

STUDY OF MACRO-BENTHIC DIVERSITY IN BAKIYA BARRAGE DAM SATNA M.P.

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ABSTRACT: The present study examines the distribution of macro- benthic fauna in Bakiya barrage Satna to evaluate the macro-benthic community assemblages in predicting the water quality status. During the present investigation, total 5 sampling stations were identified and from these stations 32 species of benthic macro- benthic were recorded. Among the major taxonomic composition phylum arthropoda was found at dominant (72%) position. the study it can be concluded that diversity of macrozoobenthos was good at some stations but introduction of human activities altered habitat structure at some places so minimum diversity was recorded. Regular monitoring or care should be taken otherwise human interventions can be altered the ecology of Bakiya Barrage in near future. Therefore, it is suggested that research on biodiversity of macro-benthos need to be strengthened to know the current range of distribution and abundance.

KEYWORDS:- Macro-benthos, Diversity, Bakiya Barrage.

INTRODUCTION:-

The benthic macro-invertebrates community of the lotic ecosystem, like other communities has a series of attributes that do not reside in its individual species components and have meaning only with reference to the community level of integration such as species diversity, growth in the form and structure, dominance, relative abundance and trophic structure. One of these attributes many of these or all, depending upon situation may be changed with the changing ecology of the water body concerned. Species are distributed individualistically according to their own genetic characteristics and population of most of the species tends to change gradually along the environmental gradients. Most species are not in obligatory associations with other species, which suggests that association is formed with many combinations of species, and vary continuously in space and time. Hence, a study of benthic macro-invertebrates community composition and dynamics of different population of the community becomes a reliable source to provide the picture of environmental

status and influence of changing limnology of the water body concerned (Bhandarkar and Bhandarkar, 2013).

Benthic macro-invertebrates perform a variety of functions in freshwater ecosystem. They have an important influence on nutrient cycle, primary productivity, decomposition and translocation of material (Wallace and Webster, 1996; Covich et al., 1999). They are the most commonly used for bio-monitoring in lotic habitat worldwide (Bonada et al., 2006). They play an important role in the mineralization and recycling of organic matter and are an important tool for improving and preserving water quality (Bilgrami and Munshi, 1985; Venkateswarlu, 1986). Alteration produced in the physical and chemical status of the riverine ecosystem becomes recognizable through elasticity of the community structure of the organisms (Wilhm and Dorris, 1968; Cairns and Dickson, 1971).

The aim of the present study was to measure the diversity of macro- benthic in the Bakiya Barrage Satna.

MATERIALS AND METHODS:-

Study area- In the present study is going to centralize on Tons Bakiya Barrage Dam of Satna district in central India. The Tons Barrage Dam is situated in village Bakiya tiwariyan village, tehsil- kotar, district Satna (M.P.) and lies at latitude of 24° 42'04"N and longitude of 81° 09'15"S. The catchment area of Tons Barrage dam is 4457sq.km. and gross Capacity in the. 35427cum., height of the Dam in 20.5m. and length of Dam in 4855m. The Dam water use is domestic purposes, irrigation, aquaculture etc. The surrounding area of dam semi urban semi agricultural and to generate electricity. The present study examines the distribution of macro-benthic fauna in Bakiya barrage Satna to evaluate the macro-benthic community assemblages in predicting the water quality status. Satellite map of Bakiya barrage is shown in Figure- 1.



Fig. 1 Satellite Map of Bakiya Barrage Satna (M.P.)

Collection, Sieving, Sorting, Preservation, Transportation and Identification of samples:-

Most of the sampling stations fall under shallow zone with macrophytic vegetation. So, for the collection of benthic macro-benthos D- frame net was used and some were collected directly from stones using forceps and brushes very carefully. Samples were sieved using 0.3 micron mesh size brass sieve and with utmost care these were sorted and kept safely in reagent grade wide mouth plastic screw bottle with 4% solution used as preservative to transport the sample carefully to the laboratory for further work.

In next step, identification of macro-benthos was done with the help of stereo microscope and hand lens with 6x zoom capacity to observe the finest details about the organisms. Available keys and monographs were used to identify fauna up to their lower taxonomic levels (Needham and Needham, 1962; Rao, 1989; McCafferty and Provonsha, 1998; Dey, 2007).

