Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

Journal of Entomology and Zoology Studies

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2020; 8(5): 2416-2419

Received: 30-06-2020
Accepted: 29-08-2020

Shibam Saha
Ph. D Student, Department of Fisheries Resource Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

S Behera
Professor, Department of Fisheries Resource Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

TS Nagesh
Professor, Department of Fisheries Resource Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

SK Das
Professor, Department of Fisheries Resource Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

SK Rout
Professor, Department of Aquatic Environment Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

Lianthuamluaia
Scientist, RWF Division, ICAR-CIFRI, Barrackpore, West Bengal, India

Abhrajyoti Mandal
Ph. D Student, Department of Fisheries Resource Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

Corresponding Author:
Shibam Saha
Ph. D Student, Department of Fisheries Resource Management, Faculty of Fishery Sciences, West Bengal; University of Animal and Fishery Sciences, Chakgaria, Panchasayar, Kolkata, West Bengal, India

Status of macrophyte diversity at Purbasthali oxbow lake in Purba Bardhaman district, West Bengal

Shibam Saha, S Behera, TS Nagesh, SK Das, SK Rout, Lianthuamluaia and Abhrajyoti Mandal

Abstract
Aquatic macrophytes diversity and its role in understanding the oxbow lake ecosystem dynamics have tremendous significance. Thus a study was conducted in Purbasthali Oxbow Lake which is locally known as Chupi Char in Purba Bardhaman district of West Bengal to assess the status and distribution of macrophytes during April, 2019 to March, 2020. During the study period, a total of 14 species of macrophytes were recorded. Submerged species contributed (43%) to the total macrophytes followed by floating (29%), emergent (21%) and marginal type (7%). In this Lake, water hyacinth (89.39%) was maximum followed by floating macrophytes *Ipomoea* sp (1.26%), then submerged aquatic weed *Ceratophyllum* sp (1.25%) in respect to their biomass contribution in dry weight basis. The average standing crop of macrophytes weight was 479.72 g dry wt/m^2 in Purbasthali oxbow Lake. *Eichhornia* sp was highly dominant throughout the year which could be the main reason for gradually decreasing the productivity status of the ecosystem. Therefore, it is suggested that excess amount of *Eichhornia* sp should be removed immediately from this wetland by the help of local fishermen for long run sustainability of these Lake.

Keywords: macrophytes, diversity, chupi char, ecological status, sustainabile management

1. Introduction
Aquatic macrophytes are macroscopic forms of aquatic vegetation, including macro algae, mosses, ferns and angiosperms found in aquatic habitat. Aquatic macrophytes represent the most important biotic component of the littoral zone of the lake ecosystem. Various types of macrophytes (free floating, emergent, submerged, etc.) are common life forms of an aquatic ecosystem. They have evolved from many diverse groups and often demonstrate extreme flexibility in structure and morphology in relation to changing environmental conditions. Aquatic macrophytes diversity and its role in understanding the oxbow lake ecosystem dynamics have tremendous significance. Macrophytes can be used as tool in the determination of pollution and nutrient level, water quality and lake condition, trophic status [1]. Macrophytes are affected by a variety of abiotic factors, including water and sediment nutrients, under water light, fetch, and water-level fluctuations. The growth, propagation and abundance of aquatic and semi aquatic macrophytes along with other hydrophilic terrestrial vegetations during different seasons help enhancement of biodiversity and influence their distribution pattern in the oxbow lake ecosystem [2, 3].
The Purbasthali Oxbow Lake is locally known as Chupi or Chupi Char (Chupi island), formed by the River Bhagirathi on its right bank in Burdwan district of West Bengal, India [4]. This lake harbors a number of aquatic plants in the submerged as well as floating state, on which thrive a large number of organisms. Due to abundant food available throughout the year in the form of aquatic crustaceans, insects, mollusks, fishes etc. the lake attracts a number of birds throughout year. This Lake is recognized as globally important for migratory birds as thousands of migratory birds stop here to feed and rest every winter during their long-distance migrations. The large and productive oxbow Lake is an important source of income and nutrition for the surrounding areas [5].
Several workers have done ecological studies on macrophytes of different water bodies of India [6-9]. Though few researchers have done ecological studies on aquatic macrophytes of various water bodies in West Bengal [10-14]. However, works related to macrophytes diversity

status in terms of biomass and species composition of Purbasthali oxbow Lake is rare. In this context, the main objective of this study was to evaluate macrophytes diversity of Purbasthali oxbow Lake, West Bengal to know the productivity status of the ecosystem.

