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Present Status and Habitat Ecology of *Ompok pabo* (Ham-Buchanan) in Goronga Beel, Morigaon; Assam (India)

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ABSTRACT

In the present communication, habitat ecology of Ompok pabo (Ham-Buchanan) in Goronga beel (Wetland), Morigaon; Assam were studied from September 2007 to August 2009. The wetland is riverine in origin and lies between the latitude of 19^0 2$^/$ E and longitude of 26^{0}15$^/$ N. The endangered fish, Ompok pabo now restricted only few natural habitat including this wetland. Physico-chemical attributes of the wetland showed within permissible limit to support significantly in habitat suitability of the species. A total of 77 species recorded from the wetland during the period of investigation. The less recorded species in Bagridae family was also help in habitat suitability of Ompok pabo. The Shannon–Weiner diversity index of fish population of the wetland ranged from 2.11 to 3.41, which significantly indicates maximum species richness of the wetland. The floral and other faunal diversity of the wetland also showed important role in shaping microhabitat of the species.

Key words: status, habitat ecology, Goronga *beel*, Assam.

INTRODUCTION

The catfish *Ompok pabo* (Hamilton-Buchanan) locally known as pabda or pabo or butter fish is an indigenous freshwater small fish belonging to the family Siluridae of the order Siluriformes [1]. Owing to its delicious taste, pabo is a very favourite food fish of the people of India. Pabo is commonly found in natural water bodies *i.e*. rivers, beels, and floodplains of N.E. India. It is also found in other parts of India, Pakistan, Afghanistan and Burma [2]. *Ompok pabo* dwells and breeds in the rivers and reservoirs and in connected water sheds during floods.

At present, *Ompok pabo* exhibits most of the characteristics of species vulnerable to extinction [3, 4], narrow geographic range, small population size, low population density and low rate of population increase. As deforestation, erosion, and wetland conversion continue in Assam there is increasing urgency to determine the species habitat requirements and to identify areas that are critical to the survival of the species. In Assam, this species now restricted to only one or two natural habitat including Goronga *beel* (wetland) of Morigaon district of Assam. Hence, restorations of Micro habitat of *Ompok pabo* and to define the factors and process that maintain the ecosystem of Goronga *beel* have been hour of need. Although, there have been a number of studies pertaining to limnology and fisheries of wetlands in India and in Assam [5, 6, 7, 8, 9 and10]. However, nothing has been reported regarding habitat ecology of any endangered species of wetland. Habitat ecology may also be useful for assessing altered as well as less altered fish habitat of the wetlands.

DESCRIPTION STUDY AREA

The Goronga *beel* (wetland) lies between the latitude of $19^0 2^/$ E and longitude of $26^0 15^/$ N respectively. Total length of the *beel* is 3.5 Km (Approx) with an area of 0.40 Km^2. The average depth of the *beel* was found 6-22 feet but in the monsoon season it extends up to 28 feet. The *beel* routed through border of the Pobitora wildlife sanctuary of Morigaon district, Assam. Maximum area of the sanctuary is surrounded by the *beel* in the south-east side. Goronga *beel* is originated from upland area forming a wetland called 'Nekara *beel*'. Then it flows to the down stream where it known as 'Molia *beel*'. During its last part of the journey it is known 'Goronga *beel*' the present studied wetland near Pobitora wildlife sanctuary of Morigaon district, Assam. Goronga *beel* is well connected with river Kolong (tributaries of Brahmaputra River) through an inlet known as 'Dipuji Jan'. Thus, the Goronga *beel* has a link with river Brahmaputra.

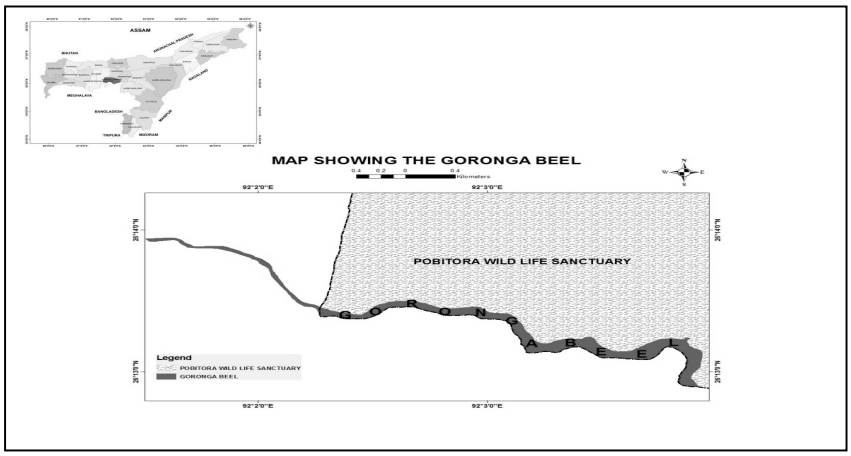

FIGURE. 1 Map showing Goronga *beel*.

