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Preliminary studies on Icthyofauna diversity and Physico-Chemical Parameters of River Bhogdoi during Winter and Pre-Monsoon Season in Assam

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Abstract: *The unique topography of North East (NE) India and watershed pattern is an attractive field for Icthyological studies. This region has already been recognized as a global spot of freshwater fish diversity. The study was conducted on fish diversity and physico-chemical parameters during January 2015 to May 2015 in River Bhogdoi, one of the south bank sub-tributaries of the mighty River Brahmaputra. A total 30 species of fishes under 26 genera, 5 orders and 16 families were recorded form the River Bhogdoi. Cypriniformes were found to be the most abundant group while Synbranchiformes and Beloniformes were less abundant groups during the whole study period. The study of physico-chemical parameters of River Bhogdoi revealed that, the river water appeared to be less polluted and physico-chemical parameters were mostly found to be in the favourable and suitable ranges for the aquatic organisms. The results that were recorded in the different stations and different seasons were compared with the World Health Organization (WHO) and it was found that the water of River Bhogdoi may be suitable for drinking and domestic purposes because all the values were between WHO limits. Almost similar results had also be reported from other rivers in the region, notably the River Brahmaputra, River Kolong and so on; and, these latter were also surveyed in the present exercise.*

Keywords: *Icthyofauna, Physico-Chemical Parameters, Brahmaputra, Bhogdoi, Kolong, Assam.*

I. Introduction

Fishes are of economic importance to human beings in many different forms since time immemorial. Fishes are in variable living components of water bodies. These organisms are important food resource and good indicators of the ecological health of the waters they inhabit. Out of a total of 2500 species of fish in India, 930 are in freshwaters and belong to 326 genera, 99 families and 20 orders [1]. India is one of the 12 mega biodiversity hot spots contributing 60-70% of the world's biological resources. India has about 11.72% of total global fish biodiversity. This diversity is being eroded each day mainly because of unending anthropogenic stress. This diversity is the wealth of India and the world but it also has serious implications on fishery. The country was endowed with vast and varied resources possessing river ecological heritage and rich biodiversity. The unique drainage system of the state falls under upper Brahmaputra basins. Rivers provides main water resources for domestic, industrial and agricultural purposes [2].

Various important studies have been conducted on the fish diversity. Das et al. [3] reported a total 87 different fishes were collected under 55 genera; they were classified into 9 orders and 22 families. Jayaram [4] studied the freshwater fishes of Indian region. Kar et al. [5] studied the fish diversity and conservation aspects in aquatic ecosystems in northeastern India. Kar and Sen [6] worked on the systematic list and distribution of fish biodiversity in Mizoram, Tripura and Barak drainages in North-East India. Sen [7] reported 806 ichthyo species inhabiting the freshwaters of India. Talwar and Jhingran [1] represented 267 fish species belonging to 114 genera under 38 families 10 orders from the northeastern region.

II. Materials And Methods

Study site: The study area lies in the eastern part of the Brahmaputra Valley with an area of 543.98 sq. km. Its geographical location was in between 26´28" to 26´49" N latitude and 94´03" to 94´28"E longitude. It is bounded by Brahmaputra River in north and Mukokchung district of Nagaland in south. In its east, there is Sivsagar district and in west, Kakodonga river [8]. Bhogdoi River is a southern sub-tributary of Brahmaputra [8].

