How to Cite:
Devi, P. (2022). Assessment of water quality and overall biodiversity of certain wetlands of Sivasagar urban area. *International Journal of Health Sciences*, *6*(S1), 3363–3371.
https://doi.org/10.53730/ijhs.v6nS1.5352

Assessment of Water Quality and Overall Biodiversity of Certain Wetlands of Sivasagar Urban Area

Parishmita Devi
Department of Life Sciences, Dibrugarh University-786004, India

***Abstract*---**Various physic-chemical parameters such as ph, Dissolved Oxygen (DO), free CO2 are commonly used criteria for water quality assessment. It provides information about the overall health of the water bodies. Biodiversity of macro-invertebrates and physic-chemical water quality parameters of Juliva fishery and Moribeel wetland of Sivasagar district of Assam were assessed from different sampling sites monthly from April, 2017 to April, 2018. By studying macro-invertebrates diversity of the wetland as bioindicator, we have assessed the overall quality of these water bodies, mainly about their pollution status.

***Keywords*---**Wetland, Physico-chemical property, Bio-diversity, Macro-invertebrates, Biological indicator.

Introduction

Limnology is the study of inland waters. It is often regarded as the division of ecology or environmental sciences. It covers the biological, chemical, physical, geographical and other attributes of all inland waters. This includes the study of lakes and ponds, rivers, springs, streams and wetlands. A more recent sub-discipline of limnology, termed landscape limnology, studies, manages and conserves these aquatic ecosystems using a landscape perspective.

Limnology is closely related to aquatic ecology and hydrobiology, which study aquatic organisms in particular regard to their hydrological environment. Although limnology is sometimes equated with freshwater science, this is erroneous since limnology also comprises the study of inland salt lakes.

Biological diversity means the variability among living organisms. From all sources including, interlay, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part, this included diversity within species, between species of ecosystems. The terms' contracted form biodiversity

International Journal of Health Sciences ISSN 2550-6978 E-ISSN 2550-696X © 2022.
***Corresponding author**: Devi, P.; Email: parishmitadevi08@gmail.com*
Manuscript submitted: 18 Jan 2022, Manuscript revised: 09 Feb 2022, Accepted for publication: 27 March 2022

may have been coined by W.G. Rosen in 1985 while planning the 1986 National Forum on Biological Diversity organized by the National Research Council. Ecological biodiversity is a biodiversity of ecosystems, natural communities and habitats. Biodiversity boosts ecosystem productivity where each species, no matter how small, all have an important role to play.

It is very essential and important to test the water before it is used for drinking, domestic, agricultural or industrial purposes. Water must be tested with different physico-chemical parameters. Water does contain different types of floating, dissolved, suspended and microbiological as well as bacteriological impurities. The quality of water is of vital concern for the man-kind since it is directly linked with human welfare.

Numbers of institutions are working on the various aspects of water at national and international level from last several years. American Public Health Association (APHA), AWWA and World Health Organization (WHO) are working at international level. Indian Water Work Association (IWWA) and Central Pollution Control Board (CPCB) are involved in the conservation and proper maintenance of fresh water bodies.

The earth is a watery place. About 71% of the earth's surface is water covered but the 96.5% of all earth's water is salty which are held by oceans and the remaining a little amount of water is fresh water. Wetland is an area of land that is covered by shallow water. Wetlands are the link between land water, and are some of the most productive ecosystems in the world. Wetlands may support both aquatic and terrestrial species. One of the most important benefits that wetlands provide is their capacity to maintain and improve water quality. Wealthy wetlands have a rich natural diversity of plants and animals. A wetland is a unique ecosystem that forms a zone of transition between an aquatic and terrestrial ecosystem. It is considered to be the most productive amongst the entire ecosystem. Wetlands are a critical part of our natural environment, and play a key role in supporting biological diversity. Wetlands support water bird, fish, amphibian, reptile and plant species during important life stages by providing resting and feeding habitat as well as refuse during extreme weather conditions. They also form corridor or stepping stone habitats that support the migration of species, including water birds and marine mammals.

The objective of this project is to assess the water quality of two urban wetlands of Sivasagar in terms of certain physico-chemical parameters and to observe the overall biodiversity status of the wetlands. The project also wants to assess the present status of the wetlands using macro invertebrates as bioindicator.

