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Research article

ECO-HYDROBIOLOGY WITH SPECIAL AMPHASIS ON ICHTHYOFAUNAL DIVERSITY OF URPOD WETLAND OF GOALPARA, ASSAM, INDIA

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ABSTRACT: Urpod wetland, situated to the south of the Brahmaputra river of Goalpara District, Assam comes under the Asian wetland directory. The present findings reported a total of 60 fish species belonging to 21 family from the wetland. Many riverine species have amalgamated in this wetland due to connection with the Jhinari and Jhimjiram river. Encroachment, agricultural activities, forest cover change in the adjoining reserved forests, and human settlement within the wetland and its buffer zone resulting in an imbalance in the wetland eco-system. The wetland supports considerable numbers of migratory bird populations which are declining owing to extensive human disturbances.
Keywords: Hydrobiology, Diversity, Wetland

INTRODUCTION

Wetlands are unique ecosystem having rich nutrient status and carrying capacity with immense production potential hence considered as food and fodder resources for human and its related allies. Ecologically wetlands are of great significant for an area as they support different food chain, food webs, regulate hydrological cycle, recharge ground water, trapping of energy and shelter to large numbers of flora and fauna having great ecological and economical value [1,2]. Wetland fishery is an important component of fisheries of Assam [3, 4, 5, 6, 7]. Situated near Agia in Goalpara district of Assam Urpod is a large wetland. The wetland is riverine in origin and covers an area of about 649.38 ha. The wetland surrounded by 10 villages. The wetland not only provides water for cultivation in the nearby agricultural land but also maintain the ecosystem of the area through preservation of many species of aquatic plants, fishes, insects, birds, underwater animals and domestic as well as migratory birds. The wetland has already been included in Asian wetland directory [8]. The present investigation was undertaken to study the ecological parameters and assessment of biotic potential of the wetland with special emphasis on ichthyofaunal diversity.

MATERIALS AND METHODS

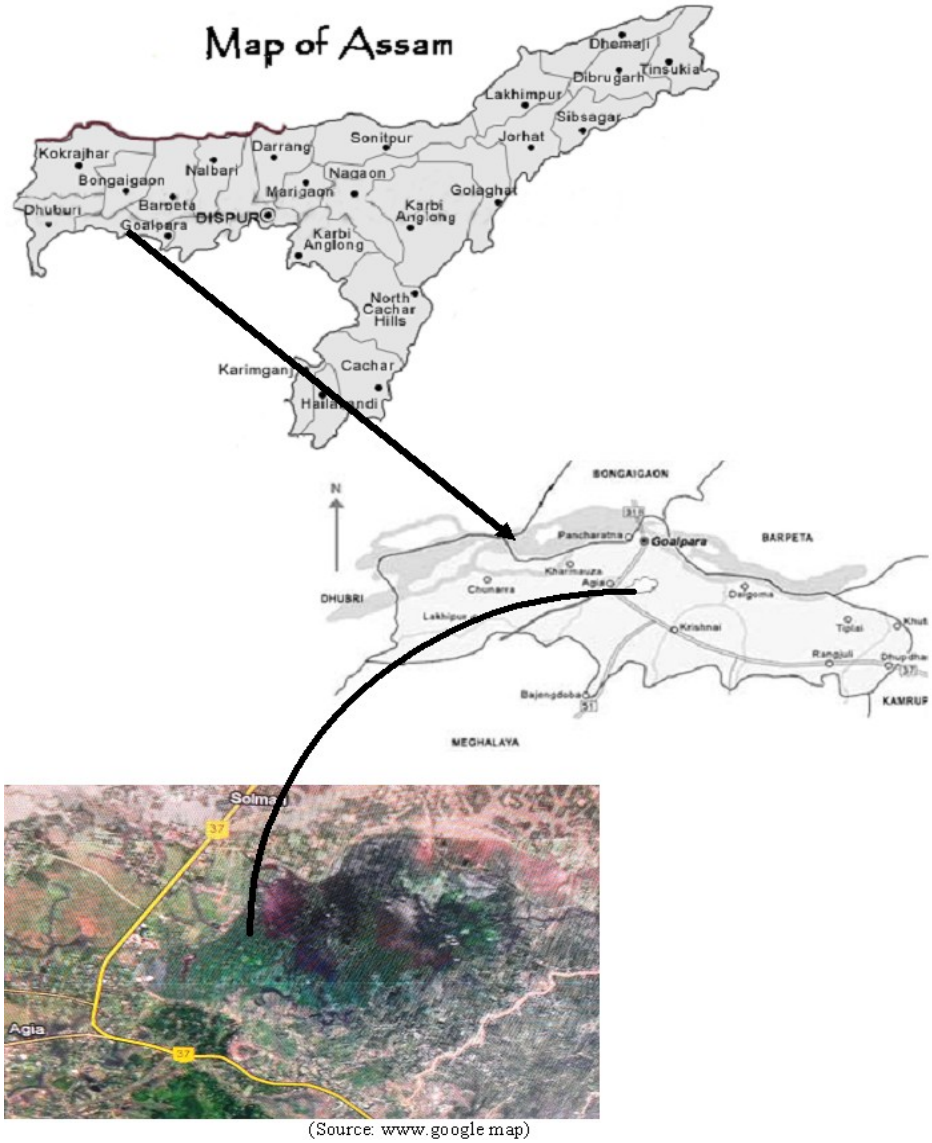
The study was conducted from 2010-2011. For diversity study fishes were sampled in five pre-selected sampling sites. Cast net was mostly used to collect the fish, however others were also used. Fish species available at the local market and caught by local fishermen were also purchased. The collected fish species were preserved in 8-10% formaldehyde solution for further study using standard method of Jhingran and Jayaram [9, 10]. Plankton, Benthos and Macrophytes were also collected for diversity study