RESULT AND DISCUSSION:-

Macro-benthos are best indicators for Bio-assessment. Macro-invertebrate are living beings without spines, which are visible to the eye without the guide of a magnifying instrument. Aquatic macro- invertebrate live on, under and around rocks and residue on the bottoms of lakes, waterway and streams. Because of their environment choice, macro-benthos are frequently viewed as "benthos" which alludes by and large to life forms which live on, in or close to the bottom. There are

many different types of macro invertebrates such as dragonfly larvae, mosquito larvae, water fleas, beetles and snails. Organisms require good water quality to survive. They may require high dissolved oxygen levels, or clear, non-turbid waters, or they may be predators that require an ample source of prey.

In the present investigation July 2017-May 2018 study on Bakiya Barrage Satna was found a total of 32 species were found from five sampling stations, 13 order of macro-invertebrate i.e. Ephemeroptera, Trichoptera, Placoptera, Coleoptera, Hemiptera, Odonata, Crustacea, Diptera, Pulmonata, operculata and pelecypoda, Oligocheata and Hirudinaria belonging to 3 phylum's Arthropods, Mollusca, Annelida were reported shown on table no 1.

The five sampling station of Bakiya Barrage was found to be inhabited by a variety of benthic macro invertebrate all through the period of investigation. During the present study July 2017- June 2018 of a total 13 order, 32 families belonging to 3 phylum Arthropoda, Mollusca, Annelida were recorded on winter summer and rainy season. Phylum Arthropoda was the most dominating group in all season winter, summer rainy. On season comparison of macro-invertebrates is observed that abundance were winter>rainy>summer.

Seasonal pattern of macro invertebrate population (org/l) at sampling station S1-S5 is given in table no. 3- .Among the macro invertebrate Arthropoda dominate the sampling station of Bakiya Barrage. Abundance in macro invertebrate was in the order of Arthropoda > Mollusca > Annelida.

ARTHROPODA-

The Arthropoda is a phylum of Ecdysozoan animals in which the epidermis makes a segmented, jointed and solidified exoskeleton, which has interior musculature. Each portion crudely bears a couple of jointed appendages. Appendages might be uniramous (one branched) or biramous (two fanned). Portions have a tendency to be assembled into body areas or tagmata. Each major group of arthropods is described by a specific tagmosis. Arthropods include group that are entirely marine, terrestrial and freshwater (chelicerates and crustacean); terrestrial and freshwater insect or terrestrial (myriapods). Arthropods display unparalleled

assorted variety and plenitude alongside a correspondingly vast environmental effect. Phylum Arthropoda formed the first largest group of bottom fauna. 23 families of the 8 orders i.e. Ephemeroptera, Trichoptera, Placoptera, Coleoptera, Hemiptera, Odonata, Crustacea, Diptera belonging to phylum Arthropoda were identified during the present study period. Arthropoda contribute the largest share constituting 4787 with 54.50 % of total macro-invertebrates.

Site wise abundance of Arthropoda is 566 org/l at site s1, 630 org/l at site s2, 800 org/l at site s3, 1281 org/l at site s4, 1510 org/l at site s5. The order of presence of Arthropoda is S1<S2<S3<S4<S5 as shown in table no 2. The season wise abundance of Arthropoda (Table No 3) is observed as rainy> winter >summer (Table No 3).

This clearly indicates the rainy and winter water quality was good in comparison to summer. Arthropoda an indicator of clean water quality and also sensitive to pollution.

MOLLUSCA-

Mollusca are delicate bodied animals, a larger part of which are secured by a hard calcareous shell. The shell may comprise of one, two or numerous pieces or once in a while it might be interior and cartilaginous. The phylum incorporates a heterogeneous group of organism, which are famously known as 'shells' or by various names, for example, snails, slugs, mussels, shellfish, mollusks, cuttle angles, squids, octopuses.

Phylum Mollusca formed the second largest group of macro-invertebrates. 7 families of the 3 orders pulmonata, operculata and pelecypoda belonging to phylum Mollusca were identified during the present study period. phylum Mollusca the second share constituting 2274 with 25.89% of total macro-invertebrates.

Site wise abundance of Mollusca is 274 org/l at site S1, 371 org/l at site S2, 439 org/l at site S3, 536 org/l at site S4, 654 org/l at site S5. the order of Mollusca is S1<S2<S3<S4<S5 as shown in table no 2.

The season wise abundance of Mollusca (Table No 3) is observed as summer>rainy>winter. This clearly indicates the order pulmonata is tolerant to pollution but operculata sensitive to pollution. Therefore maximum

number of Mollusca presents in summer season and minimum number of Mollusca present in winter.