Bhattacharyya *et. al* (2008) studied on special emphasis of water birds as bio-indicator and they found that the data on water birds, as a biological indicator indicates that there is a change in the wetland habitat and for which human activities are chiefly responsible. Numbers of locally extinct species of water birds is substantially high. Fragmentation of wetlands into relatively smaller patches, draining of water bodies and release of urban waste water has resulted into changes in wetlands habitat.

Brraich *et. al* studied about the temporal composition and distribution of benthic macro-invertebrates in wetlands and they recorded altogether co-groups of benthic macro-invertebrates viz. Ephemeropterans, Plecotera, Hemiptera, Diptera, Tricoptera, coleoptera, araneae, Odonata, Annelida and Gastropoda and their diversity was found to vary in different years.

Ravichandran and Teneson (2015) studied the assessment of water quality in koothapar wetland, Tiruchirapalli district and found that the koothapar wetland is facing severe pollution in all seasons. The water is not suitable for human consumption such as drinking, bathing etc. but is can be use for agricultural activities, animal propagations and recreational purposes. Saha in 2013 studied about the water quality of four different wetlands and he found that Renuka Lake has been experiencing decreasing DO and BOD but increasing pH level, COD etc. where Udhagamidalem Lake also has high total ammonia indicating eutrophication in the wetland. The Ramgarh Lake has experienced high nitrate and phosphate levels but DO is within permissible limits where the Chandola Lake has experienced satisfactory water quality.

Methods and Materials
About the area

Sivasagar district is one o f the 32 districts of Assam state in North-east India. It is located 354 km. west towards state capital Dispur. Sivasagar district is the 11th largest district in the state by population; Sivasagar town is the administrative headquarters of this district. This historic place is also known for its rich and diverse biodiversity. The district covers an area of 2668 square kilometers as against total area of 78438 square kilometers of Assam as per census of 2001. The district Sivasagar lies between 26.45˚N and 27.15˚N latitudes and 94.25˚E and 95.25˚E longitudes. The district is bounded by the Brahmaputra River on the north, Nagaland on the South, the Charaideo district on the east and the Jhanji River on the west.

Two wetlands of Sivasagar town were selected for the present study, those are:

1. Juliva Fishery 2. Moribeel

The study was carried out monthly at each sampling station from August, 2017 to April, 2018.

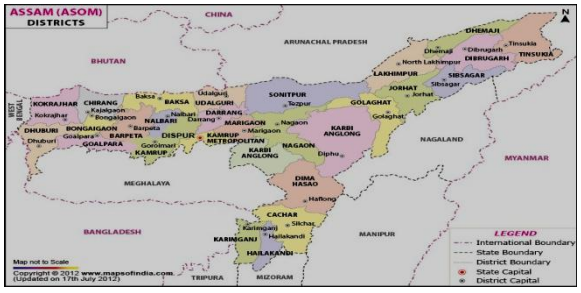
- **Methodology:**

(A) For assessment of physico-chemical properties of water:

a. pH: pH was measured with a pH meter.
b. Temperature: Temperature was measured with a mercury thermometer.
c. Dissolved oxygen (DO): DO was determined by winkler's method.
d. Free CO2 and total alkalinity were determined by Titrametric method

(B) To access the diversity of macro invertebrates:

a. Water samples were collected from the sampling sites.
b. The sediment samples were collected from the same study sites and the macro benthic invertebrates were collected from the sediment.
c. The macro invertebrates were identified by comparing with standard literature.
d. Biodiversity was studied by direct observation method and interview metho



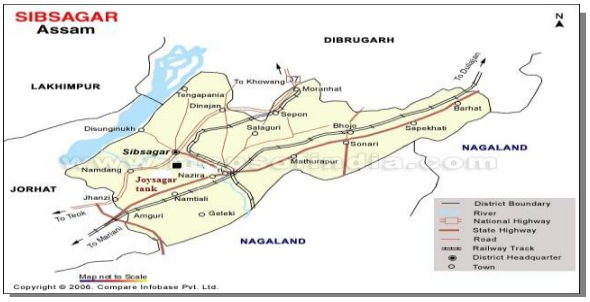


Fig 1: Map showing the study areas Juliva fishery and Moribeel

Fig 2: Views of the Moribeel

Fig 3: Panoramic views of the Juliva Fishery

Analysis: Physico-chemical parameters of water of the study sites recorded during the period of investigation are shown in the Table 1 and Table 2. Again, the observed biodiversity of the two sites are presented in the tables 3 and 4.

