Life Science Informatics Publications

Research Journal of Life Sciences, Bioinformatics, Pharmaceutical and Chemical Sciences

Journal Home page http://www.rjlbpcs.com/

RJLBPCS

ISSN 2454-6348

Original Research Article **DOI: 10.26479/2019.0503.16**

STUDY ON RELATION BETWEEN ZOOPLANKTONS AND ABIOTIC FACTORS OF SODAV BANDHARAN WETLAND, KODINAR

Kiran C. Deshmukh[1], Nikunj B. Patel[2], Nikul B. Chavada[*]

1. Department of Microbiology, Shree P. H. G. Municipal Arts and Science College, Kalol

2. Department of Microbiology, Smt. S. S. Patel Nootan Science & Commerce College, Sankalchand Patel University, Visnagar, India.

ABSTRACT: Wetland is most productive ecosystems in the biosphere. Its supports the growth of organisms and maintain the biodiversity, which inhabitants inside and outer surface of the wetland water. Hydrology of wetland gives idea about physical and chemical properties of water and their relationship with ecosystem. Investigation was done base on correlation between abiotic factors and zooplankton diversity of wetland. Phytoplankton is an integral component of freshwater wetlands, which significantly contributes towards developmental of zooplankton and fish diversity. present report is based on relationship between zooplankton diversity and abiotic factors during pre, middle and post winter time period of 2016-17 at sodav bandharan (Temporary wetland) near Vellan Village, Kodinar.

KEYWORDS: Wetland ecosystem, Biodiversity, Physico-Chemical Parameter, Zooplankton, Abiotic factor.

Corresponding Author: Mr. Nikul B. Chavada*

Shree Mahila Arts and Science College, Veraval, India.

1. INTRODUCTION

Wetland ecosystems are among the most productive ecosystems in the biosphere. wetland receives surface water inputs from streams (surface run off), precipitation, overland flow and subsurface water inputs from surface infiltration, stream zones and ground water. these different inputs are important to wetland productivity as they contain markedly different quantities and qualities of transported nutrients [1] [2] and organic matter. wetlands are recognized as ecosystems that harbour high biological entities, provide suitable habitat for millions of people. Due to encroachment of

human society,it is faceing threats as results of human activities and endangered for aquatic sustanability. this is a common trend throughout the world [3]. Ecosystem wetlands are highly volatile. they are vulnerable to environmental fluctuations. although wetland biodiversity constitutes a significant portion (e.g., 15-20%), of the total biodiversity of the indian subcontinent [4],though studies of wetland ecosystems are limited[5] increasing anthropogenic interventions influence in and around aquatic systems and their catchment areas have contributed to a larger extent towards deterioration of water quality leading to accelerated eutrophication. the hydro geochemical characteristics and phytoplankton biomass of water bodies are not constant and fluctuate with seasonal variation as well degree of pollution[6]. Phytoplanktons are integral components of freshwater wetlands, which significantly contributes towards succession of development of zooplankton dynamics and fish [7]·community structure dominance and seasonality of phytoplankton in tropical wetlands are highly variable and are functions of nutrient status, water level, morphometry of the underlying substrate and other regional factors [8]. phytoplankton's form the main producers of nitrients of an aquatic ecosystem which control the biological productivity. The zooplankton is divided into two groups. temporary flora and permanent flora. temporary plankton consists of planktonic eggs and larvae of the members of the benthos and nekton.[9][10][11] permanent plankton includes all animals that live their complete life cycles in a floating state and the temporary plankton particularly are in abundance in coastal areas. it is characteristically seasonal in occurrence, though variations in spawning time of different species ensures its presence in all seasons.[12][13] they are absent in fresh water. the ciliate protozoans are represented mainly by the tintinnids, which are between 20 and 640 microns in size and sometimes occur in vast numbers. oysters, mussels, other marine bivalves and snails begin life as planktonic larvae. the wing snails (Pteropoda) spend their entire life cycles as plankton.[14][15]

