e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:04/April-2021 Impact Factor- 5.354 www.irjmets.com

STUDY OF SEASONAL VARIATION OF PHYSICO-CHEMICAL PARAMETERS IN CONTEXT OF CONSERVATION OF GHORAMARA BEEL , MOINAPARA, GOLAGHAT, ASSAM

Dhritiman Talukdar*[1], Md. Sajidur Rahman*[2]

*[1] Assistant Professor, Dept. of Zoology, D.R. College, Golaghat, Assam, India.

*[2] Assistant Professor, Dept. of Zoology, Namrup College, Namrup, Assam, India.

ABSTRACT

Physico-chemical parameters play an important role in maintaining a perfect aquatic ecosystem of wetland. The area of our investigation was Ghoramara beel of Golaghat district, Assam (26°29'20''-26°29'45''N and 93°55'46''-93°56'46''E). The study was done from June,2019 to May, 2020 which involved the analysis of 7 physico-chemical parameters of water ,viz; P^H , salinity, turbidity, temperature, TDS, conductivity, DO and evaluation of the season-wise variation of these parameters. The survey and water collection was carried out in all the four seasons viz;winter(January-February), pre-monsoon(March-May),monsoon(June-August) and post-monsoon(September-December). Temperature was maximum in monsoon and minimum in winter. P^H was maximum in winter and minimum in pre-monsoon. TDS, salinity and conductivity were minimum in pre-monsoon and maximum in post-monsoon while turbidity was minimum in post-monsoon and maximum in monsoon. DO was minimum in monsoon but maximum in the winter. Among these parameters, P^H and temperature play the most important role in this wetland ecosystem. The study also revealed destruction of the wetland habitat. Moreover, degradation of the wetland is a major concern owing to mostly fishery production. Anthropogenic pressure like grazing, overfishing, fragmentation of the wetland by fisherman by accumulating water hyacinths in the beel for business purposes are among major concerns.

Keywords: Beel, Physico-chemical, Ecosystems, parameters, Wetland.

I. INTRODUCTION

Limnology is also called as freshwater science or the study of inland water, regarded as a division of ecology or environmental science. This covers the biological, chemical, physical and geological and other attributes of all inland water. The different limnological parameters are temperature, pH of water and soil of the waterbody, temperature, TDS (total dissolved solid), conductivity, salinity, turbidity, D.O. (dissolved oxygen) of water as well as nitrogen, phosphorous and potassium content of soil etc. Limnological parameters plays an important role in maintaining a perfect aquatic ecosystem. One of the essential parameters is temperature affects a number of physical, chemical, and biological processes in natural aquatic systems.

Biologically, one of the most important effects of temperature is the decrease in oxygen solubility as the temperature increases. As a result, the increase in temperature can increase the oxygen demand of biological organisms such as aquatic plants and fish. The pH of water is an important general water quality indicator because pH is a major factor in most chemical and biological reactions. Therefore, the pH range of 6.5 to 9.0 units would be suitable for the protection of aquatic habitats. The dissolved oxygen (DO) concentration of a wetland is an important indicator for determining the conditions of a wetland. Analysis of DO helps in the determination of productivity through the photosynthetic activity of algae and weed as well as the physical-chemical properties of wetland the composition of biota through DO concentrations. Conductivity, a major factor is a measure of the ability of water to conduct an electric current and is dependent on the number of dissolved ions in solution. Conductivity is closely related to, and highly correlated with, the concentration of dissolved solids within the water column. Another essential parameter is turbidity, the measure of suspended particles (such as plankton, microscopic organisms, silt, clay, and/or organic matter etc) within the water column. Nutrients are important parameters and phosphorous and nitrogen are major nutrients required for the growth of algae and rooted vegetation in a water body.

Studies of wetland in Assam are restricted to Dey (1981) who estimated the presence of 1,392 wetlands in the state of Assam. Deuri and Lahon (1987) studied the effect of embankments, sluice gates and similar structure in

the fisheries of Nagaon and Kamrup districts. Again, different wetlands of Barak valley of Assam were studied by Nath (1987) and Kar and Dey(2000). Most significant contributions on beel ecology are those of Agarwala in Tamranga wetland; Biswas and Boruah(2000) in lentic and lotic water bodies of upper Brahmaputra basin; Dutta (2002) in "closed" and "open" bceels in upper Assam; Bera et al . (2008) in Deeporbeel ; Singh et al., (2009); Dakua et al., (2009); in Maijanbeel ; Hussain & Biswas (2011) in wetland of Dhemaji ; Paswan et al. (2012) in Borsala beel of Jorhat.