Table 1: Monthly variation of physico -chemical parameters of water of Juliva Fishery recorded during August, 2017–April, 2018

Period	DO (mg/l)	Total alkalinity (mg/l)	Free CO_2 (mg/l)	pH	Air temp. (^{0} C)	Water temp. (^{0} C)
Aug, 17	5.52	1.58	0.16	6.30	29.7	30.3
Oct, 17	4.42	1.64	0.20	6.20	23.75	25.25
Jan, 18	5.00	1.52	0.14	5.89	11.75	15
March, 18	4.64	1.54	0.18	6.00	11.51	14
April, 18	4.24	1.62	0.12	6.16	12	13.5

Table 2: Monthly variation of physico -chemical parameters of water of Moribeel recorded during August, 2017 -April, 2018

Period	DO (mg/l)	Total alkalinity (mg/l)	Free CO_2 (mg/l)	pH	Air temp. (^{0} C)	Water temp. (^{0} C)
Aug, 17	----	1.50	1.38	6.15	24.75	29
Oct, 17	----	1.58	1.20	6.00	23.25	25.5
Jan, 18	----	1.62	1.32	5.88	12.25	17.75
March, 18	----	1.44	1.36	5.90	16	19.25
April, 18	----	1.48	1.30	6.12	16.25	19.25

Table 3: List of some major aquatic plants found in Juliva Fishery & Moribeel

Serial no.	Common Name	Scientific Name
1	Water hyacinth	*Eichhornia crassipes*
2	Sacred lotus	*Nelumbo nucifera*
3	Taro	*Colocasia esculenta*
4	Buffalo nut	*Trapa natans*
5	Water-thyme	*Hydrilla verticillata*
6	Dwarf waterclover	*Marsilea minutia*
7	Water primrose	*Ludwigia adscendens*
8	Water spinach	*Ipomoea aquatica*
9	Water lettuce	*Pistia stratiotes*
10	Water moss	*Salvinia cucullata*
11	Loureiro	*Nymphoides hydrophylla*
12	Tape grass	*Vallisneria spiralis*
13	Hamilt	*Hygrophilla schulli*
14	Coontail hornwort	*Ceratophyllum demersum*

Table 4: List of some of the Aquatic Macro-fauna of Juliva Fishery and Moribeel

Serial no.	Common Name	Scientific Name
1	Giant water bug	*Belostoma*
2	Water strider	*Gerris lacustris*
3	Damsel bug	*Zygoptera*
4	Water boatman	*Corixidae*
5	Water strider	*Gerris paludum*
6	Frog	*Rana tigrina*
7	Mosquito larvae	*Anopheles spp. , Culex spp. Etc.*
8	Snail	*Pomacea spp.*
9	earthworm	*Glyphidrilus spp.*
10	Water beetle	*Cybister spp.*
11	Caddisfly larva	*Trichoptera*
12	leech	Hirudo spp.
13	Mola carpet	Amblypharyngodon mola
14	Rohu	Labeo rohita
15	Striped snakehead	Channa striatus
16	Giant snakehead	Channa marulius
17	Stinging catfish	Heteropneustes fossilis
18	Day's mystus	Mystus bleekeri
19	Indian potasi fish	Pseudeutropius atherinoides
20	bata	Wallago attu
21	Catla	Catla catla
22	Bata labeo	Labeo rohita
23	Dwarf gourami	Colisha lalia
24	Gangetic leaf fish	Nandus nandus
25	Olive berb	Puntius sarana
26	Magur	Clarius batrachus
27	calbasu	Labeo calbasu
28	Mrigal carp	Cirrhinus mrigala
29	minnows	Puntius stetrarupagus
30	wallago	wallago attu
31	Spotted snakehead	Channa punctata
32	Banded gourami	Collisa fasciata
33	Assamese snakehead	Channa stewartii
34	Climbing perch	Anabus testudineus
35	Swamp eel	Monopterus cuchia
36	Long whiskered catfish	Aorichthys aor
37	Flying barb	Esomus danricus
38	Globe fish	Tetradon cutcutia

Result and Analysis

Temperature is one of the most important variables in an aquatic ecosystem. During the period of investigation, the water temperature of Juliva Fishery ranged from 29^0C – 19.25^0C and Moribeel ranged from 30.3^0C – 13.35^0C. The availability of oxygen is one of the most important abiotic factors that affect the survival of individuals both in air and water and it is treated as a prime ecological parameter for the existence of aquatic life. During the investigation, the DO content of water of Juliva fishery varied from 5.52 mg/*l* during August, 2017 to 4.24 mg/*l* during April, 2018 and where DO content of water of Moribeel was not traced. The value of free CO_2 in the Juliva Fishery and Moribeel, water has been found maximum in October 2017 and minimum in April 2018 (Table 1 and Table 2). Free CO_2 concentration may be fluctuated by presence of domestic waste, phytoplankton, microorganisms and sunlight (Snap et.al, 2006).