MATERIALS AND METHODS

The study was carried out during September 2007 to August 2009. The present study covered entire area of Goronga *beel*. For physical and chemical parameters analysis random samples of water were collected in five pre selected sampling sites of the wetland. Selection of sampling sites was made on the basis of morphometry and physiography of the studied wetland. Samples were collected seasonally *i.e.*, twice in a season, for a period of two years.

Physico-chemical parameters of water of the wetland were performed adopting the method of [11, 12, 13 and 14]. Identification of aquatic biota was followed after [15, 16 and 17]. Microhabitat assessment of *Ompok pabo* was also made adopting the method of [18, 19]. The relative abundance (percentage of catch) of the fish across different sites was also worked out. The fish diversity indices were calculated as per standard method of [20].

RESULTS AND DISCUSSION

1. Aquatic Macrophytes of the wetland:

Total of 26 aquatic macrophytes belonging to six ecological classes were recorded in the Goronga *beel* **(Table 1)**. Altogether four free floating macrophytes were recorded, out of which *Eichhornia crassipes* was the dominant one. Only one species belonging to free submerged category i.e. *Hydrilla verticiellata* was recorded. One species of anchored submerged group was recorded i.e. *Ottelia alismoides.* Highest number of macrophytes (nine) found under the group of anchored floating which was found as the dominant group. Other macrophytes include 6 species of emergent amphibious and 5 species of Marshy amphibious class.

Apart from the macrophytes, the marginal grass species are *Leersia hexandra, Hemarthia compressa, Cynodon dactylon, Andropogon aciculatus, Phragmites karka, Saccharum spontaneum, Imperata cylindrical, Pollinia ciliate, Arundo donax, Alpinia allughas* etc.

Table 1. Aquatic macrophytes of the Garanga *beel* along with its ecological class

Sl. No.	Scientific name	Ecological class
1.	*Hydrilla verticiellata*	Free submerged
2.	*Eichhornia crassipes*	Free floating
3.	*Pistia stratiotes*	Free floating
4.	*Trapa natans*	Free floating
5.	*Ipomoea aquatica*	Free floating
6.	*Nymphoides cristatum*	Anchored floating
7.	*Monochoria hastate*	Emergent amphibious
8.	*Eurayle ferox*	Anchored floating
9.	*Enhydra fluctuans*	Anchored floating
10.	*Ipomoea carnea*	Emergent amphibious
11.	*Nelumbo nucifera*	Anchored floating
12.	*Nymphaea nouchali*	Anchored floating
13.	*Alternanthera philoxeroides*	Emergent amphibious
14.	*Commelina bengalensis*	Marshy amphibious
15.	*Commelina diffusa*	Marshy amphibious
16.	*Cyperus brevifolius*	Marshy amphibious
17.	*Ludwigia adscedens*	Marshy amphibious
18.	*Ludwigia octavalvis*	Marshy amphibious
19.	*Monochoria vaginalis*	Emergent amphibious
20.	*Nymphaea alba*	Anchored floating
21.	*Nymphaea pubescens*	Anchored floating
22.	*Nymphaea nouchali*	Anchored floating
23.	*Nymphoides indica*	Anchored floating
24.	*Ottelia alismoides*	Anchored submerged
25.	*Sagittaria guayanensis*	Emergent amphibious
26.	*Sagittaria sagittifolia*	Emergent amphibious

2. Macro invertebrate population of the wetland:
Macro-invertebrates of the beel belong to Annelids, Gastropod, Odonata, Ephemeroptera, Diptera, Hemiptera, and Coleoptera. Depending upon the degree of association of macro-invertebrates with aquatic macrophytes; they can be classified into two major groups.

(a) The fauna closely associated with submerged macrophytes (i.e., Annelids, Chironomids, Odonata and Ephemeroptera) were recorded.
(b) Other comparatively less associated or generally not moving types (Gastropoda, Hemiptera, and Coleoptera). Both adults and larval forms of Mayflies (Ephemeroptera), Caddis flies (Trichoptera), Midges (Diptera), Mosquito larvae, Chironomids, Water bugs like Notonecta, Nepa etc. were also found.

