

Status of fishery and its management in Kakorikota Beel of Majuli Island, Assam

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The present study was carried out to assess fishery status and management practices of Kakorikota beel of Majuli Island, Assam, from May 2010 to April 2011. Among the fish families encountered Cyprinidae dominated with 37 per cent of the total species recorded. The species contribution was seen lowest by families Balitoridae, Cobitidae, Sisoridae, Badidae, Gobiidae, Erethistidae, Belonidae, Nandidae, Synbranchidae, Anguillidae, Anabantidae, Heteropneustidae, Clariidae, Tetraodontidae, Notopteridae and Mastacembelidae together contributing 29 per cent. Among the cat fishes the family Bagridae contributed 10 per cent, followed by Schilbeidae and Siluridae contributing 5 per cent and 4 per cent, respectively. The other families contributed were Channidae (7%), Osphronemidae (4%) and Ambassidae (4%). On the usability and fishery importance it was found that 66 per cent of fish species have food as well as ornamental value, 25 per cent were found to have only food value, 4 per cent were non-food ornamental fishes and 5 per cent fishes were found to have food, ornamental as well as sports values. The yearly fish catch in the Kakorikota beel, as reported by leaseholder, from 2002-2003 to 2010-2011 indicated that the fish catch is in declining trend. The Kakorikota beel exhibits a diverse fish population supporting a multi-species fishery, which is more complex to understand but is more resilient. Though the beel has multi-species fisheries, only a few species dominated the landings. Siltation in the connecting channel and poaching are also other problems observed. Immediate needs of fishers of the beel include proper transportation, communication and marketing facilities, construction of fish hatcheries to encourage aquaculture practices. The data generated in the present study would help to evolve appropriate strategies for sustained development of fisheries of the Kakorikota beel.

Key words : Kakorikota wetland, Majuli island, Assam, Fishery and management status.

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INTRODUCTION

Floodplain wetlands (beels) form an integral component of the Ganga and Brahmaputra river basins which are either seasonally inundated by the overspill from the main river channels or receive run off water from the catchments. These water bodies together cover an area of 2.02 lakh hectares and constitute important fishery resources in the state of Assam, West Bengal, Bihar, Manipur, Arunachal Pradesh, Tripura and Meghalaya (Sugunan and Bhattacharjya, 2000). Among the Indian states, Assam has the maximum number and the largest waters area under floodplain wetlands (beels), mainly associated with the Brahmaputra and Barak river systems (Sugunan and Bhattacharjya, 2000). The state has 1,392 beels covering 100,000 ha, which is 49.5 per cent of the total area

under floodplain wetlands in India. Beels constitute 28.9 per cent of the total fishery resources (347,000 ha) and as much as 70.4 per cent of lentic water bodies (142,000 ha) of Assam (Bhattacharjya, 2002). Thus, they are the second largest and the most potential fishery resources of the state. The northeastern India with its vast and varied topography and watershed pattern has been recognized as a global hot spot of fresh water fish diversity (Kottelat and Whitten, 1996). Recently, a good number of new species have also been reported from the northeastern India (Menon *et al.*, 2000; Vishwanath and Shanta, 2004) indicating the scope for exploring more on the rich ichthyofaunistic of the region.

The Majuli River Island (93°30' - 94°35' E and 26°50' - 27°10' N) is located in the north of Jorhat district of Assam state in India and is bounded by three major rivers *viz.*,

Kherkutia Suti (Luit), Subansiri (on the north) and the Brahmaputra (on the south). Majuli is one of the largest inhabited river islands (a sub-division) of the world covering 92,460 ha that supports a population of about 15 per cent of the total population of Jorhat district (Anonymous, 2002). The island has a large number of wetlands and a couple of seasonal rivers (*e.g.* Tuni) criss-crossing the island. Together these open water bodies constitute important fisheries resource of the sub division. But information on fisheries of the rich wetlands of the island is scanty. Kakorikota beel situated in Majuli island of Assam, which is one of the highest revenue earning beels of the state under the administrative control of the Assam Fisheries Development Corporation (AFDC). Despite its fisheries importance, no attempts has been made to study the ichthyofaunal diversity and fisheries management of the wetland. Against this background, the present study was undertaken to investigate the ichthyo-faunistic richness and management of Kakorikota beel.

