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Effect of Climate Change on Copepods Diversity in a Subtropical Pond of Jammu

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ABSTRACT

The prevalence of copepods that constitute an important role in food chain of aquatic ecosystem and act as indicators of productivity were examined in Kunjwani pond, Jammu. Five copepod species, Cyclops vicinus, Mesocyclops hyalinus, M. leukarti, Paracyclops fimbriatus and Neodiaptomus diaphorus were recorded along with their different level of developmental stages like nauplius, metanauplius and copepodite. These exhibited trimodal peaks during March, June and October. The data revealed that their distribution is correlated with physico-chemical factors. January to June higher density may be influenced by temperature (19.89-34.5 ^{0}C), suspended matter (50.0-112.5 mg/l.), pH (7.58-9.98), DO (2.68-11.0 mg/l.), Ca++ (12.49-31.30 mg/l.) and Mg++ (2.64-8.68 mg/l.). The species diversity index ranged between 0.9583-1.6539.

***Keywords*--** Copepods, Physico-Chemical Analysis, Species Diversity Index

I. INTRODUCTION

Copepods comprise 70-80 % of the total zooplankton population (Anonymous, 1991). They feed on diatoms, bacteria and minute particles of organic material in the water and in turn serve as food for many of the larger aquatic animals, chiefly fish. Thus, they play an important role in the food chain of aquatic ecosystem at various trophic levels and act as indicators of productivity. Based on these, various studies have been carried out in India by Sewell (1940, 1957), Sehgal (1983), Babar and Choubey (1987), Patil and Gounder (1989), Kanagasabapathi and Rajan (2010), Saba and Sadhu (2015), Shivkami et. al. (2015) and Sinha and Singh (2016). The present study aims to examine the community structure of copepods in relation to various physico-chemical parameters.

II. MATERIALS AND METHODS

Water and plankton samples were collected fortnightly from four sites during 1989-1990 and analysed by adopting the methods of APHA (1985) .Plankton samples were preserved in five percent formalin and counted in Sedgwick rafter cell (Welch, 1952). Identification were done as per description by Ward and Whipple (1959) and Sehgal (1983). The organisms expressed as nosl^{-1} and results are discussed as the mean of four study sites. Statistical evaluation of data were done as outlined by Trivedy et. al. (1987) and Shannon and Weaver (1963).

III. RESULTS AND DISCUSSION

A number of inter-dependent abiotic and biotic environmental factors influence the plankton dynamics in different biotopes. Copepoda represented by five species (*Cyclops vicinus, Mesocyclops hyalinus, M. leukarti, Paracyclops fimbriatus* and *Neodiaptomus diaphorus)* and their larvae (nauplius, metanauplius and copepodite). Copepods have registered their seasonal association in this pond. Monthly population density in percent composition is given in Table 1.

Table 1- Percent composition of copepoda in kunjwani pond, Jammu

	Apr	May	Jun	Jul	Aug	Sep
Cyclops vicinus	6.25	4.9	-	-	-	-
Mesocyclops hyalinus	15.62	21.72	15.07	10.71	53.44	12.5
M. leukarti	-	2.45	-	-	-	-
Paracyclops fimbriatus	22.91	24.59	6.58	4.91	15.51	12.5
Neodiaptomus diaphorus	5.2	9.01	-	-	15.51	25
Nauplius	44.27	37.29	33.12	35.26	5.17	-
Metanauplis	2.08	-	43.73	48.21	5.17	25
Copepodite	3.64	-	1.48	0.89	5.17	25

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	Oct	Nov	Dec	Jan	Feb	Mar
Cyclops vicinus	-	-	-	11.42	36.36	-
Mesocyclops hyalinus	-	-	3.65	9.71	12.12	12.48
M. leukarti	-	-	-	-	-	-
Paracyclops fimbriatus	-	-	3.65	22.28	4.76	7.64
Neodiaptomus diaphorus	100	58.82	47.56	35.42	14.71	66.98
Nauplius	-	-	37.8	3.42	26.83	6.87
Metanauplis	-	23.52	7.31	16	2.59	5.42
Copepodite	-	17.64	-	1.71	2.59	0.58

Table 2- Coefficient of correlation between Copepoda and various abiotic factors

Factors	Copepoda ® (r)
Air temperature	0.111
Water temperature	0.134
Depth	-0.168
Transparency	0.249**
Suspended matter	-0.148
	0.192*
Dissolved oxygen	0.029
Free carbondioxide	-0.065
Carbonate	0.047
Bicarbonate	0.004
Chloride	0.196*
Calcium	-0.094
Magnesium	-0.061
Total Hardness	-0.044
n = 48, **p<0.05, *p<0.1	

Table 3- Coefficient of correlation between copepod and other group of zooplankton

Groups	Copepoda (n - 48) (r)
Protozoa	-0.17
Rotifera	-0.084
Cladocera	-0.058
Ostracoda	-0.067
Total Zooplankton	0.056
(n = 48) non significant	

Table 4- Shannon Weaver species diversity index for copepoda

Months	Sp. Div. Index
Apr	1.5159
May	1.4995
Jun	1.2538
Jul	1.148
Aug	1.3719
Sep	1.559
Oct	1.2589
Nov	0.9583
Dec	1.1535
Jan	1.6539
Feb	1.5921
Mar	1.0959

The copepods dominated over other groups during spring and summer season. Percentage composition of this group indicated inverse relationship between calanoids and cyclopoids. Sehgal (1983) stated that ponds with high density of calanoids contained only a few cyclopoids species and vice-versa. These two planktonic forms are never found in equal proportions in the same habitat . Larval stages of this group reported highest density in June (369 $nosl^{-1}$) and march (133 $nosl^{-1}$). Minimum density, noticed during August to November with its absence in October.