3. Fish diversity of the wetland:
A total of 77 important fish species were recorded during the period of investigation **(Table 2)**. Out of which and as per IUCN status, 3 species are endangered (EN), 17 species are vulnerable (VU), 27 species are lower risk-near threatened (LRnt), 6 species are lower risk-less concern (LRlc) and other 24 species are not evaluated (NE). The taxonomic composition of the fish fauna suggests that Cyprinidae was the most dominant family with 30 representative species and contributed 38.9% out of the collected species, followed by Bagridae with 6 species as well as contribute 7.7%. Besides *Ompok pabo*, the beel were also found as homeland of some other endangered fish species like, *Ompok pabda, Rasbora elanga*, and *Puntius sarana* **(Fig. 1.)**.

Catch unit per effort of gill net were also found uniform relative abundance (*n* 30-35 per catch) of fish through out the wetland during the period of investigation. Catching of fishes is only entitled to those fishers, who are dealing with the *moholdar* (who leased the wetland from state govt.). A total of 60 to 100 fishermen involves with the fishing activity. The highest catching rate recorded was 600 Kg/day while lowest recorded as 25 Kg/day through various fishing gear used in the wetland

Table 2. Fish faunal diversity of Garanga Beel along with its family, annual catching percentage and IUCN status

Sl. No	Scientific name	Family	Annual catching Percentage	IUCN Status
1	*Chitala chitala*	Notopteridae	1.8	EN
2	*Notopterus notopterus*	Notopteridae	1.5	LRnt
3	*Gudusia chapra*	Clupeidae	2.1	LRlc
4	*Aspidoparia jaya*	Cyprinidae	1.6	VU
5	*Aspidoparia morar*	Cyprinidae	1.4	LRnt
6	*Amblypharingodon mola*	Cyprinidae	2.5	LRlc
7	*Barilius barna*	Cyprinidae	1.2	LRnt
8	*Chela cachius*	Cyprinidae	1.3	NE
9	*Crossocheilus burmanicus*	Cyprinidae	0.9	VU
10	*Chela laubuca*	Cyprinidae	1.6	LRlc
11	*Cirrhinus mrigala*	Cyprinidae	2.4	LRnt
12	*Cirrhinus reba*	Cyprinidae	0.3	VU
13	*Catla catla*	Cyprinidae	2.3	VU
14	*Danio aequipinatus*	Cyprinidae	0.4	LRnt
15	*Danio daverio*	Cyprinidae	1.5	LRnt
16	*Esomus danricus*	Cyprinidae	1.2	LRlc
17	*Labeo bata*	Cyprinidae	1.9	LRnt
18	*Labeo calbasu*	Cyprinidae	1.6	LRnt
19	*Labeo gonius*	Cyprinidae	0.5	LRnt
20	*Labeo rohita*	Cyprinidae	1.8	LRnt
21	*Puntius chola*	Cyprinidae	0.2	VU
22	*Puntius chonconius*	Cyprinidae	0.6	VU
23	*Puntius gelious*	Cyprinidae	0.4	NE
24	*Puntius javanicus*	Cyprinidae	0.6	NE
25	*Puntius sarana*	Cyprinidae	0.2	VU
26	*Puntius shalynious*	Cyprinidae	1.4	VU
27	*Puntius sophore*	Cyprinidae	2.5	LRnt
28	*Puntius terio*	Cyprinidae	0.6	LRnt
29	*Puntius ticto*	Cyprinidae	0.5	LRnt
30	*Rasbora rasbora*	Cyprinidae	2.3	NE
31	*Rasbora daniconius*	Cyprinidae	2.0	NE
32	*Salmophasia bacaila*	Cyprinidae	0.7	LRlc
33	*Rasbora elanga*	Cyprinidae	0.1	NE
34	*Acanthocobitis botia*	Balitoridae	0.5	NE
35	*Botia Dario*	Cobitidae	1.7	NE
36	*Somileptis gongota*	Cobitidae	0.3	LRnt
37	*Lapidocephalus guntea*	Cobitidae	2.5	NE
38	*Mystus bleekeri*	Bagridae	0.3	VU
39	*Mystus cavasius*	Bagridae	0.4	LRnt
40	*Mystus tengera*	Bagridae	2.4	NE
41	*Mystus vittatus*	Bagridae	2.5	VU
42	*Rita rita*	Bagridae	0.4	LRnt
43	*Aorichthys aor*	Bagridae	0.4	NE
44	*Ompok pabda*	Siluridae	1.7	EN
45	*Ompok pabo*	Siluridae	2.6	NE
46	*Wallagu attu*	Siluridae	1.7	LRnt
47	*Ailia coila*	Schilbeidae	0.3	VU
48	*Clupisoma garua*	Schilbeidae	1.9	VU
49	*Eutropichthys vacha*	Schilbeidae	0.4	EN
50	*Bagarius bagarius*	Sisoridae	0.8	VU