2. MATERIALS AND METHODS

2.1 Sample collection Points

Three sampling points was selected of wetland (Sampling Points) with specific GPS location, suitable depth and surface. Samples were collected in plastic bottle. (non metallic, free-flushing sample recommended for general purpose of water sampling), For physicochemical analysis approximately 5 liters samples was collected less than 2 feet of wetland water. Time and temperature was note down and transferred all sample as soon as possible to laboratory for further analysis. Temperature range was 18 ^{0}c to 21 ^{0}C during sampling time (winter period). Plankton sample were collected with plankton net (20µm mesh size)

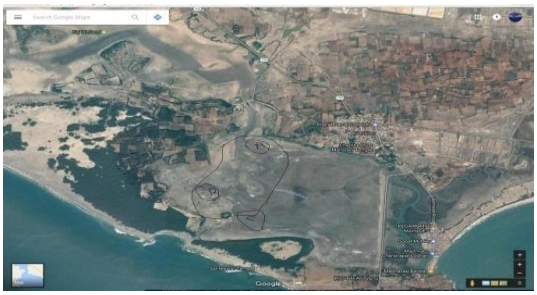

Fig 1: Wetland Site from Google Map

Sr.No	Sodam Bandharan Site Location
1	N20·43' 10.5" E 070·48" 51.9"
2	N20·43' 0.15" E 070·48" 44.9"
3	N20·43' 48.6" E 070·48" 35.9"

Table 1: GPS Location of Collection Site

2.2 Sample collection for zooplankton Analysis

One liter water sample was collected each three collection point with Plankton net (0.20 microne). Added 4% formalin solution in collected samples bottle and stay it for 48 hrs, after incubation time period drop count method was used for identified plankton diversity.

2.3 Physicochemical Analysis

Primary Examination has done base on physical examination of water sample by Color, odor and turbidity. PH and conductivity measured by pH meter and conductivity meter. T.S, T.D.S., D.O., B.O.D., water hardness and chloride estimation done by as per APHA 2012

2.4 Statistical Analysis

Statistical analysis has done by simple method use mode, average and group average with Microsoft excel program.

3. RESULTS AND DISCUSSION

Wetland is a great ecosystem because its support wide varieties of biodiversity. In this project water samples collected from tree site of Bandhara with specific GPS location (figure: 01 & table: 01) physicochemical parameter were studied as per standard method of collected water sample manual. there were 15 Physico-chemical parameters selected for analysis of wetland water and it can compared with standard water analysis data of Indian standard water guide manual. parameters are Temperature, pH, Conductivity, T.S., T.D.S., D.O., B.O.D., water hardness., Clorinity, alkalinity, acidity and NaCl concentration of water samples.(Table:02) temperature range was 19 ^{0}c to 21.01^{0}c during sampling period. pH range of wetland water was 7.6 to 7.9, it was normal in range as per standard but higher pH and conductivity was recorded on Jan-27. It was indicated that salts concentration may higher during that time period. A result of dissolved oxygen (D.O) and biological oxygen demand (B.O.D) was in 8.0 to 9.9 mg/L range and it was good for aquatic life in water. T.S. and T.D.S. data were highly fluctuate during sampling and analysis. T.S. range was 6970 mg/L to 9000 mg/L, and TDS range was 1930 mg/L to 3080 mg/L the results of T.S and T.D.S was comparatively higher than normal range so, water is not directly use for agriculture and drinking purpose, it's also unsafe for normal aquatic life. Water hardness results saw that salts concentration ranges between 260 mg/L to 384 mg/lit and its increase during sampling time period. Plankton lives in water and it's fluctuated with physicochemical property of water (Abiotic factors) more than 15

zooplankton ssp. isolated during analysis. greatest diversity of zooplankton noted on 20-Nov/2016 sampling point: 02 (86.22 %) (Table: 03) and qualitative analysis of zooplankton completed by drop count method, isolated 15 spp. of zooplankton in which *Globigerina rubescense(10.33 %), Sapphirina nigromaculata(10.0 %) and Acrocalanus longicorhis(9.6%)* were predominant found during analysis.(Tablel:4a) all isolated spp. classified base on their phylum, order, family, classes ,genus and spp. and prepared a systematic classification of zooplanktons.(Table:4b) Zooplankton and phytoplankton are very important biotic factor maintaining water body ecosystem. They also serve as bioindicator of water body system and maintain wetland ecosystem. During analysis isolated 15 spp. of zooplankton with different concentration (figure: 02) in which *Temora discadata, Centropages tenuiremis* and *Calanopi minor (*Figure: 01, 02&03) were *predominant* spp. as water indicator of wetland.

