

SEASONAL VARIATIONS IN DENSITY AND DIVERSITY OF ZOOPLANKTON OF WAGHUR DAM NEAR JALGAON (M.S.), INDIA.

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ABSTRACT

Present study deals with seasonal variation in density and diversity of zooplankton of Wahgur dam water near Jalgaon in Maharashtra. Wahgur dam water is mostly used for drinking, irrigation and domestic purposes. The zooplankton dynamics can greatly influence the water quality of this dam. Therefore the population composition and seasonal variation of zooplankton were carried out. For study, samples were collected from the four different sampling stations (A, B, C and D) of Wahgur dam. The quantitative analyses of zooplankton has revealed the fact that rotifers, cladoceran, copepods and ostracods were the major components of its total bulk in Wahgur dam. The maximum abundance of total zooplankton appeared in summer and its minimum was noted in early monsoon. The values of number of zooplankton species indicating the pattern of diversity has exhibited a different dominating trends of its major subgroups as given Rotifera>Cladocera>Copepoda>Ostracoda. The Wahgur dam had moderate diversity of total zooplankton with 23 species belonging to four taxonomic groups. Out of 23 species, 10 species belong to Rotifera, 6 to Cladocera, 4 to Copepoda and 3 to the Ostracoda.

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KEY WORDS : Diversity, Jalgaon, Wahgur, Zooplankton.

Introduction

The zooplankton plays a vital role in any aquatic ecosystem. Zooplankton species have different types of life histories influenced by seasonal variations of biotic factors, feeding ecology and predation pressure. Zooplankton constitute major link in the energy transfer at secondary level in aquatic food webs between autotrophs and heterotrophs. The distribution and diversity of zooplankton in aquatic ecosystems

depend mainly on the physicochemical properties of water⁹. Zooplankton communities of fresh water bodies constitute an extremely diverse assemblage of organisms represented by most of the invertebrate phyla¹⁴.

The zooplankton which plays a role of converting phytoplankton into food, suitable for fish and aquatic animals has acquired importance in fishery research. The zooplankton can also play an

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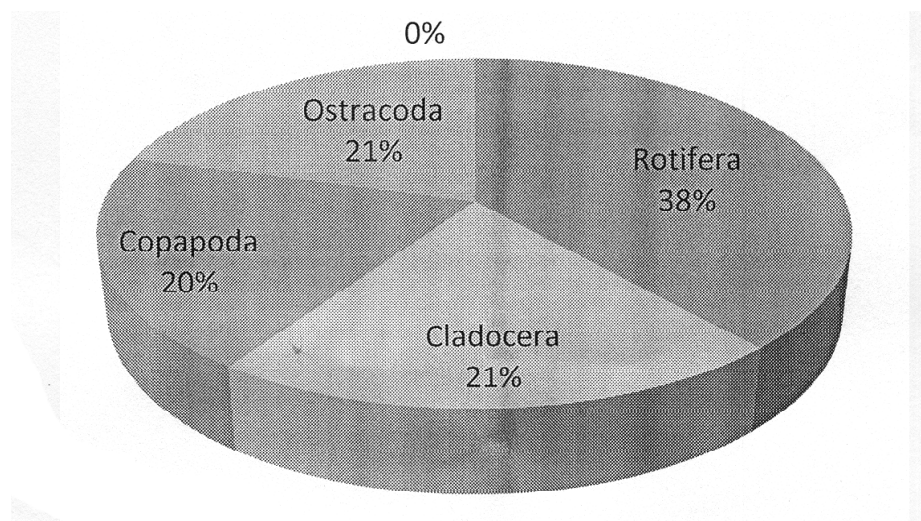