51	*Gagata cenia*	Sisoridae	0.2	NE
52	*Clarius batrachas*	Claridae	2.6	VU
53	*Heteropneustes fossilis*	Heteropneustidae	1.4	VU
54	*Chaca chaca*	Chacidae	0.3	NE
55	*Sicamugil cascasia*	Mugilidae	0.4	VU
56	*Xenentodon cancilla*	Belonidae	2.3	LRnt
57	*Monopterus cuchia*	Symbranchidae	2.0	LRnt
58	*Macrognathus aral*	Mastacembelidae	1.7	LRnt
59	*Macrognathus puncalus*	Mastacembelidae	2.2	LRnt
60	*Mastacembalus armatus*	Mastacembelidae	2.5	NE
61	*Chanda nama*	Chandidae	2.1	NE
62	*Chanda ranga*	Chandidae	1.5	NE
63	*Badis badis*	Nandidae	1.3	NE
64	*Nandus nandus*	Nandidae	0.7	LRnt
65	*Glossogobius giuris*	Gobiidae	2.2	LRnt
66	*Glossogobius gutum*	Gobiidae	0.3	NE
67	*Anabas testudinius*	Anabantidae	2.4	VU
68	*Colisa fasciata*	Anabantidae	2.0	LRnt
69	*Colisa sota*	Anabantidae	0.7	NE
70	*Colisa lalia*	Anabantidae	0.3	NE
71	*Colisa labiosus*	Anabantidae	0.8	NE
72	*Ctenops nobilis*	Cyprinidae	0.5	NE
73	*Channa marulius*	Channidae	0.6	LRnt
74	*Channa punctatus*	Channidae	2.5	LRnt
75	*Channa striatus*	Channidae	1.6	LRlc
76	*Channa gachua*	Channidae	0.4	NE
77	*Tetradon cutcutia*	Tetrodontidae	1.8	LRnt

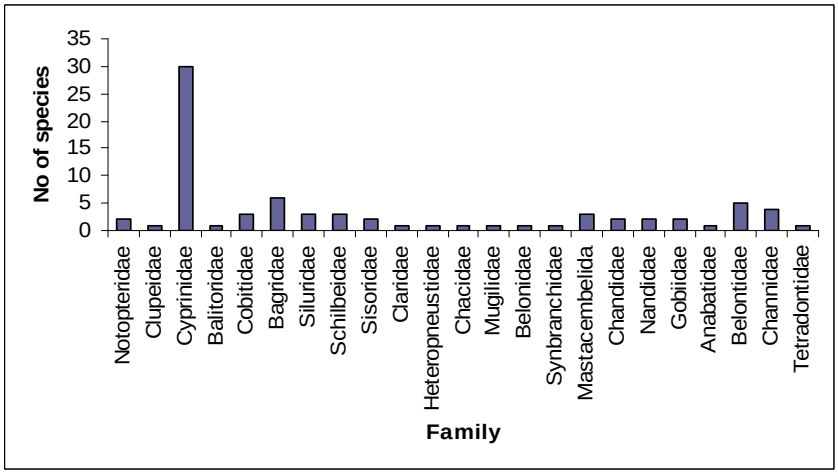

FIGURE 2. Family wise distribution of fish fauna of the Goronga *beel*

4. Physico-chemical parameters of the Beel:

Mean pH value of Goronga *beel* was observed between 7.9 and 8.4, highest being recorded in winter and lowest in retreating monsoon. The water temperature of the wetland observed between the range of 20.5^{0}C and 29.3^{0}C, lowest being recorded in winter and highest in Monsoon season. Transparency ranges observed between 40.2 cm to 48.9 cm, of which lowest recorded in winter and highest in Retreating monsoon. DO were observed between 8.4 mg l^{-1} and 12.5 mg l^{-1}. Lowest was in winter and highest in monsoon season. DO level throughout the studied period showed an orthograde profile as in conformity with the finding of [21]. The entire water body of the wetland had more than 50% saturation of oxygen and provided a suitable habitat of fish. Free CO_2 ranges between 2.2 mg l^{-1} and

6.4 mg l^{-1} of which maximum was observed in winter and minimum in retreating monsoon. Maximum range of free CO_2 was recorded in winter might be due to high rate of decomposition of organic matters by the microbes resulting in rapid production of free CO_2 [22].