Figure-3 *Temora discadata* **Figure-4** *Centropages tenuiremi* **Figure-5** *Centropages tenuiremis*

4. CONCLUSION

Biodiversity of zooplankton at barda bandharan was fluctuated with Abiotic parameters. During study sampling point number: 03 has highest diversity of zooplankton where fish concentration is predominant than other sites. *Globigerina rubescense* (10.33 %), *Sapphirina nigromaculata* (10.0 %) and *Acrocalanus longicorhis* (9.6%) were predominant were predominant during study. Zooplankton spp. was fluctuated with physicochemical parameters and it may balance water body ecosystem.

ACKNOWLEDGEMENT

We are thankful to shree kidivav Science College which provides laboratory facility for this work.

CONFLICT OF INTEREST

Authors have no conflict of interest.

REFERENCES

1. Attayde JL, Bozelli RL. Assessing the indicator properties of zooplankton assemblages to disturbance gradients by canonical correspondence analysis. Canadian Journal of Fisheries and Aquatic Sciences. 1998; 55(8):1789-1797.
2. Balcer MD, Korda NL, Dodson SI. Zooplankton of the Great Lakes: a guide to the identification and ecology of the common crustacean species. Univ of Wisconsin Press; 1984.

3. Bertram PE, Stadler-Salt N. Selection of indicators for Great Lakes basin ecosystem health. United States Environmental Protection Agency; 1998.
4. Berzins B, Bertilsson J. On limnic micro-crustaceans and trophic degree. Hydrobiologia. 1989;185(2):95-100.
5. Berzins B, Pejler B. Rotifer occurrence and trophic degree. Hydrobiologia. 1989;182(2):171-180.
6. Botts PS. Lake Erie coastal wetlands: a review and case study of Presque Isle invertebrates. Invertebrates in Freshwater Wetlands of North America. John Wiley and Sons, New York, NY, USA. 1999:995-1012.
7. Burton TM, Uzarski DG, Gathman JP, Genet JA, Keas BE, Stricker CA. Development of a preliminary invertebrate index of biotic integrity for Lake Huron coastal wetlands. Wetlands. 1999; 19(4):869-82.
8. American Public Health Association. Standard methods for the examination of water and wastewater. 18th edition. American Public Health Association. Washington, D.C., USA 2012.
9. Cardinale, B. J., V. J. Brady, and T. M. Burton. Changes in the abundance and diversity of coastal wetland fauna from the open water/macrophyte edge towards shore. Wetlands Ecology and Management.1998. **6**:59–68.
10. Chow-Fraser, P. A conceptual model to aid restoration of Cootes Paradise Marsh, a degraded coastal wetland of Lake Ontario, Canada. Wetland Ecology and Management. 1998, **6**:43–57.
11. Chow-Fraser, P. 1999. Seasonal, interannual and spatial variability in the concentrations of total suspended solids in a degraded coastal wetland of Lake Ontario. Journal of Great Lakes Research **25**:799–813.
12. Chow-Fraser, P., and D. A. Albert. 1999. Coastal wetland ecosystems: biodiversity investment areas. Environment Canada and U.S. Environmental Protection Agency. Stateof the Lakes Ecosystem Conference 1998. [Online, URL:^www.cciw.ca/solec&.].
13. Chow-Fraser, P., V. Lougheed, V. Le Thiec, B. Crosbie, L.Simser, and J. Lord.. Long-term response of the bioticcommunity to fluctuating water levels and changes in waterquality in Cootes Paradise Marsh, a degraded coastal wetlandof Lake Ontario. Wetland Ecology and Management. 1998, 6:19–42.
14. Crosbie, B., and P. Chow-Fraser. Percentage land usein the watershed determines the water and sediment qualityof 22 marshes in the Great Lakes basin. Canadian Journal of Fisheries and Aquatic Sciences. 1999, 56:1781–1791.
15. Derevenskaya, O. Yu., and N. M. Mingazova. Communitiesof zooplankton in lakes in the course of their contamination and restoration. Hydrobiological Journal. 2000, 36:1–7.