II. MATERIAL AND METHODS

The experiment was undertaken in Ghoramara beel (wetland) of Golaghat district during June,2019 to May, 2020. This wetland is about 5 kms from Golaghat town. The wetland is located in geographical ordinance of 26°29'20''-26°29'45''N and 93°55'46''-93°56'46''E. Earlier this was a part of Dhansiri river. The study period for water parameters was divided into four seasons viz. winter (December- February), pre- monsoon (March-May), monsoon (June- August), post- monsoon (September- November) and the study period for soil parameters was divided into four months from September to December.

For water analysis, different probes and cells of Deluxe water and soil analysis kit- model LT-60 were used. The different parameters of water are measured in the following ways:

- Temperature measurement: To measure the temperature, at first the temperature probe is connected at the temperature input socket keeping the function switch at TEMP. position. As the probe is dipped in the water sample, the display will indicate the temperature of the sample.
- Measure of pH: For the measurement of pH two buffer solution, namely 7pH and 4pH are required. At first the function switch is put to pH mode. Then the electrode is rinsed with distilled water. After drying with the help of tissue paper. Then the electrode is connected to BNC plug at the input socket followed by putting the electrode in buffer solution 7pH. The temperature is set by adjusting temperature compensation knob to the temperature of the buffer solution. Then the electrode is taken out from the 7ph buffer solution and after rinsed with distilled water and drying, is put in 4pH buffer solution. The displayed value is adjusted to 4.00 by adjusting the SLOPE control. After that the electrode is taken out from the 4pH buffer and rinsed. The above process is repeated again. Now the electrode is put in the solution which is going to be measured.
- Method for measurement of conductivity: For the measurement of conductivity at first the cond. /TDS cell is cleaned with distilled water followed by drying and connecting at the cond./TDS input . Putting the function switch at Cond. Position, The cell is dipped in solution under test.
- Measurement of TDS: For the determination of TDS, the same process is repeated as we have done in cond. measurement, but here the function switch should be at TDS position .
- Measurement of salinity: Salinity can be measure with the help of the cond./TDS cell by putting the function switch at the salinity position .
- Measure of turbidity: Turbidity measurement is done in the turbidity sampler (TS). For this, the sampler is connected to the instrument sampler socket through TS connecting lead. After switching on the turbidity function the TS is allowed to warm out for two minutes. A test tube containing distilled water is taken into sampler followed by closing the lead of the TS and adjusting the display 000 by adjusting zero set knob.Now the formal test tube is replaced by an another test tube containing standard solution (200 NTU) . Then the caliberate knob is adjusted to read 200 NTU. Now the test tube containing distilled water is again put in the TS to check whether the display show zero or other value. If it shows zero, then the measurement of the suspension under test is done.
- Measure of DO (dissolved oxygen): For DO the water sample should be collected In a DO bottle. In the process of DO measurement the membrane for DO probe is fitted on the lower part of the electrolyte tube and then it is filled with potassium chloride solution (7.5%) . Then it is screwed up tightly with the black plastic cap on silver electrode. While tightening the cap. Ensure that there should not be any air bubbles in the tube along the electrode. The DO probe is inserted in the DO socket and the instrument is caliberated by using 2% sodium sulphite solution, keeping the temperature knob to the actual temperature of solution,

and by using CAL knob and zero knob. After caliberation, the instrument is ready for the measurement of the DO of the sample to be tested.

III. RESULT AND DISCUSSION

Physico-chemical parameters of Ghoramara beel have been conducted during January' 2020 to December' 2020 (Table-I). Surface water temperature fluctuated from21.3 to 31.4°C with an average value of 26.4°C.Water temperature lowest and highest values were recorded during winter and monsoon season respectively (Fig.1). Temperature of the water has profound effects on the chemistry and biochemical reactions in the organisms present in water. pH was found to be lowest (6.8) and that of highest (7.4) during September and February respectively with an average value of 7.1. The minimum pH was observed in postmonsoon and that of maximum in winter (Fig.1). Water bodies were slightly alkaline features and found within the permissible limit of 6.5 to 8.5 (BIS-1982).

