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Research Article

Zooplankton Diversity and Limnological Parameters of Salchapra Anua, an Oxbow Lake in Silchar, Assam

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Abstract:

Limnological parameter and plankton diversity are an important criterion for determining the suitability of water for irrigation and drinking purpose. Lake Pichhola has greatest importance for humankind. The specific status of limnological characteristic and diversity of plankton in lake Pichhola have been studied through seasonal surveys in two annual cycles (2005-06 and 2006-07) and annual survey of fishes in two annual cycles (2005-06 and 2006-07). The water remained moderately alkaline (pH 7.5) while electrical conductance (0.3958 mS/cm), TDS (237.5mg/l), chloride (176mg/l), hardness (174.33mg/l) and alkalinity (207.16mg/l) showed low mean values. Average dissolved oxygen levels were at 5.75mg/l while average nitrate and phosphate levels were 3.70mg/l and 2.79mg/l respectively. On the basis of water quality parameters in general, lake Pichhola was found to be eutrophic. A high rate of primary production (302.085mgc/m2 /hr), diversity of phytoplankton (58 forms), zooplankton (104 forms) and fish (15 species) were also observed during the study period. Therefore, lake Pichhola has rich number of species and biodiversity of aquatic animals.

Keywords: aquatic, limnology, sampling, water quality

Introduction

The earth is occupied less than 0.3% of inland lakes and reservoirs by volume that provide important resources and ecosystem services to humans. Life within an aquatic body is mainly run by balance physico-chemical parameters and correlation among them that can be used as a basis to study trophic status variables within it further helps to manage them (Wetzel, 2001). Moreover, the diversity, distribution, abundance of plankton and the variation according to the abiotic factors afford information of energy turnover in the aquatic ecosystem (Forsberg, 1982).In any form of size, depth and origin, a lake acts as an ecosystem with complex interactions among all biotic and abiotic components within it (Likens, 2009).In this study we will attempt to understand the interrelation between major physico-chemical parameters and limno-plankton diversity pattern in a stagnant but shallow lake of central Nepal.

In Nepal, limnological studies of lotic and lentic water bodies were conducted after

1960. Löffler, 1969) explored physico-chemical and biological aspects of 24 high altitude lakes (4500-5600m asl) of Nepal. Since then over 150 publications on limnology of lakes were conducted until 2010 (Bhuju et al. 2012). In Lake Rupa, some study presented a bathymetric map (Ferrow and Swar 1978),comparative study on limnology of three major lakes of Pokhara valley with major focus on physico-chemical parameters and nutrient loads (Rai, 2000). Also, other researchers Gurung (2007), Kunwar (2012), Gurunget al., (2009), Swar and Fernando (1980) and Oli (1996) did different aspects of limological studies of the Lake Rupa. Most of them were focused on studying seasonal variations on physico-chemical parameters and or biological parameters like planktons, macrophytes, aquatic weeds and fish species as separate factors.

Literature Review

Gyanendra Gautam (2016) We investigated the diversity of limnoplankton along with habitat parameters in a shallow Rupa Lake, one of the major fishery resources in Pokhara valley of Central Nepal. We conducted field visit from June to December 2002 and collected water samples from three sampling sites. We analyzed temperature, depth, transparency and pH of water in the field and further we collected samples from all sites separately to identify rest of the water quality parameters. Water samples for zooplanktons were collected by using Wisconsin's Plankton Net and for phytoplanktons, water samples were stored in plastic bottles and fixed with Lugol's solution (1%). All of the physico-chemical parameters were fluctuating in similar pattern in all sites throughout the study period. Sites II and III were possessing comparatively less dissolved oxygen than site I except during July and August. Nitrates and phosphates were recorded in higher concentrations from site II and III than site I during most of the study period. we found the zooplanktons from three different groups as Rotifera (38%), Cladocera (35%) and Coopepoda (27%). Also, we observed highest density of zooplanktons (1123/L) in December from site II whereas the lowest density (357/L) in August from site I. We detected 20 species of phytoplankton from seven families, where Bacillariophyceae (41%) was most dominant family followed by Chlorophyceae (24%) and Cyanophyceae (15%). Maximum density of phytoplankton (5730/L) was recorded in November (site II) and minimum (666/L) was observed in July (site I).

Masuma Ferdaush Laskar (2017) Zooplankton diversity and Limnological parameters are the most important criteria for determining the suitability of an aquatic ecosystem for any kind of aquacultural programme. Water quality of the freshwater habitats provides information about the existing resoureces which depend on physico-chemical parameters and biological features. Some of the limnological parameters and Zooplankton composition of SalchapraAnua was studied for a period of six months from October, 2016 to March, 2017. The limnological parameters of the study site was found to be highest during the month of October, 2016. A total of 15 taxa belonging to three groups were recorded during the investigation of which 5 taxa were from Cladocera group, 4 from Copepoda and 6 taxa from Rotifera group. The highest Zooplankton abundance was recorded from the site during the month of October, 2016 and lowest during the month of February, 2017. Cladocera contribute highest percentage of 43% of the total Zooplankton composition followed by 42% of Rotifera and 15% of Copepoda. Presence of highest percentage of Cladocera again depicts the better condition of the water body and can be used for aquacultural

program. Keywords: Zooplankton, Limnology, Cladocera, Anua, Aquaculture.