Table 2: Physico-chemical Analysis of Water sample

Date	**20/11/2016**			**24/12/2016**			**27/01/2017**			**7/02/2017**		
Location	1	2	3	1	2	3	1	2	3	1	2	3
Time	7:45	8:01	8:20	8:15	8:31	8:49	9:2	9:2	9:45	8:32	8:43	8:54
Temp.	19.7	19.5	19.4	20	20.2	20.1	19	19.5	19.2	20.1	20.0	20.2
Color	Clear											
Order	Slightly smell											
pH	7.60	7.73	7.81	7.78	7.81	7.83	7.92	7.80	7.82	7.84	7.92	7.89
Conductivity µs/20	22.1	21.7	21.4	21.7	22.9	24	24.6	24.4	24.6	23.01	23.20	24.2
T.S. mg/L	7 800	7 915	8000	7300	8900	7900	6970	7770	7010	9000	8600	8700
T.D.S mg/L	1930	2010	2011	2000	3000	3080	2020	2570	2080	3000	2001	2752
D.O. mg/L	8.1	8.0	8.2	7.8	9	8.9	9.3	9.8	9.5	9.7	9.2	9.9
B.O.D. mg/L	2.0	2.5	2.1	3.5	3.7	4.0	2.7	3.0	2.8	2.3	2.0	2.0
Water hardness mg/L	310	290	315	300	260	320	384	360	396	380	350	390
Clorinity mg/L	632.3	645.5	635.4	613.8	612.5	615.0	693	685	697	920	970	840
Salinity mg/L	1012.94	1064.25	1048.41	982.34	979.62	985.23	1143.45	1130.25	1150.05	1518	1600	1386
Alkalinity mg/L	4500	4670	4635	4200	4500	6150	5900	5750	5800	5700	5820	5723
Acidity mg/L	3500	3600	3240	3400	2600	3080	4200	3800	3680	4300	3620	3580
NaCl Con. mg/L	1023.84	1064.25	1048.41	1011.9	1008.9	1014.7	1110.18	1097.37	1118.68	1473	1553	1345

Table 3: Zooplankton variations during sampling time period

Sodav Bandharan 20/11/2016 (Wetland)	**Sampling Station**	**Abundance in units observed/L**	**No. of species observed/total species**	**% of Diversity**
	1	112	11/15	73.33
	2	121	13/15	86.66
	3	109	10/15	66.66

Sodav Bandharan 24/12/2016 (Wetland)	**Sampling Station**	**Abundance in units observed/liter**	**No. of species observed/total species**	**% of Diversity**
	1	100	10/15	66.66
	2	98	9/15	60.00
	3	110	12/15	80.00
Sodav Bandharan 27/01/2017 (Wetland)	**Sampling Station**	**Abundance in units observed/liter**	**No. of species observed/total species**	**% of Diversity**
	1	103	11/15	73.33
	2	112	13/15	86.66
	3	101	10/15	66.66

Sodav Bandharan 07/02/1017 (Wetland)	**Sampling Station**	**Abundance in units observed/liter**	**No. of species observed/total species**	**% of Diversity**
	1	121	10/15	66.66
	2	100	12/15	80.00
	3	114	10/15	66.66
	3	114	10/15	66.66

Table 4 (a) Quantitative Analysis of Zooplankton (Vellan Village)

	Name of species	Abundance in no./li of Barda (Wetland)at Three station			Representation by group and individual genus/species		
	Zooplankton	**1**	**2**	**3**	**Total**	**AVG**	**% of group**
1	*Temora turbinata*	12	00	10	22	7.3	5.5
2	*Temora discadata*	10	09	07	26	8.6	6.5
3	*Calanopi minor*	14	08	03	25	8.3	6.3
4	*Labidocera acuta*	13	12	00	25	8.3	6.3
5	*Centropages tenuiremis*	12	09	07	28	9.3	7.1
6	*Acrocalanus longicorhis*	14	12	03	29	9.6	7.3
7	*Tortanus burbatus*	11	05	03	19	6.3	4.8
8	*Euchaeta marina*	06	07	04	17	5.6	4.3
9	*Sapphirina nigromaculata*	12	11	07	30	10.0	7.6
10	*sapphirina ovatolancelata*	08	09	03	20	6.6.	5.0
11	*Corycaeuscatus*	10	12	07	29	9.6	7.3
12	*Clytemnestra*	13	05	09	27	9	6.8
13	*Oithona spinirostris*	12	12	06	30	10	7.6
14	*Tintinnopsis nordqvisti*	15	11	10	36	12	9.13
15	*Globigerina rubescense*	11	10	10	31	10.33	7.8
	Total	173	132	89	394	131.3	……

