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## Zooplankton diversity recorded from the man-made wetlands of Cooch Behar town of West Bengal, India

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**Abstract**

The district Coochbehar lies between 26°17'58.57" to 26°20'23.72" N and 89°26'01.74" to 89°27'34.26" E and is a part of Terai Himalaya of West Bengal of India. This district has a unique character of floral and faunal diversity for its geographical position which is adjacent to Indo-Malayan Hotspot. A number of lentic and lotic wetlands are present in this district as the district is located in a flood prone area. A large number of artificial wetlands are also present in the Coochbehar town most of which were created during the 'Koch dynasty' to cater the needs of the society. Some of them are Sagardighi, Rajmatadighi, Malidighi, Boiragidighi, Narasingha dighi, Lamba dighi, Laldighi etc. All these wetlands harbour a large number of Zooplanktons which are very important for their role as a part of second trophic level in aquatic ecosystem, that we had recorded during our study at UG level as a course curriculum of the syllabus. Our report is an extension of our previous study at UG and PG level based on the diversity and distribution of Zooplankton recorded from the man-made wetlands of Coochbehar town. This study recorded 14 Arthropods and 7 Rotifer from 7 man-made wetlands of the town. Detail diversity indices and Fisher (alpha) abundance index are analyzed. High counting of *Cyplops* from two wetlands indicating high level of organic pollution needs further limnological investigation.

**Keywords:** Zooplankton, diversity, wetland, Coochbehar town

**1. Introduction**

The district of Coochbehar is situated in the foothills of the Eastern Himalayas of West Bengal. It lies between 26°17'58.57" - 26°20'23.72" North Latitude and 89°26'01.74" - 89°27'34.26" East Longitude. The town is located at the North-Eastern part of West Bengal; bounded by the district of Alipurduar in the north and Jalpaiguri in the west, state of Assam in the east and the International Border in the form of Indo-Bangladesh boundary in the south. Coochbehar town, popular for its historic palace of Maharaja which looks like Buckingham palace of England, is the district town and one of the planned town of West Bengal. A number of artificial wetlands (ponds) are present in Coochbehar town, most of which were created at the time of 'Koch dynasty'. Some of them are Sagar dighi, Rajmata dighi, Mali dighi, Bairagi dighi, Narasingha dighi, Lamba dighi, Lal dighi etc. Perhaps the nomenclature of these ponds was according to their size, shape or purpose of utilization. All these wetlands harbor a large number of Zooplanktons which are very important for their role as a part of second trophic level of aquatic ecosystem, that we had studied during our Under Graduate and Post Graduate courses as a curriculum of the syllabus.

Planktons are also indicator of water health (Datta, 2011; Harris and Vinobaba 2012; Pal *et al.* 2015a) <sup>[1-3]</sup>. Composition and community structure of Zooplanktons are sensitive to nutrient enrichment and level of pollution (Ahmed *et al.* 2011) <sup>[4]</sup>. Besides playing an integral role as bio-indicator, it also influences all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter (Das *et al.* 2013) <sup>[5]</sup>.

A number of research publications are available regarding the diversity and distribution of planktons of wetlands of North Bengal, such as Datta (2011) <sup>[1]</sup> tabulated the zooplanktons of the wetlands of Jalpaiguri district, Mondal *et al.* (2012) <sup>[6]</sup> on the Rotifer diversity of Mirik lake of Darjeeling Himalaya, again Mondal *et al.* (2013) <sup>[7]</sup> on the Cladocera and Copepods

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of the same lake, Patra *et al.* (2015) [8] on the Zooplankton diversity of the lake situated at Moraghat forest in Jalpaiguri district. Only a few papers are available about the zooplanktons of Coochbehar district, such as Das *et al.* (2012, 2013) [5, 9] published papers on the diversity and density of Zooplanktons from the Rasik beel wetland complex of Coochbehar district, Pal *et al.* (2015a) [3] compared the zooplankton availability in an artificial pond and a natural wetland of Coochbehar district, again in a study Pal *et al.* (2015b) [10] recorded fifteen types of Zooplankton from the Panishala beel situated 8 km away from Coochbehar town.

But there is no publication available on the diversity of the zooplanktons of the wetlands of Coochbehar town. This report is an extension work of our previous study at Under Graduate course and 2<sup>nd</sup> semester Post Graduate level based on the diversity and distribution of Zooplankton recorded from the man-made wetlands of Coochbehar town. In this study we have recorded the Zooplanktons of 7 man-made ponds of Coochbehar town namely, Sagar dighi, Lamba dighi, Bairagi dighi, Lal dighi, Narasingha dighi, Rajmata dighi, Dangarai dighi and from Policeline dighi. Spot locations of the studied ponds were presented in Plate 1.

