

## Zooplankton diversity on Taleigao Plateau, Goa

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### SUMMARY

We have sampled zooplankton from five different fresh water bodies on Taleigao Plateau, Goa, by using standard zooplankton collection methods. This report provides first

estimates of the diversity and abundance of zooplankton on any plateau in India in general and Taleigao plateau, Goa, in particular.

*Key words* : Diversity, Zooplankton, Plateau, Goa.

### Introduction

The diversity indicates the degree of complexity of a community structure. The diversity is a concise expression of how individuals in a community are distributed within sub-sets of species. Diversity is often related to certain environmental characteristics of water masses and the degree of complexity of flow of energy within the community (Omori and Ikeda, 1984). The zooplankton community is a heterogeneous group of tiny animals adapted to suspension in aquatic media. Their intrinsic movements, if any, are so feeble that they remain at the mercy of every water current. Further, the tropical region of the world is known to be rich in biodiversity (Pomeroy, 1986) because of the higher metabolic rate exhibited by biological organism living in tropics. Though there are several reports on zooplankton of freshwater lakes of high altitudes (Prasad, 1988; Das and Akhtar, 1992; Subia, *et al.*, 1992), river estuaries (Sarkar, *et al.*, 1985), there is great dearth for information on such studies on any plateau. Hence, an attempt has been made to collect, identify and

study zooplankton diversity on one of the tropical plateau, viz., Taleigao plateau in Goa.

### Materials and Methods

The water bodies in general and temporary water bodies in particular are extremely important from the scientific point of view as they are populated by quite a wide variety of species with interesting and unique physiological and behavioural properties. For the present studies, five freshwater water bodies on Taleigao plateau, Goa ( $15^{\circ} 48'' 00''$  N and  $14^{\circ} 53' 54''$  N latitude and  $70^{\circ} 20' 13''$  E and  $73^{\circ} 40' 33''$  E longitude) were selected. The elevation of the study area is around 50-60 meters above the MSL. Southern side of the plateau is bordered by Zuari creek and northern side with flat valleys. The slopes have thick vegetation. The area receives abundant rain fall of about 3000 mm of S.W. monsoon. The climate of the area is warm and humid. The temperature ranges from  $19^{\circ}$  to  $36^{\circ}$  C. The humidity during monsoon period is high; varying from 90-95% and for the rest of the year it ranges from 80-85%. In the study area,

Table 1. Zooplankton diversity on taleigao plateau, Goa.

	Zooplankton	Pond-I (%)	Pond-II (%)	Pond-III (%)	Pond-IV (%)	Pond-V (%)	Percentage amongst the group	Percentage in entire population
Sl. No.	<b>Protozoans</b>							
1.	<i>Glenodium cinctum</i>	6.10	-	4.42	-	-	9.30	0.941
2.	<i>Euglena acus</i>	31.70	7.84	-	-	-	34.88	3.529
3.	<i>Euglena oxyuris</i>	4.88	7.84	-	-	-	9.30	0.941
4.	<i>Stentor coeruleus</i>	1.22	-	-	-	-	1.16	0.117
5.	<i>Vorticella convallaria</i>	8.54	9.80	-	-	-	13.96	1.411
6.	<i>Paramecium caudatum</i>	4.88	-	-	-	-	4.65	0.470
7.	<i>Glaucoma pyriformis</i>	3.66	5.89	-	-	-	6.97	1.294
8.	<i>Chlamydomonas angulosa</i>	1.22	1.96	1.48	-	-	3.50	0.352
9.	<i>Litonotus pleurosigma</i>	-	3.92	-	-	-	2.34	0.235
10.	<i>Uronema marina</i>	3.66	-	4.42	-	-	6.97	1.294
11.	<i>Gonium pectorale</i>	2.44	-	2.95	-	-	4.65	0.470
12.	<i>Gonium compactum</i>	1.22	-	1.47	-	-	2.32	0.235
	<b>Rotifers</b>							
13.	<i>Notholca sp.</i>	7.32	13.73	13.23	-	-	10.84	2.588
14.	<i>Polyarthra multiappendiculata</i>	-	-	22.05	25.00	11.90	82.52	19.790
15.	<i>Filinia longiseta</i>	-	3.92	-	-	-	0.98	0.235
16.	<i>Asplanchna intermedia</i>	3.65	3.92	-	-	-	2.46	0.588
	<b>Crustacea (Anostraca)</b>							
17.	<i>Artemia salina</i>	3.65	-	-	-	-	100.00	0.352
	<b>Cladocera</b>							
18.	<i>Diaphanosoma sarsi</i>	3.66	-	-	-	-	0.63	0.352
19.	<i>Daphnia pulex</i>	3.66	-	-	1.45	-	2.61	1.411
20.	<i>Moina brachiata</i>	-	-	-	40.00	-	53.91	28.870
21.	<i>Sida crystallina</i>	-	-	-	30.00	-	40.43	21.650

