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A Preliminary Survey of Dhir Beel with Special Reference to its Some Physico-Chemical Parameters and Ichthyofauna

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Abstract

Beels, wetlands which possess huge fishery resources, if manage properly, it may provide huge benefits to the fishery sector and also for the settlement of unemployment problem. Assam is blessed with around 1,030 beels covering an area of 92,693 hectares (Goswami *et. al*). The potential of these beel fisheries could not be harnessed so far, as there is lack of proper management and change in the area of these beels due to encroachment. Presently, these beels are under the threat from many factors like pollution, habitat fragmentation and degradation which eventually lead to loss of biodiversity. The present investigation was undertaken, during the 2015–2016, to study the ecological parameters and hydrobiology of the Dhir beel for taking up proper managerial practices for sustainable utilisation of the available aquatic resources of the state. Dhir beel is situated at latitude 26° 16′54.65″ North and longitude 90° 23′21.52″ East with an altitude 34 m above sea level. It covers an area of about 689 hectare of land with depth of 7–22 feet during pick monsoon season. It is a floodplain lake of the Brahmaputra River basin is situated near Chapar town at about a distance of 5 km. The present investigation deals with the ichthyofaunal diversity of Dhir beel, its conspecific biotic communities present in the system and the understanding of its hydrobiology. A total of 65 species of fish under 37 genera belonging to 11 families and 6 orders have been identified. The fish productivity was around 14,740 kg during 2015–2016. The beel has shown an average temperature of 23^0 C; transparency ranges from 49.2- 104 cm during the study period; the pH of water ranges from neutral to acidic i.e. 7.4 – 6.2; free CO_2 fluctuated from 3.0 to 17.2 mg/L; alkalinity ranged from 25 – 38 mg/L; total hardness was quite low as found to be 24-36.5 mg/L. Thus, the present studies have revealed the ichthyofaunal diversity of the beel with reference to its hydrobiology and ecological parameters, and it is suggested that the productivity of the beel can be sustained the by managing the environmental degradations in and around the beel.

Keywords: Dhir Beel, Ichthyofaunal Diversity, Hydrobiology, Ecology, Management, Productivity.

Introduction

The richness of the flora and fauna of north eastern region is well known to all. Starting from Hamilton (1822) till date, the region has discovered about 360 species of fishes (Vishwanath *et al.*, 2014). Wetlands, since time immemorial, have been perceived as life sustaining units of the world. They are considered as future food and fodder resources for human population and its related allies. Ecologically, wetlands are of great significance as they support varied food chains and food webs, regulate hydrological cycle, recharge ground water and maintain its quality by acting as filters, provide refuge to a large number of endangered flora and fauna help in trapping of energy and carbon-dioxide and in nutrient cycling treatment of waste water and provide natural check to floods. Wetlands also have great recreational and aesthetic values. Around 6.4% of the earth's surface is covered with wetlands. They are continuum of rivers and are locally known as beels, pats, mauns, jheels etc and are biologically sensitive ecosystems which play a vital role in the inland fish production of the eastern and northeastern part of the country. The beels are unique water bodies which need in depth scientific study before undertaking any management measure. Fishes make up most of

the abundant class of vertebrates, both in terms of number of species and of individuals. They exhibit enormous diversity of size, shape and biology, and in the habitats they occupy.