The water quality of the beel observed moderately alkaline range throughout the year (alkalinity value found between the range of 40.5 mg l^{-1} and 75.2 mg l^{-1}). However, in monsoon season due to greater influx of nutrient, the level of alkalinity enhanced.

Table 3. Mean Value (± SD) of water quality parameters of Goronga *beel* in four seasons (2007-2009)

Parameters	Seasons			
	Pre-monsoon	Monsoon	Retreating Monsoon	Winter
pH	8.2 ± 0.6	8.3 ± 0.5	7.9 ± 0.3	8.4 ± 0.5
Water temperature (^oC)	24.9 ± 1.8	29.3 ± 2.6	25.4 ± 2.4	20.5 ± 1.6
Transparency (cm)	46.5 ± 3.5	53.6 ± 3.7	48.9 ± 3.8	40.2 ± 3.1
Dissolved oxygen (mg l^{-1})	10.2 ± 0.8	12.5 ± 0.3	10.8 ± 0.2	8.4 ± 0.4
Free CO_2 (mg l^{-1})	4.3 ± 0.6	5.8 ± 0.9	2.2 ± 1.1	6.4 ± 0.6
Alkalinity (mg l^{-1})	40.5 ± 14.6	75.2 ± 15.8	64.1 ± 17.5	55.5 ± 15.1
Hardness (mg l^{-1})	39.5 ± 1.5	40.2 ± 1.7	36.8 ± 1.5	42.7 ± 1.9
Chloride (mg l^{-1})	11.15 ± 0.54	8.08 ± 0.50	12.41 ± 0.62	14.22 ± 0.58

5. Fishing gears operated in the *beel*:

A good number of fishing gears are used in the *beel* in different seasons **(Table 4)**. Among the fishing gears used, some are used in the *beel* almost all the times except monsoon season *i.e.* in breeding season due to banned on fishing. The main fishing gears are as follows:

Table 4. Fishing gears operated in Goronga *beel*

Sl. No.	Gears	Fishing season
1	Drag net(*Ber jal*)	Operated when fishing in the *Jeng* during winter season
2	Gill net(*Kareng jal*)	Operated throughout the year
3	Hooks(*Khuti borosi*)	Hooks are used to catch mainly *Rita rita* and *Wallago attu* throughout the year
4	Gill net (*Fasi jal*)	Operated during monsoon season against current
5	Dip net(*Doli jal* or *Basuri jal*)	Operated throughout the year in all sites of the beel
6	Lift net(*Khora jal*)	Operated in all season for all type of fish
7	Cast net (*Sewali jal*)	Operated in all season for all type of fish

6. Microhabitat of *Ompok pabo* in Goronga wetland.

Microhabitat can be defined as the exact location and condition where an animal spend all or a portion of its time [23]. The place is presumably selected by the fish in respond to proximate factors to optimize its net energy gain [24] while avoiding predators and minimizing interactions with competitors [25].

Ompok pabo fishes are carnivorous in feeding habit and dwells in River to riverine Wetland. From the investigation, it has been observed that it is a bottom dweller one and prefers to live in shoal. The fish preferred sandy soil with low velocity water current. According to the local fishers of the wetland that occasionally the species prefer to eat decomposed bark of fallen trees, *Streblus asper* (Lour). It has been observed that the shoal of *Ompok pabo* was generally found in association with the fish species *Pseudotropius atherinoides* (*Bordaia* in Assamese) at Goronga *beel*. Fishing of *Ompok pabo* was carried out by the fishers mainly in winter season by making a suitable region (preferably in deep area) of the wetland which is locally known as *jeng* or *katol*. This is constructed by protecting a particular region of the wetland (about 100-150^2 feet) with a net of appropriate size where some tree branches and floating weeds *i.e. Eicchornia crassipes., pistia sp.* etc is dumped. After 10 to 15 days, fishing is done in this *jeng* to catch *pabo*. This is the main reason for which this *jeng* is also called as pabho *jeng*. Fishing in one pabho *jeng* can yield 7 to 8 kg pabo fish in each trial. Every year at least 35-40 *pabho jeng* are raised throughout the wetland by the Mahalder to catch

pabho besides other species and a total of three fishing trial are practiced in each jeng.

