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Diversity of zooplankton and seasonal variation of density in Sukhana Dam, Garkheda Dist Aurangabad (M.S.) India

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Abstract

The present study was to understand the diversity of zooplankton during July 2008 to June 2009 in the Sukhana dam, Garkheda Dist. Aurangabad India. During the present study total 29 species of Zooplankton belonging to four groups i.e. Cladocera (10 species), Copepoda (05species), Rotifera (12 species) and Ostracoda (02 species). Total number of 15,058 zooplanktons was noticed in Sukhana dam, consisting of 23.83% of Rotifera; 28.52% of Cladocera; 44.48% of Copepoda and 3.17% of Ostracoda during present study period.
It was noticed that Zooplankton population density of Sukhana dam was maximum in summer and minimum in rainy season.

Keywords: Zooplankton, Seasonal variation, Sukhana dam and Garkheda.

Introduction

The world plankton refers to the floating organism that lives on surface water. These organisms can be plant or animals. The plant forms are phytoplanktons and animal forms are zooplankton. Zooplanktons are the heterotrophic type of planktons. These are organisms drifting in the water column of oceans and fresh water bodies. The name of zooplanktons is derived from the Greek zoon, meaning "animal" and planktos, meaning "wanderer" or "drifter". Many zooplanktons are too small to be seen individually with the naked eye. Zooplanktons are small animals that float freely in the water column of Lakes and oceans and whose distribution is primarily determined by water currents and mixing.

Zooplanktons play a role of converting phytoplanktons in to food, suitable for fish and aquatic animals and acquired importance in fishery research. The zooplanktons can also play an important role, indicating the presence or absence of certain species of fishes or in determining the population densities. Freshwater zooplanktons are an important component in aquatic ecosystems, whose main function is to act as a primary and secondary links in the food chain (Hutchinson, 1967).

Zooplankton are one of the most important biotic components influencing all the functional aspects of an aquatic ecosystem, such as food chains, food webs, energy flow and cycling of matter (Murugan *et al.*, 1998; Dadhick and Sexena, 1999; Sinha and Islam,

2002; Park and Shin, 2007). The distribution of zooplankton community depends on a complex of factors such as, change of climatic conditions, physical and chemical parameters and vegetation cover (Rocha *et al.,* 1999; Neves *et al.,* 2003). According to Murugan *et al.* (1998) and Dadhick and Sexena (1999) the zooplankton plays an integral role and serves bio-indicators and it is a well-suited tool for understanding water pollution status (Contreras *et al.,* 2009). A number of studies have been carried out on ecological condition of freshwater bodies in various parts of India (Gulati and Schultz, 1980; Rana, 1991; Sinha and Islam, 2002). The higher abundance of zooplanktonsic fauna recorded during summer, while lower value during rainy season. This fluctuation of zooplanktons is mainly due to environmental changes (Sunkad and Patil, 2004; Sheeba and Ramanujan, 2005).

Keeping this view in mind present study has been undertaken to assess monthly variation, group wise seasonal variation, group wise total percentage, species diversity and species evenness in Sukhana dam.

Materials and Methods

Study area:

Sukhana dam is situated near the village Garkheda in Aurangabad tahsil. It is build over Sukhana river which passed through the Chikalthana the suburb, known for Breweries and Pharmaceuticals' industrial hub. It is 22 K.M. away from the East side of Aurangabad city. The dam was constructed in the year 1968 as medium irrigation dam. Soil has been used as bunding materials, the bund height is 16.92 meters and the catchments area is about 21.34 Sq.km. The Top width of bund is about three meters. The initial purpose of dam was irrigation but latter the water was used for industrial activities as chikalthana industrial area grown up during 1974 to 1990.

Sampling Methods and Analysis:

During the present study zooplankton sample were collected monthly for the period of one year i.e July 2008 to June 2009. At two sampling station (Station A & B) from Sukhana dam Plankton hand net made of nylon bolting cloth (mesh size 25µm) was used for sampling purpose. After collection concentrated plankton sample were fixed and preserved as early as possible in 4% formalin. Plankton sample were examined under compound binocular microscope and identified up to genus and species level with the help of standard literature. (Edmonson, 1963; Battish, 1992; IAAB, 1998).

Results and Discussion

Diversity of Zooplanktons:

Total number of 15,058 zooplanktons was noticed in Sukhana dam, consisting of 23.83% of Rotifera; 28.52% of Cladocera; 44.48% of Copepoda and 3.17% of Ostracoda during the year of 2008-09 (has shown in fig. no. 1). The population density of zooplankton of all recorded four groups was maximum in the summer season and that was minimum in the rainy season. (Table no. 2). The monthly zooplankton population density has given in table no. 1.