RESEARCH METHODOLOGY

Present study was carried out Kakorikota beel located near Auniati Satra (a prominent Vaishnavite pilgrimage centre.) of Majuli island, Jorhat district, Assam is an open beel connected with Brahmaputra river through a connecting channel (Kakorikota jan) for a period of 1 year from May, 2010 to April, 2011. The morphometric and hydrographic details of the beel are presented in Table A. Fish specimens regularly collected from the fishers and from the fish landing centres of the beel, the ichthyofaunal species composition (Besides, fishers were also instructed to collect fishes of different species on every sampling operation in personnel absence.). The collected samples were cleaned thoroughly with water and preserved in 8-10 per cent formalin. As far as possible, fish specimens were identified in the field itself. The fishes that could not be identified were brought to the

laboratory (Department of Fisheries Resource Management, Faculty of Fishery Sciences, Kolkata and Central Inland Fishery Research Institute, Regional Centre, Guwahati) and were identified following identification manuals Talwar and Jhingran (1991), Jayaram (1999) and Viswanath (2002). The nomenclature followed in the paper is after Froese and Pauly (2011) and the latest taxonomic nomenclature was cross-checked with *www.fishbase.org* (Froese and Pauly, 2011). The local names of fishes were collected from the fishers and local inhabitants. Fishes were grouped into four categories based on their abundance *viz.*, abundant, moderate, low and very low. Fisheries importance of the fish species occurring in the wetland were ascertained through focused group discussion with fishers, fish traders and local inhabitants. Data on annual fish landings were obtained from the records of lease holder, while data on fishing methods, type of gear and mesh size, were collected through direct observation.

RESEARCH FINDINGS AND ANALYSIS

The experimental findings of the present study have been presented in the following sub heads:

Occurrence and abundance of Ichthyofauna :

Fish fauna recorded from Kakorikota beel comprised of 73 species belonging to 24 families under 9 orders. An overwhelming majority (37%) of the ichthyo-species occurring in the beel, belonged to family Cyprinidae, followed by family Bagridae (10%), family Channidae (7%), family Schilbeidae (5%), family Siluridae, Osphronemidae and Ambassidae (4% each). The remaining 16 families (Balitoridae, Cobitidae, Sisoridae, Badidae, Gobiidae, Erethistidae, Belonidae, Nandidae, Synbranchidae, Anguillidae, Anabantidae, Heteropneustidae, Clariidae, Tetraodontidae, Notopteridae and Mastacembelidae) had low representation, contribute to 29 per cent of total ichthyospecies of the beel. The ichthyofauna occurring in the beel (Table 1) have been divided into abundant, moderate, low and very low. Fifteen fish species (*Labeo gonius*, *Wallago attu*, *Channa marulius*, *Channa striata*, *Labeo bata*, *Chitala chitala*, *Notopterus notopterus*, *Sperata aor*, *seenghala*, *Mystus cavasius*, *Mastacembelus armatus*, *Monopterusuchia*, *Puntius sarana*, *Heteropneustes fossilis* and *Clarias batrachus*) were found to be commercially important each contributing to more than 1 per cent of the annual revenue generated by the beel lessee.

Ichthyofauna of the beel constituted as much as 33.79 per cent total fish species (216) recorded and reported from Assam (Bhattacharjya *et al.*, 2003). It is 26.64 per cent of 267 species from the Northeastern region of India (Mahapatra *et al.*, 2004) and about 9.05 per cent of the approximately 806 species inhabiting freshwaters of India (Talwar and Jhingran, 1991). The species *Erethistes horai* recorded in the beel is

Table A: Morphometric and hydrographic details of Kakorikota beel

Parameters	Particulars
Length of the beel	2.8 km
Maximum depth of the beel	9.8 m
Minimum depth of the beel	5.2 m
Total water spread area	Max. – 58 ha., Min. – 20 ha
Age of the beel*	More than 60 years
Average annual rainfall in the area**	200-250 cm
Relative humidity**	80%
Maximum summer temperature**	30-35°C
Minimum winter temperature**	12°C

*As per revenue and local records.