Water samples for physico-chemical parameters were collected from five pre-selected sampling sites in each season (i.e. in premonsoon, monsoon, retreating monsoon and winter). Physico-chemical parameters were analysed adopting the method of APHA [11].

DESCRIPTION OF THE WETLAND

Location

Urpod wetland is located between latitudes 26º05'05" N to 26º 06'45" and longitude 90º 34'08" E to 90º 37'45"E 90º36/ E to the south of the Brahmaputra river of Goalpara District, Assam (Figure-1). The wetland is surrounded by the NH-37 in the south, west and north. The eastern side of the wetland is surrounded by villages like Maijunga, Garaimari, Khurabhasa etc. Perennially, the wetland is fed by Jhinjiram (outlet of the wetland) and Jinari (inlet of the wetland). The Jinari is originates from the garo hills of Meghalaya in the southern side, passes by the side of the wetland to the north and north-east direction before meeting the Brahmaputra River. And the river Jhinjiram originates from the Urpod wetland at its south and flows westwards towards the Brahmaputra. The Urpod wetland is connected with Patakata wetland by a small drain located in the eastern side of the wetlands.



(Source: www.google map)

Figure-1. Satellite imaginary of Urpod wetland

Geography and geomorphology of the wetland

Geographically the wetland is formed by Archean Gneissic complex consisting of granites, gneisses, schists and amphibilities [12]. The wetland and the valleys in its vicinity are underlined by recent alluvium consisting of clay silt, sand and pebbles. The older Archean basement is concealed under the alluvium. The major part of the wetland is consists of heavy textured soils with pH ranging from 5.5 to 6.8 [12]. The wetland is bounded by the agricultural land of villages like Agia, kalpani, Shyamnagar, Gendera, Garukutia etc. The eastern side of the wetland is surrounded by agricultural land of villages like Maijunga, garaimari, Kurabhasa etc. While the wetland and its lowland fringe area underlaid by recent alluvium consisting of clay, silt, sand and pebbles, the highlands immediately to the north and south of the wetland are made up of gneisses and schists of the Archaean age.

Hydrology

The wetland receives water from the river Jinari and Jhinjiram. The wetland also collects part of the water from the plains and isolated undulating areas in the north through a network of drains. The local monsoon run off is also a major source of water to the wetland. The area experiences heavy rainfall during June, July and post monsoon season extend upto the end of October.

Climatic condition

The climate of in and around the wetland more or less moderate with temperature variation between the average minimum of 10^{o} C in winter and average maximum in summer limited to around 33^{o}C. The monsoon is long extending from May to September. Though most of the rainfall occurs during the monsoon, occasional heavy downpour is often experienced during winter.

LIMNOCHEMISTRY

The wetland is less contaminated and henceforth provides sheltering place for large numbers of aquatic resources. But due to heavy silt coming into the wetland every year the depth of water has reduced which also affect the physico-chemical characteristics of the wetland (Table-1). The wetland water is alkaline in nature through out the year which ranged from 7.2 to 8.6. High dissolve oxygen value was recorded during winter (10.2 mg/l). While less value was observed during monsoon (6.4 mg/l) because of influx of nutrients from the catchments.