ANNELIDA-

Annelida is a group normally alluded to as segmented worms, and they are discovered worldwide from the most profound marine sediment to the soils in our city parks and yards. Through the greater part of the twentieth century Annelida was part into three noteworthy group; Polychaeta, Oligochaeta (earthworms and so on.) and Hirudinea (leeches). Earthworm and leeches are the recognizable annelids for the vast majority, however polychaetes involve the main part of the decent variety of Annelida and are found in almost every marine habitat, from intertidal algal tangles downwards. There are even pelagic polychaetes that swim or float, preying on other planktons, and a some group found in fresh water and moist terrestrial environment.

phylum Annelida the smallest group of the macro-invertebrates. 2 family of the 2 order oligochaeta and hirudinea belonging to phylum Annelida were identified during the present study period. phylum Annelida was found total 1723 with 19.62% of macro-invertebrates.

Site wise abundance of Annelida is 200 org/l at site S1, 292 org/l at site S2, 332 org/l at site S3, 374 org/l at site S4, 525 org/l at site S5. The order of Annelida is S1<S2<S3<S4<S5 as shown in table no 2.

The season wise abundance of Annelida (Table No 3) is observed as summer>rainy>winter.

This clearly indicates the these animals are indicator of highly polluted water and can live without oxygen several days and the enrichment of organic nutrients in summer season.

In this way the total unit of macro invertebrates in sampling site of Bakiya Barrage water is 8784 in the 100% organisms/liter.

Table - 1: Macro-benthos of Bakiya Barrage Satna (M.P)

S. No.	Phylum	Class	Order	Family	
01	Arthropoda	Insecta	Ephemeroptera (May fly)	Bactidae	
			Trichoptera (Caddise fly)	Hydropsychidae	
			Placoptera (Stone Fly)	Chloroperlidae	
			Coleoptera (Beetle)	Hydrophilidae	
				Psephenidae	
				Gyrinidae	
				Dytiscidae	
			Hemiptera (Water Bug)	Notonectidae	
				Gerridae	
				Belostomatidae	
				Corixidae	
			Odonta	Nepidae	
		Coenagriidae			
		Corduliidae			
		Crustacea	Diptera	Gomphidae	
				Crustacean	Palaemonidae
				Diptera	Chironominidae
					Culicidae
Simuliidae					
Dixidae					
Ephydriidae					
Tanypodinae					
Muscidae					
02	Mollusca	Gastropoda	Pulmonata	Planorbidae	
			Operculata	Lymnaciidae	
				Physidae	
				Viviparidae	
		Thiaridae			
		Bivalvia	Pelecypoda	Corbiculidae	
				Unionidae	
03	Annelida		Oligochaeta	Glassiphonidae	
			Hirudinea	Eropobdellidae	

Table No. 2. Variation of Macro-benthos (Org/Liter) of various sampling stations in Bakiya Barrage Stana (M.P.)

Site/Organism	S1	S2	S3	S4	S5	Max	Min	Mean	SD	TOTAL	%
Arthropoda	566	630	800	1281	1510	1510	566	957.4	416.91	4787	54.50
Mollusca	274	371	439	536	654	654	274	454.8	146.83	2274	25.89
Annelida	200	292	332	374	525	525	200	344.6	119.63	1723	19.62
TOTAL	1040	1293	1571	2191	2689			1756.8	674.71	8784	

Table No. 2. Seasonal Variation of Macro-benthos (Org/Liter) in Bakiay Barrage Stana (M.P.)

Season	Arthropod	Mollusca	Annelida	Total
Rainy	278	94	68	440
Winter	179	75	56	310
Summer	109	105	76	290
Mean	188.67	91.33	66.67	346.67
SD	84.91	15.18	10.07	81.45

CONCLUSION:-

According to the baseline information of the study it can be concluded that diversity of macro-benthos was good at some stations but introduction of human activities altered habitat structure at some places so minimum diversity was recorded. Regular monitoring or care should be taken otherwise human interventions can be altered the ecology of Bakiya Barrage in near future. The natural population of Bakiya Barrage is fast depleting due to Agricultural pollution. Therefore, it is suggested that research on biodiversity of macro-benthos need to be strengthened to know the current range of distribution and abundance. To generate current information on the macro- benthic biodiversity, intensive survey is required so that better management plans are implemented for conservation of native species.

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