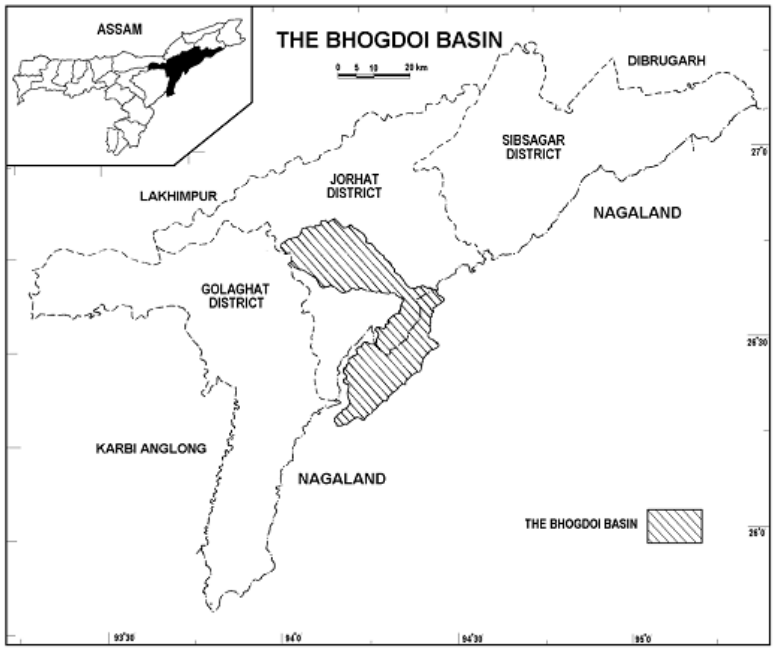

Fig.: Location of the Bhogdoi basin in the study area (www.mapsofindia.com)

Fish samples were collected from River Bhogdoi during January 2015 to May 2015 through experimental fishing; using cast nets (dia.3.7 m and 1.0 m), gill nets (vertical height 1.0 m- 1.5 m; length 100 m -150 m), drag nets (vertical height 2.0 m), triangular scoop nets (vertical height 1.0 m) and a variety of traps and with hook and lines. In the laboratory, the fishes were identified by following standard literature, notably, Day [9], Roberts [10], Sen [11], Talwar and Jhingran [1], Jayaram [4], Vishwanath [12, 13], Kar [14, 15] and www.fishbase.org. The conservation status of the collected fish species were assessed as per IUCN [16]. All the fishes were kept in the Assam University Fish Museum (AUFM) for preservation and record. Water was collected and stored in clean polyethylene bottles that had been pre washed with deionized water. Air temperature, water temperature and pH were determined in the field because of their unstable nature. Water temperature and air temperature were measured with the help of mercury thermometer and pH was measured with pen type pH meter in the field and other parameters was analyzed in the laboratory using standard procedure of APHA [17, 18].

III. Results And Discussion

A total of 30 fish species had been recorded from the River Bhogdoi and they belong to 26 genera and 16 families under 5 orders (Table-1). It had been observed that among the families The fishes belonging to Cyprinidae have been found to be most abundant in the river, which includes 11 species (Table-3), followed by the Cobitidae, Nemacheilidae, Ambassidae and Bagridae family each with 2 species. The observation indicated that the quality of water is within the favourable limits for fishes. The fish species richness had been reported as good. Family Belonidae under order Beloniformes was the less abundant with the only species Xenentodon cancila.

According to IUCN (2014) the conservation status of the recorded fishes, they have been classified into five category viz., EN - Endangered, NT – Near Threatened, LC - Least Concern, VU- Vulnerable and DD - Data Deficient (Figure-3); of which, 27 species were found under the least concern (LC) category and 1 species each was observed under as near threatened (NT), 1 in endangered (EN), 1 in vulnerable (VU) and 1 in data deficient category (Figure 3).

Table-1: List of icthyofauna diversity of River Bhogdoi during January 2015-May 2015 in upstream and downstream