There were twenty nine species of zooplankton belonging to four classes viz. Cladocera, Rotifera, Copepodaa and Ostracoda were recorded from the Sukhana dam. The species observed were as *Brachionus caudatus, Brachionus rubens, Brachinous forficula, Asplanchana priodonata, Keratella cochlearis, Trichocera sylindrica, Branchinous calyciflorus, Filinia opoliensis, Filinila longiseta, Trichocera similis, Asplanchana brightwelli* and *Brachionus diversicomis* among the group of **Rotifera** (12 species). *Ceriodaphni cornuta, Alona pulchella, llll.Moina macrocopa, Monia micrura, Chydrous reticulatus, Chydrous sphaericus, Daphnia carinata, Diaphnanosoma sarsi, Macrothrix goeldi* and *Biapertura karua,* among the group of **Cladocera** (10 species). *Heliodiaptomus viduus, Tropocyclops parasinus, Mesocyclops leuckarti, Rhinediaptomus indicus* and *Copepod larvae* among the grpup **Copepoda** (5 species). *Llyocypris gibba* and *Darwinula* sp among the group **Ostracoda** (2 species). Monthly fluctuation of Zooplankton population density of Sukhana Dam (org/L) (has given in table no.1.)

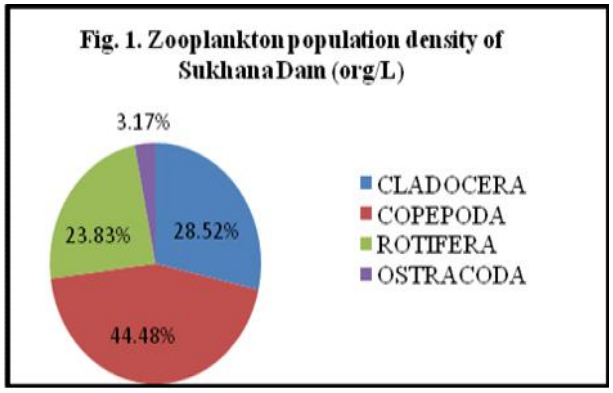
Similarly, Dahiwale, (2008) has described 4 genera of Rotifers, 13 genera of Cladocera, 8 genera of Copepoda and 1 genus of Ostracoda from Hussain Sagar Lake at Hyderabad and Sukhana dam at Marathwada respectively. (Smith *et al.,* 2009) has described 6 genera of Protozoa, 36 genera of Rotifers, 5 genera of Cladocera, 8 genera of Copepoda, 3 genus of Ostracoda, 2 genus of larvae, 2 genus of Brachiopod, 2 genus of Oligochaeta and 2 genus of Nematoda in Panchganga River, Kolhapur. (Rajagopal *et al.,* 2010) has described 24 genera of Rotifers, 8 genera of Cladocera, 9 genera of Copepoda and 4 genus of Ostracoda in Perennial Ponds of Virudhunagar Dist. Tamilnadu.

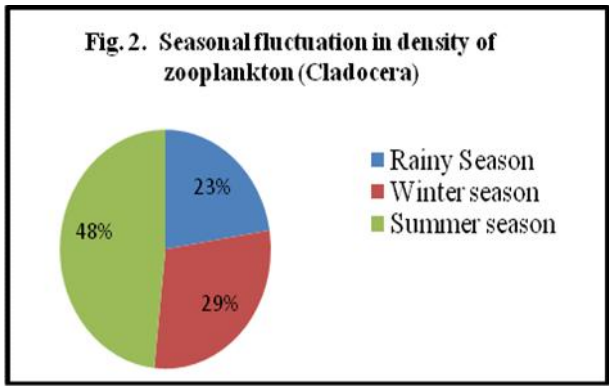
Table No. 1. Zooplankton population density of Sukhana Dam (org/L) during 2008- 09.