2. Materials and Methods

Macrophytes from Lake was collected using 1 m^2 quadrate for quantification of macrophytes and weighed with spring balance for biomass [15] from three sites sampling stations *viz*., station 1 (Near Pakhiralay), station 2 (Near Purbasthali Railway Station) and station 3 (Near Madhaipur Bus Stop), in early morning in between 7am to 8 am during April, 2019 to March, 2020. Subsequently, the macrophytes was identified according to the [16 & 17] and their percentage coverage of water surface area was also noted down. The wet weight was taken immediately using simple plastic spring balance. Further the dry weight of the collected macrophytes was found out by placing the already weighed macrophytes in the hot air oven at 105˚C for 24 hour at the Laboratory of Department of Fisheries Resource Management; Faculty of Fishery Sciences, West Bengal University of Animal and Fishery Sciences, Kolkata.

3. Statistical Analysis

The Biomass and species composition of macrophytes in the Lake were statistically analysed by using the software packages (SPSS Statistics v16 and Microsoft Excel 2010).

4. Results and Discussion

During the study period, a total of 14 species of macrophytes were recorded (Table 1). The floristic composition shows that the vegetation of macrophytes in Purbasthali oxbow Lake includes 6 species were submerged macrophytes, 4 species were free floating, 3 species were emergent type and 1 species was marginal marophytes. Submerged species contributed (43%) to the total macrophytes followed by floating (29%), emergent (21%) and marginal type (7%) (Figure 1). The dominant families were Nymphaeaceae, Pontedericaceae and rest of other families was same in contribution (Figure 2).

According to [18], they noticed 15 species of aquatic macrophytes in Nagrala Lake in Maharashtra, India. [1] recorded 16 number plant species in Sakhya Sagar Lake, in Madhya Pradesh, India. However [19] identified 29 species of aquatic macrophytes from Santragachi Jheel Lake, Howrah district of West Bengal which was higher in number than the present study. In a study, [20] observed that maximum percentage of aquatic macrophyte in Ansupa Lake, Odisha was contributed by submerged species followed by free floating aquatic macrophyte species. But [1] reported that free floating aquatic macrophytes were more dominant in Sakhya Sagar Lake, Madhya Pradesh. However, [7] recorded maximum contribution from emergent macrophytes in Poiroup at Lake; Manipur. [10] identified more percentage of marginal macrophytes from Santragachi Jheel Lake, West Bengal. These present finding is similar with the earlier study reported by [20].

Table 1: Dominated aquatic macrophytes of Purbasthali oxbow Lake from April, 2019 to March, 2020

Category	Family	No	Species	Common name	Local name
Floating	Pontedericaceae	1	*Eicchornia* sp	Water Hyacinth	Kochuripana
	Nymphaeaceae	2	*Nynphaea* sp	Water Lily	Shapla
		3	*Nymphoides* sp	Banana Lily	Chandmala
Floating	Convolvulaceae	4	*Ipomoea* sp	Water Spinach	Kalmisakh
Submerged	Ceratophyllaceae	5	*Ceratophyllum* sp	Coontail	Jhanji
Submerged	Hydrocharitaceae	6	*Hydrilla* sp	Hydrilla	Jalkhangi
Submerged	Potamogetonaceae	7	*Potamogeton* sp	Long leaf pond weed	Potas
Submerged	Lythraceae	8	*Rotala* sp	Indian toothcup	Daton
Submerged	Perkariaceae	9	*Ceratopteris* sp	Water hornfern	Mosii
Submerged	Characeae	10	*Chara* sp	Musk grass	Kara
Emergent	Pontederiaceae	11	*Monochoria* sp	Pickerel weed	Kajallata
Emergent	Typhaceae	12	*Typha* sp	Cat tail	Bulrush
Emergent	Araceae	13	*Colocasia* sp	Taro	Kochu
Marginal	Marseliaceae	14	*Marsilea* sp	Four leaf clover	Shushnishak