Sl. No	Scientific name	Order	Family	IUCN Category	Human use
1	Acanthocobitis botia	Cypriniformes	Nemacheilidae	LC	Fisheries of no interest
2	Anabas testudineus	Perciformes	Anabantidae	DD	Commercial, Aquaculture
3	Amblypharyngodon mola	Cypriniformes	Cyprinidae	LC	Fisheries of no interest
4	Bangana dero	Cypriniformes	Cyprinidae	LC	Ornamental, Commercial
5	Barilius canarensis	Cypriniformes	Cyprinidae	EN	Ornamental, Commercial
6	Barilius bendelisis	Cypriniformes	Cyprinidae	LC	Ornamental, Commercial
7	Botia rostrata	Cypriniformes	Cobitidae	VU	Ornamental, Commercial
8	Cirrhinus mrigala	Cypriniformes	Cyprinidae	LC	Commercial, Aquaculture
9	Chanda nama	Perciformes	Ambassidae	LC	Ornamental, Commercial
10	Chanda ranga	Perciformes	Ambassidae	LC	Ornamental, Commercial
11	Channa puntata	Perciformes	Channidae	LC	Ornamental, Commercial
12	Clarias batrachus	Siluriformes	Clariidae	LC	Commercial, Aquaculture
13	Eutropiichthys vacha	Siluriformes	Schilbeidae	LC	Ornamental, Commercial
14	Garra lissorhynchus	Cypriniformes	Cyprinidae	EN	ornamental, Commercial
15	Gagata cenia	Siluriformes	Sisoridae	LC	Ornamental, Commercial
16	Glossogobius giuris	Perciformes	Gobiidae	LC	Ornamental, Commercial
17	Labeo rohita	Cypriniformes	Cyprinidae	LC	Commercial, Aquaculture
18	Lepidocephalichthys guntea	Cypriniformes	Cobitidae	LC	Ornamental, Commercial
19	Mastacembelus aral	Synbranchiformes	Mastacembelidae	LC	Ornamental, Commercial
20	Mesonoemacheilus sp.	Cypriniformes	Nemacheilidae	LC	Ornamental, Commercial
21	Mystus cavasius	Siluriformes	Bagridae	LC	Ornamental, Commercial
22	Mystus tengara	Siluriformes	Bagridae	LC	Ornamental, Commercial
23	Nandus nandus	Perciformes	Nandidae	LC	Ornamental, Commercial
24	Puntius sophore	Cypriniformes	Cyprinidae	LC	Ornamental, Commercial
25	Puntius sarana	Cypriniformes	Cyprinidae	LC	Ornamental, Commercial
26	Salmophasia bacaila	Cypriniformes	Cyprinidae	LC	Ornamental, Commercial
27	Securicula gora	Cypriniformes	Cyprinidae	LC	Ornamental, Commercial
28	Trichogaster fasciata	Perciformes	Osphronemidae	LC	Ornamental, Commercial
29	Xenentodon cancila	Beloniformes	Belonidae	LC	Ornamental, Commercial
30	Ompok bimaculatus	Siluriformes	Siluridae	NT	Ornamental, Commercial

Table-2: Number and composition of different orders of the fishes found in River Bhogdoi along with the number of species

Sl. No	Order	No. of Species
1	Beloniformes	1
2	Cypriniformes	15
3	Perciformes	7
4	Siluriformes	6
5	Synbranchiformes	1

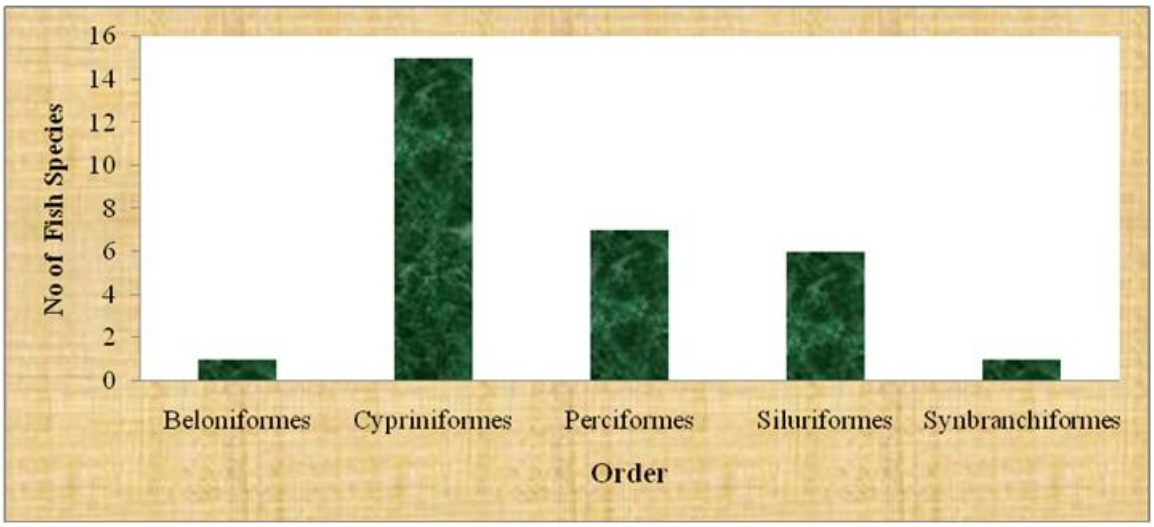

Figure 1: Order wise distribution of Fish Specimens of River Bhogdoi

Table-3: Number and composition of different families of the fishes found in River Bhogdoi along with the number of species

Sl. No	Family	No. of Species
1	Belonidae	1
2	Cyprinidae	11
3	Cobitidae	2
4	Nemacheilidae	2
5	Anabantidae	1
6	Ambassidae	2
7	Channidae	1
8	Gobiidae	1
9	Nandidae	1
10	Osphronemidae	1
11	Bagridae	2
12	Clariidae	1
13	Schilbeidae	1
14	Siluridae	1
15	Sisoridae	1
16	Mastacembelidae	1