A number of bases are main contributors of alkalinity in water. In the investigation, alkalinity of Juliva fishery water has been found between 1.52 mg/*l* and 1.64 mg/*l* and In Moribeel between 1.44 mg/*l* 1.62 mg/*l*. Maximum degree of alkalinity has been recorded during October month on Juliva fishery. During the study period, the air temperature at the Juliva Fishery ranged from 24.75◦C – 16.25◦C and Moribeel ranged from 29.7◦C - 12◦C.

The value of pH of Juliva Fishery water ranged between 5.89 to 6.30 and Moribeel ranged between 5.88 to 6.15. The pH is found to be less in the marginal undisturbed area whereas it deviates towards alkaline in the areas where there are continuous anthropogenic activities. Unlike many other ponds, tanks and lakes, Juliva Fishery does not receive water from the surrounding areas. Ground water and rainfall are the only sources of water for this water body. Therefore, the physico-chemical parameters of water of this water body are within permissible limit.

In contrast, the condition of the water of Moribeel is very poor. Significantly, the amount of DO in its water could not be traced by the adopted method. The people near by the Moribeel dispose off their house-hold garbages directly into the water which more or less have some effect on the physico-chemical parameters.

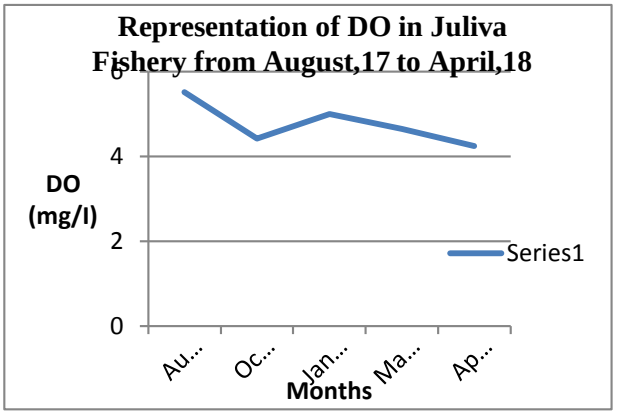


Fig 4: Monthly variation of Dissolved oxygen of Juliva Fishery (Series 1)

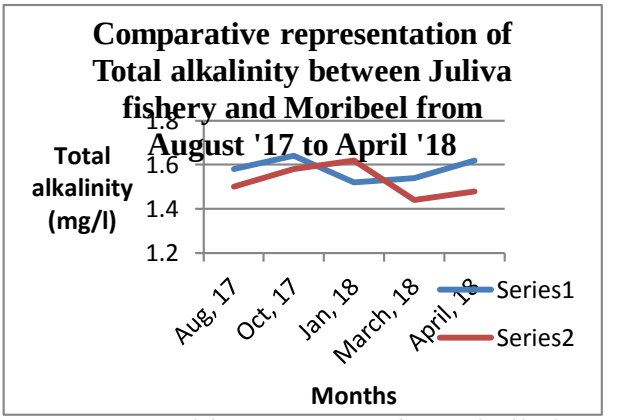


Fig 5: Monthly variation of Total alkalinity of Juliva fishery (Series1) and Moribeel (Series2)

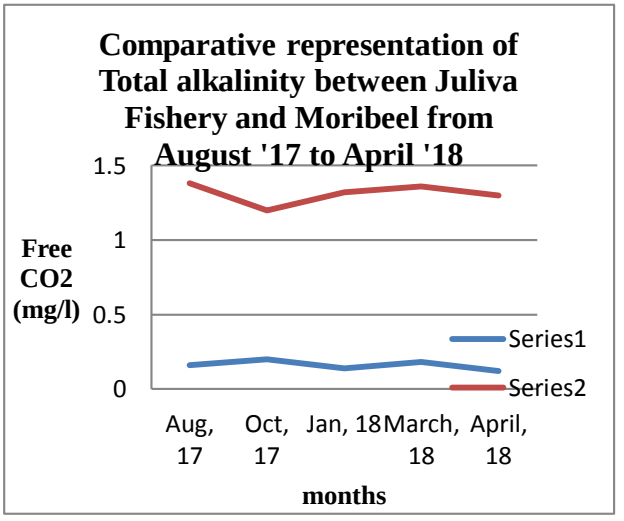


Fig 6: Monthly variation of free carbon dioxide of Juliya Fishery(Series1) and Moribeel (Series2)