The Shannon–Weiner diversity index of fish population of the wetland ranged from 2.11 to 3.41 indicated a strong relationship with overall species richness of the wetland and also indicate suitable habitat for the silurid species.

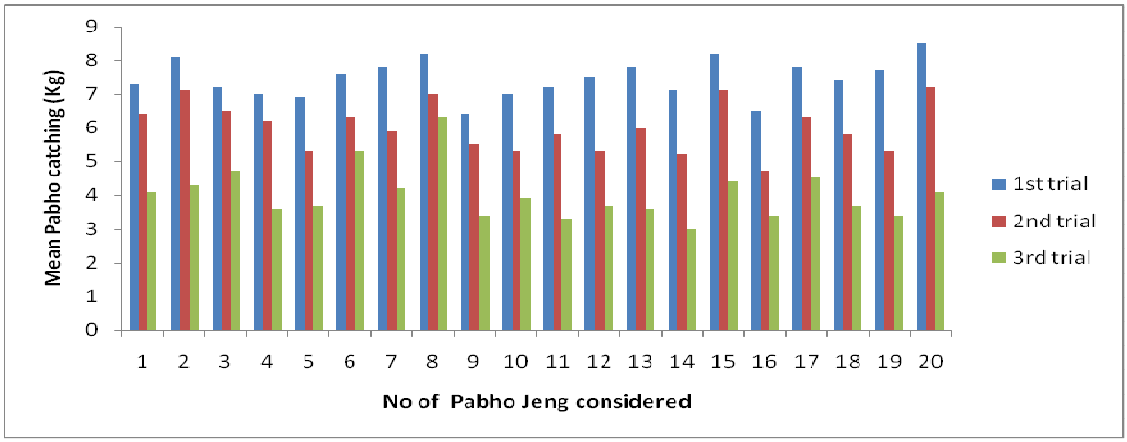

FIGURE 3. Pabho catching record in three subsequent fishing trials at *Pabho jeng*

From the investigation, it has also been observed that *Ompok pabo* is mostly acquainted with the low velocity running water ecosystem. Occurrence of this endangered species in the Goronga *beel* may be due to having constant low velocity current generated from inlet and outlet of the *beel*. Gut content analysis of *Ompok pabo* reveals that the species besides fish also eat different type of insects. 26 species of recorded aquatic macrophytes can provide habitats for different insect's population. Therefore, the macrophytes can provide required numbers of foods for the said species. The submerged and floating leaved emergent macrophytes have positive benefit when they are in optimum condition in the wetland [26]. Present findings are also in conformity with the above that though the species of aquatic macrophytes were remarkably high but eutrophied condition not yet prevailed in the wetland.

The habitat is found to be suitable in terms of food and space availability for the species because due to less competition amongst the catfishes as less number of fish under Bagridae family were recorded **(Fig. 2.)**. The habitat suitability preference distinctly provide ecological safeguard to this silurid fish species to avoid competition with the others inhabiting in the same area. The significant of habitat preference is that the fish species can live comfortably in it and use available space efficiently. [23, 25] assumed in case of stream that the variables measured to define the microhabitats used are generally those that can be measured easily both on transects and with association with the fishes such as mean water column velocity, total depth and substrate. However, in the studied wetland, the variables measured were pH, water temperature, transparency, DO, FCO_2, alkalinity, hardness and chloride.

All studied physico chemical parameters of the beel were found suitable for existing fish community **(Table 3)**. Physico-chemical parameters are considered as the most important principles in the identification of the nature, quality and type of the water (fresh, brackish, saline) for any aquatic ecosystem [27]. Several physico- chemical or biological factors could act as stressors and adversely affect fish growth and reproduction. Fish survive and grow best in waters with a pH between 6 and 9[27]. In present study, the value of pH through out the annual cycles was in conformity with the above findings.

Macro-invertebrates of the studied wetland include different species of Annelids, Molluscans, and Arthropods. The macro invertebrates were closely associated with submerged macrophytes, also reported two types of macro invertebrates from the Urpod *beel* of Goalpara district, Assam [10]. Again, the biota of an aquatic ecosystem directly reflects the conditions of existing in the environment in terms of the quality and quantity of the biota.

CONCLUSION

All the studied parameters of the wetland were found within the permissible limit for the maximum growth of fishes. Fish catching percentage also indicates the maximum relative abundance of species in the wetland. No any destructive fishing devices were also reported from the beel. Therefore, it has been felt that it is a critical need for conservation of existing habitat for maintain and manage the endangered species *Ompok pabo* in the wetland.

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