Ponds were selected considering their different size, location and daily use by the local people.

## 2. Materials and Methods

Water samples were collected periodically from three randomly selected zones of each wetland during morning session (6.30 to 7.30 am). Zooplankton samples were isolated from the study sites by filtering 30 liters of subsurface water through a fine nylon mesh (50 No.) conical zooplankton net. The content collected in a plankton tube which was attached to the lower end of the net and the content was then transferred to separate tube instantly. The collected zooplankton organisms were preserved in 4% formalin solution. Identification was carried out using a compound microscope having 4X objective lens following the literature of Sehgal, 1983 [11]; Battish, 1992 [12]; Sharma, 1999 [13]; and Venkataraman, 1999 [14]. The quantitative analysis of planktonic organisms was carried out using Sedgwick Rafter plankton counting cell. Three indices were used to obtain the estimation of species diversity (Shannon and Weaver 1949) [15], species richness (Margalef, 1951; Menhinick, 1964) [16, 17] and species evenness (Pielou, 1966; Sheldon, 1969) [18, 19].

**Table 1:** Checklist of Zooplanktons recorded from different Pond of Coochbehar Town

Common / Scientific Name	Status in different Ponds (in 30 lit.)							
	Bairagi dighi	Lamba dighi	Rajmata dighi	Lal dighi	Dagarai dighi	Narasingha dighi	Sagar dighi	Poloceline dighi
<b>Phylum: Arthropoda : Sub-phylum: Crustacea</b>								
Nauplius larva	00	00	390	90	90	00	420	210
<b>Class: Branchiopoda : Order: Cladocera</b>								
<i>Moina sp</i>	30	390	120	270	390	00	00	00
<i>Alona sp</i>	00	00	60	00	00	30	90	30
<i>Daphnia sp</i>	00	00	00	90	30	00	30	00
<i>Diaphanosoma sp</i>	210	180	1560	240	30	00	00	00
<i>Chydorus sp</i>	120	00	00	00	00	90	00	60
<b>Class: Maxillopoda : Sub-class: Copepoda</b>								
<i>Cyclops sp</i>	1260	2760	930	1800	1410	1440	300	90
<i>Mesocyclops sp</i>	120	300	160	1200	00	00	00	00
<i>Tropocyclops sp</i>	320	450	580	600	540	420	120	30
<i>Diaptomus sp</i>	30	00	00	00	60	00	60	00
<i>Neodiaptomus sp</i>	120	90	30	120	480	30	60	00
<i>Heliodiaptomus sp</i>	150	2160	460	1690	710	30	00	90
<b>Class: Ostracoda</b>								
<i>Cypris sp</i>	390	120	00	00	00	210	00	00
<i>Hemicypris sp</i>	30	00	00	00	180	30	60	00
<b>Phylum: Rotifera</b>								
<i>Brachionus sp</i>	1980	1290	520	210	120	960	210	1320
<i>Lacane sp</i>	120	00	00	60	360	00	00	00
<i>Epiphanes sp</i>	60	00	00	00	630	00	00	00
<i>Conochilus sp</i>	00	00	30	00	00	60	00	00
<i>Keratella sp</i>	90	120	180	00	120	210	330	00
<i>Ascomorpha sp</i>	00	00	30	00	30	30	210	00
<i>Rotaria sp</i>	00	00	00	00	00	00	60	00