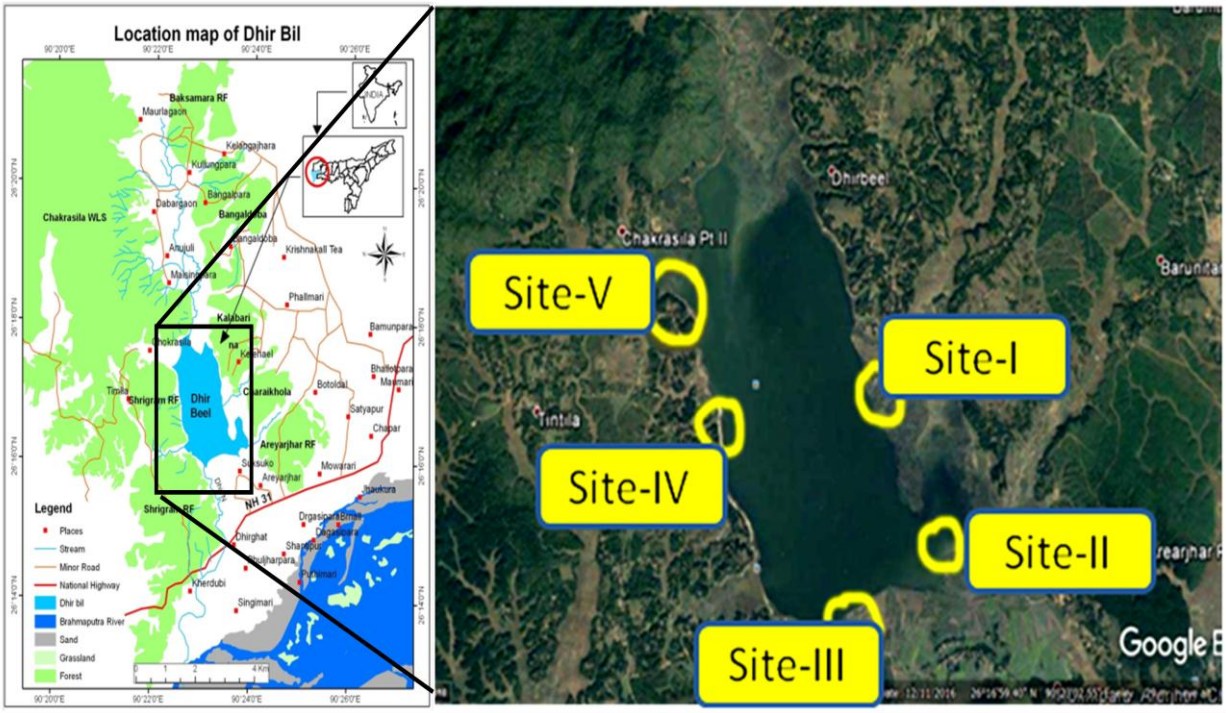
The work on limnological features of beels has been reported by Barbhuiyan et al. (2015) and on macro vegetation dynamics by Das & Ahmed (2015). There have been reports on some of beels in Assam providing valuable information regarding limnological features, productivity status and management measures for these resources. However, as beels are peculiar ecosystems each having a separate identity, a general study on the various limnochemical parameters and assessment of the fisheries potential is very essential. Keeping this in mind, the present investigation was undertaken at the Dhir beel, located at the lower Brahmaputra valley in Chapar district of lower Assam, to study its ecological parameters and hydrobiology for taking up proper managerial practices for sustainable utilisation of the available aquatic resources of the state. The present investigation deals with the fish diversity of the beels, the qualitative and quantitative biotic communities present in the system, fish production potential together with various management measures for optimizing fish production from such systems.

Materials and Methods

Study Area

The Dhir beel is situated in the extreme western part of the lower Brahmaputra valley in Chapar district of lower Assam. The Beel is situated at latitude 26°16′54.65″ North and longitude 90°23′21.52″ East and altitude 9 m above sea level and covers an area of about 689 hectare of land. It is a floodplain lake of the Brahmaputra River, situated near Chapar town at about a distance of 5 km. The district is characterized by almost flat topography but the eastern part has an undulating topography. The drainage system is dominated by the Brahmaputra River that flows through the district with a sharp south turn in the extreme west end of the district.

Fig 1: Dhir Beel, Chapar, Dhubri (Assam)



The Dhir beels was divided into five sectors (Table 1) for collecting information on ecological parameters. Monthly sampling was done from all the sectors starting from for the analysis of water, biotic communities like plankton, benthos, macrophytes etc. For the analysis of water quality parameters, samples were collected from the surface from various sectors.

Table 1. **Five Different Sampling Site of The Dhir Beel Along With Their Respective Coordinate Points**

Sl. No.	Observation site	Coordinates
1.	Site-I (Arrearjhar)	26°16′53.33″N & 90°23′28.33″E
2.	Site-II (Dhir Ghat NH 31)	26°16′06.62″N & 90°23′24.82″E
3.	Site-III (Dhir Ghat)	26°16′57.46″N & 90°22′31.62″E
4.	Site-IV(Tintila)	26°17′26.51″N & 90°22′29.30″E
5.	Site-V(Chakrashila)	26°17′44.68″N & 90°22′33.91″E

Collection of specimen were done by following Walsh & Meador (1998). General measurements and counts of specimens were done by followed by Hubbs & Lagler (1946) and Kottelat (2001). Fishes were identified by following Vishwanth *et al.* (2014). The physico-chemical parameters were analyzed as per APHA (2012). Macrophytes were collected seasonally from different sectors from the

beel with the help of a quadrant sampler and fresh weight was taken with the help of a balance. Fish catch statistics of commercially important species have been collected covering all the months of the year.

Results and Discussion

By virtue of the unique position, location and carrying capacity, the lake shows major life sustaining entities. The Dhir water bodies are extremely rich in nutrients and have immense production potential as reflected by their rich nutrient status in the water phase. The shallow nature of Dhir beel with their rich nutrient status and penetration of light upto the bottom have led to the infestation of weeds to such an extent that the beels have remained choaked with macrophytes.