January to June increase in copepods seem to be influenced by temperature (19.89 – 34.5^0c), suspended matter (50.0 – 112.5 mg/l) pH (7.58 – 9.98), DO (2.68 – 11.0 mg/l), Ca++ (12.49 – 31.30 mg/l) and Mg++ (2.64 – 8.68 mg/l) and showed maximum density in March (1033 $nosl^{-1}$). Minimum density of this group was usually observed during monsoon (August – September) and winter (November – December) season.

The low population density in August – September followed by the dilution effect and production of resting stages by some copepods in response to unfavourable conditions such as rise in water level, increase in suspended matter, low light penetration and food etc. Effect of winter rains and low temperature may explain low production of copepods noticed during November- December. Wierzbica (1966) documented that a number of cyclopoids enter into various periods of diapause either at egg stage or in copepodite stage with or without encystment at sediments.

The coefficient of correlation between copepoda with abiotic and biotic factors are presented in Table 2 and 3. The numerical value of species diversity index of copepoda ranged between 0.9589 – 1.6539 (Table 4).According to Sehgal (1983) that copepods are found in turbid as well as clear water infested with aquatic weeds (Hydrilla, Vallisnaria, Potamogeton and Najas) with water temperature (25.70 – 31.5^{0}c), pH (7.2 – 8.8), DO (6.6- 7.8 ppm) and total alkalinity (160 – 220 ppm). The ranges are similar to the present findings. It is generally thought that water temperature and transparency plays an exceedingly important role in the activity and distribution of copepods.

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REFERENCES

[1] Anonymous (1991). Animal Resources of India. State of Art. Zoological Survey of India, Calcutta : 73.
[2] APHA, (1985). Standard Methods for Examination of Water and Wastewater. 16th edition, APHA Inc. New York 1193.
[3] Babar, V. and Choubey, U. (1987). Studies on the Copepod fauna of Gandhisagar Reservior. Pers. In Hydrobiol. (eds. K. S. Rao and S. Shrivastava). Vikram Univ. Ujjain. Sec. 4 (26) : 135-138.
[4] Kanagasabapathi, V. and Rajan, M.K. (2010). A Preliminary Survey of Plankton In Irrukkangudi Reservior, Virudhunagar dist., T.N. India. J. Phytology, 2(3): 63-72.
[5] Patil, C.S. and Gounder, B.Y.M. (1989). Freshwater invertebrates of Dharwad, Prasaranga, Karnataka Univ. Dharwad.
[6] Saba, F. and Sadhu, D.N. (2015). Zooplankton diversity of Ganga Reservior of Bokaro, Jharkhand. Int. J. Bioassays, 4(4) : 3792-3795.
[7] Sehgal, K.L. (1983). Planktonic Copepods of Freshwater Ecosystem, Interprint, New Delhi, Sec. 4 (36): 1-169.
[8] Sewell, R.B.S. (1940). Fauna of Chilika lake Crustacea; Copepda; Mem. Ind. Mus. 5 : 771-851.
[9] Sewell, R.B.S. (1957). A review of the subgenus Thermocyclops Kiefer of genus Mesocyclops Sars with a description of a new form of copepod, Rec. Ind. Mus. 55 (1) : 69-117.
[10] Shannon, G.E. and Weaver, W. (1963). The mathematical theory of Communication. Univ. Illinois's Press, Urhana USA.
[11] Sinha, P.K. and Singh, R. (2016). Seasonal zooplankton diversity in relation to physico-chemical parameters of perennial pond of Chaibasa, West Singhbhum, Jharkhand. Int. J. of Bioassays, 5(9): 4906-4908.
[12] Sivakami, R., Arumugam, V. and Premkishor, G. (2015). An analysis of zooplankton in a ake,Pudukkottai, dist, Tamilnadu. Int. J. Curr. Microbiol. App. Sci. 4(5): 377-389.
[13] Trivedy, R.K., Goel, P.K. and Trisal, C.L. (1987). Practical methods in Ecology and Environmential Sciences, Environmental publications, Post box 60, Karad, India.
[14] Ward, H.B. and Whipple, G.C.(1959). Freshwater Biology. John Wiley and Sons, Inc. New York.
[15] Welch, P.S. (1952). Limnological methods, Mc-Graw Hill book Co., Inc. New York.
[16]Wierzbicka, M. (1966). Les resultata des recherches concernant letal de repos (restingStage) des cyclopoida. Verh. Int. Ver. Limnol, 16 : 592-599.