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Seasonal Floodplain Haor Wetlands in Assam Hotspot in India

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Abstract:

The North-Eastern (NE) region of India includes the province of Assam, which provides enough potential for high fish production which can supplement food requirement of the region and could provide answer to the diminishing protein supply. Assam is gifted with innumerable nature's wealth in the form different kinds of lentic and lotic water bodies. A `Haor' is a kind of seasonal floodplain wetland which contains water for some time of the year only, particularly, during the rainy season. Definitions of other kinds of wetlands along with details about `Haors' in the region, have been discussed in the present communication.

Keywords: Wetland; Haor; Assam Hotspot; India; Asia

Introduction

The North-Eastern (NE) region of India, which includes the province of Assam, is typically a difficult topography with undulating terrains. It, however, provides enough potential for fish production which can supplement food requirement of the region and could provide answer to the diminishing protein supply. Development of agriculture has, sometimes, been a constraint due to not much availability of flat land with facilities of irrigation. Nevertheless, the region provides enough scope for development of inland fisheries [1-11].

The NE India, with c 8 % of the country's geographical area and c 4 % of the total population, provides a picture of mini- India. Having diversities with regard to topography, water resources, biota, climate, race, language and culture, the region harbours more than a hundred tribes differing ethnologically yet sharing a common destiny. Besides lotic territories, the lentic water bodies having 0.72 × 106 ha lake coverage in India, constitute great potential of fishery resources. The NE region is blessed with a number of lentic systems, locally called `Beel, Haor, Anua, Hola, Doloni, Jalah, etc., which alone constitute c 81 % of the total lentic area (0.12 × 1o6 ha) in Assam. These lentic systems are generally shallow and open, ranging in size from 35 to 3458.12 ha and with depth ranging from 0.25 to 3.0m (in some, however, the maximum depth may be upto 6.0 m) at FSL. Further, in Assam, there are c 1392 number of wetlands having a total of c 22,896 number of fisheries of different categories; out of which, the number of registered wetlands is only 394 (30.38 %) covering an area of c 70,000 ha; of which, c 19,000 ha is in good condition; c 15,000 ha is in semi-derelict condition and c 35,000 ha is in derelict condition [3,12].

In Assam, and in adjoining Tripura and Bangladesh, 3 kinds of wetlands are generally found. They are locally called as follows:

a) Beel

Perennial wetlands which contain water throughout the year.

b) Haor

Seasonal wetlands which contain water for some period of the year only, particularly, during the rainy season. As such, they are also called `floodplain wetlands'.

c) Anua

These are peculiar river-formed perennial oxbow-type wetlands which are generally formed due to change in river course and which may or may not retain connection with the original river.

A brief account of the principal Haors of the region is given below:

Chatla Haor

It is situated between 24° 42' 38 "N to 92° 46" 11.8" E in the Cachar district of Assam. It was said to be a `Beel' (perennial wetland) some decades ago having its waterspread area reaching Silchar town. Due to gradual siltation and eutrophication processes occurring naturally in the successional process, accelerated by human interference, today it has become a `Haor' (seasonal wetland) and retains water for approximately six months in a year having practically no dead storage level (DSL). So, it is almost completely dry during the winter. Having a water spread area of c 1600 ha at the FSL, Chatla is considered as one of the biggest `Haor' in Assam.

Around Chatla, the soil in the catchment is generally sandy loam, but shore vegetation is thin. The Haor is drained by a number of small inlets (viz., Jalengachhara, Baluchhara, Salganga) and an outlet (viz., river Ghagra) which drains itself into the river Barak. The catchment of the Haor includes a small portion of the Innerline Reserve Forest. During monsoon, the Chatla, like other similar wetlands, receive some humic as well as inorganic and organic nutrients from the hillocks and surrounding cultivable lands.

The Silchar city is situated c 15 km away from the east of the wetland. Hailakandi town is situated c 35 km away from the western shore of the Haor. The Block HQ at Barajalenga is situated c 5km away from the southern end of the wetland.

The maximum length (L), breadth(B), depth(D) and water spread area(A) of the wetland at FSL have been measured to be 10km, 2.5km, 5.5m and 1600 ha respectively. Prominent Silt Islands (SI), viz., Bairagitila and Harintila have been found to occur towards the eastern shore of the Haor. Other small SIs, viz., Haltia, Diblia and Barshangan occur towards the SW side of the Haor.