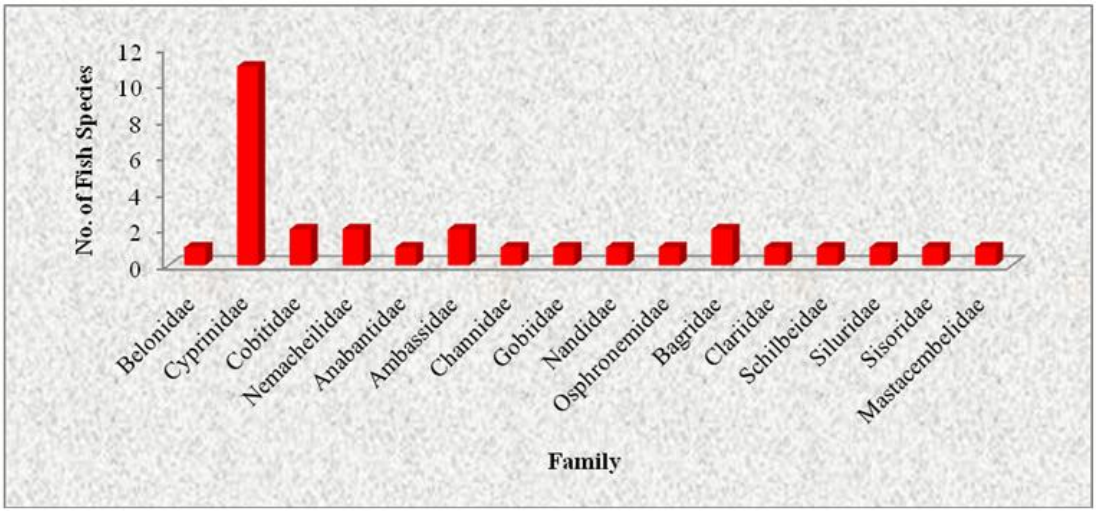

Figure 2: Family wise distribution of Fish Specimens of River Bhogdoi

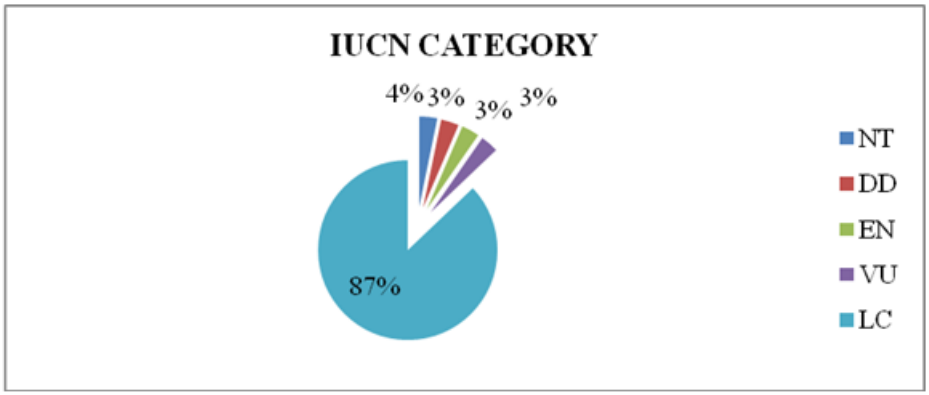

Figure 3: Percentage distribution of conservation status of recorded fish species.

NB: EN - Endangered, NT - Near Threatened, LC -Least Concern, VU- Vulnerable and DD - Data Deficient.

Physico-Chemical Characteristics of River Bhogdoi

1. **Water Colour:** The colour of water colour was clear in most of the study sites but the colour is pale green in the mid-stream of the river.
2. **Air Temperature:** The value of air temperature was highest in pre-monsoon season in the downstream, 16.6 degree Celsius and minimum in the winter season in upstream as 15.3 degree Celsius.