Physico-Chemical Parameters of Water

Fig 2. Water parameters seasonal wise variation in Dhir Beel

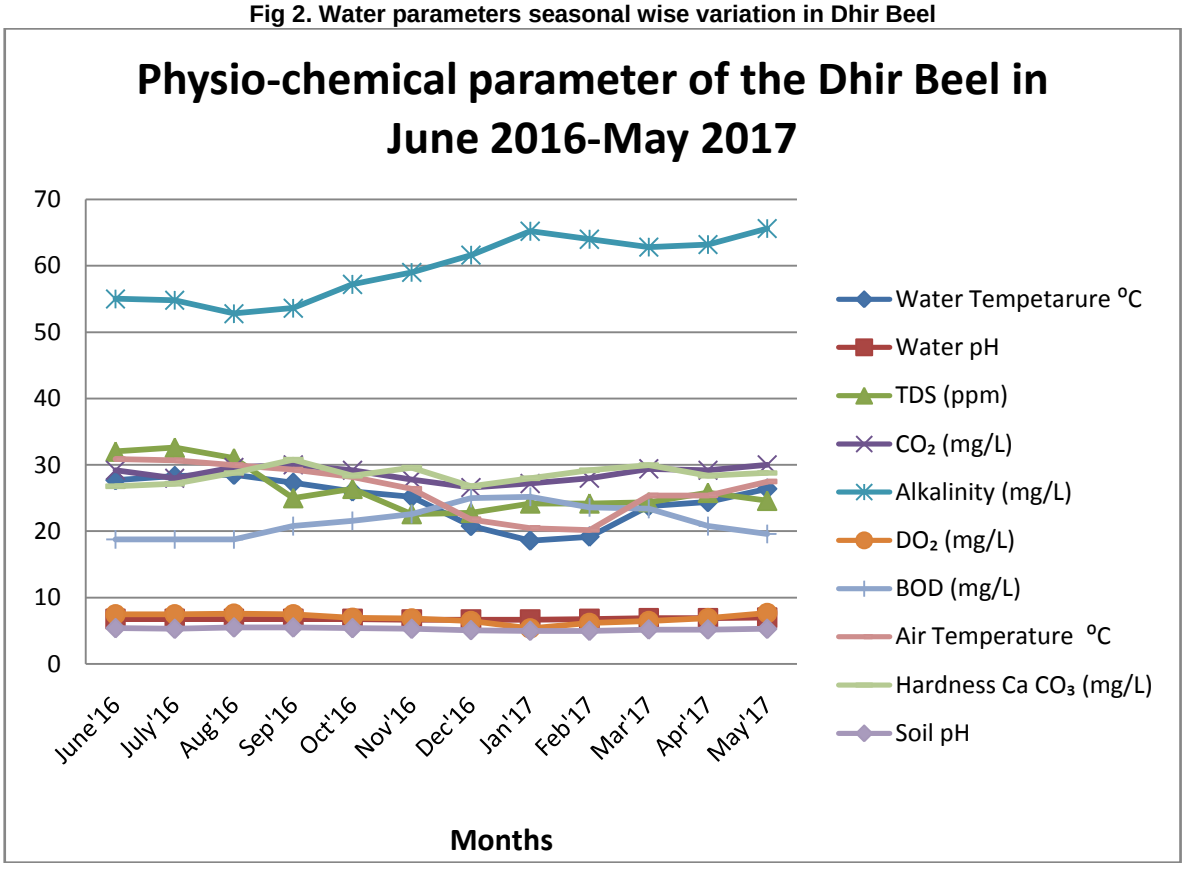


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Table 2: Physicochemical parameters recorded in Dhir Beel (2016-17)