Among the inlets, river Salgonga originates from the foothills of the Mizo Hill range while the Jalengachhara and Baluchhara, which are mostly rheophilic in nature, flow down into the Haor from the Innerline RF. The only major outlet, river Ghagra, drains the water of the Haor directly into the river Barak traversing a tortuous course of c 14km from the northern boundary of the Haor.

The physico-chemical characteristics of water of Chatla Haor has been presented in Table 1.

Table 1: Physico-chemical characteristics of water of the `Haor' wetlands in Assam.

Sl No.	Water Body	Temp. (C)Water Air		Turbidity (NTU)	pH	DO mg/l	Free- CO_2 (mg/l)	TA (mg/l)	Conductivity (μ mhos/cm)
1	Chatla Haor	13.1-33.5	13.0-33.0	83.27	6.09	6.5	7.59	83.39	142.91
2	Puneer Haor	13.4-34.1	13.1-34.0	1014	5.56	2.7	6.5	26.5	168.5
3	Bakri Haor	13.5-34.7	13.5-34.2	46	6.5	6.1	6	48	74

An account of Zooplankton of Chatla Haor Wetland (Kar and Barbhuiya, 2004)

Studies conducted in c 1600 ha Chatla Haor in Cachar district revealed the occurrence of 18 species of zooplankton consisting of 2 species each of Protozoa and *Copepoda*, 6 species of Rotifera and 8 species of Cladocera. Occurrence of *Arcella sp* among the protozoans and Brachionus calyciflorus among the rotifers, indicate eutrophy of the wetland. Two protozoans, viz., *Arcella sp* and *Paramoecium sp*, represented c 11.11 % of the total zooplanktonic taxa in the wetland. There had been reports of Arcella sp in eutrophic waters. Six rotifers constituting 33.33 % of the total zooplanktonic taxa were also identified; of which, *Filinia sp* and *Lecane sp* were found to be abundant. The identified Copepods included the *Cyclops sp* and the *Diaptomus sp* and they represented 11.11 % of the total zooplanktonic taxa. The total zooplanktoum c count was found to be 68±45 units/litre [13].

An Account of the AM of Chatla Haor Seasonal Floodplain Wetland (Kar and Barbhuiya, 2001)

23 species of AM could be recorded, till date, in the 1600 ha (at FSL) Chatla Haor situated in the Cachar district of Assam. These could be classified as follows:

5 free floating, 4 rooted floating, 2 submerged and 12 emergent. Of these, 6 AM species could be found throughout the year. These are: *Azolla pinnata, Eichhornia crassipes, Salvinia cucullata, Trapa bispinosa, Jussiaea repens* and *Cynodon dactylon*. *J.repens* showed flowering during March-May, while Nymphaea nouchali bloomed during June-August followed by *Nymphoides cristatum* and *N. indicum* which exhibited profuse flowering during September-October. *Ipomoea aquatica* depicted significant growth of population during July-August. *Hydrilla verticillata*, *Vallisneria spiralis* among the submerged varieties and Alternanthera sessilis, *Cyperus platystylis, Echinochloa stagnina, Eleocharis acutangula,*

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Enhydra fluctuans, Scirpus eriophorum, Sagittaria trifolia among the emergent varieties succeeded at a lesser water level during the dry season. The floating varieties, viz., *A. pinnata*, *E. crassipes*, *S. cucullata* were recorded throughout the year and found to be associated with each other. Further, among the submerged varieties, *H. verticillata* and *V. spiralis* were found to be associated.

Significant phyto-social association were also observed among *Nymphaea sp* and *Nymphoides sp*; and, among *Eleocharis acutangula*, *Scirpus eriophorum* and *Echinochloa stagnina*.

Puneer Haor

It is situated (N 24º 38' 33.9 " and E 92º 52 ' 6.3 "), c 38 km away from south of Silchar city near the village Dhalai near the Assam-Mizoram border. This Haor has a waterspread area of c 2.5 ha at FSL and c 1.3 ha at DSL. The maximum L, B and D of Puneer Haor at FSL have been found to be 1.5km, 0.9km and 2.5m while its average depth was found to be 0.4 m. The Puneer Khal, flowing along the eastern shoreline of the Haor, originates from Panchhara hill ranges and water from this khal spills over into the Haor at FSL. A drain from the adjoining Bhubandhar TE flows along the western shoreline of the Haor and water containing TE pollutants also said to spill over into the Haor at FSL.