Total alkalinity was maximum in winter (157.3 mg/l) which may be due to high photosynthetic activity. Dilution of water may be responsible for minimum value (92.2 mg/l) in monsoon. Total hardness usually ranged from 20.2 mg/l to 37.8 mg/l. usually higher values are observed in winter season (Table-1).

Table 1. Physico-chemical parameters of Urpod wetland.

Water Quality parameters	Pre-monsoon	Monsoon	Post Monsoon	Winter
pH	7.2-8.4	7.2-8.5	7.6-8.6	7.9-8.5
Temperature	7.9-16.7	7.2-19.3	6.8-16.4	6.2-7.2
Dissolve oxygen	8.5-8.7	6.4-8.0	8.5-10.0	8.6-10.2
Free carbondioxide	6.2-6.3	6.5- 6.7	7.3- 7.5	7.7- 7.8
Alkalinity	124.3-143.5	92.2-124.7	127.1-132.3	152.1-157.3
Hardness	20.2-37.6	27.1-34.5	22.3-42.1	29.6-37.8

BIOLOGICAL RESOURCES

Urpod wetland is endowed with rich floral and faunal diversity. The Urpod ecosystem harbours large numbers of migratory waterfowl each year. It regularly supports substantial numbers of fish fauna indicative of wetland values, productivity and diversity.

PLANKTONS

Rich plankton diversity is noticeable in this wetland of which 15 were phytoplankton and 30 zooplanktons. Pre-monsoon records of the plankton was 480 nos./litre. The phytoplankton percentage was 54.2% and zooplankton 35.8%. Cyanophyceae was the most dominant group among phytoplankton and copepods among zooplanktons. Other dominant groups were chlorophyceae and rotifers. The dominance of cyanophyceae and Chlorophyceae indicated the eutrophic nature of the water body. The dominant species encountered were *Anacystic* sp. *Oscillatoria* sp. *Spirogyra* sp. *Selanastrum* sp. *Microcystis* sp. *Anabena* sp. *Zygnema* sp. *Closterium* sp. *Hydrodictyon* sp. *Trichonema* sp. *Chlorella* sp. *Navicula* sp. *Melosira* sp. and *Synedra* sp.

BENTHOS

The important benthic fauna found in Urpod wetland ecosystem includes, *Tubifex* sp., *Naisi* sp*, Dero* sp*., Limnodrillus* sp*., Chaoborus* sp*., Chironomus* sp*., Bellamya* sp*. Bortia* sp*., Chaoborous* sp*., Culicoids* sp., *Dragonfly* larvae, stone fly larvae, Cybister larvae, *Pila globosa* and *Unio* sp.

MACROPHYTES

Macrophytes form an important component of the wetland and constitute divers form of free floating submerged and imerged macrophytes. Important floating macrophytes found in the wetland are *Eichhornia crassipes, Pistia stratiotes, Lemna minor,Azolla pinnata, salvinia natans, Nelmbo lotus, Nymphaea alba, Nelumbo rubra, Euryale ferox, Marsiela quandrifolia, Spirodela polyrrhiza* and *Trapa bispinosa.* The submerged macrophytes include *Potamogeton crispus, Vallisneria spiralis, hydrilla verticellata, Nais sps., Najas* sp., *Nitella* sp. *Nechamendra* sp., *Chara* sp., *Ceratophyllum demarsum I and* utricularia sp. the emergent species are represented by *Paspalum serobiculatum, Ipomoea reptans, Cyperus* sp., *Eupatorium* sp. *Phragmitis* sp. *Saccharum* sp., *Accium* sp., *imperata* sp. *Vitex* sp., *Eleocharish pentagine, Sagittaria sagitifolia* and *Hygrorhiza* sp.