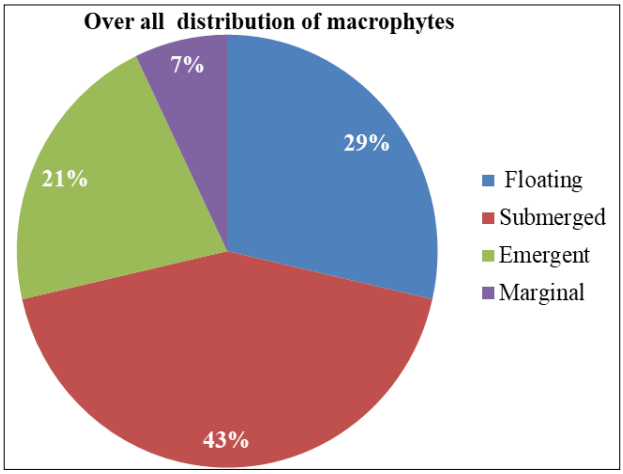

Fig 1: Macrophytes composition in Purbasthali oxbow Lake from April, 2019 to March, 2020

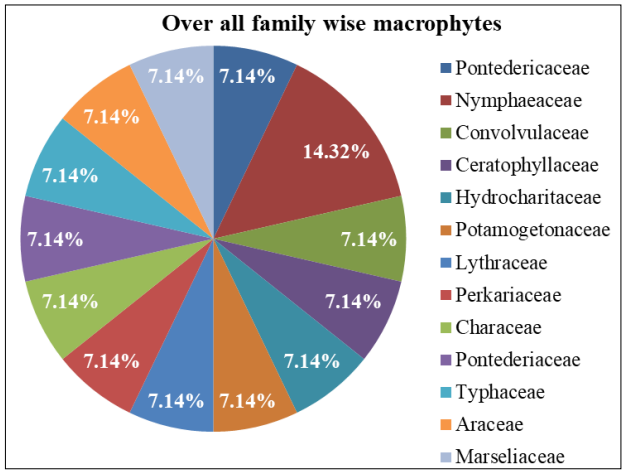

Fig 2: Macrophytes family composition in Purbasthali oxbow Lake from April, 2019 to March, 2020

Macrophytes Biomass

The average standing crop of macrophytes weight was 479.72 g dry wt/m^2 in Purbasthali oxbow Lake. During the present study, maximum overall category wise contribution in term of dry weight basis was by floating type of aquatic vegetation (93%) followed by submerged (4%), emergent (2%) and then marginal (1%) aquatic macrophytes (Figure 3).It was found that maximum free floating macrophyte infestation was in S3 followed by S1 and S2.Submerged vegetation was dominated in S2 followed by S1, S3. Like wise, Emergent type of vegetation was higher in S2 followed by S1 and S3. Lastly, marginal type of vegetation was same in S2 and S3 compare to S1.During the present study, the lowest biomass was recorded in winter months and highest was recorded in monsoon months at three stations S1, S2 and S3 respectively. The biomass gradually increased from June onwards and maximum in July, after which biomass again declined to reach low levels in January. Maximum value of the macrophytes dry weight was found during the monsoon season of the study period. It may due to the availability of water along with the nutrients leached from the nearby areas of the oxbow Lake. But it was minimum in winter season may be due to the scarcity of water levels of the Lake as well as the removal of aquatic macrophytes by the local fishermen communities for fishing purposes. Similar kind of observation was reported by [12].

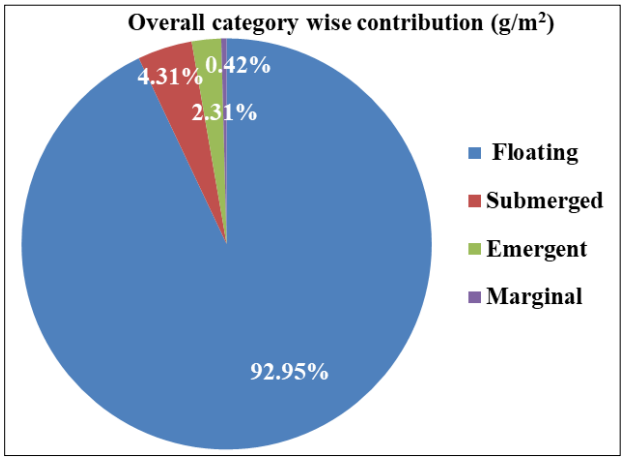

Fig 3: Overall category wise percentages in macrophytes infestation (g/m^2 dry weight) at Purbasthali oxbow Lake from April, 2019 to March, 2020

Macrophytes species composition

Among the free floating macrophytes, *Eichhornia* sp was highly dominant throughout the year while *Nynphaea* sp and *Nymphoides* sp were most dominant during monsoon months. In case of submerged genera, *Ceratophyllum* sp was highest in contribution in October month but *Rotala* sp and *Ceratopteris* sp were only observed during monsoon months. *Chara* sp was mostly dominant during December month. Among the emergent macrophytes, *Colocasia* sp was mostly dominated through the study period. Similarly marginal macrophyte *Marsilea* sp was also least dominated species throughout the study period.