The catchment of the Haor contains mainly trees and some amount of herbs and shrubs. The soil consists mainly of sand and gravel. A big portion of the catchment contains the tea plantation of the TE. There are also human habitations in the catchment. The catchment of the wetland includes a portion of the Dhalai RF. The Block HQ at Narsingpur is situated c 20km away from the northern boundary of the wetland.

The physico-chemical characteristics of water of Puneer Haor has been presented in Table 1.

Bakri Haor

It lies (N 24º 48 ' 41.4 " and E 92º 35' 58.8 ") in Hailakandi district of Assam, c 20km away from Hailakandi town. This Haor is very much silted now and it retains very little amount of water at the Dead Storage Level (DSL).

The physico-chemical characteristics of water of Bakri Haor has been presented in Table 1.

An Account of the Ichthyospecies

Zoogeographically, FW fish have been classified differently by different workers. Although the classification made by Myers [14] have been proved to be the most useful, and widely accepted one, the FW fish of marine origin had been further classified as `peripheral FW forms' by Nichols [15] and Darlington [16] which has also been accepted by many recent fish geographers. Incidentally, the ichthyofauna of this region, by and large, have been found to belong to the following categories [17]:

a) Primary FW Fish

b) Peripheral FW Fish

In addition to the above, on the basis of Indian and Extra-Indian fish distribution [18], the following ichthyospecies of this region could significantly be incorporated under the following two groups:

a) Widely distributed species

b) Species of Northern India

In addition to the foregoing analyses, ecomorphologically [19], the fishes of this region could further be categorized into four distinct groups which are as follows:

a) True Hill-stream or rheophilic form

b) Semi-torrential forms

c) Migratory forms

d) Plainwater forms

Information about the habit and habitat of these fish species is scarce and are based mainly on the present study. Data about the reproductive period, sites of breeding, feeding, etc., is scanty. According to our field observations, there is difference in habitat preference within the species in many families. Young fishes are generally found to prefer little deeper regions of the Haors while, the adults tend to live in all the different niches (Smith, 1986). The food of the adults generally consist of herbivorous items with occasional carnivorous components. The gut contents revealed the occurrence of mainly phytoplankton food with zooplankton encountered only occasionally.

There is a bewildering diversity of fishes in the lentic systems of this region. An account of the principal fish fauna of the Haors have been presented in Table 2.

Fish Diversity in Chatla Haor of Assam

57 species of fishes, belonging to 28 genera, 17 families and 9 orders, have been recorded in Chatla Haor [20] (Table 2).

Zoogeographically, the ichthyospecies of Chatla Haor contains 79.62 % of Primary FW fish while the rest (20.38 %) belong to the Peripheral class [15-17]. Further, on the basis of Indian and Extra-Indian territorial fish distributional pattern [18], ichthyospecies of Chatla Haor did contain fishes belonging to the groups called `widely distributed species (notably, *Puntius, Ompok, Channa, Anabas*) and species of Northern India (notably, *Botia dario, Lepidocephalus guntea*, etc.). Ecomorphologically [19], fish species of Chatla Haor contain only the `Semi-torrential' forms and the `Plainwater' forms (notably. *A.mola, C.catla, C. carpio, Puntius spp., Mystus spp*).

Fish Diversity in Puneer Haor of Assam

24 species of fishes belonging to 22 genera, 15 families and 8 orders have been recorded in Puneer Haor wetland (Table 2).

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Table 2: Fish Biodiversity in the `Haors' of Assam.