Parameters	Seasons	Monsoon			Pre-Winter			Winter			Pre-Monsoon		
		June'16	July'16	Aug'16	Sep'16	Oct'16	Nov'16	Dec'16	Jan'17	Feb'17	Mar'17	Apr'17	May'17
Water Temperature	Average	27.7	28.3	28.5	27.3	26.0	25.2	20.8	18.6	19.2	23.8	24.4	26.3
	SD	±0.8	±1.5	±0.6	±0.6	±1.3	±1.6	±1.2	±1.2	±1.1	±1.0	±0.9	±1.4
	Range	26.8-28.5	26.5-29.7	27.4-28.9	26.5-27.8	24.4-27.2	23.2-27.4	19.4-22	17.2-19.5	17.6-20.2	22.3-25	23.2-25.1	24.8-27-8
Water pH	Average	6.8	6.8	±6.8	6.8	6.8	6.7	6.7	6.8	6.8	6.9	6.9	7.0
	SD	±0.3	±0.3	±0.2	±0.3	±0.3	±0.4	±0.4	±0.4	±0.4	±0.6	±0.4	±0.5
	Range	6.7-7.4	6.4-7.1	6.7-7.2	6.5-7.2	6.7-7.4	6.3-7.2	6.1-6.9	6-6.9	6.1-6.9	6-7.3	6.3-7.3	6.2-7.5
TDS	Average	32	32.6	31	25	26.4	22.6	22.8	24.2	24.2	24.4	25.8	24.6
	SD	±2.1	±2.5	±8.9	±7.8	±8.5	±3.6	±5.0	±4.0	±4.3	±6.1	±5.4	±6.3
	Range	30-35	30-35	15-35	17-33	18-35	18-26	18-28	19-29	20-29	20-35	22-35	18-35
CO_2	Average	29.2	28	29.6	30	29.2	27.8	26.6	27.2	28	29.4	29.2	30
	SD	±5.1	±4.5	±3.6	±2.0	±1.8	±1.5	±2.6	±1.8	±2.4	±2.4	±2.2	±3.2
	Range	24-35	22-34	26-34	28-32	28-32	26-30	24-30	26-30	26-32	27-32	27-32	26-34
Alkalinity	Average	55	54.8	52.8	53.6	57.2	59	61.6	65.2	64	62.8	63.2	65.6
	SD	±3.7	±4.6	±2.3	±0.9	±6.6	±5.5	±6.1	±5.6	±4.9	±5.9	±6.4	±6.2
	Range	50-58	48-60	50-56	52-54	50-64	54-65	56-68	60-72	58-70	54-69	54-70	56-72
DO	Average	7.5	7.52	7.64	7.52	7.26	6.88	6.46	5.36	6.24	6.5	6.92	7.66
	SD	±1.1	±1.2	±1.1	±1.1	±1.0	±1.0	±0.8	±0.6	±0.7	±1.0	±1.1	±1.2
	Range	6.2-8.8	6.4-8.8	6.2-8.7	6.3-8.5	6.3-8.4	6.2-8.4	6.1-7.7	4.8-6.1	5.5-7.2	5.6-8.1	5.8-8.3	6.2-8.9
BOD	Average	18.8	18.8	18.8	20.8	21.6	22.6	25	25.2	23.6	23.4	20.8	19.6
	SD	±3.4	±3.8	±3.9	±3.9	±3.0	±4.2	±5.9	±7.1	±5.4	±3.8	±4.1	±2.7
	Range	14-23	14-24	16-24	18-26	18-26	18-28	18-32	17-34	18-32	19-28	16-24	16-23
Air Temperature	Average	30.9	30.7	30.0	29.3	28.2	26.4	21.8	20.5	20.2	25.4	25.4	27.5
	SD	±0.9	±0.6	±0.2	±0.4	±0.3	±0.7	±0.3	±0.9	±1.0	±0.5	±0.7	±0.6
	Range	29.8-32.1	29.8-31.5	29.8-30.2	28.8-29.8	27.9-28.6	25.5-27	21.4-22.2	19.5-21.4	18.9-21.1	24.9-26.2	24.4-26.1	27.1-28.2
Hardness (CaCO3)	Average	26.8	27.2	28.8	30.8	28.4	29.6	26.8	28	29.2	30	28.4	28.8
	SD	±2.7	±1.1	±1.1	±1.8	±1.7	±3.0	±3.0	±4.0	±2.3	±3.7	±2.6	±3.0
	Range	24-30	26-28	28-30	28-32	26-30	26-34	24-30	24-32	26-32	26-34	24-30	24-32
Soil pH	Average	5.4	5.3	5.5	5.5	5.4	5.3	5.1	5.0	5.0	5.2	5.2	5.3
	SD	±0.3	±0.4	±0.3	±0.2	±0.3	±0.3	±0.2	±0.3	±0.3	±0.4	±0.3	±0.4
	Range	5.1-5.8	4.9-5.7	5.1-5.8	5.2-5.7	5.1-5.7	4.8-5.6	4.8-5.3	4.7-5.5	4.7-5.5	4.8-5.7	4.8-5.6	4.8-5.7
Conductivity	Average	128.6	114.6	113.8	115	112	107.8	107.4	111.6	114	116	119.6	122.2
	SD	±4.3	±3.6	±1.8	±5.2	±3.2	±5.8	±5.0	±5.9	±2.8	±5.1	±2.9	±3.9
	Range	124-134	110-118	112-116	108-120	108-116	98-112	102-112	102-118	110-114	110-124	117-124	118-126

Water temperature: 23.2 ^{0} C.

Transparency

Transparency of water in the beel ranged between 49.2 and 104 cm during 2016 and 2017.

Dissolved oxygen

The water quality with respect to dissolved oxygen was quite rich in the beels. The monthly trend of dissolved oxygen showed a gradual decline from February onwards reaching minimum in June (2016) and August (2017) and subsequently increasing trend was noticed till December.

pH: Water in the beel was almost neutral to acidic, pH ranging between 6.4 and 7.4 in 2016 and 6.2 and 7.1 in 2017.

Free carbon-di-oxide

The free carbon-di-oxide in the beel fluctuated between 3.0 and 17.0 mgl^{-1} in 2016 and 3.2 and 17.2 mgl^{-1}in 2017.

Total alkalinity

Total alkalinity ranged from 25.0 to 37.2 mgl^{-1}in 2016 and 24.8 to 38 mgl-1 in 2017 was low beel.

Specific conductance

Specific conductance ranging between 107.8 and 128.6µmhos in 2016 and 114.0 and 122.2 µmhos in 2017. Maximum conductance was observed in December and minimum in July. It shows fewer amounts of minerals like K, Cl, Na, NO_3 and SO_4 in water.

