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Study of plankton diversity of Konar dam, Hazaribagh, Jharkhand, India

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Abstract : - Konar is a tributary of river Damodar, one of the easternmost tributaries of river Ganga. The present work was carried out during the year 2012 on the master dam of Hazaribagh district in the state of Jharkhand. Planktonic Organism is known to reach to different types of water pollutants. Analysis of data reveals that monthly abundance of the Zooplankton was highest in the months of September during the period of observation. The most dominant group was copepods among zooplankton. High rotifers populations in certain months indicate pollution from organic matter due to direct entry of untreated domestic sewage from catchment area. The maximum and minimum diversity (D) were found in the month of April 2012 as is evident that community existing here is moderately stable. The winter population maxima of copepods in the present study can be attributed to favourable temperature and availability of abundance of food in the form of bacteria, nano-plankton and suspended detriters.

Keywords : Pollutants, plankton, copepods, bacteria, nano-plankton.

INTRODUCTION

Plankton forms directly or indirectly food for fishes, the primary object of this investigation is get a general picture of the changes in the plankton concentration and abundance as indicated by fluctuations in the number of plankton, fresh water plankton (1952)¹ induces representatives from the photosynthetic algae, bacillariophyceae (diatoms), myscophyceae (Blue- green algae), chlorophyceae (Green- algae) and occasionally other from the non-photosynthetic bacteria, and other fungi and among zooplankton, all clases of protozoa, (except sporozoa), Rotatoria, Entomostraca, some immature Diptera, the gemmules of bryozoans and sponges and occasional aquatic termites, Gantrotiridis and others.

The different species of plankton vary in their response to seasonal changes in the physical and chemical conditions of water, in number of generations per year and in time of occurrence. Every organism of a water body whether plant or animal or whether small or large in the link of food chain and/or food web and thus play an important role in the flow of energy in the system and as such the present study will remain incomplete without having a complete picture of primary producers. Hence an attempt was mae to evaluate the plankton of Konar Dam.

Physiography

Konar is a tributary of river Damodar, one of the eastern most tributaries of river Ganga. It is situated as about 64 km. from its origin as latitude 23°53'N. The drainage area of the river as konar dam is about 997 sq. km. which includes thick jungles, waste and cultivated lands.

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MATERIALS AND METHODS

The plankton samples were collected with a plankton net made of standard bolting silk cloth no.25 (mesh size. 03-04 mm) collection were made at monthly intervals during one year(2006) from two station. From the sample quantitative and qualitative plankton analysis were made. Quantitative estimations were made after. Well accepted counting method of individual species (Att Willen, 1976) using, Jagwick" raftor counting cell. Most of the identification works have been carried out in the ecological research Laboratory of R.S.P(PG) College, Jharia (Dhanbad) using the standard taxonomical keys of Jhingran (1983). Some of the identifications were further confirmed by Z.S.I. Kolkata (W.B.).

OBSERVATION

The Fresh water ecosystem of Jharkhand harbours a rich wealth of plankton. Depending on the quality and quantity of planktons the quality and quantity of other higher forms of life belonging to different trophic levels of the food chain of the water body are determined. Plankton thus plays an important role in the flow of energy in the systems. Phytoplankton is an important component of ecosystem which responds to ecosystem alterations rather rapidly. It is due to the fact that the plankton plays a key role in the turnover of organic matter and energy through the ecosystem (Telesh, 2004).

Qualitative Analysis of Phytoplankton

The phytoplankton communities of the konar dam were represented by three groups of algae namely chlorophyta, cyanophyto and chrysophyta , of the total planktonic taxa recorded 3 belonged to the chlorophyta, 3 belonged to the chrysophyta and 2 belonged to the cyanophyta. In the present study a total of 16 taxa were recorded from the lotic region of konar of which 8 taxa belonged to phytoplankton and 8 taxa belonged to zooplankton. The phytophonkton taxa were represented by Cosmarium sp., Spirogyra sp., Pediastrum sp., Microcystis sp., Oscillatoria sp. Nitzschia sp., Navicula sp. and Diatoma sp. It is evident from the present study that among the chrysophyta showed its regular presence throughout the year. Among chlorophyta, all the three taxa showed its regular presence but Pedistmm sp. was absent

in Nov'07. Among cyanophyta both two taxa namely Nuorocysti sp. and Oscillatoria sp. showed regular presence except in the month of June'07 Oscillatoria was absent (Table-I).