Fish Species	Chatla Haor	Puneer Haor	Bakri Haor
Pisodonophis boro (Hamilton)	-	-	
Gudusia chapra (Hamilton)	+	-	+
Tenualosa ilisha (Hamilton)	+	-	
Chitala chitala (Hamilton)	+	-	
Notopterus notopterus (Pallas)	+	+	
Amblypharyngodon mola (Hamilton)	+	+	+
Acanthocobitis botia	-	-	+
Aspidoparia morar (Hamilton)	-	-	
Barilius bendelisis(Hamilton)	-	-	
Osteobrama cotio (Hamilton)	-	-	
Catla catla (Hamilton)	+	-	
Cirrhinus mrigala (Hamilton)	+	-	
Cirrhinus reba (Hamilton)	+	+	
Chela laubucaHam)	-	-	
Cyprinus carpio Linnaeus	+	-	
Ctenopharyngodon idellus (Valenciennes)	+	-	
Hypophthalmichthys molitrix (Valenciennes)	+	-	
Danio dangila	-	-	+
Devario devario (Hamilton)	+	-	
Esomus danricus (Hamilton)	+	-	
Labeo bata (Hamilton)	-	-	
Labeo calbasu (Hamilton)	+	+	
Labeo calbasu (Hamilton)	+	+	
Labeo gonius (Hamilton)	+	-	
Labeo nandina (Hamilton)	-	-	
Labeo rohita (Hamilton)	+	-	
Puntius chola (Hamilton)	+	-	
Puntius conchonius (Hamilton)	+	+	+
Puntius sarana sarana (Hamilton)	+	-	
Puntius ticto (Hamilton)	+	+	
Rasbora daniconius (Hamilton)	+	-	
Bengana elanga (Hamilton)	-	-	
Salmostoma bacaila (Hamilton)	+	+	
Securicula gora (Hamilton)	-	+	
Botia dario (Hamilton)	+	-	
Lepidocephalichthys guntea (Hamilton)	+	-	
Acanthocobitis botia (Hamilton)	+	-	
Somileptes gongota (Hamilton)	-	-	
Mystus bleekeri (Day))	-	+	
Mystus cavasius (Hamilton)	+	-	
Mystus corsula (Hamilton)	+	-	

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Mystus tengara(Hamilton)	+	-	
Mystus vittatus (Bloch)	+	+	
Sperata seenghala (Sykes)	+	-	+
Rita rita (Hamilton)	-	+	
Ompok bimaculatus (Bloch)	+	+	
Wallago attu (Bloch and Schneider)	+	-	
Ailia coila (Hamilton)	+	-	
Clupisoma atherinoides (Hamilton)	+	-	
Clupisoma garua (Hamilton)	+	-	
Eutropiichthys vacha (Hamilton)	+	-	
Eutropiichthys murius (Hamilton)	+	-	
Silonia silondia (Hamilton)	-	-	
Pangasius pangasius (Hamilton)	-	-	
Nangra nangra(Hamilton)	-	-	
Glyptothorax telchitta (Hamilton)	-	-	
Clarias batrachus(Linnaeus)	+	+	
Heteropneustes fossilis (Bloch)	+	+	
Chaca chaca (Hamilton)	-	-	
Xenentodon cancila(Hamilton)	+	+	
Aplocheilus panchax (Hamilton)	+	+	
Channa orientalis (Schneider)	+	-	
Channa marulius (Hamilton)	-	-	
Channa punctatus (Bloch)	+	+	
Channa striata (Bloch)	+	-	
Amphipnous cuchia (Hamilton)	+	-	
Parambassis baculis(Hamilton)	+	-	
Parambassis ranga(Hamilton)	+	+	
Chanda nama Hamilton	+	-	
Badis badis (Hamilton)	+	-	
Nandus nandus (Hamilton)	+	+	
Oreochromis mossambica (Peters)	-	+	
Rhinomugil corsula(Hamilton)	-	-	
Sicamugil cascasia(Hamilton)	-	-	
Glossogobius giuris (Hamilton)	+	-	
Anabas testudineus (Bloch)	+	+	
Colisa fasciatus (Schneider)	+	+	
Colisa lalia (Hamilton)	+	-	
Colisa sota (Hamilton)	-	+	
Macrognathus aral (Bloch and Schneider)	+	-	
Macrognathus pancalus (Hamilton)	+	-	+
Mastacembelus armatus	+	+	
(Lace'pe'de)			
Tetraodon cutcutia (Hamilton)	-	-	

('+' Present, '-' Absent).

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Fish Diversity in Bakri Haor of Assam

8 species of fishes belonging to 8 genera have been recorded in Bakri Haor of Assam (Table 2).