Fig. 1 : Percentage Population of Zooplankton in Summer

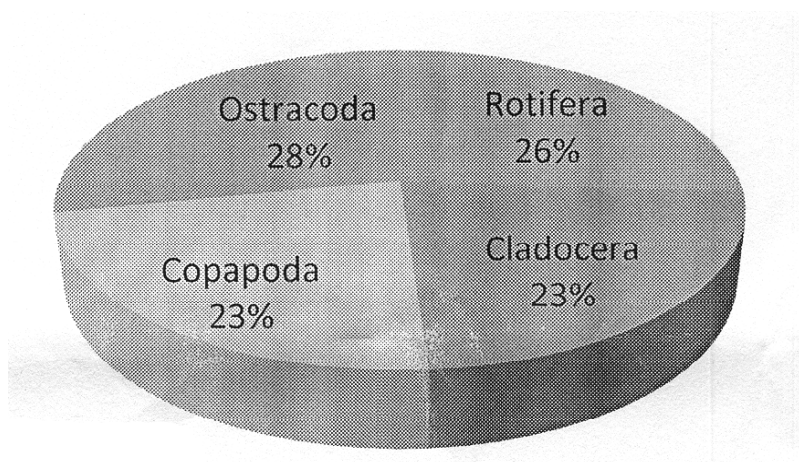


Fig. 2 : Percentage Population of Zooplankton in Monsoon

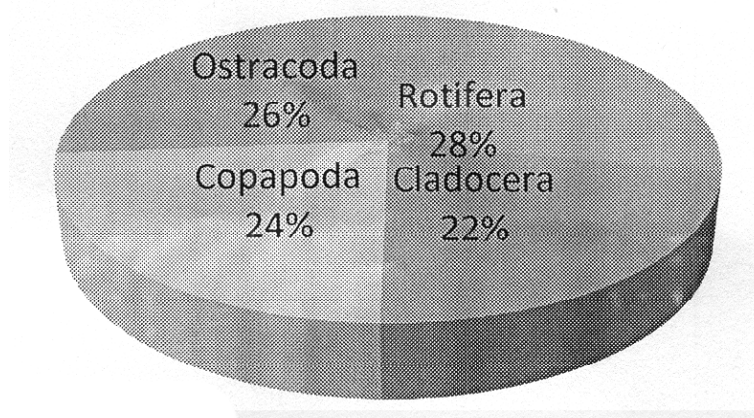


Fig. 3 : Percentage Population of Zooplankton in Winter

important role in indicating the presence or absence of certain species of fishes in determining the population densities. Zooplankton plays major role in the food web of an aquatic ecosystem and forms an intermediate link between primary and tertiary production. Study of plankton diversity and their ecology greatly contribute to an understanding of the basic nature and general economy of an aquatic habitat.

The present investigation was undertaken for identification and assessment of monthly variations in the occurrence of zooplankton of Waghur dam water.

The present study aims to calculate quantitative analysis of zooplankton and to evaluate density and diversity of zooplankton in waghur dam water near Jalgaon. The study would emphasize on seasonal variations, composition and total population of zooplankton in different sampling stations of Waghur dam water.

Material and Methods

Present study dealt seasonal variations in density and diversity of zooplankton of Waghur dam near Jalgaon in Maharashtra. The samples of zooplankton were collected monthly from four different sampling stations (A,B,C and D) in morning hours from 7am.to 10 am during June, 2011 to May, 2012.

The samples were collected by using planktonic net having mesh size 41 µm, The collected samples were transferred into 100 ml capacity of plastic bottles and preserved by using 4% formaldehyde solution. The samples were centrifuged and number of plankton per liter were determined by using Sedgewick Rafter Cell by taking 1 ml of approximately dilute sample. Then identification and the classification was done by using standard literature.

Result and Discussion

Population composition of Zooplankton

1. Rotifera

The Rotifera are major groups of the zooplankton. In present study 4 genera and 10 species were found. The most dominant genus was *Brachionus*, represented by 4 species viz., *Brachionus angularis*, *B. candatus*, *B. calyciflorus* and *B. rubens*. The others were *Tricocera*

cylindrica, *T. smiles*, *Lepadella ovalis*, *Lecaeluna*, *Karatell atropica*, and *K. cochlearis*.

2. Cladocera -

Cladocera group is represented by 4 genera with 6 species Viz. *Moniabrachiata*, *Moniam acrocopa*, *Daphnia carinata*, *Daphnia pluxes*, *Euryalonaorientalis*, and *Alonapulchella*. This group was second dominant group during the study period.

3. Copapoda

The copepoda group was represented by 3 genera with 4 species Viz., *Mesocyclopslukarti*, *Mhyalinus*, *Paracyclopsfimbriatus*, and *Neodiaptomusstrigilipes*.

4. Ostracoda

Ostracoda occupied fourth position of zooplankton and represented very low population diversity compared to other groups. This group was represented by three genera with one species of each Viz., *Cyprissps.*, *Stenocyprissps.* and *Srandesiasps.*

Rotifers

The rotifers are commonly called wheel animals. Most rotifers are around 0.1 - 0.5 mm long although their size can range from 50 µm to over two millimeters. Rotifers are an important part of the freshwater zooplankton, being a major food source. Filter-feeding with a rotating wheel from the anterior end due to presence of corona the groups of organismis known as rotifers. Mostly littoral, sessile, but some are completely planktonic. Rotifers have a pharynx which is muscular and made up of two jaws known as trophi. The trophy is small structure used for identification of rotifers. Rotifers act as food for most of fish and some larval fish due to their small size.