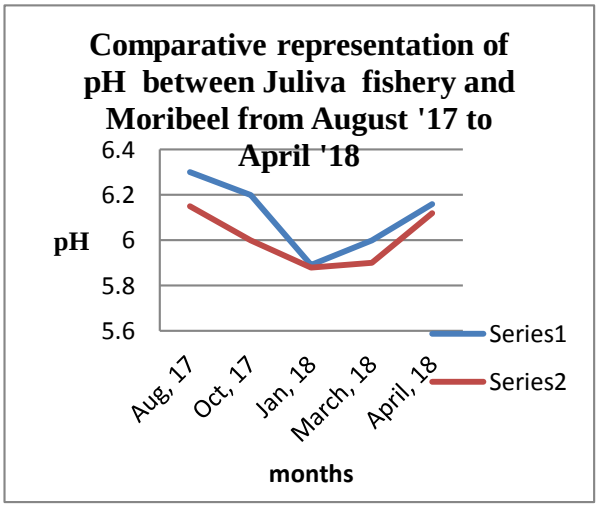


Fig 7: Monthly variation of pH of Juliva fishery (Series1) and Moribeel (Series2)

Conclusion

From the study, the Juliva Fishery is identified as one of the significant water body from ecological point of view supporting diverse groups of flora and fauna including the migratory birds visiting during winter months. However, the water of Moribeel is not suitable for various domestic usages like washing clothes, utensils, bathing of domestic animals etc. Therefore, it can be said that, the water of Moribeel is extremely polluted and cannot be manage for sustainable use.

During the investigation, it can be observed that the Moribeel is not properly maintained. Juliva provides a variety of ecological values and functions. For example, the people can take the advantage of recreational opportunities. Such as boating, etc. Though, Moribeel water body is so polluted, but it also provides some

benefits directly or indirectly to people. For example, it may enhance downstream water quality by filtering chemicals, excess nutrients and sediments. It can also act as natural flood control areas through retaining flood waters and delaying their release downstream. So, because of their numerous ecological and socioeconomic functions, every effort should be made to protect these water bodies and to minimize the harmful anthropogenic activities.

References

Alam M.Z. (2014): Status Of Biodiversity At Wetland Ecosystem Of Mohanganj Upazila In Netrankona District Advances In Ecology. Vol. 2014(2014) Article ID 642450, 8 Pages.

Bhattacharyya A., Sen S., Roy P.K. And Mazumdar A. (2008): A Critical Study On Status Of East Kolkata Wetlands With Special Emphasis On Water Birds As Bio-Indicator. The 12th World Lake Conference. PP. 1561-1570.

Brraich O.S And Kaur R(2017) : Temporal Composition And Distribution Of Benthic Macro-Invertebrates In Wetlands. Current Science Vol. 112(1). PP. 116-125.

Chandra R., Nishadh K.A., Azeez P.A. (2009): Monitoring Water Quality Of Coimbatoro Wetlands, Tamil Nadu, India. Springer Science + Business Media. PP. 671-676.

Gorgizade, Ali, Marzouni M.B. Haghighifard N.J. Esmaeill M. (2014): Water Quality Evaluation of Bamdezh Wetland Using Combination of NSFWQI And Geographic Information System. International Journal Of Advanced Biological And Biomedical Research. Vol.2 Issue 5. PP. 1454-1467.

Manral U. And Khudsar F.A.(2013) : Assessment Of Wetland Water Quality And Avian Diversity Of A Human Modified Floodplain Wetland On River Yamuna. Notulae Scientia Biologicae. Vol. 5(1). PP. 25-33.

Ravichandran C. And Teneson R. (2015): Assessment Of Water Quality In Koothapar Wetland, Tiruchirapalli District. International Research Journal Of Engineering And Technology. Vol. 02. PP. 240-250.

Saha S.(2013) : Water Quality Assessment Of Four Different Wetlands And It's Implication To Climate Change. International Index And Referred Research Journal. Vol. 4. PP. 33-37.