Fish yield from some of the water bodies in Assam

Chatla haor: 57 species of fishes, belonging to 28 genera, 17 families and 9 orders, have been recorded in Chatla Haor. Species diversity by Shannon-Weaver Index revealed high diversity of the fish speices of this wetland (H= - 6.15) [20]. Of the 57 species, as revealed from our studies [20], Cypriniformes was found to constitute 32.3 % of the total fish population followed by Channiformes (22.8 %), Siluriformes (14.02 %), Clupeiformes (10.52 %), and Osteoglossiformes (0.00029 %). Family Notopteridae showed the least abundance (0.00064 %). Interestingly, among the clupeids, occurrence of Hilsa *(Tenualosa)* ilisha (0.000041%) is a remarkable feature in the distribution of the species in freshwater. Further, occurrence of advanced fry stages of hilsa (45.5 to 128.0mm) is an exceptional feature in the zoogeography and biology of the fish. On the other hand, yield of Gudusia chapra revealed an alarming trend of decline in this wetland. Furthermore, occurrence of juveniles of Indian major carps (IMC) in Chatla Haor indicate the possibility of this wetland serving as a breeding ground for these large growing fishes [21].

Occurrence of advanced fry of Hilsa (Tenualosa) ilisha in Chatla Haor wetland

The anadromous fish hilsa, portrays a single run in the wetlands of Barak valley region of Assam [22-24]. Advanced fry of hilsa has been collected from Chatla Haor through experimental fishing operations from August 1995 to July 1998 with the help of 8910 m2 encircling gear (locally called `Mahajal') having mesh size of 1.0 mm^2 [1,25].

The knowledge of minimal size of fish at its first maturity is of great significance which may be utilized for the development of the fishery [26]. There had been records of a single young hilsa in Monghyr market and tried to reveal the possibility of hilsa breeding ground in the river Ganges in the vicinity of Monghyr town [27]. Spawning activity of hilsa brings it to the fore, cleavage of opinion with regard to its spawning habit, duration of spawning season and the location of spawning grounds. There could be several spawning grounds in Hooghly and Ganga rivers which could change from year to year [27]. Southwell & Prashad [28] had reported the occurrence of hilsa in the waterbodies in Bengal, Bihar and Orissa. Finlow [29] had opined that the probable spawning grounds of hilsa could be occurring in Eastern Bengal.

Contrary to this, Chatla Haor is a seasonal floodplain wetland with no significant fluviatile condition existing in it. However, advanced fry of hilsa ranging from 45.5 to 220.0mm have been recorded in Chatla Haor. Further, the advanced fry collected from Chatla Haor conformed to the diagnostic characters of hilsa [30]. Further, mature hilsa swarms have also been recorded in this Haor between June and September [1,25]. Study, elsewhere [31], revealed that, upstream migration of hilsa mainly occurs during the monsoon season. Availability of both mature and juvenile hilsa in Chatla Haor, only during the period from June to October every year, suggests a single run of the fish in this lentic habitat; thus, conforming earlier studies conducted by the present author in Sone Beel [1,25]. Also, the physico-chemcial characteristics of Chatla Haor (Table 1), having similarity with that of Sone Beel [1,25], suggests that, hilsa can live even in lentic condition which is quite different from the characteristics of lotic system where two runs of hilsa have been reported by many workers.

Nevertheless, it is assumed that, flood and seasonal maturity of the migrants seemed to induce the spawning hilsa in the sea to undertake upward journey into the rivers [27]. Occurrence of mature hilsa, as far as near the Assam-Manipur border in the upstream of river Barak, supports the previous observation [25]. Our study is also in conformity with the occurrence trend of hilsa juveniles in the Palta Waterworks in West Bengal [27], who had opined that, hilsa could enter the settling tanks of the Waterworks through the water intake pipes either in the egg stage or as very young larvae. It is interesting to note here that, fishermen of Chatla Haor (most of them are immigrant `Kaibarta' from the earstwhile East Pakistan) use the term `Jatka' to denote the advanced fry of hilsa [29]. Studies elsewhere portrayed that the hilsa juveniles generally start their downstream migration after attaining a size of 80-110mm while upstream migration has been found to be associated mainly with the state of sexual maturity supported by factors, like rainfall, temperature, water current, etc.