Total dissolved solids

Total dissolved solids was low in both the beels. The range of variations in Dhir beel was 27.5 to 40.2 mgl^{-1}in 2016 and 26.4 to 42.0 mgl^{-1} in 2017. Highest values of Total Dissolved Solids were recorded during retreating monsoon and winter.

Total hardness

Total hardness was quite low in Dhir ranging between 24.0 and 36.5 mgl^{-1} in 2016 and 25.2 and 33.4 mgl in 2017 respectively.

pH is one of the determining factors of productivity. The investigation reveals fairly productive nature of the beel as the water is slightly alkaline to acidic. Dissolved oxygen exhibited higher values during winter and lower during monsoon. The impact of rain washings seems to influence the increase in free carbon-di-oxide in the form of carbonic acid. Total dissolved solids, specific conductance in Dhir beel is poor. Based on the observation of hardness, Dhir beels can be considered as soft-water bodies.

Fish and fisheries

Fisheries resources in Assam, particularly beel fisheries is facing resource depletion mainly due to environmental degradation coupled with lack of scientific management practices. Though the average fish production from the beels of Assam is 160 Kg ha $^{-1}$ yr $^{-1}$(Dutta and Lahon, 1987), the average fish production from the beels under investigation is far from below. Dighali beel depicted an yield of 34.7 Kg ha $^{-1}$ yr $^{-1}$(*Acharjee et al.*). Low production in many of the beels have been reported by Lahon (1983) in Salsella beel (116 Kg ha^{-1} yr $^{-1}$), Kar (1984) in Sone beel (90 Kg ha $^{-1}$yr $^{-1}$), Bhagawati and Kalita (1987) in Rangai beel (31 kg ha -1 yr -1) and Hagal beel (70 Kg ha^{-1} yr $^{-1}$), Yadava (1987) in Dhir beel (377 kg ha $^{-1}$ yr $^{-1}$) recorded high fish production. The dominance of trade fishes and those feeding on the higher food chain reflected upon the poor fishery of the beels. The uneconomic minnows, demios, barails etc provide forage base for the development of predatory catfishes, feather backs, and live fish population of the beel which in turn affect the recruitment potential of the commercially important important carps. *Gudusia chapra* contributes more than 20%, live fishes 20% and *Notopterus notopterus* 5% clearly reflect the prevailing situation in the beels. The dominance of *Gudusia chapra* and its occurrence round the year provide ample proof of its extremely predatory habits and existence of favourable condition for reproduction.

The knowledge of natural stock from which it comes is very important (Gulland, 1955). It has been observed that majority of the recruits in these beels come to the fishery from the adjoining rivers. A total of 65 species of fish under 37 genera belonging to 11 families and 6 orders have been identified from the Dhir Beel (Table 3). Highest assemblage of fish has been found under order Cypriniformes representing 52 species under 24 genera belonging to 3 families. Most of the fishable stock enters into the beels during the first year of life and are constantly vulnerable to regular capture. However, the stock is supplemented by fresh recruits every year. During monsoon catch is low in all the beels because of higher water level and restricted fishing activities. Post monsoon and winter facilitates the operation of almost all types of gears and hence fetches more catches. Various indigenous gears and traps are operated during different seasons. During monsoon, hooks, lines and traps are used for fishing. Cast net, gill net and dip net are prominent nets used in these beels. *Katal* and *banas* fishing are done during winter and monsoon respectively. Odum (1960) felt that a harvest of 1.2% of primary production of fish would be excellent. Based on Odum's theory, the fish production potential of Dhir beel was found to be 173 kg ha^{-1} yr^{-1} (Barbhuiyan *et al*.2015) against actual harvest of only 377 Kg ha $^{-1}$$yr^{-1}$ (Choudhury 1987).

Table 3. Preliminary Systematic list of fish identified from Dhir beel, Assam along with common name and Status