** As per Assam Agricultural University (Jorhat) records.

Groups	Important ichthyofauna
Abundant	<i>Labeo gonius, Labeo bata, Channa marulius, Channa straita, Notopterus notopterus, Puntius ticto, Puntius terio, Puntius sophore, Badis badis, Wallago attu</i> and <i>Monopterusuchia</i> .
Moderate	<i>Bangana dero, Amblypharyngodon mola, Rasbora rasbora, Pseudambassis baculis, Chanda nama, Parambassis ranga, Trichogaster fasciata, Trichogaster chuna, Channa punctata, Mystus cavasius, Mystus tengara, Mystus vittatus, Neotropius atherinoids, Xenentodon cancila, Macrognathus pancalus, Mastacembelus armatus</i> and <i>clupisoma garua</i> .
Low	<i>Labeo boga, Cirrhinus reba, Chela cachius, Acanthocobitis botia, Lepidocephalichthys guntea, Trichogaster lalius, Channa orientalis, Nandus nandus, Anabus testudineus, Hemibagrus menoda, Sperata aor, Sperata seenghala, Ompok pabo, Ompok pabda, Heteropneustes fossilis, Clarias batrachus, Tetradon cutcutia, Chitala chitala, Gudusia chapra</i> .
Very low	<i>Labeo rohita, Labeo dyocheilus, Labeo calbasu, Labeo nandina, Tor putitora, Cirrhinus mrigala, Catla catla, Ctenopharyngodon idella, Cyprinus carpio carpio, Hypophthalmichthyes molitrix, Aspidoparia morar, Puntius sarana, Puntius conchoniuis, Salmophasia bacaila, Megarashora elenga, Botia dario, Glossogobius giuris, Channa gachua, Rita rita, Gagata cenia, Erethistes horai, Eutropiichthys vacha, Clupisoma garua, Ailia coila, Tenualosa ilisha</i> and <i>Anguilla bengalensis bengalensis</i> .

noteworthy to mention here, as it is being reported for the first time from the state of Assam. This finding indicates that many more new records/species may be made from remote localities like Majuli river island and other parts of Assam in the year to come. The northeastern region of India was identified as a biodiversity hotspot by the World Conservation Monitoring Centre (Anonymous, 1998). The rich diversity of this region can be attributed to certain reasons notably the geomorphology and the tectonic instability of this region. The hills and the undulating valleys of this area gives rise to large number of torrential hill streams, which lead to many big rivers; and finally become part of the Ganga-Brahmaputra-Barak, Chindwin-Kolodyne and Gomati-Meghna systems (Kar, 2005). The geological upheavals of the past in the Northeastern India have resulted in mixing up of drainages and their fish fauna. Diverse fish populations present in the open beels in

the state of Assam support a multi-species fishery, which is more complex to understand but is more resilient (Bhattacharjya, 2008). Rich ichthyofaunistic diversity of beels of Assam has been reported by Kar and Dey (1993) in Sone beel (70 species), Acharjee (1997) in three beels of Kamrup district (56 species) and Bhattacharjya (2002) in two beels of Morigaon district (43 species). Hazarika (2010) total 80 and 64 fish species occurring in Maijan and Kotoha beel, respectively from Dibrugarh district. Bhattacharjya (2011) reported that a total of 96 fin-fish species and belonging to 24 families and 11 orders were observed in the beels of Assam.

Occurrence of exotic ichthyo-species :

Three exotic species (*Cyprinus carpio caprio, Hypophthalmichthyes molitrix* and *Ctenopharyngodon idella*) had been observed in the beel during the study period. Bhattacharjya (2011) reported five exotic fish species including the three carps recorded from the beels of Assam. Apparently the three exotic carps found their way to the open beel after these were washed down to river Brahmaputra by floods waters during the south-west monsoon season.