Turbidity of water was varied between 11 (October) and 43 NTU(June) with an average value of 27 (NTU). Higher rate of turbidity was recorded in monsoon and minimum value was observed in October (Fig. 2). Turbidity reduced light penetration in the water that affected photosynthesis process of Phytoplankton as well as reduced productivity of the beels.

Dissolved oxygen was ranged from 5.8(June) to 7.8 PPM (October) with an average value of 6.8 PPM. Seasonal variation of dissolved oxygen has been observed throughout the entire study period. Maximum dissolved oxygen was recorded in postmonsoon and gradually decreased from premonsoon onwards(Fig. 2). A seasonal fluctuation of DO is also reported earlier from Indian lentic water Dey,1981; Lahon, 1983; Goswami, 1985; Yadava, 1987; Agarwala, 1996; Kalita and Goswami, 2006;Jhingran and Pathak, 1987).Several workers have reported variable dissolved oxygen level in the beels of Assam.

Salinity of water was ranged from 0.2(March) to 4.5PSU (September) with an average value of 2.4PSU. Seasonal variation of salinity has been observed throughout the entire study period. Maximum salinity was recorded in post monsoon and gradually decreased from winter onwards and reached minimum in premonsoon. Salinity implies the measure of saltiness of a water body. Low salinity implies the sites have more dissolved oxygen which is required for the aquatic life.

In the current study the TDS values ranged from0.14 to 0.53 with an average value of 0.34. Seasonal variation of TDS has been observed throughout the entire study period. Maximum TDS was recorded in postmonsoon and minimum in premonsoon. High TDS values imply the increased nutrient status of water body which leads to eutrophication of aquatic bodies as repoted by Swarnalatha et al.(1998) & Singh et al.(2005).

Conductivity of water was ranged from 0.2 to 0.57 mS/cm with an average value of 0.39 mS/cm. Seasonal variation of Conductivity has been observed throughout the entire study period. Maximum Conductivity was recorded in September and minimum in May.

Table I: Physicochemical parameters of Ghoramara Beel

Characteristics of water	Range	Mean
Water temperature ^{0}C	21.3-31.4	26.4
pH	6.8-7.4	7.1
DO ppm	5.8-7.8	6.8
Turbidity(NTU)	11-43	27
Salinity(PSU)	0.2-4.5	2.4
T.D.S.	0.14-0.53	0.34
Conductivity(mS/cm)	0.2-0.57	0.39

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:04/April-2021 Impact Factor- 5.354 www.irjmets.com

Table 2: Physicochemical parameters of the water samples

Seasons	Samples	Temperature (°C)	pH	T.D.S.	Conductivity (mS/cm)	Salinity(PSU)	Turbidity (NTU)	DO (ppm)
Monsoon (June-August)	I	30	6.9	0.27	0.29	2.2	43	3.8
	II	30	7.5	0.29	0.33	2.1	26	7.6
	III	30	7.7	0.3	0.35	2.1	33	7.5
	IV	30	7.1	0.25	0.27	2	30	7.3
	V	30	7	0.24	0.27	2	29	6.5
Post-monsoon (September-October)	VI	31.4	6.8	0.32	0.36	2.4	24	6.4
	VII	30	7.3	0.53	0.57	4.5	18	7.1
	VIII	30	7.3	0.46	0.48	4.5	19	7.4
	IX	25	7.3	0.46	0.5	4.1	11	7.5
	X	25	7.2	0.46	0.45	4.1	14	7.8
Winter (December-February)	XI	21.3	7.3	0.32	0.38	2.2	16	7.3
	XII	21.3	7.4	0.28	0.33	2.2	20	7.2
Pre-monsoon (March-May)	XIII	25.9	7.1	0.15	0.22	0.2	22	6.8
	XIV	25.8	7.1	0.14	0.2	0.3	18	6.9