Sl. No.	Order	Family	Species	Local Name	IUCN Status
1	Osteoglossiformes	Notopteridae	*Notopterus notopterus (Pallas, 1769)*	Kandulee	LRlc
2			*Chitala chitala (Hamilton, 1822)*	Chital	LRnt
3	Clupeiformes	Clupeidae	*Gudusia chapra (Hamilton, 1822)*	Karati	LRlc
4			*Tenualosa ilisha (Hamilton, 1822)*	Ilish	LRlc
5	Cypriniformes	Cyprinidae	*Hypophthalmichthys molitrix (Valenciennes, 1844)*	Silver carp	LRnt
6			*Hypophthalmichthys nobilis (Richardson, 1845)*	Bighead	DD
7			*Cabdio morar (Hamilton, 1822)*	Boriola	LRlc
8			*Salmostoma bacaila (Hamilton)*	Selkona	LRlc
9			*Barilius barila (Hamilton, 1822)*	Korang	LRlc
10			*Barilius bola (Hamilton, 1822)*	Rajamaas	LRlc
11			*Laubuka laubuca (Hamilton, 1822)*	Lau Punthi	LRlc
12			*Devario devario (McClelland, 1839)*	LauPunthi	LRlc
13			*Esomus danrica (Hamilton, 1822)*	Dorikona	LRlc
14			*Amblypharyngodon mola (Hamilton, 1822)*	Moa	LRlc
15			*Ctenopharyngodon idella (Valenciennes, 1844)*	Grass Carp	NE
16			*Cyprinus carpio (Linnaeus, 1758)*	Common carp	VU
17			*Puntius chola (Hamilton, 1822)*	Punthi	LRlc
18			*Pethia ticto (Hamilton, 1822)*	Punthi	LRlc
19			*Puntius sophore (Hamilton, 1822)*	Punthi	LRlc
20			*Puntius terio (Hamilton, 1822)*	Punthi	LRlc
21			*Pethia conchonius (Hamilton, 1822)*	Punthi	LRlc
22			*Puntius sarana (Hamilton, 1822)*	Punthi	LRlc
23			*Cirrhinus cirrhinus (Hamilton, 1822)*	Mrigaa	LRlc
24			*Cirrhinus reba (Hamilton, 1822)*	Bata	LRlc
25			*Gibelion catla (Hamilton, 1822)*	Bhokua	LRlc
26			*Labeo gonius (Hamilton, 1822)*	Kuhi	LRlc
27			*Labeo calbasu (Hamilton, 1822)*	Baahu	LRlc
28			*Labeo rohita (Hamilton, 1822)*	Rou	LRlc
29			*Labeo bata (Hamilton, 1822)*	Bhangon	LRlc
30		Noemacheilidae	*Paracanthocobitis botia (Hamilton, 1822)*	Botia	LRlc
31		Cobitidae	*Botia dario (Hamilton, 1822)*	Bagh maas	LRlc
32			*Lepidocephalichthys guntea (Hamilton, 1822)*	Botia	LRlc
33	Siluriformes	Bagridae	*Rita rita (Hamilton, 1822)*	Ritha	LRlc

34			*Mystus vittatus (Bloch, 1794)*	Singora	LRlc
35			*Mystus tengara (Ham.-Buch.)*	Tengna	LRlc
36			*Mystus bleekeri (Day, 1877)*	Singora	LRlc
37			*Batasio batasio (Hamilton, 1822)*	Batakhi Maas	LRlc
38		Siluridae	*Ompok bimaculatus (Hamilton, 1822)*	Paavo	LRnt
39			*Wallago attu (Bloch and Schneider, 1801)*	Baraali	LRnt
40		Schilbidae	*Ailia coila (Hamilton, 1822)*	Kajoli	LRnt
41			*Clupisoma garua (Hamilton, 1822)*	Neria	LRlc
42			*Eutropiichthys vacha (Hamilton, 1822)*	Bacha	LRlc
43		Pangasidae	*Pangasius pangasius (Hamilton, 1822)*	Pangaas	LRlc
44		Sisoridae	*Bagarius bagarius (Hamilton, 1822)*	Bagaras	LRnt
45		Claridae	*Clarias magur (Linnaeus, 1758)*	Magur	EN
46		Heteropneustidae	*Heteropneustes fossilis (Bloch, 1794)*	Singhi	LRlc
47		Chacidae	*Chaca chaca (Hamilton, 1822)*	Chaka	LRlc
48	Beloniformes	Belonidae	*Xenentodon cancila (Hamilton, 1822)*	kottimaas/Kokila	LRlc
49	Synbranchiformes	Synbranchidae	*Monopterus cuchia (Hamilton, 1822)*	Kuchia	LRlc
50		Mastacembelidae	*Macrognathus aral (Bloch and Schneider, 1801)*	Turi	LRlc
51			*Macrognathus pancalus (Hamilton, 1822)*	Turi	LRlc
52			*Mastacembelus armatus (Lacepede, 1800)*	Bami/gosi	LRlc
53	Perchiformes	Ambassidae	*Chanda nama (Hamilton, 1822)*	Chanda	LRlc
54			*Parambassis lala (Hamilton, 1822)*	Chanda	LRnt
55			*Parambassis ranga (Hamilton, 1822)*	Chanda	LRlc
56		Nandidae	*Nandus nandus (Hamilton, 1822)*	Gadgadi	LRlc
57		Badidae	*Badis badis (Hamilton, 1822)*	Dom	LRlc
58		Gobiidae	*Glossogobius giuris (Hamilton, 1822)*	Patimutura	LRlc
59		Anabantidae	*Anabas testudineus (Bloch, 1792)*	Kawoi	DD
60		Osphronemidae	*Trichogaster fasciata (Bloch and Schneider, 1801)*	Kholisa	LRlc
61			*Trichogaster lalius (Hamilton, 1822)*	Kholisa	LRlc
62		Channidae	*Channa gachua (Hamilton 1822)*	Cheng	LRlc
63			*Channa punctatus (Bloch, 1793)*	Goroi	LRlc
64			*Channa striatus (Bloch, 1793)*	Sol	LRlc
65	Tetraodontiformes	Tetraodontidae	*Leiodon cutcutia (Hamilton, 1822)*	Tepa	NE

LRnt	Near Threatened
LRlc	Least Concern
VU	Vulnerable
DD	Data Deficient
NE	Not Evaluated
EN	Endangered

Table 4. Fish Catch from Dhir Beel during 2015-2016.

