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A comparative study of the seasonal trend of Biological Oxygen Demand, Chemical Oxygen Demand and Dissolved Organic Matter in two fresh water aquaculture ponds of Assam

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Abstract
Seasonal variation of BOD, COD and DOM were studied in two perennial aquaculture ponds located at Gauhati University Campus, Guwahati, Assam India. One of the experimental pond is manually managed with the application of lime and inorganic and organic fertilizer. The other is a naturally maintained pen culture pond recovered from a part of swamp without addition of lime and fertilizer. The reclaimed zone of natural pond is separated from the perennial swamp by bamboo screen. All the three organic parameters of water BOD, COD and DOM maintain higher profile in manually managed pond with high degree of fluctuation. Results of all three parameters verify that both the ponds are free from pollution.

Keywords: manually managed pond, natural pen culture pond, BOD, COD, DOM

1. Introduction
The productivity of freshwater community that determines the fish growth is regulated by the dynamics of its physicochemical and biotic environment (Wetzel, 1983) [13]. For successful fish production from a water body, it is important to study the physicochemical factors, which influence the biological productivity of the same. The property of water regulate the fish food organism and other bio-community in an aquatic ecosystem and thereby helps in the process of fish productivity, because the biological productivity of any water body is mostly influenced by the quality of water column of aquaculture system. The pollution caused on the other hand is also an important criterion for successful fish production. Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Dissolved Organic Matter (DOM) are used to know the pollution status of an aquaculture system.
In view of the importance of pollution status in a pond ecosystem the present work has been carried out in two perennial fish located at Gauhati University Campus, Guwahati, Assam, India ponds to know the status of pollution.

2. Materials and Methods
2.1. Site description: The present work deals with the seasonal fluctuation of Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and Dissolved Organic Matter (DOM) of water in two fresh water aquaculture ponds named as Pond A (treatment pond, manually managed with the application of lime and inorganic and organic fertilizers) and Pond B (natural pen culture pond, recovered from a part of swamp without addition of any fertilizer) located at Gauhati University Campus, Guwahati, Assam, India. The two ponds are located within the latitude of $26^0 09' 26''$ N and longitude of $91^0 40' 21''$ E. During the study period the natural pond is reclaimed from the part of perennial swamp by bamboo screen. Pond A is triangular in shape with a surface area of 1.4 hac and pond B is rectangular sized pond with a surface area of 0.5 hac (Deka and Goswami, 2011) [4]. Three sides of the Pond B are completely surrounded by swamp. In both the ponds high density of plankton were recorded in monsoon season of the year (Deka and Goswami, 2015) [5] along with high rainfall which are common phenomenon (Deka, 2012) [3] in Assam.

2.2 Sampling: To study the seasonal variation of BOD, COD and DOM, the waters were collected monthly during November 2007 to October 2009 from surface and bottom layers of the studied ponds of randomly selected spots following the sampling procedure of Jhingran *et al*. (1969) [6]. Since the degree of variation of different properties of surface and bottom samples are mostly variable, so both the samples were mixed to represent the sample of the pond as a whole. The water samples were collected in the morning hours between 8.00 A.M. to 8.30 A.M. The parameters were analysed at the laboratory situated at the spot and analysed following "Standard Methods for Examination of Water and waste Water", A.P.H.A (1998) [1], "Manuals on Water and Waste Water Analysis", N.E.E.R.I. (1989) [10]. BOD was measured by incubating the sample in a BOD incubator at 20 ^{0}C for 5 days followed by estimation of dissolved oxygen content using modified Winkler's method (APHA, 1985; APHA, 1998) [1, 2]. All the results are expressed as Mean ± SD.

3. Result: It is observed that BOD lies between 1.35 mg.l^{-1} and 4.5 mg.l^{-1} ($\bar{x}$=3.06±0.89) in Pond A. In Pond B it ranges between 0.55 mg.l^{-1} and 2.95 mg.l^{-1} ($\bar{x}$=1.58±0.57), which has been depicted in Figure 1.

The COD of water in the studied ponds has been depicted in Figure 2. The COD of water is ranging between 4.0 mg.l^{-1} and 49.0 mg.l^{-1} ($\bar{x}$=23.13±12.89) in Pond A and 4.0 mg.l^{-1} and 36.5 mg.l^{-1} ($\bar{x}$=16.62±10.41) in Pond B.

BOD: COD value of water of Pond A is from 0.05 to 0.63 with an average of 0.19±0.13 and in Pond B from 0.04 to 0.43 with an average of 0.13±0.10.

The observed DOM value of the two ponds during two years of study period shows that the differences are not well marked. The DOM of water in the studied ponds has been depicted in Figure 3. The range of DOM in Pond A varies from 0.8 mg.l^{-1} to7.4 mg.l^{-1} ($\bar{x}$=3.59±1.79) and in Pond B from 0.4 mg.l^{-1} to 7.6 mg.l^{-1} ($\bar{x}$=2.59±1.57). The peak value is recorded in the month of June, 2008 as observed in both the ponds whereas the minimum value is recorded in the month of August, 2009 in Pond A and in Pond B it is recorded in the month of September, 2009.