3. **Water Temperature:** The value of water temperature was highest in downstream 17.8 degree Celsius and minimum in upstream 16.4 degree Celsius.
4. **pH:** The pH of a water body was very important in determination of water quality since it affects other chemical reactions such as solubility and metal toxicity, [19]. During the present study the value of pH was found normal in every portion of the river; the total ranges of value is lies between 6 to 8.
5. **Dissolved Oxygen:** Dissolved Oxygen (DO) was an important limnological parameter indicating level of water quality and organic pollution in the water body, [20]. The maximum value of DO was recorded as 5.1 mg/L in downstream and minimum recorded as 4.1 in upstream.
6. **Free Carbon-di-oxide:** Free carbon-di-oxide (FCO_2) dissolves in water varying amounts and the dissolution depends on partial pressure and temperature. FCO_2 plays an important role in water bodies by producing calcium bicarbonate from calcium carbonate and this gas alters the pH of water by reacting with it to form carbonic acid [2]. The value of FCO_2 ranges between 6.4 to 7.4 mg/L. The value was minimum in upstream and maximum downstream.
7. **Total Alkalinity:** The value of total alkalinity (TA) provides idea of natural salts present in water. The value was recorded maximum in upstream and minimum in downstream.

In River Bhogdoi, Pearson's correlation of water revealed strong positive and negative correlations among the physico-chemical parameters as shown in Table 4. The strong positive correlation of WT with AT was due to the relationship of air temperature and water temperature. The strong positive correlation of WT with pH was recorded due to the hydrolysis of ion on surface of water in River Bhogdoi. DO shows positive correlation with AT.

Table 4: Physico-Chemical parameters of the River Bhogdoi

Sl. No.	Parameters	Upstream	Downstream
1	Water Color	Light Copper Red	Clear or Pale Green
2	Air temperature ^{0}C	15.3	16.6
3	Water temperature ^{0}C	16.4	17.8
4	pH	6.6	7.1
5	Dissolved Oxygen (mg/L)	4.1	5.1
6	Free Carbon dioxide (mg/L)	6.4	7.4
7	Total Alkalinity (ppm)	109	87.4

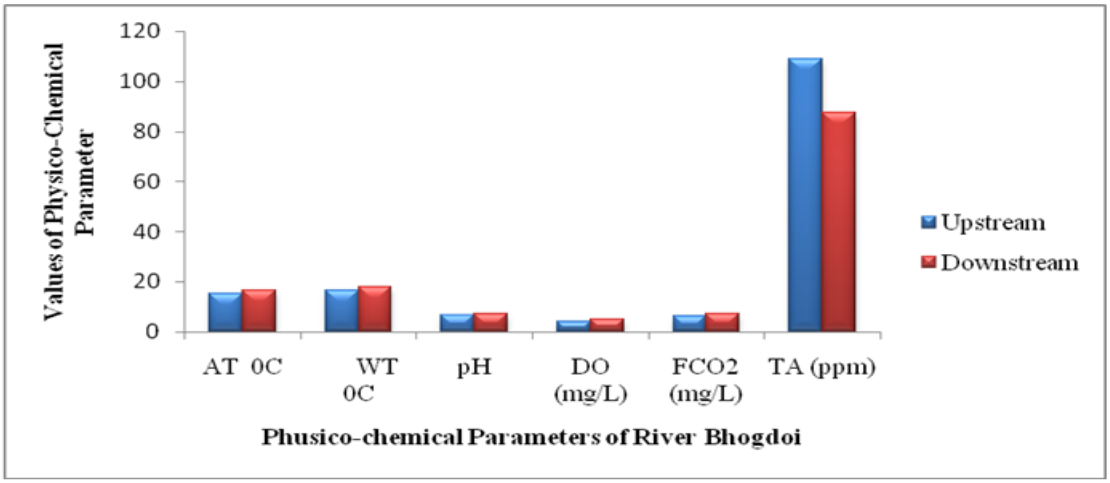

Figure 4: Variation of physico-chemical parameters in upstream and downstream of River Bhogdoi

Table-5: Pearson correlation of Physico-chemical Parameters of River Bhogdoi in upstream and downstream

	AT ^{0}C	WT ^{0}C	pH	DO (mg/L)	FCO_2 (mg/L)	TA (ppm)
AT ^{0}C	1					
WT ^{0}C	1	1				
pH	1	1	1			
DO (mg/L)	1	1	1	1		
FCO_2 (mg/L)	1	1	1	1	1	
TA (ppm)	-1	-1	-1	-1	-1	1

IV. Conclusion

The present study was done for a shorter duration i.e. from January 2015 to May 2015 in River Bhogdoi, therefore some common fish species which were found in other season could not be collected. In these sites Cyprinidae family was the most abundant, which includes 11 species and Clariidae, Siluridae, Schilbeidae, Sisoridae and Mastacembelidae was found lowest in number. The observation indicated that the quality of water was within the favorable limits for fishes. As our study was done for only four months so in some cases it shows less significance which may be because of less study period time.