Seasonal Variationsof Phytoplankton

From the quantitative analysis it was observed that the monthly abundance of phytoplankton was highest in the months of March and Aug during the period of observations where as the lowest densities of the phytoplankton population were recorded in the months of May and Dec except No'O? Chrysophyta was the most commonest group among the phytoplankton and also among the plankton Chrysophyta and chlorophyta both showed two peaks and two troughs following the period of observation single peak was observed in Cyanophyta in the month of sept,(Table-II).

Zooplankton

Altogether eight taxa of zooplankton were recorded of which four taxa belonged to copepod i.e. Cyclops sp., Mesocyclops sp., Acantho diaptomus sp and Diaptomes sp. Daphnia and Ceriodaphnia sp. belonged to cladocera. Brachionones sp. and Keratella sp. belonged to Monogononta of Brachionidae family.

Table -I. Phytoplankton recorded from the Konar Dam from Jan'2007 to Dec'2007

Division	- Chlorophyta
Class	- chlorophyceal
Genus	- i. Cosmarium
	ii. Spirogyra
	iii. Pediastrum
Division	- Chrysophyta
Class	- Bacillario phyceae
Genus	- i. Nitzschia sp.
	ii. Navicula sp.
	iii. Diatoma sp.
Division	- Cyanophyta
Class	- Myxophyceae
Genus	- i Oscillatoria
	ii Microcystic sp.

QUALITATIVE ANALYSIS OF ZOOPLANKTON

TABLE : 3. ZOOPLANKTON RECORDED FROM KONAR DAM FROM JAN'2007 TO DEC'2007

Class	Monogononta
Order	Ploima
Family	Brachionidae
Genus	(a) Brachionus (b) Keratella
Class	Cmstacea
Subclass	Cupezoda
Genus	(a) Cyclops (b) Mesocyclops (c) Diaptomus (d) Acanthodiaptomus
Sub Class	Brachiopoda
Order	Claducera
Genus	(a) Daphnia (b) Ceriodaphnia

Seasonal variation of Zooplankton

Among the zooplankton encountered the Bmchionus sp. was recorded in all months except in the month of Nov'07. Keratella sp. was the only taxa among the Rotifera which showed its regular presence in all months during period of observations. Among copepods, Cyclops sp. & Mesocyclops sp. showed its regular presence in all the months during the entire period of observation. Diaptomills sp. showed its regular presence in all the months except in the month of June'07 where it was absent. Aconthudiaptomus sp. showed its regular presence in all the months during the entire period of observation but it was found to be lower in July' 07. Ceriodaphnia sp. was observed to vary low in number in March'07 and Aug'07 (Table 4).

RESULTS & DISCUSSION

The dam receives pollutants from the discharge of sewage and industrial water of varying characteristics load. Seasonal variation in the phytoplanktons in temperature as well as tropical climates are common feature of any aquatic ecosystem. Singh et. al. (2012)⁵ Suggests that there are marked seasonal variations in the occurrence and abundance of various plankton. The higher phytoplankton density during monsoon months appear to be directly related to two relatively high concentration of nutrients such on phosphate and nitrates. The use of diatoms as indicators of pollution has been emphasized by many workers. The dam has several pollution indicator like