Table 1: A Summary Of Bod, Cod And Dom Of Water Showing The Ranges, Mean And Standard Division (SD) (Nov 2007-Oct 2008 And Nov 2008-Oct 2009.

Parameters	Year	Pond	Range	Yearly Mean	SD
BOD (mg.l^{-1})	2007-2008	Pond A	1.6 to 4.5	3.1	0.82
	2008-2009		1.35 to 4.4	3.02	0.98
	2007-2008	Pond B	1.05 to 2.95	1.83	0.52
	2008-2009		0.55 to 2.2	1.34	0.53
COD (mg.l^{-1})	2007-2008	Pond A	7 to 36.5	21.27	11.14
	2008-2009		4 to 49	25	14.69
	2007-2008	Pond B	6.8 to 35.5	21.53	9.38
	2008-2009		4 to 36.5	11.71	9.28
DOM (mg.l^{-1})	2007-2008	Pond A	1.7 to 7.4	4.38	1.87
	2008-2009		0.8 to 5.3	2.8	1.72
	2007-2008	Pond B	1.3 to 7.6	3.29	1.72
	2008-2009		0.4 to 4.1	1.9	1.06

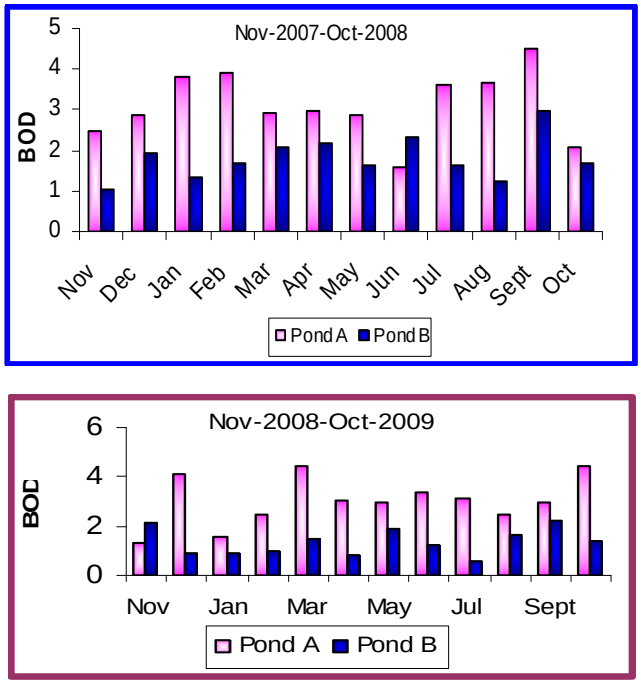

Fig 1: Monthly Variation of BOD (mg.l^{-1}) Of Water in Pond A and Pond B

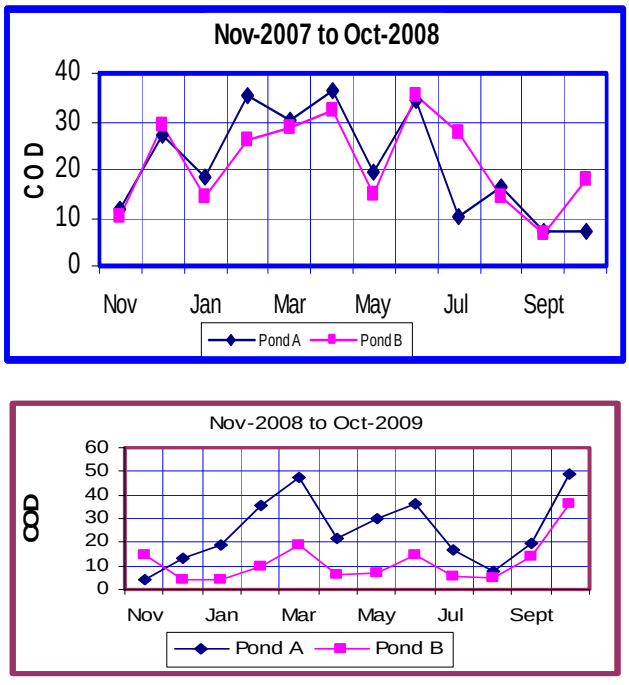

Fig 2: Monthly Variation of COD (mg.l^{-1}) Of Water in Pond A and Pond B

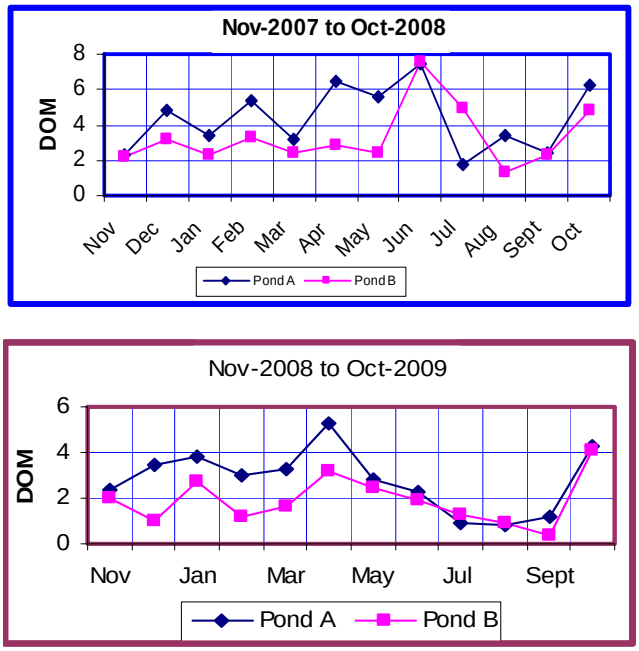

Fig 3: Monthly Variation of DOM (mg.l^{-1}) Of Water in Pond A and Pond B

4. Discussion: BOD is an indicator of organic load of water, which is used to monitor pollution of water (Rajan, 2015) [12]. Waters with BOD levels less than 4 mg.l^{-1} are regarded as clean and those with BOD levels greater than 10 mg.l^{-1} are considered as polluted as they contain large amounts of degradable organic matter (Mc Neely *et al*., 1979) [9]. In the present study BOD lies between 1.35 mg.l^{-1} and 4.5 mg.l^{-1} in Pond A and between 0.55 mg.l^{-1} and 2.95 mg.l^{-1} in Pond B which shows that both the ponds are not polluted. Moreover, BOD: COD values less than 1.0 so observed throughout the study period may also indicates that water may be free from pollution. Lower BOD so observed in monsoon season may be due to growth of phytoplankton and zooplankton (Patra *et al*., 2010) [11]. The higher BOD was found when the decomposition of the weeds occurs, which is an indication of assimilation of organic load and occurrence of more microorganisms (Nayak and Behera, 2004 [7]; Nayak *et al*., 2004) [7]. Oxygen consumed during oxidation of organic matter may be considered as an index of dissolved organic matter in water. In the present study dissolved organic matter ranges from 0.8 (Aug 2009) to 7.4 mg.l^{-1} (Jun 2008) in Pond A while 0.4 (Sept 2009) to 7.6 mg.l^{-1} (Jun 2008) in Pond B during investigation period. The causes of minimum concentration during the late monsoon period may be due to dilution of pond water by rain.