Eichhornia sp was the most dominant species in Purbasthali oxbow Lake at three stations respectively. It contributed near about 90% of the overall macrophyte standing crop in dry weight basis. In this Lake, water hyacinth (89.39%) was maximum followed by floating macrophytes *Ipomoea* sp (1.26%), then submerged aquatic weed *Ceratophyllum* sp (1.25%) in respect to their biomass contribution in dry weight basis. Species wise yearly contribution of macrophytes during the study period is presented in Figure 4.

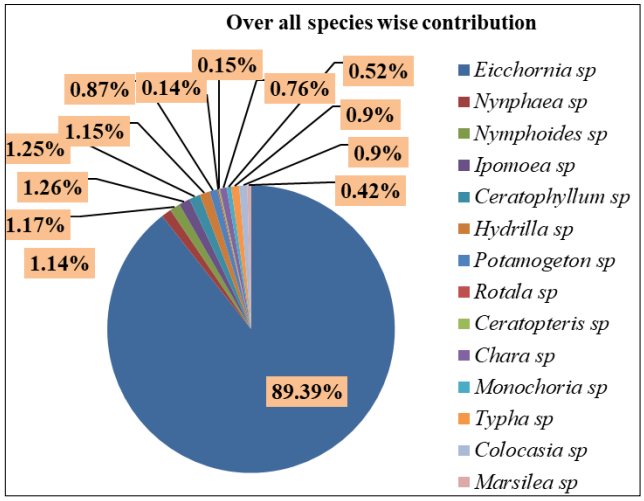

Fig 4: Overall species wise percentages in macrophytes infestation (g/m^2 dry weight) at Purbasthali oxbow Lake from April, 2019 to March, 2020

Earlier studies made in different water bodies were comparable with the present study regarding species diversity. [12] reported that among the free floating genus, *Eichhornia* sp was highly dominant throughout the year and *Nynphaea* sp was most dominant floating macrophytes during monsoon months and similarly among the submerged genus, *Hydrilla* sp was observed to be the most dominant genus throughout the year. [9] studied that *Hydrilla* sp and *Ceratophyllum* sp were dominant macrophyte species in Govardhan Sagar water body, Madhya Pradesh. According to [1] recorded the major macrophytes found in Sakhya Sagar Lake, Madhya Pradesh, were *Nymphaea* sp, *Ipomoea* sp and *Potamogeton* sp. [18] reported different macrophytes from Nagrala Lake; Maharashtra. They observed that *Marsilea* sp was found in abundance in all the sites of Nagrala Lake. These findings are comparable with the present study.

Earlier it was opined that macrophytes function as integrators of environmental condition and thus can be effectively used as biological indicators. Different macrophyte species are the most competitive in the aquatic environment for light, and usually are dominant macrophytes communities when nutrient levels in the water are sufficiently high. It is considered as an important component of the aquatic ecosystem not only as the habitat and food source for aquatic life, but also act as an efficient accumulator of heavy metals and as an important participant in the natural processes of water self-purification of water [3]. It was studied that certain aquatic vegetative species like *Eichhornia*, *Potamogeton*, and *Marsilea* were pointed as pollution indicator [21]. The present findings are comparable with the above mentioned findings which were reported by several authors [12, 18, 21].

5. Conclusion

Aquatic macro vegetation plays important role in maintaining ecological balance by nutrient recycling. Present findings revealed that these Lake was found in almost good condition and favorable for macrophytic growth. However, *Eichhornia* sp was highly dominant throughout the year which could be the main reason for gradually reducing the productivity status of the ecosystem. Therefore, it is suggested that *Eichhornia* sp

should be removed immediately from this wetland. For overall conservation and management of this Lake, proper biological and mechanical treatments of macro phytic growth need to be done with the help of local stake holders by the direct involvement from the Government officials, to the system for long run sustainable of the resources.

6. Acknowledgement

The authors are thankful to the Dean and Head of the Department for providing necessary facilities to conduct the research works and their encouragement. The first authors are very much grateful to the West Bengal University of Animal and Fishery Sciences for providing fellowship during the study periods.