Devashish KAR (2019) Water is indispensably important for sustenance of life. Wetlands serve as potentialreservoirs of water which also harbour coveted bioresources, which sustain animal life. Fish isa potential bioresource for nutrition and offer work places for people. The Asian continent hasinnumerable wetlands with the Indian sub-continent portraying myriads of wetlands ofdifferent kinds, including perennial wetlands (locally called "Beel" or "Taal"), seasonalfloodplain wetlands ("Haor") and river-formed oxbow wetlands ("Anua"). In addition toplaying a pivotal role in providing nutrition and work places to the people, wetlands also play asignificant role in flood management, in regulating biogeochemical cycles, and above all,perhaps, in the rehabilitation of the innumerable fish stocks.

Sulata Kar (2016) Zooplankton are known to inhabit all freshwater habitats of the world as they are cosmopolitan in nature. They are the integral part of aquatic food web and contribute significantly to aquatic biological productivity in freshwater ecosystem. It is helpful in evaluating the ecological status of the freshwater reservoirs as they are important in nutritive level and as well as ameliorating pollution status and thus used for determining the health of an aquatic ecosystem. The present investigation reveals that the study site, Malini Beel a perennial freshwater wetland is rich in biodiversity. 29 taxa of zooplankton were registered from Malini Beel of which rotifera showing highest diversity of 17 taxa followed by that of cladocera with 8 taxa and copepoda with 4 taxa. Abundance status of zooplankton in the site shows high percentage composition of 52% by rotifera followed by 26% of cladocera and 22% by copepoda. High diversity of rotifera indicates the presence of suspended material in the waterbody which may lead to degradation of the perennial freshwater body. Thus, the present investigation may help the authorities for conservation and preservation of the freshwater perennial pond.

Materials and Methods:

Pichhola is an old lake believed to be constructed by a Banjara at the end of 14th century which later renovated in 1560 A.D. by Maharana Udai Singh. The river Sisarma, a tributary of the river Kotra is the main source of water for the lake. lake pichhola is situated in Udaipur district of Rajasthan at Latitude 24°34'N and Longitude 73°40'E. The water spread area of the lake is 6.96 Km. The length of the lake is 3.6 Km and the maximum depth of the lake is 8 m. towards the central western part. The maximum and mean width of the Lake is 2.61 and 1.93 Km. respectively. Lake Pichhola commands a total catchment area of about 12,700 hr.

Results and Discussion

During the study period, water temperature, pH, Dissolved Oxygen (DO), Free Carbon Dioxide (FCO2), Total Alkalinity were measured monthly for six months. Their values are depicted in Table 1. The limnological parameters of the study site was found to be highest during the month of October, 2016. pH of the Anua was found to be at par during the six months study period. DO and FCO2 were found to be highest during the month of October and lowest during the winter months i.e, December, 2016 – January, 2017. This depicts that the water body used as our study site is very much good for an aquacultural programme to carry on.

Table 1: Physico-chemical parameters of SalchapraAnua during the study period

PARAMETERS	OCT-16	NOV-16	DEC-16	JAN-17	FEB-17	MAR-17
Water Temperature (^{0}C)	25	23	20	19	21	24
pH	6.9	6.8	6.8	6.9	6.8	6.8
Dissolved Oxygen, DO (mg/l)	7.3	7.1	7	7	7.1	7.1
Free Carbon Dioxide, FCO_2 (mg/l)	0.9	0.7	0.6	0.5	0.6	0.5
Total Alkalinity (mg/l)	57	56	53	55	56	57

The present study reveals the Zooplankton composition and diversity of SalchapraAnua during the study period (Table 2). A total of 15 taxa belonging to three groups were recorded during the investigation of which 5 taxa were from Cladocera group, 4 from Copepoda and 6 taxa from Rotifera group. The highest Zooplankton abundance was recorded from the site during the month of October, 2016 and lowest during the the month of February, 2017. On a similar study in three different kind of freshwater waterbodies in Penang Island, Ismail and Zaidin, 2015 reported highest Zooplankton abundance on the month of November while the lowest in the month of February. Among all the Zooplankton groups, Rotifera was reported to be dominant among other groups during the period of investigation consisting of 6 taxa of which Filinia sp. shows highest abundance and Keratella sp. shows the lowest abundance all throughout the six months study. In Cladocera group, Moina sp. shows highest and Bosmina sp. shows lowest abundance while Copepoda group, Mesocyclops sp. shows highest abundance and Microcyclops sp. shows lowest abundance throughout the study period. Compared to all other taxa, Filinia sp. of Rotifera group was found to dominate the population of Zooplankton. Abundance of Rotifera group may indicate the presence of dissolved solids in the study site, as they are known to increase the growth of minor phylum of Zooplankton in the water body (Goswami and Mankodi, 2012). Fig 1 shows the percentage composition of Zooplankton in the study during the period of investigation. Cladocera contribute highest percentage of 43% of the total Zooplankton composition followed by 42% of Rotifera and 15% of Copepoda. Presence of highest percentage of Cladocera again depicts the better condition of the water body and can be used for aquacultural program. Fig 2 depicts the graphical representation of the abundance of three different groups during the study period. Cladocera shows highest abundance among other groups of Zooplankton present in the study site. Cladocera were found to be abundant during the month of October, 2016 whereas Copepoda and Rotifera was also found abundantly during the month of October, 2016. Lowest abundance of Zooplankton composition was found to be during the month of February, 2017.

