boat (No.)	Others (No.)	Remarks
Fish Protection and Conservation Act. 1950 (Amendment,1995)	2006-07	682			1	Bana-150 Bora Vair-9 Kholson-50	
	2007-08	509	-	-	1	Bana-480 Bora Vair-141	
	2008-09	904	-	-	3	Bana-57 Bora Vair-5	
	2009-10	3	-	-	-	Borsi-6000 Jhupi-8	

Source: Annual report of the ChalanBeel Fish Development Project

The present study shows that, the monitoring system is not sufficient. Thus, their improved enforcement is urgently needed.



Plate 4: Monitoring activities of the administrative authority

Establishment of Community Based Organization (CBO): As the current Jalmohal Leasing Policy in practice favors the more affluent investors over the most resource-dependent professional fishers, other Community Based Fisheries Management options (CBFM) should be explored. Longer term access might's for local beneficiaries under CBFM could be used to promote more sustainable bio-ecological management of the ChalanBeel, in contrast to the present practices, which simply promote short-term revenue maximization.

The declare Ecologically Critical Area (ECA): Ecologically Critical Area (ECA) is ecologically defined areas or ecosystems affected adversely by the changes brought through human activities. The Director General of the Department of Environment has the provision for declarations of ECA in certain cases where ecosystem is considered to be threatened to reach a critical state.

In Bangladesh, there are eight ECAS's declared by Department of Environment (DoE). Islam (2005) and Kothari *et al.* (2000) suggests that the ChalanBeel should be declared as a Ecologically Critical Area (ECA) by the proper authority like other eight areas.

Harvest Control Rule (HCR): In order to meet the problems of over fishing, a precautionary approach and Harvest Control Rule (HCR) management principles have been introduced in the main fisheries around the study area. A current model for predicting acceptable levels is the Harvest Control

Rule (HCR), which is a variable over which management has some direct control as a function of some indicator of stock status. Constant catch and constant fishing mortality are two types of simple harvest control rules. Another possible solution, at least for some areas, is fishing quotas, so fishermen can only legally take a certain amount of fish.

Fishing conservation aims to control the human activities that may completely decrease a fish stock or washout an entire aquatic environment. These laws include the quotas on the total catch of particular species in a fishery, limits on the number of vessels allowed in specific areas, and the imposition of seasonal restrictions on fishing.

Technical regulation of fishing may include the followings:

- The prohibition of fishing with the use of mechanical devices such as bows and arrows, and spears.
- The prohibition of fishing with special nets e.g. Current jal, Sutijaletc.
- The prohibition of fishing with bait.
- Snagging of fish.
- Regulation of fish traps.
- Restrictions on the number of poles or lines per fisherman.

Elderly maternal fish: Elderly females are far more important than younger fish in maintain productive fisheries. The larvae produced by these older maternal fish grow faster, survive starvation better, and are much more likely to survive than the offspring of younger fish. Stock of maternal fish for spawning can be enhancing the productivity of fishes in the study area of the ChalanBeel.

Setup in-situ and ex-situ conservation innersoles: The use of over fishing and illegal fishing were found to be very common problems in the ChalanBeel. Fishermen were harvesting indiscriminately without considering the impact on natural brood stock or fry. More than 80% of the nets used in fishing were found to be small meshed, capable of catching almost all types of fishes. As both brood stock and fry were caught indiscriminately, fish abundance and the availability of particular species in the beel are decreasing every year. For these reasons, setup in-situ and ex-situ conservation.

Approach to the fishing activities for sustainable development framework of the ChalanBeel can be performed using the model shown in Figure2.