Utilization pattern :

Among the ichthyo-species 48 species (66%) have food as well as ornamental value, 18 (25%) were found to have only food value, 3 (4%) were non-food ornamental fishes and 4 (5%) fishes were found to have food, ornamental as well as sports values (Fig. 2). Among those which have food and ornamental values, 25 are more preferable as food and 23 as ornamental. In other words, out of total fishes (73) recorded 70 could be considered as food fishes and 3 as non food fishes (*Badis badis, Tetraodon cutcutia* and *Erethistes horai*). Likewise, a total of 55 fishes could be considered as ornamental fishes. Thus, it appears that the Kakorikota beel has immense

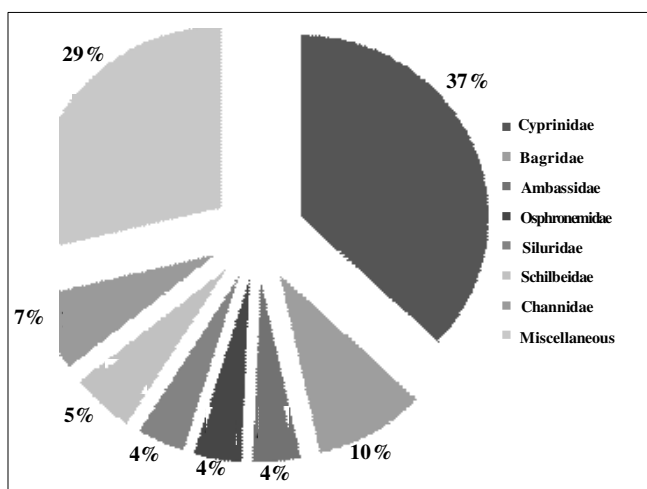
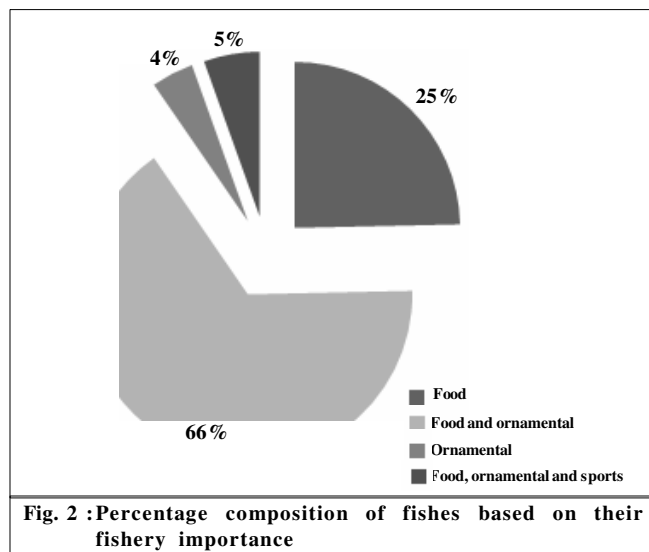


Fig. 1 :Percentage composition of fish families in Kakorikota beel



potential for fish and fisheries activities and there is an urgent need to develop this beel through scientific management to increase the current fish production. *Chitala chitala*, *Sperata seenghala*, which are considered as good sport fishes of Assam, were observed present in good in the beel during the study period.

Fishing methods :

A varieties of fishing methods gear were practiced in the beel which could be categorised under four major groups *viz.*, active gear, passive gear, fish aggregating devices (FADs) and falling gear. The active gear *viz.*, *Ghayala jal* (Surrounding net), *Fesu jal* (boat operated sieve net), *Mohsori jal* (Shore seine), were found to be most effective and dominant contributing to about 58 per cent of the total annual catch. The passive gear *viz.*, *Ghat jal* (Chinese dip net) and traps account for 20-22 per cent of total catch. Fish aggregating device (FAD) locally known as *Jeng* fishing is the major harvesting method, which fetch an average harvest of 100 kg in single operation in the beel. This fishing is basically operated by outside (Bihar) fishers in winter seasons. Falling gears *viz.*, *Polo*, Cast net (*Khewali jal*), Hook and Line (*Boroshhes*), Grappling and woundings (*Kali*, *Pocha*, *Dhanu Karh*) etc. together contribute around 12-15 per cent of total catch. The artisanal fishery in which mostly women and children use small gears and fish for self-consumption is also common practice in the beel. Many of these gears are either exclusively used in the riverine fisheries in Assam or elsewhere in India (Job and Pantalu, 1958). Barik and Sarma (2006) reviewed the similar kinds of fishing practices in beels of Majuli Island of Assam. Bhattacharjya *et al.* (2004) recorded more than ninety varieties of fishing craft and gears used in the North-east states of India.