FISH AND FISHERIES

A total of 60 species belonging to 21 family have been recorded (Table-1) from the wetland. Earlier also a wide array of fishes is recorded in this wetland [13] Majority of them are resident fauna of this wetland. Some of the fishes migrate between the wetland and the river Jhinari and Jhinjiram and so many riverine species have amalgamated in this wetland. Numbers of exotic fish species is also recorded from the wetland. Commonly encountered exotic carps in this wetland are. *cyprinus carpio, ctenopharyngodon idella, and Hypothalmichthys molitrix.*. The wetland is a good breeding ground for almost all fishes except the carps which breed in running water. The commercially important fish species found in the wetland are, *, Labeo rohita, Labeo calbasu, Labeo gonius, Catla catla, Cirrihinus mrigala, Labeo gonius, Notopterus chitala, Aorichthys aor, Wallago attu, Channa marulius, Channa striatus, Cirrihinus reba, Heteropneustes fossilis, Clarias batrachus, Ompok pabo, Anabas testudineus, Gadusia chapra, Rasbora elanga, Mystus cavasius, , Monopterus cuchia* etc. Three species of freshwater Prawn belonging to *Palinomidae* family such as *Macrobrauchium dayanum M. assmensis* and *M. lamerrie* were found in the wetland.

Fishing in this wetland continuous through out the year with a peak during winter (Sep- Feb). Since the wetland encompases a huge area it is difficult to estimate the total catch. In Urpod wetland *Katal fishing* or *Bush Park* fishing is an indigenous method practiced by the villagers during winter. These are usually installed using bamboo/ tree branches, water hyacinth etc. in a circular form during winter. Fishes gradually aggregate in these areas when fishing is intensified in the wetland. Gill nets locally called Phasi or Lungi jal is widely used and chaki or chak jal, a conical shaped net 1.5-3.0 m wide is widely used. The shore seines and drag nets are used in those parts of the wetland where macrophytes are not present or moderately infested. Some groups of fishermen are completely dependent on fishing activity. They fish round the year in groups and are completely dependent on fishing for their livelihood. They have no landholdings of their own or marginal land holdings. The other groups of fishermen are those who take up fishing as subsidiary source of income and fish only for their domestic consumption. They generally cultivate Boro rice by the side of Urpod wetland. They fish with small nets like cast net and dip net.

Table 2. Fish species occurring in Urpod wetland with potential food, ornamental and sport value.

Fish taxa/ species	Potential value			Conservation status*
	FF	OF	SF	
ORDER: I. OSTEOGLOSSIFORMES				
Family: (1) Notopteridae				
1. *Chitala chitala* (Ham-Buch)	√√	√	√	EN
2. *Notopterus notopterus* (Pallas)	√√	√	√	LR-nt
ORDER: II. CLUPEIFORMES				
Family: (2) Clupeidae				
3. *Gudusia chapra* (Ham- Buch)	√√			LR-lc
ORDER: III. CYPRINIFORMES				
Family: (3) Cyprinidae				
4. *Salmostoma bacaila* (Ham- Buch)	√	√		LR-lc
5. *Amblypharyngodon mola* (Ham-Buch)	√			
6. *Brachydanio rerio* (Ham-Buch)	√	√		LR-nt
7. *Danio devario* (Ham- Buch)	√	√		LR-nt
8. *Esomus danricus* (Ham-Buch)	√	√		LR-lc
9. *Parlicosoma daniconius* (Ham- Buch)	√	√		LR-nt
11. *Catla catla* (Ham- Buch)	√			
12. *Cirrhinus mrigala* (Ham-Buch)	√			LR-nt
13. *C. reba* (Ham-Buch)	√			Vu
14. Ctenopharyngodon idella (Valenciennes)	√			
15. *Cyprinus carpio* var. *communis* (Linnaeus)	√			
16. *Labeo calbasu* (Ham- Buch)	√			Vu
17. *L. gonius* (Ham- Buch)	√			LR-nt
18. *L. rohita* (Ham- Buch)	√			LR-nt
19. *Osteobrama cotio cotio* (Ham- Buch)	√	√		LR-nt
20. *Puntius chola* (Ham-Buch)	√	√		Vu
21. *P. conchonius* (Ham- Buch)	√	√		Vu
22. *P. gonionotus* (Bleeker)	√			LR-lc
23. *P. phutonio* (Ham- Buch)	√			
25. *P. sophore* (Ham- Buch)	√			LR-nt
26. *P. ticto* (Ham- Buch)	√	√		LR-nt
27. *Hypothalmichthys molitrix* (Valenciennes)	√			
28. *Aristchthys nobilis* (Richardson)	√			
29. *Chela laubuca*				
Family: (4) Balitoridae				
30. *Acanthocobitis botia* (Ham- Buch)	√	√		LR-nt
Family: (5) Cobitidae				
31. *Lepidocephalus guntea* (Ham- Buch)	√			
ORDER: IV. SILURIFORMES				
Family: (6) Bagridae				
32. *Sperrata seenghala* (Sykes)	√	√		
33. *Mystus bleekri* (Day)	√			Vu
34. *M. tengara* (Ham-Buch)	√	√		
35. *M. vittatus* (Bloch)	√	√		
Family: (7) Siluridae				
36. *O. pabda* (Ham-Buch)	√			EN
37. *Wallago attu* (Scheidner)	√			LR-nt