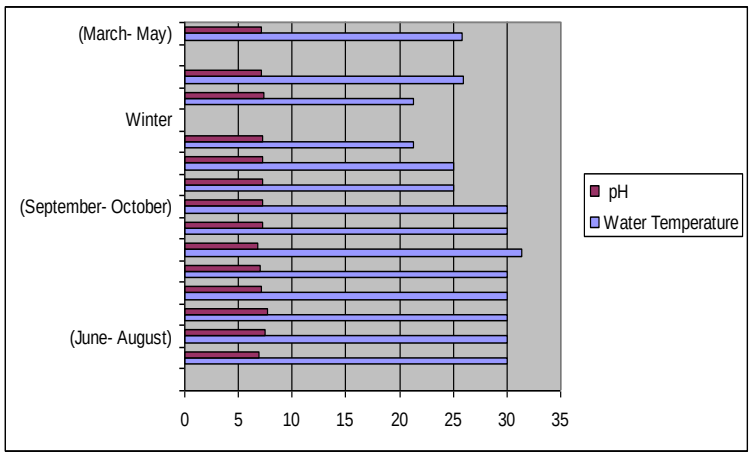

Fig. 1: Seasonal variation of pH/Water temperature

e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
Volume:03/Issue:04/April-2021 Impact Factor- 5.354 www.irjmets.com