Sl. No.	Species	2016		2017	
		Total catch (Kg)	%	Total catch (Kg)	%
1	*Labeo catla*	155	4.47	140	3.76
2	*Cirrhinus mrigala*	25	0.72	20	0.54
3	*Labeo rohita*	240	6.91	210	5.63
4	*Cyprinus carpio*	60	1.73	72	1.93
5	*Cirrhinus reba*	20	0.58	21	0.56
6	*Labeo bata*	46	1.33	40	1.07
7	*Mystus seenghala*	15	0.43	12	0.32
8	*Gudusia chapra*	525	20.82	545	22.2
9	*Wallago attu*	95	2.46	91	2.2
10	*Sperata aor*	6	0.17	4	0.11
11	*Notopterus chitala*	45	1.3	62	1.66
12	*Notopterus notopterus*	225	6.48	130	3.49
13	*Live fishes*	810	23.34	840	22.5
14	*Prawns*	60	1.73	42	1.13
15	Miscellaneous group	955	27.52	1260	33.81
	Total	3,470		3,727	

**Report collected from Dhir Beel management committee*

Plankton

Beels in Assam are generally characterized by poor concentration of plankton but consist of diverse assemblage of nearly all the taxonomic groups despite the fact that different plankters have different environmental requirement. The present investigation carried out in the Dhir beel of showed poor occurrence of plankton. The monthly average plankton concentration of plankton was found to be 703 UL^{-1}in 2016 and 689 UL^{-1}in 2017 in the beel. In general, plankton showed two primary peaks, a primary peak during retreating monsoon and a secondary one in winter. The present study clearly indicates the dominance of phytoplankton in Dhir beel (63.6% in 2016 and 64.9% in 2017). Out 196 species of phytoplankton distributed in Assam beels (Bordoloi, 1973 ; Devi, 1981, Lahon, 1983), 55 species of phytoplankton have been identified in Dhir beel and most of the two species are common to these two beels. Bacillariophyceae dominated in both the beels represented by species like *Spirogyra* sp., *Navicula* sp., *Synedra* sp., *Nitzschia* sp., *Tabellaria* sp., *Fragillaria* sp*., Pistia, Lemna* etc. The richness of rotifers may be attributed to dense accumulation of macrophytes and high accumulation of organic nutrients due to their annual decomposition (Edmondson 1944, 1945, 1946).

Macrophytes

Beel diversity in Assam are threatened by rapid proliferation of vascular aquatic plants as they upset the ecological plants, viz. balance of biota in the aquatic ecosystem. The present findings depict extensive development of submerged, emergent, marginal and floating type of vegetation supported by optimum environmental conditions like temperature, alkalinity, light etc. Among the commonly encountered species in the two beels are *Eichhornia* spp., *Hydrilla* spp., *Potamogeton* spp. and miscellaneous species. Besides these factors, nutrient availability may also be held responsible for their growth. As the response to these factors is species specific, the infestation of 50% Eichhornia in the beel may account for increased biomass. *Eichhornia* being able to survive in changing chemical environment and constituting a large portion of the beel waters may account for high biomass.

Status and need of Ecobiology management of Dhir beel at present

1. The Beel is connected with channels which are subjected to continuous siltation during floods. Continuous siltation and petrified nutrients have led to the shallowness of these channels. As a result autostocking processes have been disturbed to a great extent and hence these channels should be desilted by some manual means.

2. It is important to maintain the water quality of the Dhir beel so as to maintain the diversity of the beel in terms of Aquatic plants, Zooplanktons and Ichthyofauna.
3. Restriction of paddy fields in marginal areas and pockets of these beels is necessary to increase fish production. This practice reduces the effective water area of the beels. Also during late winter, necessary water is provided from the feeding canal affecting the main fishery of the beel.
4. Breeding season should be practically closed season for fishing. Catching of brood fishes should be restricted.
5. Pollution from nearby area should be restricted.
6. Management of the boundary of the Beel is very important to save the ecosystem of the beel.
7. Leasing policy should be such which can encourage stocking and proper management of beels.