7. References

1. Arya M, Mishra AK, Bhat MH. Macrophyte diversity and trophic status of Sakhya Sagar Lake, Shivpuri, Madhya Pradesh, India. Journal of Annals of Plant Sciences 2018;7(8):2398-2402.
2. Das SK, Biswas D, Roy S. Study of Hydrophytes in some lentic water bodies in West Bengal, India. Ecoprint Ecological Society (ECOS), Nepal 2009;16:9-13.
3. Sharma RC, Singh S. Macrophytes of Sacred Himalayan Lake Dodi Tal, India: Quantitative and Diversity Analysis. Biodiversity International Journal 2017;1(4):1-11.
4. Mandal MH, Giyasuddin S, Roy A. Threats and Opportunities of Ecosystem Services: A Geographical Study of Purbasthali Oxbow Lake. International Journal of Geography, Environment and Earth Science 2018;6(4):1-24.
5. Chowdhury S. A study on avifaunal species diversity of Purbasthali Oxbow Lake, West Bengal, India. International Journal of Science and Research 2015;6(3):866-871.
6. Singh KK, Sharma BM, Usha K. Inventory of the Aquatic Macrophytes in Lake Kharungpat, India. Journal of Energy Technologies and Policy 2013;3(11):64-75.
7. Singh KK, Usha K, Sharma BM. A study on the biomass variation of the macrophytes in Poiroupat Lake, Manipur, northeast India. Journal of Science and Vission 2018;18(1):22-31.
8. Panda M, Samal RN, Bhatta KS, Lenka S, Rout J, Patra HK, *et al*. Diversity and distribution of vascular macrophytes in Ansupa Lake, Odisha, India. Journal of Bonorowo Wetlands 2018;8(1):1-12.
9. Patel K, Dubey S. Diversity and distribution of macrophytes in Govindgarh Lake of Rewa district (M.P.), International Journal of Advanced Science and Research 2019;4(2):20-22.
10. Patra A, Santra KB, Manna CK. Macroinvertebrate community associated with macrophytes in the Santragachi Jheel Lake, West Bengal, India. Journal of Ekológia (Bratislava) 2012;31(3):274-294.
11. Pal S, Mukherjee AK, Senapati T, Samanta P, Mondal S, Ghosh AR. Study on littoral zone sediment quality and aquatic Macrophyte diversity of opencast coal pit-lakes in Raniganj coal field, West Bengal, India. International Journal of Environmental Sciences 2014;4(4):575-588.
12. Ghosh D, Biswas JK. Biomonitoring Macrophytes Diversity and Abundance for Rating Aquatic Health of an Oxbow Lakeecosystem in Ganga River Basin. American Journal of Phytomedicine and Clinical Therapeutics 2015;3(10):602-621.
13. Das D, Mondal S, Mandal S. Studies on Some Economically Important Aquatic Plants of Katwa Subdivision of Burdwan District, West Bengal, India. International Journal of Current Microbiology and Applied Sciences 2016;5(6):961-972.
14. Goswami SN, Trivedi RK, Saha S, Mandal A, Jana S. A study on plankton diversity of three urban ponds in Kolkata of West Bengal state, India. International Journal of Advanced Biological Research 2017;7(4):687-691.
15. Leka J, Kanninen A. Field surveys of aquatic macrophytes as a tool for monitoring and assessing the ecological status of the boreal lakes. In: How to Assess and Monitor Ecological Quality in Freshwaters. Nordic Council of Ministers 2003, 127-130.
16. APHA. Standard methods for the examination of water and waste water, 21st edn. American Public Health Association, Washington, DC USA 2005, 1368.
17. Holmes NTH. Macrophyte Plant Identification Guide: A document to support a Training Course for NRA Wessex Region 1992, 1-115.
18. Bhute KB, Harney NV. Macrophytes biodiversity of Nagrala lake of Bhadrawati, district- Chandrapur (M.S.), India. International Research Journal of Science and Engineering 2017;6(1):17-19.
19. Patra A, Santra KB, Manna CK. Ecology and diversity of zooplankton in relation to physico-chemical characteristics of water of Santragachi Jheel, West Bengal, India. Journal of Wetlands Ecology 2017;5:20-39.
20. Panda M, Samal RN, Bhatta KS, Lenka S, Rout J, Patra HK, *et al*. Diversity and distribution of vascular macrophytes in Ansupa Lake, Odisha, India. Journal of Bonorowo Wetlands 2018;8(1):1-12.
21. Varshney CK. Macrophytes as indicators of water quality. In: WHO Workshop on Biological Indicators and Indices of Environment Pollution, Hyderabad, Indian Centre Ed. Proceeding. Control Water Pollution. Osmania University 1981, 64.