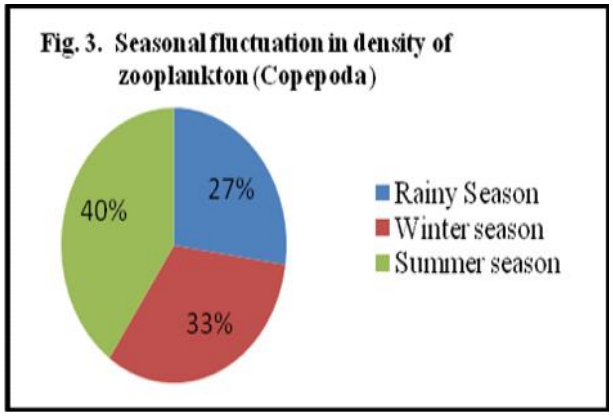
Sr. no.	Species	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Cladocera													
1.	*Ceriodaphni cornuta*	40	120	120	90	80	80	110	120	160	110	120	20
2.	*Alona pulchella*	30	40	-	50	60	-	60	30	50	40	50	20
3.	*Moina macrocopa*	40	60	-	50	70	-	80	80	100	70	80	-
4.	*Monia micrura*	-	30	20	-	20	-	20	-	50	-	30	-
5.	*Chydrous reticulatus*	50	-	60	30	50	50	30	60	50	70	70	-
6.	*Chydrous sphaericus*	-	-	60	30	30	10	30	-	70	40	-	-
7.	*Daphnia carinata*		-	20	10	-	-	-	-	30	-	40	-
8.	*Diaphnanosoma sarsi*	-	-	-	-	-	-	-	-	30	50	-	-
9.	*Macrothrix goeldi*	-	-	-	30	-	-	-	40	50	40	50	-
10.	*Biapertura karua*	60	60	70	50	80	-	10	-	60	90	70	10
Copepoda													
1.	*Heliodiaptomus viduus*	130	110	198	150	160	50	170	150	200	90	140	60
2.	*Tropocyclops parasinus*	-	70	80	110	110	70	120	70	120	90	110	40
3.	*Mesocyclops leuckarti*	80	50	80	100	90	30	70	90	110	80	60	80
4.	*Rhinediaptomus indicus*	-	-	-	30	10	-	50	40	120	30	60	-
5.	*Copepod larvae*	200	250	320	230	220	210	290	280	330	270	380	160
Rotifera													
1.	*Brachionus caudatus*	20	110	80	110	90	40	140	100	130	170	70	40
2.	*Brachionus rubens*	-	-	70	20	30	-	-	-	70	60	-	-
3.	*Brachinous forficula*	-	-	-	20	-	20	-	50	30	40	50	-
4.	*Asplanchana priodonata*	-	-	-	-	-	-	-	30	-	-	10	-
5.	*Keratella cochlearis*	-	60	20	-	-	20	-	40	50	30	40	-
6.	*Trichocera sylindrica*	-	-	-	-	-	-	30	-	-	-	20	-
7.	*Branchinous calyciflorus*	30	50	30	60	50	40	70	-	60	130	100	50
8.	*Filinia opoliensis*	-	-	-	30	20	-	20	-	10	-	-	-
9.	*Filinila longiseta*	-	-	40	20	60	-	70	-	-	50	90	-
10.	*Trichocera similis*	-	20	-	10	-	-	-	10	20	20	30	-
11.	*Asplanchana brightwelli*	-	-	-	30	-	-	-	-	40	30	40	-
12.	*Brachionus diversicomis*	-	40	20	-	-	-	50	-	40	40	20	10
Ostracoda													
1.	*Llyocypris gibba*	-	20	20	10	10	-	40	30	20	30	-	-
2.	*Darwinula sp*	10	20	30	20	30	20	30	30	30	40	20	-

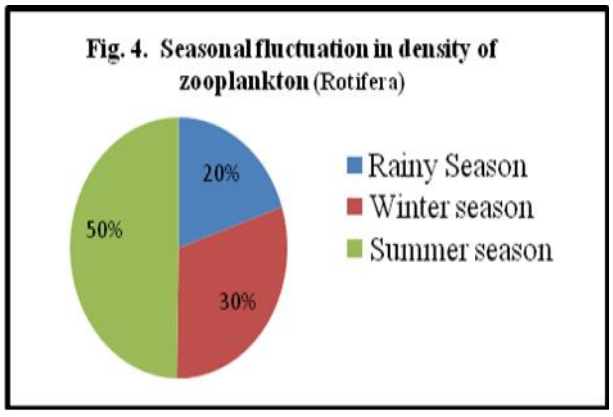
Table No. 2. Average value of seasonal density of observed Zooplankton of Sukhana Dam (org/L) during 2008-09.