Notwithstanding the above, hilsa forms a lucrative fishery also in the Brahmaputra river system. Study revealed that, hilsa occupied, in order of abundance, the foremost position in the overall fish landing records from the river Brahmaputra at Dhubri (5427 to 12045 kg/year), moved to second position at Guwahati (1980 to 8648 kg/year at Uzan Bazar and 3796 to 15,967 kg/year at Fancy Bazar) and ranked third at Tezpur (1635 to 3282 kg/year). A sharp decline in the commercial catches of hilsa have been registered (trend equation: $X_1 = 448.1 - 979.3\ t + 72.5\ t^2$) from the river Brahmaputra in the recent past [32].

Fish catching devices in the haors

Fish catching devices, popularly called `Fishing gears and crafts', are the implements to harvest fishes from a water body. These exhibit bewildering diversity globally, nationally, regionally and locally. Variations also exist according to fish type, fishermen type and season type.

The efficacies of the gears have been determined on the basis of fish catch (kg/person/gear/hour: CPGH) (Dey, 1981); while, wherever necessary, % of fishing communities operating a particular kind of gear has been evaluated from field survey.

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Attempts have been made to calculate Mechanisation Index (MI) [33], Hanging Co-efficient (HC), and Niche' Width (NW) [34] from the field data [35-38]. ANOVA tests, wherever done, indicated that, there exists highly significant differences between the different kinds of scooping gears with regard to their CPGH [37].

An account of the fishing gears and crafts, in vogue, in the Haor wetlands in Assam are briefly given below:

The Haors generally retain water for about six months in a year; usually from around May to around October every year. The fishing gears operated in Chatla Haor are not as diverse as in Sone Beel. The principal types of fishing implements in vogue in Chatla Haor are the following:

a) Multiple long lines(like the Lar barshi); the cage traps,(like the Dori, Paran, Khati bundh); the trawls,(like the Pelain); the Chinese dip net(called the `Dheki jal'), the gill nets, (like the Patan jal); and, the enormous encircling gear,(called the `Maha jal); other encircling gears, like (the Dal jal, Ghuran jal, Jhaki jal, etc.).

b) In Puneer Haor, the Lar barshi, gill nets, Pelain and Jhaki jal are the principal types of fishing gears used; while, in Bakri Haor, fishermen operate mainly the cast net, the lar barshi and the gill nets.

Fisherfolk in the haor wetlands of assam

`Fisherfolk' or the `Fishermen' are the instruments to harvest fish from any water body. They are trained, not only in various methods of fishing, but also, in fabrication of different types of fishing implements and devices according to fish type, habitat type and season type. Sometimes, a fishing implement is fabricated specifically for a particular fishing community and often they feel proud of such identification of a community specialized in operating a particular type of fishing implement or device [20].

In the studied Haor wetlands, the there are a large number of fishermen belonging to different types of fishing communities. They could be broadly classified under different categories, based on the communities, intensity of fishing, and so on. Most of the fishermen in this region belong to the Scheduled Caste community (if non-tribals) and to the Scheduled Tribe community (if tribals) as notified in the Constitution of India. The fishermen, in general, are not that poor today but are not much educated. The co-operative movement has also been not much well organized among the fishermen. In Chatla Haor, c 15,000 fishermen, belonging mainly to the Kaibarta community, live in 22 villages around the Haor. The fishermen belonging to other communities fishing in the Haor include some `Meitei' (Manipuri) and some `Behari' community, who are mostly labourers in the surrounding Tea Gardens. The Kaibartas, by and large, belong to the Professional category of fishermen while the Meiteis and Beharis mostly belong to the Part-time and Occasional categories of fishermen [39,40].

Unlike in Sone Beel, there is not much diversity of fishing gears in Chatla Haor. The Kaibartas are generally seen to fish with Lar barshi, Dori, Paran, Patan jal, Maha jal, Ghuran jal, Jhaki jal and Dal jal. The Meiteis are seen to operate mainly the Patan jal and the Jhaki jal while the Beharis generally operate the Jhaki jal. Further, the Pelain (small trawl) is seen to be operated in Chatla Haor by all the three communities of fishermen. As in Sone Beel, the socio-economic condition of the fishermen in Chatla is not very poor today but, they need to be more educated today.