The present study reveals that total population of rotifers were found 255/l in summer season. The maximum 24/lit. were found at station 'C' in the month of Feb. and minimum 1/l. occurred at station 'A' and 'D' in May at the station 'C' in April during summer season. In monsoon total population of rotifers was 125/lit. The maximum 11/lit. at the station 'D' in August while minimum 5/lit. at the station 'A' in August and at the station 'D' in June. During winter total population of rotifers was 284/lit. The minimum number of rotifers were 241/lit. at the station 'A' and '8' during the month of January minimum 121/lit. at the station 'A' in Oct.

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TABLE-1 : Seasonal variation in density and diversity of Zooplankton of Waghur dam (Organism/Lit)

Groups of Zooplankton	Sampling Stations	Summer					Monsoon					Winter					Gross Total
		Feb	Mar	Apr	May	Total	June	July	Aug.	Sept	Total	Oct	Nov	Dec	Jan	Total	
Rotifera	A	22	18	14	10	64	08	07	05	09	29	12	16	22	24	74	167
	B	18	20	13	11	62	09	08	07	06	30	14	18	26	24	82	174
	C	24	22	10	13	69	08	09	10	07	34	18	20	17	16	71	174
	D	18	20	12	10	60	5	7	11	9	32	16	15	14	12	57	149
	Total	82	80	49	44	255	30	31	33	31	125	60	69	79	76	284	664
Cladocera	A	12	10	11	8	41	7	6	5	9	27	12	14	11	16	53	121
	B	11	12	10	6	39	6	8	5	7	26	10	15	13	14	52	117
	C	10	8	6	5	29	9	7	4	6	26	9	12	17	18	56	111
	D	14	7	5	4	30	7	9	5	8	29	11	16	20	14	61	120
	Total	47	37	32	23	139	29	30	19	27	108	42	57	61	62	222	469
Copapoda	A	10	8	7	6	31	6	5	8	10	29	12	17	14	13	56	116
	B	8	9	12	7	36	4	7	9	12	32	14	16	19	20	69	137
	C	6	5	11	9	31	6	8	3	5	22	12	10	15	17	54	107
	D	8	4	9	12	33	7	4	9	6	26	11	15	12	18	56	115
	Total	32	26	39	34	131	23	24	29	33	109	49	58	60	68	235	475
Ostracoda	A	10	6	9	12	37	11	7	8	4	30	17	19	20	16	72	139
	B	7	10	8	5	30	14	9	2	6	31	12	22	15	19	68	129
	C	8	5	9	10	32	12	6	7	9	34	11	18	14	15	58	124
	D	10	7	9	12	38	11	7	9	12	39	16	18	12	19	65	142
	Total	35	28	35	39	137	48	29	26	31	134	56	77	61	69	263	534

and the station 'D' in Jan.

The total population compositions of rotifers during three seasons were 664/lit. in the year 2011-12. The population of rotifers occurred maximum during winter and moderate in summer. The same results were observed earlier¹¹. The maximum density of rotifera noticed in summer season, while low incidence was recorded in northeast-monsoon season observed earlier⁸. The high population of rotifers and cladocerans and low population of copepods in winter was observed. Monsoon represented less density and diversity of rotifers which attributed to huge rain water in lake^{12,17}. High rotifers noticed in summer and winter in Fatehpur Sikri pond Agra¹⁶.

Cladocera

Cladocera includes species ranging in size from less than 500 μ m to over 1 mm. They are commonly referred to as "water fleas" and have a distinct head, a single compound eye, and a large mandible for grinding food particles¹⁵. Cladocera are microscopic crustaceans having a bivalve carapace that functions as a brood chamber. In most species the carapace wraps around the entire body except the head. Four to six pairs of thoracic legs beat in rhythm to generate a current that carries food particles to the animal's mouth. The first pair of legs (antennae) are enlarged and are used for swimming. Cladocera are generally identified on the basis of body shape and size and specifically identified by examining an abdominal structure called the postabdominal claw. Larval cladocera develop inside the maternal brood chamber and when they are released, they closely resemble the adult.

The total population composition of Cladocera was 469/lit. during study period. During summer the maximum population was 14/lit. at the station 'B' in Feb. and minimum 5/lit. at station 'C' in May and at station 'D' in April. During monsoon the total population of Cladocera was 108/lit. The maximum population of Cladocera was 9/lit. at station 'C' in June, at station 'D' in July and at station 'A' in Sept., whereas the minimum 4/lit. at station 'C' in Aug. During winter total composition was 222/lit. at station 'D' in Dec. and minimum 11/lit. at station 'D' in Oct. and at station 'A' in Dec.