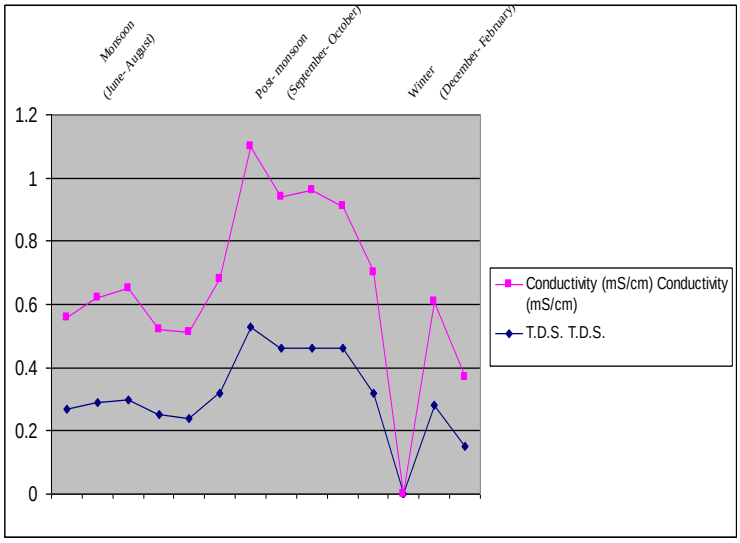

Fig. 2: Seasonal variation of Conductivity/TDS

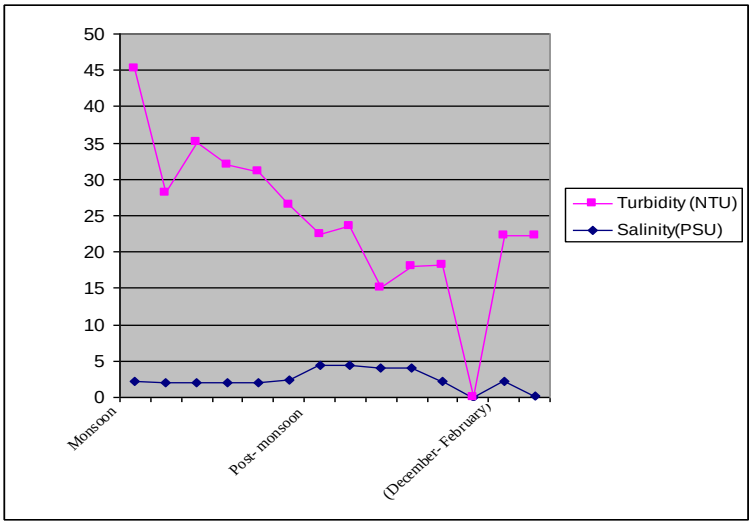

Fig. 3: Seasonal variation of Turbidity/Salinity

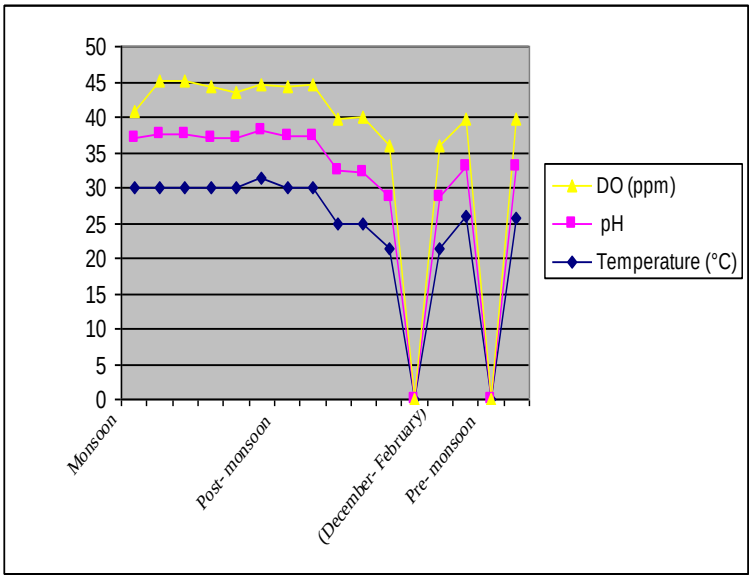

Fig. 4: Seasonal variation of pH/Water temperature/ DO

IV. CONCLUSION

All these discussions clearly indicate that limnological characters or parameters fluctuate or change monthly or seasonally. These variations are due to ecological factors. These influence the life of aquatic animals and the ecosystem at that particular time.

V. REFERENCES

[1] Abujam, S. K. S., Dakua, S., Bakalial,B.,Saikia, A. K., Biswas, S. P. and Choudhury, P., Diversity of Plankton in MaijanBeel, Upper Assam. Asian J. Exp. Biol. Sci., 2(4): 562-568., (2011)

[2] Acharjee, B., Comparative study of limnology and fisheries of three beels of lower Assam. Unpublished Ph.D. thesis, Gauhati University., (1997)

[3] Acharjee, B., Choudhury, M., Dutta, A. & Goswami, U. C., Productivity and fish yield in the beels of lower Brahmaputra. Basin. Indian J. Fish., 45(4): 419-427.,(1998)

[4] Acharjee, B., Dutta, A. &Choudhury, M.,Role of physico-chemical parameters in the evaluation of productivity of Dighalibeel, Assam. Environ. &Ecology, 17(2): 274-279., (1999)

[5] Agarwala N. K., Limnology and fish productivity of Tamranga wetland in Bangaigaon district of Assam (India) with special reference to some productivity indicator, PhD Thesis, Gauhati University, Assam, pp. x+200., (1996)

[6] APHA.,Standard Methods for Examination of Water and Wastewater. 20th Edition, AM Public Health Assoc, Washington D.C., (1998)

[7] Bera, S. K., Dixit, S., Basumatary, S. K. &Gogoi, R., Evidence of biological degradation in sediments of Deeporbeel Ramsar site, Assam as inferred by degraded Palynomorphs and fungal remains. Current Science, 95(2): 178-180., (2008)

[8] BIS,Tolerance limits for inland surface waters subject to pollution. 2296 p., (1982)

[9] Biswas, S. P. and Boruah, S., Fisheries ecology of the North-Eastern Himalaya with special reference to the Brahmaputra River. Ecol. Eng., 16: 39-50., (2000)

[10] Dakua, S., Singh, A. S. K., Choudhury, P. and Biswas, S. P., A preliminary investigation on the fish and fisheries of Maijanbeel in upper Assam. Indian J.Environ. &Ecoplan., 16 (1): 263-270., (2009)

[11] Deuri, P. C. and Lahon, B., Flood control measures in Assam: Impact on beel fisheries. In: Workshop on Development of Beel Fishery in Assam. 21st and 22nd April, 1987, Assam Agricultural University., (1987)

[12] Dey, S. C., Studies on the hydrobiological conditions of some commercially important lakes (beels) of Kamrup district of Assam and their bearing on fish production, North- Eastern Council, Govt. of India, Shillong., (1981)

[13] Dutta, P. K., A comparative study of the hydrobiology and fisheries of open and closed beels in Jorhat district of Assam. Ph.D. Thesis (unpublished), Dibrugarh University, India., (2002)

[14] Goswami, M. M., Limnological investigation of a tectonic lake of Assam, India and their bearing on fish production. Unpublished Ph.D. Thesis, Gauhati University, Assam., (1985)

[15] Goswami, N., Studies on the productivity indicators in three different types of wetlands of ssam, India, PhD Thesis, Gauhati University, Assam, pp. iv+217., (1997)

[16] Hemalatha, B. and Puttaiah, E.T. , Fish Culture and Physico-chemical Characteristics of Madikoppa Pond, Dharwad Tq/Dist, Karnatak, Hydrology Current Research, 5,1, 2014, pp. 162.