22.	<i>Bosmina longirostris</i>	2.44	-	5.88	-	-	1.30	0.705
23.	<i>Pleuroxus trionellus</i>	6.10	-	-	-	-	1.15	0.588
<b>Copepods</b>								
24.	<i>Macrocyclus albidus</i>	2.38	-	-	-	-	1.88	0.235
25.	<i>Paracyclus poppei</i>	-	5.88	5.88	0.48	22.18	16.82	2.118
26.	<i>Cyclops bicuspidatus thomasi</i>	-	-	4.41	-	24.99	11.22	1.411
27.	<i>Mesocyclops leuckarti</i>	-	11.76	2.94	0.96	-	13.08	1.647
28.	<i>Phyllodiaptonus blanci</i>	-	3.93	2.94	-	5.59	3.74	0.470
29.	<i>Eucyclops agilis</i>	-	-	-	-	11.13	3.74	0.470
	<i>Copepodid stage-I</i>	-	7.85	13.23	1.29	8.35	22.43	2.823
	<i>Copepodid stage-II</i>	-	11.76	17.64	0.80	-	21.49	2.705
	<i>Diaptomus Nauplius stage-VI</i>	-	-	-	-	16.66	5.61	0.698
Number of species		19	14	13	08	07		
J' (Evenness component diversity)		0.8574	0.9547	0.8782	0.6249	0.9424		
Sheldon diversity index		1.2879	1.6035	1.3587	0.7859	1.3966		
Shannon Weiner Index		1.0950	1.0939	0.9772	0.5646	0.7966		

laterite occurs in almost all localities. The laterites are pissolitic and highly cavernous. Pond-1 and 2 are open ponds with considerable vegetation; pond-3 was covered with thick natural and man made vegetation; while pond-4 and 5 were of laterite stones, without much vegetation in and around them.

Ten liters of water from each of these ponds was collected, sieved and filtered through No. 1 Whatman paper. Immediately, the filtrate was diluted in 200 ml of double distilled water. To this a few drops of 4% formalin was added to narcotize the zooplankton. They were later centrifuged at 2000 rpm for 10 minutes (Battish, 1992). The pellet was observed and analysed for presence of zooplankton by using Olympus BX-40 trinocular microscope and were identified, classified and recorded by following the available standard literature (Fitter and Manuel, 1986, Battish, 1992, Edmondson, 1992). The data obtained was later subjected to various statistical analysis such as diversity index, which combines species richness(s) and the distribution of individuals between species (species susceptibility) into single value (Beeby, 1993), Pileou's evenness component diversity, Sheldon's diversity index and Shannon Weiner diversity index.

### Observations

Diversity and richness of zooplankton found in ponds of Taleigao plateau is shown in Table 1, from which, it can be seen that there are maximum number of protozoans (12 species), followed by copepods (9 species), cladocerans (6 species), rotifers (4 species). While, crustacean is represented by lone *Artemia salina* species, in the under investigation.

Table 1, also provides the information on richness with regard to number of every zooplankton species found on the plateau. It can be observed from Table 1, that cladocerans such as *Moina brachiata* (29.176%), *Sida crystallina* (21.882%) accounts for maximum number of

zooplankton on the plateau, which is closely followed by *Polyarthra multiappendiculata*, a rotifer (20.470%).

Information on number of species, Pielou's evenness component diversity ( $J'$ ), Sheldon's diversity index ( $E$ ) and Shannon Weiner index ( $H'$ ) can also be seen from Table 1.

*Euglena acus* is dominant amongst protozoans (34.88%) in pond-1. *Vorticella sp.* is the next dominant group (13.96).

### Discussion

The density and diversity of zooplankton is known to be higher at increased temperature. The reasons for which is at high temperature, the metabolic rate enhances, thus resulting in higher reproduction rate and multiplication of zooplankton. (Bais and Aggarwal, 1996). The results of the present investigations corroborates these findings, which is evident from maximum number (611) of zooplankton being recorded from pond-4, which also records for maximum temperature (34° C) amongst the ponds under study.

*Euglena acus* is dominant amongst protozoans (34.88%) and shows highest percentage in pond-1. *Vorticella sp.* is the next dominant group (13.96%) followed by *Glaucoma pyriformis* (6.97%) and *Uronema marina* (6.97%).

*Polyarthra multiappendiculata* is abundant amongst rotifers (85.72%) and shows highest value in pond-4 (25.32%), followed by *Notholca sp.* As the maximum temperature of 34° C, it appears that optimal thermal and nutrient conditions prevailing in the pond are probably responsible for the abundance of rotifer population which is in accordance with the studies of Sarwar and Parveen (1996).

Amongst the Cladocerans, encountered in the study area, *Moina brachiata* is abundant (53.90%) and shows its highest percentage of 22.18 in pond-5, followed by *Sida crystallina*

(40.41%). According to Bais and Agarwal, 1995, the density of Cladocerans in primarily determined by the food supply. Also in pond-5. *Paracyclops poppei* is dominant amongst the copepods (16.82%), followed by *Mesocyclops leuckarti* (11.22%).

By the present studies of zooplankton diversity on Taleigao plateau, Goa, it can be concluded that though there is a rich zooplankton diversity, *Moina brachiata* (29.176%), *Sida crystallina* (21.882%) and *Polyarthra multiappendiculata* (20.47%) occupies top three positions in order of merit.

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