The cladoceran populations showed definite periodicity and registered maximum during September, January and February in Haleji lake³.

During present study the maximum population of cladocera was in winter due to availability of abundant food, low turbidity and favorable temperature. Growth is limited during cold conditions^{1,5}. Number of cladocerans was high in the month of December, 2001 and low in Aug, 2001⁶.

Copapoda

Copepods range in size from less than 500 μ m to over 2 mm in length. They have a cylinder shaped segmented body with many small appendages on the head and thorax and two caudal setae at the end of the abdomen. They have a prominent exoskeleton, a large pair of first legs (antennae) that are used for swimming, and a single eye. The two most common types of copepods in lakes and ponds are Calanoida (calanoids) and Cyclopoida (cyclopoids). Most copepods are transparent or gray/brown in color, although it is common to observe bright red and orange colors due to accumulated lipid droplets inside the body. Copepods feed on a wide range of food, ranging from small zooplankton to algae and bacteria. They are truly omnivores when one considers their position in the food web. Female copepods carry their eggs externally. Eggs hatch into a larval stage called a nauplius, which grows through six stages, followed by six copepodite stages. There is a pronounced metamorphosis between the nauplius and copepodite stages, with the latter having an appearance similar to the adults.

During study the population composition of Copapoda was 475/lit. During summer the maximum number of copapodes were 12/lit. at station '8' in April and at the station "B" in May. The minimum number of copapodes was 4/lit. at the station 'D' in March. The total population of copapoda during summer was 313/lit. During monsoon the population of copapodes was 109/lit. They were found maximum in number 12/lit. at the station 'B' in Sept. and minimum 3/lit. at station 'C' in Aug. During winter season total population of copapoda were 235/lit. The maximum no. of copapodawas 20/lit. at the station 'B' in Jan. and minimum 10/lit. at station "C" in Nov. In presence study inverse relationship between rotifers, cladocerans and copepodes. The high population of rotifers and cladocerans and low population of copepodes in winter was observed. During the winter period Cladocera species were maximum can be attributed to the favorable water temperature

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and food observed due to organic matter^{4,7}. It indicates that minimum temperature was favorable for cladoceras. This is confirmed in the present study. The abundance of Copepoda was found to be highest in summer season (139.0org/l) and lowest in rainy season (90.0org/l) with 3 numbers of genera observed¹³. Similar observations were found in present study.

Ostracoda

The ostracodes belong to class Crustacea, occasionally known as 'seed shrimps'. They are small crustaceans, typically around 1 mm in size, but varying from 0.2 to 30 mm. Their bodies are flattened from side to side and protected by a bivalvelike, chitinous or calcareous valve or "shell". The hinge of the two valves is in the upper (dorsal) region of the body. Ostracodes are fresh water as well as marine water in habitat. They have a wide range of diets and the group includes, herbivores, carnivores, scavengers and filter feeders.

The total number of population composition of Ostracoda was 534/lit. during summer. The maximum number of ostracodes were 12/lit. at station 'A' and 'D' in May and minimum 5/lit. at station 'B' in May. The total number of ostracodes during summer season was 137/lit. During winter the maximum number ostracodes was 12/lit. at station 'D' in Sept. and minimum 2/lit. at station 'B' in Aug. The total population composition of ostracods during monsoon was 134/lit. during winter the total population was 263/lit. They were max.22/lit.at station 'B' in Nov. and min. 11/lit. at the

station 'C' in Oct.

The population of ostracodes was maximum in winter and minimum during monsoon due to dilution effect. Maximum population of ostracodes during monsoon might be due to abundance of detritus whereas, the decrease in winter and summer may be due to feeding pressure of stocked fishes. The Cope pods are major links in the aquatic ecosystem. The Ostracoda also forms a dominant link in the aquatic ecosystem. The Ostracoda population is abundantly found in summer and in winter. This group showed dominance in summer and the lowest in winter, the same result was found earlier¹⁰.

Conclusions

During present study the groups of rotifers were dominant during the winter and summer season and minimum during the monsoon. The reason is that in monsoon maximum turbidity of water in the dam was due to run off rain water. It results less penetration of sunlight that affects the population of rotifers, while in winter and summer rotifers were dominant due to clear water and maximum growth of phytoplankton. Comparatively group copapoda was minimum in all the seasons of the year. Whereas Cladocera and Ostracoda were in moderate population. In present study a distinct fluctuation in population composition of zooplankton in different months and seasons was observed during tenure. The seasonal variation of zooplankton may affect the fish fauna and other aquatic food chain and food web.

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