Table 4 (B): Systematic Classification of Zooplankton (Vellan Village)

	Phylum	Class	Oder	Family	Spieces
Zoo plankton	Arthropoda	Maxilopoda	Calanoid	Temoridae	Temora turbinata
					Temora discadata
				Pontellidae	Calanopi minor
				Centropagidae	Labidocera acuta

					Centropages tenuiremis
				Paracalanidae	Acrocalanus longicorhis
				Tortanidrae	Tortanus burbatus
				Euchaetidae	Euchaeta marina
			Poecilostomatoida	Sapphirinidae	Sapphirina nigromaculata
					sapphirina ovatolancelata
				Corycaeidae	Corycaeuscatus
			Harpacticoida	Peltidlidae	Clytemnestra
			Cyclopoida	Oithonidae	Oithona spinirostris
	Ciliophoaa	Spirotrichea	Tintinnida	Codonollidae	Tintinnopsis nordqvisti
	Foraminifera	Polythalamea	Globigerinida	Globigerinidae	Globigerina rubescense

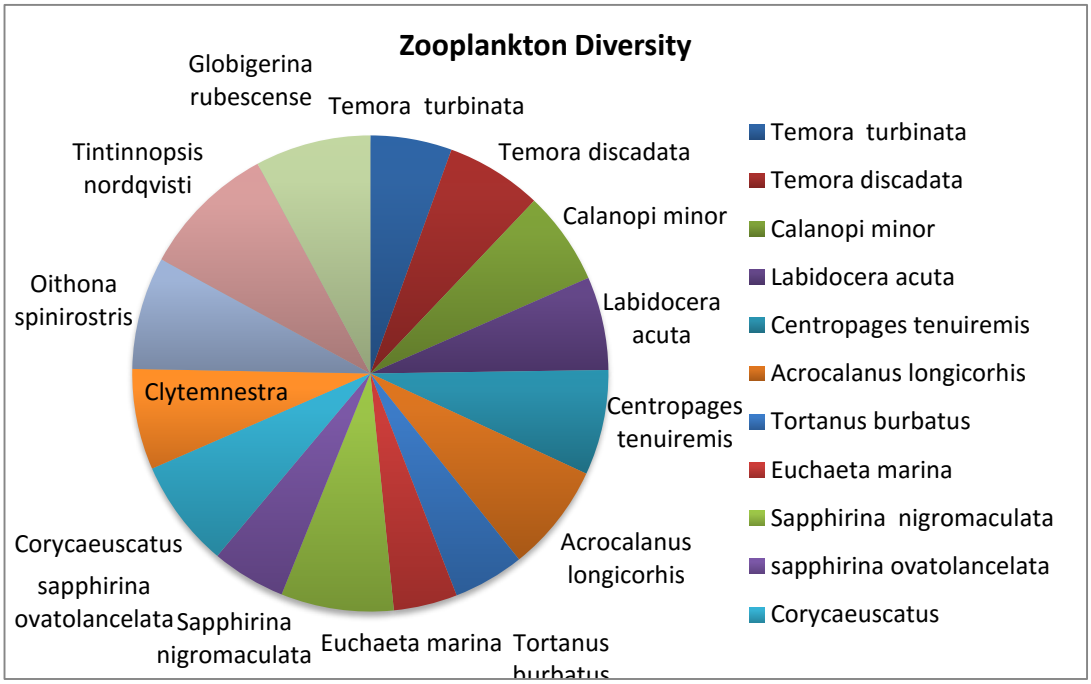

Figure: 02 Quantitative Diversity of Zooplankton