Family: (8) Schilbeidae				
38. *Ailia coila* (Ham-Buch)	√	√		Vu
39. *Eutropichthys vacha* (Ham-Buch)	√			LR-nt
Family: (9) Claridae.				
40. *Clarius batrachus* (Linnaeus)	√			Vu
Family: (10) Heteropneustidae				
41. *Heteropneustes fossilis* (Bloch)	√			Vu
ORDER: V. BELONIFORMES **Family: (11) Belonidae**				
42. *Xenentodon cancila* (Ham-Buch)	√	√		LR-nt
ORDER: VI. CYPRINIDONTIFORMES **Family: (12) Aplocheilidae**				
43. *Aplocheilus panchax* (Ham-Buch)				Vu
ORDER: VII. SYNBRANCHIFORMES **Family: (13) Synbranchidae**				
44. *Monopterus cuchia* (Ham-Buch)	√			Vu
ORDER: VIII. PERCIFORMES **Family: (14) Ambassidae**				
45. *Chanda nama* (Ham-Buch)	√			
46. *Pseudambassis baculis* (Ham-Buch)	√			LR-lc
Family: (15) Nandidae				
47. *Badis badis* (Ham-Buch)	x			
48. *Nandus nandus* (Ham-Buch)	√			LR-nt
Family: (16) Gobiidae				
49. *Glossogobius giuris* (Ham-Buch)	√			
Family: (17) Anabantidae				
50. *Anabas testudineus* (Bloch)	√			Vu
Family: (18) Belontidae				
51. *Colisa fasciatus* (Schneider)	√			LR-nt
52. *C. lalia* (Ham-Buch)	√			
53. *C. sota* (Ham-Buch)	√			
Family: (19) Channidae				
54. *C. marulius* (Ham-Buch)	√			LRnt
55. *C. punctatus* (Bloch)	√			LRnt
56. *C. striatus* (Bloch)	√			
ORDER: IX. MASTACEMBELLIFORMES				
Family: (20) Mastacembellidae				
57. *Macrognathus aral* (Bloch & Schneider)	√			LRnt
58. *M. pancalus* (Ham-Buch)	√			
59. Mastacembelus armatus (Lacpede)	√			
ORDER: X. TETRAODONTIFORMES **Family: (21) Tetraodontidae**				
60. *Tetraodon cutcutia* (Ham-Buch)	x	√		LR-nt

Note: FF = Food fish; OF = Ornamental fish; SF = Sport fish; *Based on CAMP report (1998); √√ = Commercially important; x = No food value

#Exotic species introduced in the state; CR = Critically endangered EN = Endangered; Vu= Vulnerable; LR-nt = Lower risk near threatened LR-lc = Lower risk least concern.

CURRENT CONSERVATION THREAT

During the past few decades the Urpod wetland area has undergone rapid changes due to encroachment, agricultural activities, forest cover change in the adjoining reserved forests, and human settlement within the wetland and its buffer zone; resulting in an imbalance in the wetland eco-system. Moreover, the inflow of stormwater from the adjoining settlement area to the wetland is degrading its water quality causing a hazardous environment for the aquatic flora and fauna. The threats to Urpod are typical of wetlands in this region and other developing countries. It is purposed that the following three major anthropogenic threats receive immediate attention:

- Illegal land use and settlement in and around the wetland.
- Siltation in the wetland causing decline of the water depth.
- Lack of a comprehensive management policy with adequate institutional arrangements

CONCLUSION

The wetland offer immense potential for increasing fish production, employment generation and several other additional source of income. The abiotic and biotic condition of the wetland is suitable for fish growth. It is one of the potential wetland within northeastern regions of India, who continuously supports large numbers of wetland biota. The wetland supports considerable numbers of migratory bird populations which are declining owing to extensive human disturbances. This was happened, owing to heavy human disturbances in the shallow parts of the wetland and shoreline area of the wetland.

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