Fish catch and catch composition :

The annual fish catch from the Kakorikota beel was 12,500 kg and the average fish production was 320.51 kg⁻¹ ha⁻¹yr⁻¹ during the study period in the year 2010-2011. In 2002-2003 the total catch was 35,556, where the average fish production was 911.69 kg⁻¹ ha⁻¹yr⁻¹ (Fig. 3). Total catch was declined by 2.84 times compared to 9 years ago. The decline in the total catch over the years might be attributed to several problems like siltation, loss of breeding ground, decline in riverine fishes and erection of embankments as a flood control measures which invariably affects migration of fishes and, thus, spawning of fishes as also observed by other workers in the beels of Assam (Sugunan and Bhattacharjya, 2000; Bhattacharjya, 2008).

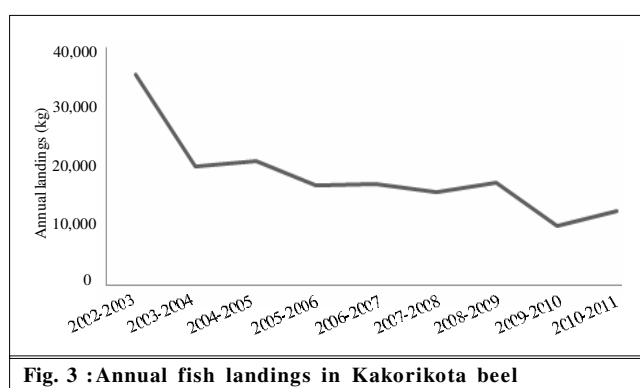


Fig. 3 : Annual fish landings in Kakorikota beel

Present fisheries management practice :

The Kakorikota beel was primarily owned by the Apex Authority Revenue Department. Later it was transferred to the AFDC, which leases out generally for a period upto seven years. The beel was initially leased by Co-operative Society, however, it is presently managed by individual leaseholder from the last nine years. There are three numbers of *Mohori* (also Known as *Bishaya*) under the leaseholder who looks after the beel. Among them the chief one is also known as *Selling mohori* under him the two more *mohori* known as *Naoria mohori*, who monitor the beel from poaching and illegal fishing. The name *Naoria mohori* derived from the word *Nao* (boat), as they investigate the whole beel by *Nao* during day and night. The *Selling mohori* deals with the fish caught on behalf of the leaseholder and look after the marketing. About 600-700 fishermen from the nearby villages *viz.*, Alimor, Borgayan-1, Borgayan-2, Borgayan-3, Patna and Kakorikota have been engaged in fishing in this beel from the days of their ancestors. The leaseholder takes share of 50 per cent from the catch of each fisherman.

It has been observed that three groups of fishers are known to fish in the Kakorikota beel; i) neighborhood group who generally fish with small gears for self consumption, ii)

Island fishers who fish only in fishing seasons and iii) fishers form outside places like Bihar who fish only in the peak season with large gears. Sharing arrangement holds key for the livelihood of the fishers. It is the mechanism through which the catch is shared between the owner and the fishers. The fishers had no ownership rights and are dependent on share of the catch for their livelihood. In Kakorikota beel, the share of fishers is 50 per cent of catch, but they had to pay entry fee called *Chalani* to the leaseholder. Chandra and Sarma (2006) opined that the sharing arrangement in the Majuli are better than other parts of the state as the fisher's share was around 25-40 per cent in other parts of the state (Barik and Kathia, 2003), as compared to 50 per cent in Majuli.

Conclusion :

The Kakorikota beel exhibits a diverse fish population supporting a multi-species fishery, which is more complex to understand but is more resilient. Though the beel has multi-species fisheries, only a few species dominated the landings. Immediate needs of fishers of the beel include proper transportation, communication and marketing facilities, construction of fish hatcheries to encourage aquaculture practices. Hence, there is a great need for scientific management to utilize the beel fisheries to its potential and sustainable level. The data generated in the present study would help to evolve appropriate strategies for sustainable development of fisheries of the Kakorikota beel.

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