The results showed that downstream of River Bhogdoi were more polluted than that of upstream; because of the sewage and wastage that comes from the nearby town. There is no significance chance in the pH value during the observation period. The physico-chemical characteristic of River Bhogdoi in the study area suggested that there was no harmful chemical contamination.

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References

[1]. Talwar, P. K. and Jhingran, A. G. Inland Fishes of India and Adjacent Countries. Oxford and IBH Co., Pvt. Ltd. (New Delhi), India. Vol. I and II, pp. xix + 1158, 1991.
[2]. Das, B. K.; Boruah, P. and Kar, D., Study of Seasonal Variation of Water Quality of River Siang in Arunachal Pradesh, India. IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT). 8 (2IV): 11-20, 2014.
[3]. Das, B. K., Dutta, B., Kar, S., Boruah, P. and Kar, D., Icthyofauna of Subansiri River in Assam and Arunachal Pradesh, India. International Journal of Current Research, 5, (11), 3314-3317, 2013.
[4]. Jayaram, K. C. (2010). The freshwater fishes of the Indian region. Narendra Publishing House (Delhi), India. Second Revised Edition. pp. xxxi + 616.
[5]. Kar, D., Nagarathna, A. V., Ramachandra, T. V. and Dey, S. C., Fish diversity and conservation aspects in an aquatic ecosystem in northeastern India. Zoos Print J, 21: 2308-2315, 2006.
[6]. Kar D. and Sen, N., Systematic list and distribution of fish biodiversity in Mizoram, Tripura and Barak drainage in North East India. Zoos print Journal, 22 (3): 2599-2607, 2007.
[7]. Sen, N., Occurrence, Distribution and Status of Diversified Fish Fauna of Northeastern India, pp 31-48. In: Ponniah A.G.; Sarker U.K. Fish Biodiversity of North-East India. NATP Publication No 2. NBFGR, Lucknow: 228, 2000.
[8]. Das, S. J., Role of the River Bhogdoi in Socio-Economic Development of Population in Its Basin of Assam. India Research Journal of Geography, 1 (2): 1-10, 2014.
[9]. Day, F., The fauna of British India, including Ceylon and Burma: Fishes. 1 and 2: 509-548, 1889.
[10]. Roberts, R. J., Fish Pathology. Bailliere Tindall (London), pp. x + 318, 1978.
[11]. Sen, N., On a collection of fishes from Subansiri and Siang districts of Arunachal Pradesh, Rec. Zool. Surv. India, 97 (Part 1): 141-144, 1999.
[12]. Viswanath, W., Fish Fauna of Manipur, Manipur Association for Science and Society, Imphal (Manipur), India, pp.143, 2000.
[13]. Vishwanath, W., Fishes of North East India: A field guide to species Identification. Manipur: National Agricultural Technology Project. Manipur University, India, pp. 198, 2002.
[14]. Kar, D. Fundamentals of Limnology and Aquaculture Biotechnology. Daya Publishing House, New Delhi. India, pp. xvi + 609, 2007.
[15]. Kar, D., Wetlands and Lakes of the World. Springer Publications (London). pp. xxx + 687, 2013.
[16]. IUCN, The Red List of Threatened Species. Version 2014. 2. Available at: www.iucnredlist.org (Data Accessed: 14 July 2014), 2014.
[17]. APHA., Standard Methods for the Examination of Water and Wastewater. American Public Health Association (USA). Washington, USA. Twenty Edition, 2605, 1998.
[18]. APHA., Standard Methods for the Examination of Water and Wastewater, American Public Health Association (USA), Washington, USA. Sixteen Edition, pp. 1-10, 2010.
[19]. Fakayode, S. O., Impart of Industrial effluent on water quality of the receiving Alero River in Ibadan, Nigeria, Ajeam-Ragee, 10 (1), 2005, 1-13.
[20]. Wetzel, R. G. and Likens, G. E., Limnological Analysis, Third Edition, Springer-Verlag, New York, 391, 2006.

Anabas testudineus

Mystus tengara

Ompok bimaculatus

Channa punctata

Puntius sophore

Cirrhinus mrigala