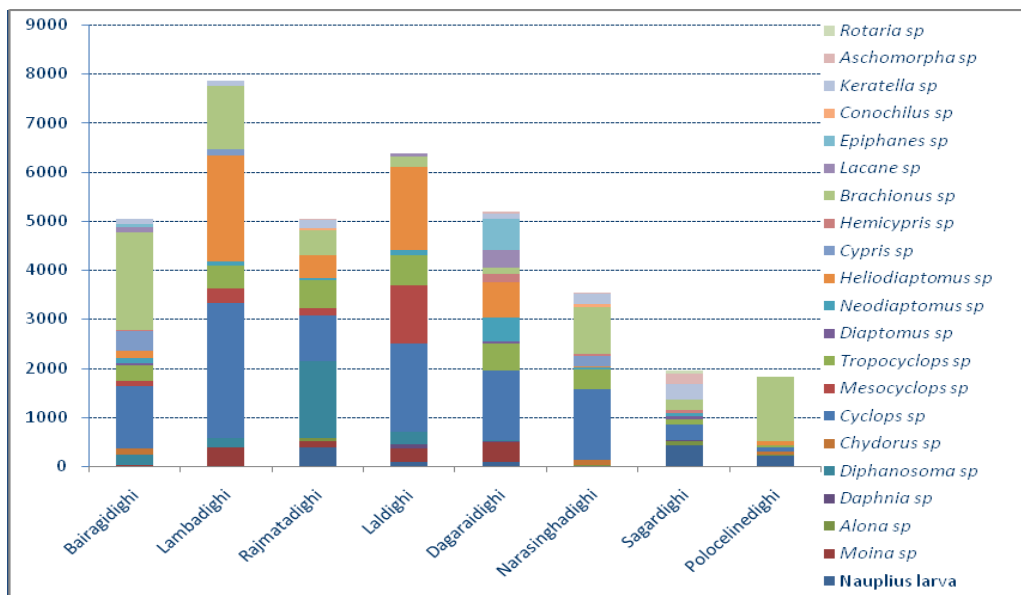
## 3. Results and discussion

Altogether 21 zooplankton species including one larval form were recorded during the course of our study. Checklists of the recorded zooplanktons are tabulated in Table 1. Out of these, 14 were recorded from the phylum Arthropod of which one is crustacean larva i.e. Nauplius, 5 belongs to

cladocera, 6 copepods, 2 ostracoda and other 7 species recorded from the phylum Rotifer. Highest populations were recorded from Lamba dighi then Lal dighi. Policeline dighi and Sagar dighi showed very low record of total population counting. Stacked column diagram representation of the recorded zooplanktons from the different ponds of

Coochbehar town are presented in Plate 2. *Cyclops* (belongs to copepods of Arthropods) and *Brachionus* (Rotifer) are the dominating species recorded from all ponds. The population

of *Heliodiaptomus* (copepods) is next to them which are recorded from all ponds except Sagar dighi which is the biggest in size in Coochbehar town.



**Plate 2:** Stacked column diagram of recorded Zooplanktons from different Ponds of Coochbehar Town of West Bengal

Table 2 represents the diversity indices of the recorded zooplanktons using Past (PAleontological STatistics) software (version 3.14) [Hammer *et al.* (2001)]. Species richness is high in Dangrai dighi, Sagar dighi and Rajmata dighi compare to other ponds though the Dominance (D') is 0.1318 in Sagar dighi indicating most favorable among the studied ponds. Both Sagar dighi and Dangraidighi showing highest diversity indices in 'Shannon index (H)' and 'Simpson (1-D)' index compare to Policeline dighi showing

the lowest. According to size Sagar dighi, Dangarai dighi, Lal dighi and Bairagi dighi are comparatively bigger in size and Policeline dighi, Lamba dighi are small. Calculation of number of species and number of individuals in log series, Fisher (alpha) is more than 1 (one) in all the studied ponds indicating comparatively good abundance record, except Policeline dighi which recorded the value 0.9218. Photographs of some of the recorded zooplanktons are presented in Plate 2.

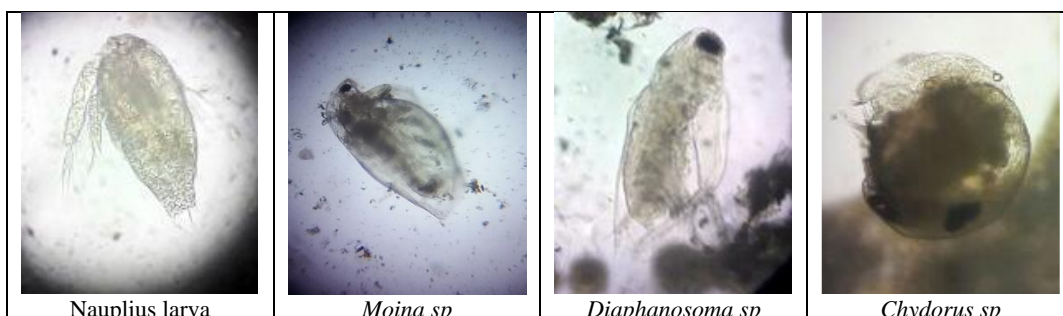
**Table 2:** Diversity Indices of the recorded Zooplanktons from different Pond of Coochbehar Town (Courtesy: Past software [Hammer *et al.*, 2001])<sup>[20]</sup>