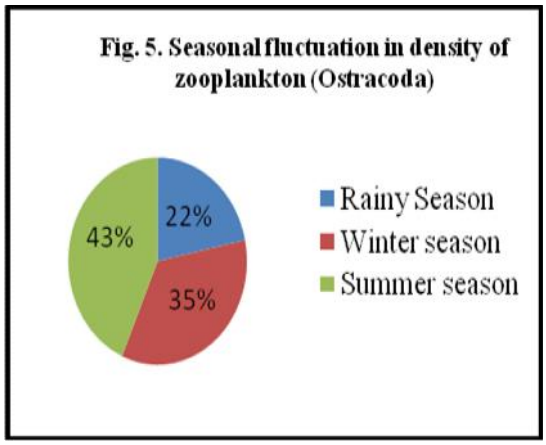
Month /Seasons		Cladocera	Copepoda	Rotifera	Ostracoda
Rainy Season	Jun	50	340	100	0
	Jul	220	410	50	10
	Aug	310	480	280	40
	Sep	350	678	260	50
Total		**930**	**1908**	**690**	**100**
Winter season	Oct	340	620	300	30
	Nov	390	590	250	40
	Dec	140	360	120	20
	Jan	340	700	380	70
Total		**1210**	**2270**	**1050**	**160**
Summer season	Feb	330	630	230	60
	Mar	650	880	450	50
	Apr	510	560	570	70
	May	510	750	470	20
Total		**2000**	**2820**	**1720**	**200**
Grand Total		**4140**	**6998**	**3460**	**460**
Percentage (%) Contribution		**28.52%**	**44.48%**	**23.83%**	**3.17%**

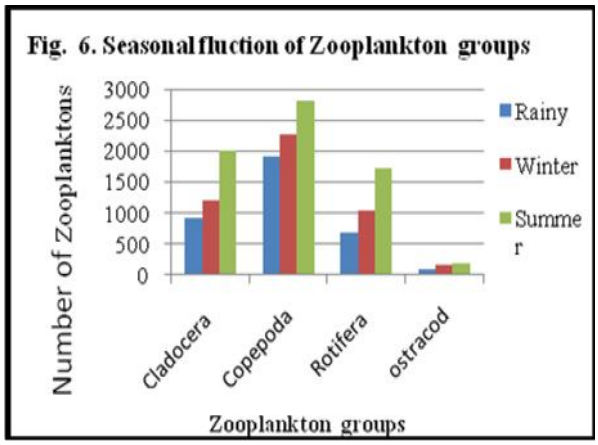












In the present study period i.e July 2008 to June 2009 total 4140 Cladocera were recorded in Sukhana dam, consisting of 48% in summer season, 29% in winter and 23% in Rainy season.. The mean value of density of Cladocera was varied from 50 org./L to 650 org./L. the maximum density of Cladocera was observed in summer season and minimum in rainy season. Seasonal variation in the density of Cladocerans has given in figure No. 2.

Total No. of 6998 Copepods were recorded in Sukhana dam, consisting of 40% in summer season, 33% in winter and 27% in rainy season. The mean value of density of Copepods was varied from 340 org./L to 880 org./L. the maximum density of Copepods was observed in summer season and minimum in rainy season. Seasonal variation in the density of Copepods has given in figure No. 3

Total No. of 3460 Rotifera were recorded in Sukhana dam, consisting of 50% in summer season, 30% in winter and 20% in rainy season. The mean value of density of Rotifera was varied from 50 org./L to 570 org./L. the maximum density of Rotifera was observed in summer season and minimum in rainy season. Seasonal variation in the density of Rotifera has given in figure No. 4

Total No. of 460 Ostracoda were recorded in Sukhana dam, consisting of 43% in summer season, 35% in winter and 22% in rainy season. The mean value of density of Ostracoda was varied from 10 org./L to 70 org./L. The maximum density of Ostracoda was observed in summer season and minimum in rainy season. Seasonal variation in the density of Ostracoda has given in figure No. 5.

It was noticed that Zooplankton population density of Sukhana dam was maximum in summer because the increasing temperature enhances the rate of decomposition due to which the water becomes nutrient rich similarly due to concentration followed by evaporation in summer season the nutrient concentration increases and abundant food present in form of phytoplankton and micro-organism to zooplanktons and minimum in rainy season because low density during the monsoon season is attributed to heavy flood and fresh water inflow.

Similar, results have been reported by (Rajagopal *et al.*, 2010) (Pandit *et al.*, 2007) When the observed Zooplankton population density arranged in an increasing order during the three seasons are:

Summer: Ostracoda < Rotifera < Cladocera < Copepods

Winter: Ostracoda < Rotifera < Cladocera < Copepods

Rainy: Ostracoda < Rotifera < Cladocera < Copepods

Seasonal variation in the density of four principal zooplankton components graphically presented in Fig. No. 6.

Conclusion

- It can be concluded that Rotifera were the dominant zooplankton group in the study period.
- It can be concluded that Zooplankton population density of Sukhana dam was maximum in summer and minimum in monsoon.
- The presence of species will depend on its environmental tolerance. If competition or predation is reduced or the food supply or suitable habitat increased, the species will become more abundant.

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