Fishing Centres, Fish Landing Stations and Fish Marketing

In a lentic water body, fishing generally goes on in the entire water spread area. Similarly, in a lotic system, fish catching usually goes on in the entire stretch of the river. However, in both lentic and lotic systems, there are certain interesting spots, which are significantly different from other areas of the water bodies with regard to possibility of fetching a richer catch. Such spots are more apparent at the DSL of the water bodies and are distinguished from others by certain features, like increased depth, favourable physico-chemical characteristics of water and so on. Such `distinguished spots', where intense fishing goes on at DSL, are regarded as `Fishing Centres'. On the other hand, the fish markets on the shoreline of the Haors, or on the banks of rivers, where the caught fishes land for the first time, are called the `Fish landing stations.' From the Fish landing stations, the fishes are marketed to other different markets in the district and province.

An account of the Fishing Centres (FC), Fish Landing Stations (FLS) and Fish Marketing (FM) is briefly given below:

Fishing centres

Unlike in Beels, in the Haors, as they do not retain any water during the dry season at DSL there are only a few insignificant fishing centres. In Chatla Haor, such fishing centres are locally called `Kheo' or `Jheng'and they are situated on the NW side of the Haor,where fishing is to be completed and all the fishes are to be harvested within Autumn. Harvest includes different types of small fishes and also big fishes, notably, the IMCs.

In Puneer Haor and in Bakri Haor, there seem to be no significant fishing centres.

Fish Landing Stations and transportation of fish

Earlier, there were only two major Fish Landing Stations (FLS), one on each shore, viz., the Rajpur FLS on the west shoreline (towards North-West) and the Silcoorie Machhghat FLS on the east shore (towards South-East). The Rajpur FLS witnessed fish landing only in the morning shift (beginning around 6 am) while the Silcoorie Machhghat FLS had witnessed fish landing in both morning (beginning around 6 am) and afternoon (beginning around 2 pm) shifts. The Machhghat FLS used to shift its position, sometimes quite frequently, upto around island village Bairagitila

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(situated c 3 km away from original 1st position (which was situated adjacent to the Silchar-Hailakandi Highway) due to changes in the water level of the Haor, particularly in the month of October. However, both the FLSs are, probably, no longer in existence today.

Surprisingly, Chatla Haor is said to be not within the administrative control of the Assam Fisheries Development Corporation (AFDC); and, as such, it is not leased-out on auction by the government. Rather, a portion of the Haor, called the`Upor Beel', was generally,leased-out by the Management of the Silcoorie TE every year to private entrepreneurs, on quite lucrative sum of money (the lease amount varied from Rs.50,000.00 approx.during 1980 to Rs.7,00,000.00 approx.during 2002). The `Upor Beel' area is said to be within the jurisdiction of Silcoorie TE. The other portion, locally called `Laamaar Beel', is not said to be within the jurisdiction of Silcoorie TE; and, here, fishing is free for all during the entire period the Haor has water (from around May to October every year). It may be mentioned here that, an embankment-cum-road (which is a State Highway connecting Silchar city with Hailakandi town with the Assam Central University in between), was said to had been constructed by the E & D Department of the Govt. of Assam; and, it has partitioned the Chatla Haor into `Upor Beel' and `Laamaar Beel'. Interestingly, although, Chatla Haor does not naturally have any DSL and is completely dry during the winter, water is retained in the `Upor Beel', by the Lessee, by constructing embankments after the lease becomes effective. Concomitantly, the fishes therein, are prevented from escaping by erecting tall` Khati bundh' (bamboo mat fencing). The lease period usually ranged from 15 April to 31 March of the following year. Having no specific connection with the Govt in leasing-out of the Haor, no toll/tax was seen to be collected from the fishermen/ fish traders in any of theFish Landing Stations (FLSs) in the Haor, unlike the situation in Sone Beel.

Fish marketing

The prices of the fishes in the Chatla Haor, Punner Haor and Bakri Haor seemed to vary according to their availability.

Fishermens' Co-operative/Development Society

Unlike in Sone Beel, Chatla Haor does not have a Chatla Haor Fishermens' Co-operative Society. Nevertheless, there are a number of small registered or unregistered `clubs', all of which are found to be not very active and not much concerned about the socio-economic upliftment of the poor fishermen. Further, there seemed to be no significant co-operative society in Chatla Haor, Puner Haor and Bakri Haor.

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