5. Acknowledgement
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6. References

1. APHA (American Public Health Association). Standard methods for the examination of water and wastewater. 120th ed. APHA/AWWA/WEF. Washington DC, 1998.
2. APHA. Standard method for the examination of water and waste water. American Public Health Association, Washington DC, 1985.
3. Deka P. Assessment of nutrient dynamics and productivity of an aquaculture system, Ph.D Thesis Gauhati University, Assam, 2012, 230.
4. Deka P, Goswami MM. A comparative study of the seasonal trend of Physicochemical Parameters in two types of fresh water aquaculture ponds of Guwahati, Assam J Aquacult. 2011; 12(2):167-175.
5. Deka P, Goswami MM. Heleoplankton productivity at lower trophic level in two types of aquaculture ponds, Guwahati, Assam. International Journal of Fisheries and Aquatic Studies. 2015; 3(1):57-61
6. Jhingran VG, Natarajan AV, Banerjea SM, David A. Methodology on reservoir fisheries investigations in India. Bull Cent, Inland Fish, Res, Inst. Barrackpore 1969; 12:109.
7. Nayak BK, Behera DP. Seasonal variation of some physic chemical parameters of Chilika Lgoon (east coast of India) after opening the new mouth, near Sipakuda. Orissa, Indian J Mar Sci. 2004; 33(2):206-208.
8. Nayak BK, Acharya Panda UC, Nayak BB, Acharya SK. Variation of water quality in Chilika Lake, Orissa, Indian J Mar Sci, 2004; 33(2):164-169.
9. Neely Mc, Neimanis RN, Divya VPL. Water quality sources book. A guide to water quality parameters, 1979, 112.
10. NEERI. Manuals on water and waste water analysis, 1989, 320.
11. Patra AP, Patra JK, Mahapatra NK, Das S, Swain GC. Seasonal Variation in Physicochemical Parameters of Chilika Lake after Opening of New Mouth near Gabakunda, Orissa, India, J World Journal of Fish and Marine Sciences. 2010; 2(2):109-117.
12. Rajan Divya S. An Assessment of the Biological Oxygen Demand of Thekkumbhagam creek of Ashtamudi estuary, J Intrnational Journal of Fisheries and Aquatic Studies. 2015; 2(6):395-397.
13. Wetzel RG. Limnology, 2nd ed. Saunders Co, Philadelphia, 1983, 860.