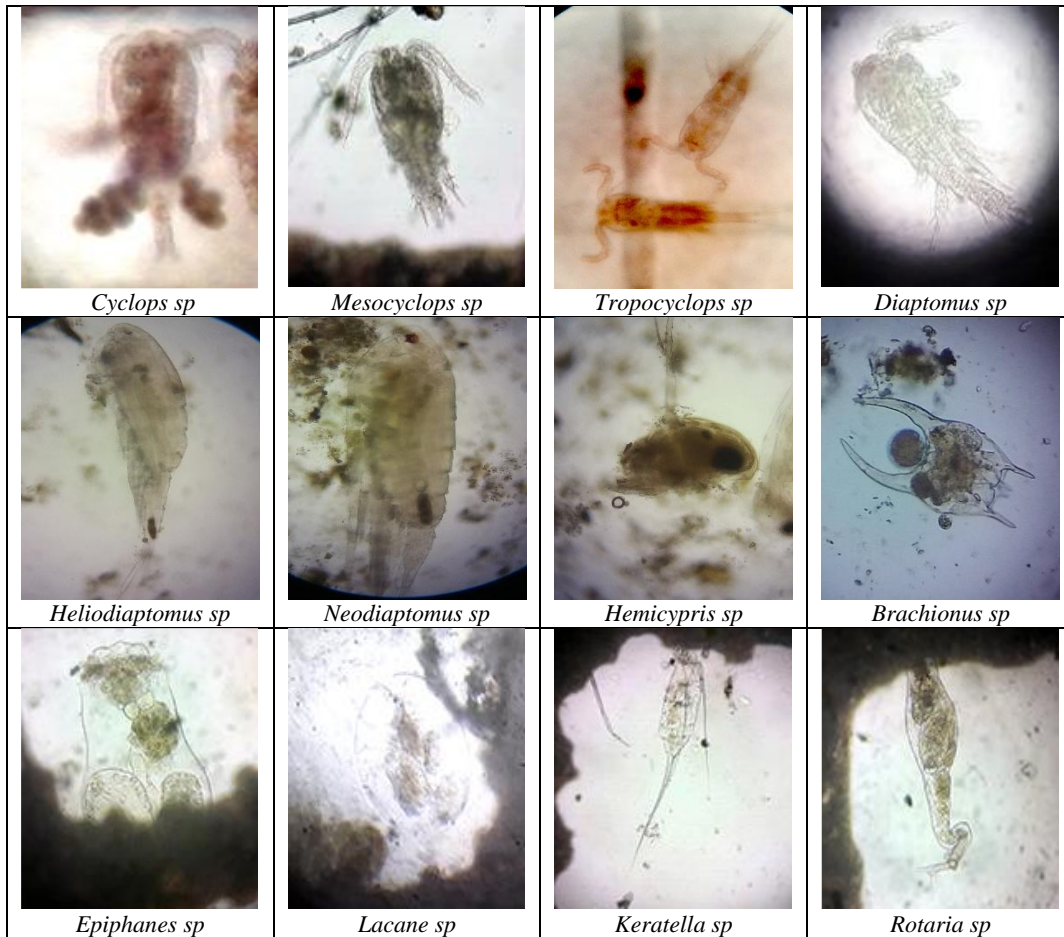
	Bairagi dighi	Lamba dighi	Rajmata dighi	Lal dighi	Dagarai dighi	Narasingha dighi	Sagar dighi	Poloceline dighi
Taxa_S	15	10	13	11	15	12	12	7
Individuals	5030	7860	5050	6370	5180	3540	1950	1830
Dominance_D	0.2332	0.2341	0.1705	0.1997	0.1404	0.2614	0.1318	0.5399
Shannon_H	1.898	1.722	2.034	1.855	2.222	1.672	2.205	1.027
Simpson_1-D	0.7668	0.7659	0.8295	0.8003	0.8596	0.7386	0.8682	0.4601
Evenness_e^H/S	0.4446	0.5595	0.5882	0.5812	0.6149	0.4438	0.7562	0.399
Menhinick	0.2115	0.1128	0.1829	0.1378	0.2084	0.2017	0.2717	0.1636
Margalef	1.643	1.003	1.407	1.142	1.637	1.346	1.452	0.7987
Equitability_J	0.7007	0.7478	0.7931	0.7737	0.8204	0.673	0.8876	0.5279
Fisher_alpha	1.904	1.13	1.615	1.294	1.895	1.552	1.704	0.9218
Berger-Parker	0.3936	0.3511	0.3089	0.2826	0.2722	0.4068	0.2154	0.7213

Very high counting of *Cyclops* in Lamba dighi, Lal dighi indicating high level of organic pollution (Pal *et al.* 2015)

needs further investigation of limnological parameters to know the actual cause of their dominance.

**Plate 2:** Photographs of plankton recorded from different ponds of Coochbehar town.





#### 4. Acknowledgement

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