Conclusion

The wetlands discussed above are under facing environmental degradation due to natural and anthropogenic factors. The main emphasis should be to conserve these natural habitats and hence formulation of management measures with proper application of scientific technologies is essential. Fisheries management can serve to conserve the ecosystem along with the existing flora and fauna which will directly benefit humans, terrestrial and also aquatic life. A major policy, financial and technological support are the requirements of the hour to utilize the vast potential resources present in the beel ecosystem. The different stakeholders including scientists, planners, entrepreneurs should put their heads together for wetland development both from ecological and fisheries point of view. India currently needs to produce about 8.2 millions fish to cater to the domestic demands. With the present fish production at the rate of 6.4 million tonnes, the country's current deficit is at the rate of 22% of the domestic demand. India's future fisheries development plans are aimed at making substantial contributions for doubling fish production for the welfare of the fishermen population as well as the consumers. In this context fish culture in the wetlands would be playing a significant role for increasing the freshwater aquaculture production of the nation in the coming years. The Beels in the Northeast plays an important part of fishery resource and now it is important to understand the Ecobiology of the Beels like Dhir and to maintain it for future.

References

APHA (2012) Standard Methods for Examination of Water and Wastewater. 20th Edition, AM Public Health Assoc, Washington D.C.

Barbhuyan, A.H., Bhattacharya, R.C. & A., Dutta, (2015) A Study of the Limnology and Ichthyology of Dhir Beel at Dhubri,Assam. International Research Journal of Applied and Basic Sciences, 4(8): 40–48.

Barik, N.K. , Gorai, B.K. & M. Choudhury (2007) Impact of changes in management regime on fisheries: A temporal case study of Dhir beel in Assam. Agricultural Economics Research review, 20(1).pp 87-98.

Choudhury, M., (1987). An analysis of fish catch statistics of Dhir beel, Assam. In: Workshop on Development of Beel Fisheries of Assam. Assam Agricultural University, Guwahati.

Das, A.N., Ahmed, R. 2015 The Phytoremediation quality of macrophytes of Dheer Beel in Dhubri District of Assam. International Journal-Remarking.Vol-2(5):9-14.

Environmental Protection Agency (2006) EPA: Wetlands Overview. Report retrieved from http://water. epa.gov/type/wetlands/outreach/upload/overview. pdf on 3/19/2014.

Goswami, S.C. (2014) Zooplankton Methodology, Collection and Identification – a field Manual. National Institute of Oceanography, Goa, 26 pp.

Hamilton, F. (1822) An account of the fishes found in the River Ganges and its branches. Archibald Constable and Company, London. 405 pp., 39 pls.

Hubbs, C. L. & C. F. Lagler (1946) Fishes of the Great Lakes Region. Cranbrook Instt. Science Bulletin, 26: 1—186.

Intergovernmental Panel on Climate Change (2013) Projections of Sea Level Rise. Report retrieved from https://www.ipcc.ch/pdf/unfccc/cop19/3_ gregory 13 sbsta. pdf on 3/4/2014.

Hamilton, F. 1822. An account of the fishes found in the River Ganges and its branches. Archibald Constable and Company, London. 405 pp., 39 pls.

Hora, S.L. 1921. Fish and fisheries of Manipur with some observations on those of Naga Hills. Records of Indian Museum, 22: 166–214.

Hora, S.L. & D.D. Mukerji. 1935. Fishes of the Naga Hills, Assam. Records of the Indian Museum, 37: 381–404.

Hubbs, C.L. & C.F. Lagler. 1946. Fishes of the Great Lakes Region. Cranbrook Instt. Science, 26: 1–186.

Lokeshwor, Y. 2014. Systematic study of the nemacheilid loaches (Teleostei: Nemacheilidae) of Northeast India. Ph. D. thesis in the Department of Life Sciences, Manipur University, 1-256 pp.

NBFGR. 2000. Manual on habitat and biological inventory under germplasm inventory and gene banking of freshwater fishes. Training manual, habitat inventory workshop, Assam University, Silchar, December 5-8, 2000 sponsored by National Bureau of Fish Genetic Resources.

Sugunan, V.V. (1995) Floodplain lakes—A fisheries prospective. In Howes, J.R. (ed.) Conservation and sustainable use of floodplain wetlands. Asian wetland Bureau, Kualumpur, 113: 67-75.

Vishwanth, W., Nebeshwar, K., Lokeshwor, Y., Shangningam, BD & Y. Rameshori (2014) Freshwater fish taxonomy & a manual for

identification of fishes of northeast India. Manipur University and National Bureau of Fish Genetic resources, Lucknow, 132pp.

Walsh, S.J. & M.R. Meador (1998) Guidelines for quality assurance/Quality control of Fish taxonomic data colleceted as part of the national water quality Assessment Program. USGS water resources investigation report 98, 4239: 1–33.

World fish (2010) http://www.worldfishcenter.org. Accessed on 22 March 2014.

Yadava, Y. S. & M. Choudhury (1981a) Katal fishing — A special device for catching fish in beels of Assam. Journal of Inland Fisheries Society of India, 13 (1): 81–86.Yadava, Y. S. & M. Choudhury (1981b) Banas fishing in beels of Assam. Journal of Bombay Natural History Society, 83 (2): 452–456.

Photo Plates:

Fig3: Brick industry nearby Site-II-Dhir Ghat NH

Fig4: Water analysis at USTM Zoology Lab

Fig5: Water analysis on field

Fig6: Water analysis on field