Navicula, sp., Nitzschia sp. etc. In the present study, different phytoplankton in were found to thrive well in different temperature. Cyanophyceae was abundant during two low temperature period while chlorophycease and diatoms were more abundant at high temperature. The lower density of phytoplankton may be due to the prevalence of high concutration of phosphate and Ammonic which appear to inhibit the photosynthesis and growth of phytoplankton(Justh et. al., 1991) Zooplankton provide food for fishes in fresh water ponds, lakes and playa major role in the fish production inspite of their great significance. In the present study 2 taxa of Rotifers, 4 taxa of Copepods and 2 taxa of cladocerans have been recorded. This is nearer to the finding of Pennok (1957)⁴ who suggested that the plankton found in the open water is a seldom more than 1 to 3 taxa of copepods, 2 to 4 species of cladoceram and 3 to 7 taxa of roti fers.It has been observed that in summer and monsoon, the factors like water temperature, turbidity, transparency etc. play an important role in controlling the density and diversity of rotifers. The highest no. of Keratella sp. in summer and early rainy season indicates eupophic condition of Konar dam similar to the finding of Sinha et.al. (2009). The present investigation indicates that the maximum number of species occurred during winter season than summer and monsoon season similar to the observation of Ugale, et. al., (2005)⁶. The less number of species might be attributed to the less nutrients in the dam which consequently result in less productivity or might be due to depletion of important factors such as dissolved oxygen and pH. Most of the cladoceran species are primary consumers and feed on microscopic algae and the four particulate matter in the detritus thus influencing the cycling of matter and energy in benthic food chain of a lake ecosystem. The winter population maxima of cladoceran in the present study can be attributed to favorable temperature and availability of abundance food in the form of bacteria, nanoplankton and suspended detritus.

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TABLE :-2 PHYTOPLANKTON POPULATION (UNIT PER LITRE) FROM JANUARY 2007 TO DECEMBER 2007 AT DISCHARGE POINT

Months/Genus	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec.
(A) CHRYSOPHYTA												
(i) Navienia sp.	44	148	471	5	41	49	348	390	94	261	38	3
(ii) Diatoma sp.	75	258	615	328	49	65	515	688	148	265	74	58
(iii) Nitzschia sp.	118	175	517	524	18	45	11	775	51	65	98	84
Total	237	581	1603	857	108	159	874	1853	293	591	210	145
(B) CHLOROPHYTA												
(i) Spirogyra	70	105	206	138	70	79	61	68	46	38	71	34
(ii) Pediatrum	68	99	188	235	54	66	32	3	49	6	0	28
(iii) Cosmarium	61	68	246	295	98	155	104	102	78	94	40	128
Total	199	272	640	668	222	300	197	173	173	138	111	190
(C) CYANOPHYTA												
(i) Oscillatoria sp.	5	39	17	49	45	0	96	108	224	58	118	84
(ii) Microcystis sp.	55	75	94	47	49	78	54	260	80	102	105	47
Total	60	114	111	96	94	78	150	368	304	160	223	131
Grand Total	496	967	2354	1621	424	537	1221	2394	770	889	544	466

TABLE :-4 ZOOPLANKTON POPULATION (UNIT PER LITRE) FROM JANUARY 2007 TO DECEMBER 2007 AT DISCHARGE POINT

Months/Genus	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec.
(A) ROTIFERA												
(i) Keratella sp.	48	112	94	86	218	216	48	75	132	48	131	64
(ii) Brachionus sp.	53	56	42	41	180	199	36	24	95	155	0	18
Total	101	168	136	127	398	415	84	99	227	203	131	82
(B) CRUSTACEA/COPEPODA												
(i) Cyclops sp.	99	185	85	61	208	112	78	28	54	108	112	90
(ii) Mesocyclops sp.	24	156	45	35	165	103	37	54	96	165	154	26
(iii) Acanthodiaptomus sp.	28	40	20	41	189	160	16	138	371	504	311	30
(iv) Diaptomus sp.	195	240	211	74	5	0	25	36	325	615	489	270
Total	346	621	361	211	567	375	156	256	846	1392	1066	416
(C) BRACHIOPODA/CLADOCERA												
(i) Daphnia sp.	82	61	48	188	188	102	38	16	102	88	118	76
(ii) Ceriodaphnia sp.	53	41	5	122	122	90	28	11	103	101	94	46
Total	135	102	53	310	310	192	66	27	205	189	212	122
Grand Total	582	891	550	648	1275	982	306	382	1278	1784	1409	620

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