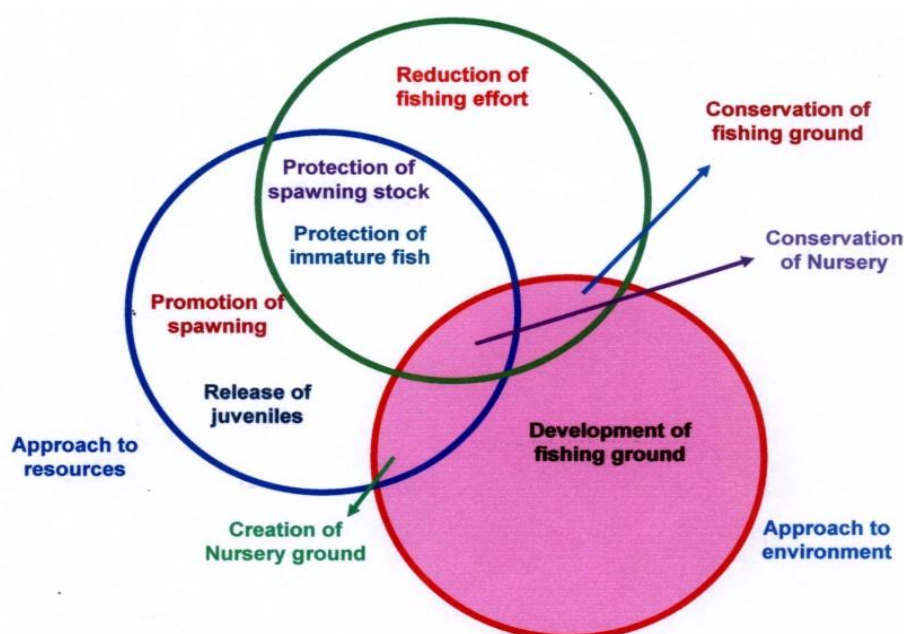


Figure 2: Sustainable development framework of the ChalanBeel..

IV. DISCUSSION

The study reveals that over fishing, high population density, extreme poverty and unemployment, habitat loss, degradation and fragmentation, environmental pollution and degradation, invasive alien species, absence of proper institutional arrangement frameworks and monitoring, lack of free political commitments and willingness, lack of people awareness are the main causes of depletion of fisheries resources in the ChalanBeel. This situation is same to (Aguero, 1989; Tsai and All, 1985, 1987).

The study reveals that only two sanctuaries and one beel nursery were found and the area was 3.5 ha. The land management policy of Bangladesh is not sufficient and not favourable to protect sustainable situation. From the early period, the land management system of Bangladesh could not be safe and sound for wetland. The former government enacted too many laws and policies to increase maximum use of land like; The Canals Act 1864, The Irrigation Act 1876, The Destructive Insects & Pests Act 1914, The Agriculral and Sanitary Improvement Act 1920, The Tanks Improvement Act 1939, The Agricultural Pesticides Ordinance 1971, The Bangladesh Irrigation and Water Reserver Ordinance 1983. All these procedures are not adequate for wetland conservation. The govermennt enacted The Environment Policy 1992 to ensure the proper management of land, develop the fertility of land, which was a revolutionary step but there was no fair application of this policy and procedure.

Principal causes behind the recent increase in the loss of fish biodiversity Bangladesh include habitat alternation, fragmentation, and

simplification. Physical habitat is altered by channelization, construction of embankments and diversions, siltation and degradation of wetlands (Chakraborty and Mirza, 2006). Other forces of change include: i) diversion for irrigation, flood control, and municipal and industrial water uses; ii) point source and non-point source pollution; iii) introduction of exotic species; iv) intentional or incidental over harvesting; v) interaction among two or more of these stressors; vi) the stress of global atmospheric change in the form of the greenhouse effect; and vii) increased ultraviolet radiation because of depletion of the ozone layer (Nehlsen *et al.* 1991).

A rich diversity of fish species is highly desirable for the ecology and sustainable productivity of beel. Fisheries resources in Bangladesh are under great threat by man made hurdle and environmental degradation. For this, unique fish bio-diversity is being drastically reduced day by day.

V. CONCLUSION

The study provides an overview of the current resource and fisheries status of the ChalanBeel. The ChalanBeel still supports a diverse ichthyofauna of major importance to the local economy and peoples livelihoods. But curse carrying by men on this wetland. If fish catches in the ChalanBeel legally and illegally continued to increase without control, the beel would be empty offish in near future. Finally, it is imperative that efforts should be undertaken to develop eco-system-based management strategies with inputs from scientists, resource managers, policy makers,

government, non-government organizations and other stakeholders, with the objective of enhancing production, maintaining biodiversity in a sustainable manner and improving the livelihood of the margin fishermen in the ChalanBeel.

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