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A Preliminary Study on the Assessment of Limnological Changes of Morna river in the Akola Region using Biological Indicators

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ABSTRACT

Limnological variables of upstream and downstream of Morna river were studied during October 2010 to March 2011. In the present investigation the water temperature 20.86oC and 21.43oC ,pH 7.91 and 8.925 , conductivity 69.3 and 56.315µmhos/ cm, total dissolved solids 2983.33 and 4139.165mg/l, ,dissolved oxygen 19.07 and 2.27mg/l, free Co2 33.75 and 29.33 mg/l, Phenolphthalein alkalinity 35.58 and 40.43mg/l, total alkalinity 307.08 and 428.245 mg/l ,total hardness 548.415and 560.5mg/l, Calcium hardness as CaCo3 197.525 and 219.7mg/l, Calcium hardness as Ca++ 79.145 and 87.98mg/l, Magnesium content 359.67and 365.97 mg/l, chloride 77.97 and 107.555mg/l , sulphate 2.74 and 3.445 mg/l ,phosphate 2.495and 1.84mg/l , nitrate 25.245 and 23.59µg/lit , and silicate 47.08 and 22.875mg/l of upstream and downstream of morna river were recorded during October 2010 to March 2011 . Among plankton diversity 8 species of Cyanophyceae, 5 species of chlorophyceae , 16 species of Basilariophyceae , 25 species Protozoan ,5 species of rotifers and 3 species of cladocerans were recorded during October 2010 to March 2011

Key Words :Limnological variables, indicator sp Morna river, Akola

Morna , a lotic system of India , originates from the Morna Hills (Morna village) that drain water to Purna river. The catchment of the Morna covers many vegetational types ranging from natural forest to agricultural lands. Upstream, the Morna receives water mainly from areas with less human interferences and downstream it receives water from areas with high human interferences. Human activities in the lower catchment of Morna include agriculture,industrial and sewage waste which could greatly affect any freshwater systems.

One way to assess the upstream and downstream limnological changes is the analysis of aquatic organisms, especially community changes of indicator organisms. Aquatic biota such as Cladocera, diatoms and chironomids respond rapidly to changes in environmental conditions (Smol, 2002) either directly or indirectly. Thus the aim of the present study was to identify and determine the plankton diversity and physicochemical characters of Morna and also to study to whether they show any community changes in upstream and downstream sites where high potential of environmental changes could exist.

Materials and methods

Four different sites were selected from the upstream and downstream of .Samples for the analysis of biota were collected once in a month for six months using a plankton net (pore size70 µm) and were preserved using the standard methods. Samples were then analyzed using a stereomicroscope and a student microscope (100x-1000x) and the selected plankton were identified using standard identification keys(e.g., Edmondson 1959) In addition, water samples from each site at each visit were collected and analyzed for temperature, pH, ,conductivity, total dissolved solids, dissolved oxygen(DO),free Co2, phenolphthalein alkalinity, total alkalinity, total hardness, calcium hardness as CaCo3,hardness as Ca++,magnesium content, chloride, sulphate, phosphate, nitrate and silicate by using standard method by APHA(1998) .Temperature, conductivity and pH were measured using portable electronic meters at the study site.

Results and discussions :

A total of 29 species of phytoplankton (cyanophyceae,chlo rophyceae,basillariophyceae)and 33 species of zooplankton (protozoans , rotifers and cladocera were identified from the four sites (Table:-2). The limnological variables measured at upstream and downstream sites showed remarkable differences(Table:-1). Diversity of the organisms was high in upstream sites where the limnological variables were favorable (e.g., low temperature, conductivity, nutrients and high dissolved oxygen) but presence of Chlorella sp, Phacus sp., Euglena sp mosquito larvae and chironomous larvae at downsream (Nimwadi and iron bridge Akola) shows very poor diversity due to increased human interference was more

Table:-1.Average values of physicochemical parameters in upstream and downstream study sites in the Morna catchment during Oct.2010 to March -2011.

Sr. No.	Physicochemical parameters	Upstream	Downstream
1	W.T.(0C)	20.865	21.43
2	pH	7.91	8.925
3	Conductivity µ mhos/cm	69.3	56.315
4	T.D.S. (mg/lit.)	2983.33	4139.165
5	Dissolved Oxygen (mg/lit.)	19.07	2.27
6	Free CO2 (mg/lit.)	33.75	29.33
7	P. Alkalinity (mg/lit.)	35.58	40.43
8	T. Alkalinity (mg/lit.)	307.08	428.245
9	T.Hardness (mg/lit.)	548.415	560.5
10	CaCO3 Hardness (mg/lit.)	197.525	219.7
11	Ca++Hardness (mg/lit.)	79.145	87.98
12	Magnesium content (mg/lit.)	359.67	365.97
13	Chloride (mg/lit.)	77.97	107.555

14	SO4 (mg/lit)	2.74	3.445
15	PO4 (mg/lit)	2.495	1.84
16	NO3 (µg/lit)	25.245	23.59
17	Silicate mg/lit	47.08	22.875

m sites where relatively unfavorable conditions existed in the water. The temperature (T), conductivity (Cond.), and the concentrations of nutrients (Nitrate, sulphate and Phosphate) showed relatively higher values compared to the upstream sites (Table 1).