Table 2: Monthly composition of Zooplankton groups in Salchapra Anua during the study period.

ZOOPLANKTON	OCT-16	NOV-16	DEC-16	JAN-17	FEB-17	MAR-17
CLADOCERA						
Diaphanosoma sp.	12	10	11	8	10	10
Sida sp.	8	8	9	7	6	7
Moina sp.	21	17	20	14	10	10
Chydorus sp.	5	3	3	1	1	3
Bosmina sp.	2	3	2	1	1	2
TOTAL	**48**	**41**	**45**	**31**	**28**	**32**
COPEPODA						
Mesocyclops sp.	8	7	8	5	3	7
Microcyclops sp.	2	1	0	1	0	0

Thermocyclops sp.	3	2	2	2	2	3
Neodiaptomus sp.	7	5	2	1	1	5
TOTAL	**20**	**15**	**12**	**9**	**6**	**15**
ROTIFERA						
Brachionus sp.	4	3	3	5	3	2
Lecane sp.	2	1	0	2	2	1
Keratella sp.	2	0	0	1	1	1
Asplanchna sp.	7	5	8	6	4	9
Testudinella sp.	6	8	8	9	7	5
Filinia sp.	22	19	16	15	18	15
TOTAL	**43**	**36**	**35**	**38**	**35**	**33**

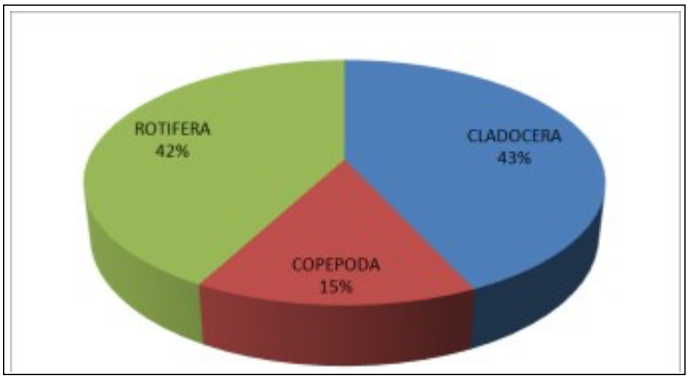

Figure 1: Percentage Composition of Zooplankton in SalchapraAnua during the study period

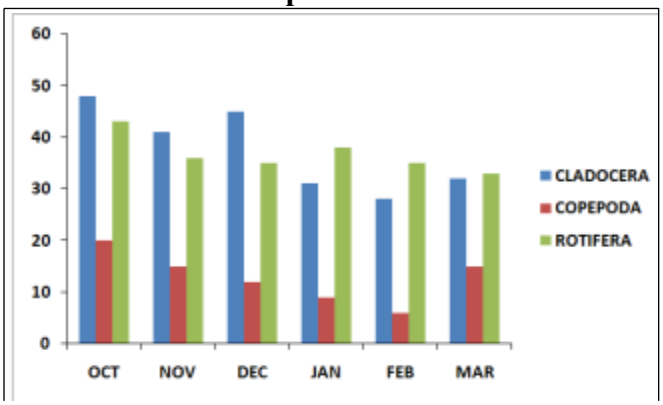

Figure 2: Abundance of different groups of Zooplankton in SalchapraAnua during the study period.

Conclusion

SalchapraAnua is a river-formed wetland of Cachar, Assam. It is also used for various aquacultural program as well as carries a great scenic beauty and thus can be used for tourism. Though the present study was of small duration but it was able to slightly depict the recent scenario of the Anua. Presence of good abundance of Cladocera is very much appreciable as they are known to be the staple food of larvae of various culturable fishes. But increasing abundance of Rotifera may be an indication to the increase of pollutants to the water body. Thus, the inhabitants and the authority should take care and educate peoples residing nearby to preserve and maintain the authenticity of the Anua.

In any aquatic ecosystem limnological characteristic can affect both fauna and flora. Biodiversity contributes both directly and indirectly to human such as food for good health, security, social relationship, life and freedom for choice etc. In last decade people interfere with ecosystem and over exploitation of natural resources its result

that biodiversity decreases. But the losses in biodiversity and change in ecosystem service have adversely affected the well-being. The present study is relevant to limnological study, biodiversity of plankton and fishes (species) in lake pichhola. This study explains that lake pichhola are in rich biodiversity of plankton, fishes and need to conservation in future.

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