[17] Hussian, Md. and Biswas, S. P., Physicochemical characteristics of a floodplain lake of Dhemaji in upper Assam.Bull. Life. Sci., 16: 81-91., (2011)

[18] Islam, M. , Ahmed, A.M. and Barman, B.. Studies on physio-chemical properties of water in some selected sites of Deepor Beel (Ramsar site), Assam, India. The Clarion, 3, 2, 2014, pp. 25-32.

[19] Jhingran, A. G. and Pathak, V., Ecology and management of beels in Assam- A case study of three beels, p. 16-36 In: Compendium Proc. Workshop on Development of Beel Fisheries in Assam. Assam Agricultural University, Khanapara, Guwahati., (1987)

[20] Kalita, T. C. and Goswami, M. M.,Microhabitat of Monopteruscuchia (Hamilton and Buchanan, 1822): A case study in wetlands of Goalpara District of Assam. Aquacult., 7(1): 43-52 p., (2006)

[21] Kar, D., An account of physico-chemical characteristics of twenty lentic systems in relation to Eutroiphica status in Barak valley region of Assam. In: National Symposium on Current Trends and Wetlands and Fisheries Research in the New Millennium, 8-9 Nov. 2000 at Assam University, Silchar., (2000)

[22] Kar, D. and Dey, S. C., Yield and conservation of Indian major carps of lakeSone in Assam. Env.&Ecology, 18(4): 1036-1038., (2000)

[23] Lahon, B., Limnology and fisheries of some commercial beels of Assam, India. Unpublished PhD. Thesis, Gauhati University, Assam, 349 p., (1983)

[24] Nath, P., Systematics, Distribution andEcology of Ichthyofauna of Arunachal Pradesh with particular reference to the Limno-biology of Itanagar Lake, PhD Thesis, Gauhati University, pp. xvii+362, Assam , INDIA., (1987)

[25] Paswan, G., Singh, A. S. K., Biswas, S. P. and Dey, M., A Study of Certain Physico-Chemical Parameters of BorsolaBeel (Wetland) of Jorhat. (Ed.) Proc. National seminar on 'Current Issues of Conservation and Wise Use of Wetlands in North Eastern Region of India', 291-297 p., (2012)

[26] Sharma, P. K., Systematic distribution and ecology of Zooplankton in some floodplain wetlands of Assam, India, Ph. D. thesis, Gauhati University, pp. 236., (2000)

[27] Singh, A. S. K., Dakua, S. and Biswas, S. P., Physico-chemical parameters and fish enumeration of Maijanbeel (wetland) of upper Assam.Geobios, 36: 184-188., (2009)

[28] Singh, R.P. and Mathur, P.; Investigation of variations in physico-chemical characteristics of a fresh water reservoir of Ajmer city, Rajasthan. Indian Journal of Environmental Sciences, 9, 1, 2005, pp.57-61.

[29] Sreenivasan, A., Limnological studiesand fish yield in three upland lakes ofMadras, India. Limnol.Ocenogr.,9(4):564-575., (1964)

[30] Swaranlatha, N. and Rao, A.N., Ecological studies of Banjara lake with reference to water pollution. Journal of Environmental Biology, 19, 2, 1998, pp.179-186.

[31] Trivedy, R. K. and Goel, P. K., Chemical and Biological Methods for Water Pollution Studies. Environmental Publication Karad (India)., (1986)

[32] Yadava, Y. S., Studies on the limnology and productivity on an ox-bow lake in Dhubri district of Assam, India. Unpublished PhD Thesis, Gauhati University, Assam., (1987)

[33] Yadava, Y. S. and Chaudhury, M.,'Banas' fishing in beels of Assam. Bombay Nat. Hist. Soc., 82(2):452-456., (1986)

[34] Yadava, Y. S., Singh, R. K., Choudhury, M. and Kolekar, V., Limnology and productivity of Dighalibeel (Assam).Trop. Ecol., 28:137-146., (1987)