Table:-2 Plankton diversity of Upstream and Downstream of Morna at Akola region during Oct.2010 to March -2011.

Sr. No.	Phytoplankton	Upstream	Downstream	Sr.No.	Zooplankton	Upstream	Downstream
I	Cyanophyceae			IV	Protozoans		
1	Desmonema sp.	259	183	1	Chlorella sp.	32	0.42
2	Gomphosphaeria wichurae	9	591	2	Difflugia lebes	NA	0.82
3	Nodularia spumigena	91	135	3	Difflugia sp 1	97.2	NA
4	Oscillatoria okenii	NA	10	4	Difflugia sp2	79.2	3.39
5	Osilatria sp.1	133	84	5	Euglena acus	29	2.23
6	Osillatria sp.2	261	43	6	Euglena caudate	35	2.58
7	Raphibiopsis curvata	247	49	7	euglena intermedia	54	NA
8	Spirulina sp.	2	30	8	Euglena proxima	24	119.35
II	Chlorophyceae			9	Euglena sp.1	89	NA
1	Closterium lanceolatum	759	70	10	Euglena sp.2	154	2.22
2	Closterium lunula	135	16	11	Euglena sp.3	NA	NA
3	Coelastrum sphaericum	17	18	12	Euglena sp.4	35	3.39
4	Crucigenia sp.	8	NA	13	Euglena sp.5	60	4.51
5	Scenedesmus sp.	8	43	14	Paramecium sp.1	24	3.14
III	Basilariophyceae			15	Paramecium sp.2	60	482.26
1	Amphora sp.	198	104	16	Peridinium sp.3	52	3.64
2	Anomoeoneis Sp.	230	54	17	Phacus acuminatus	47	NA
3	Bacillaria paradoxa	612	NA	18	Phacus acutus	20	86
4	Calidris mauri	108	57.3	19	Phacus pyrum	NA	97
5	Caloneis amphisbaena	164	31.2	20	Phacus sp 1.	56	99
6	Cocconeis placentula	123	53.3	21	Phacus sp.2	NA	98
7	Diploneis elliptica	39	35.3	22	Phacus sp.3	65	97
8	Eucocconeis flexella	205	NA	23	Phacus sp.4	NA	97
9	Fragilaria capucina	745	NA	24	Phycus sp5.	NA	86
10	Frustulia sp.	23	16.3	25	Sarcomastigophora lobosea	NA	49
11	Gyrosigma kulzingii	789	17.7	V	Rotifers		
12	Hannaea arcus	10	NA	1	Brachionus plicatilis	24	4
13	Navicula radiosa	689	24.5	2	Brachionus calyciflorus	NA	69
14	Pinnularia viridis	184	49.5	3	Brachionus sp.	724	70
15	Rhopalodia sp.	137	90.3	4	Keratella coachlearis	339	NA
16	Stauroneis phoenicenteron	464	NA	5	Keratella sp.	114	NA
	Total phytoplankton	6649	1888.3	VI	Cladocerns		
					Moina brachiata	10	NA
					Ceridaphnia reticulate	925	74
					Diaphanosoma sp.	14	NA
					Total zooplankton	3208.4	1558.81

Discussion

The present study encountered 53 species of Cyanophyceae,chlorophyceae,Basilariophyceae, Protozoa , rotifera ,and cladocera in the upstream study sites whereas in the downstream area only 46 species were recorded. Further, among the identified diatoms Fragilaria sp., which is known to indicate high nutrient concentrations in freshwater, was abundant downstream (Smol, 2002). Of the six groups of planktons studied Protozoa were the dominant group with high diversity. Euglena sp and Phacus sp, which are known to indicate higher nutrient values were common in downstream sites (Yatigammana, 2004). The rotifers were also abundant at downstream sites, however their diversity was low. Cladoceran were more abundant in upstream sites where the trophic conditions were high. The downstream sites showed higher values of conductivity, total dissolved solids, Alkalinity ,Hardnes chloride and nutrients, which may be due to soil erosion, agricultural activities, deforestation in the catchment, andcontamination with domestic waste.

Conclusions

The selected groups of organisms studied appear to be responding to the environmental changes by showing community changes. No studies had been conducted in Morna river relating to indicator organisms and their response to measured limnological variables. The present study provides a foundation for such research. However, qualitative and quantitative analysis of the flora and fauna would show the direction of species variations to particular environmental variables, which would be beneficial to environmental studies.

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