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Research Article

POPULATION DENSITY OF CYCLOPOID COPEPODS IN DIFFERENT TYPES OF WATER BODIES OF LUDHIANA (PUNJAB)

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ABSTRACT

The present study was carried out in different types of water bodies of Ludhiana (Punjab) to record the population density of cyclopoid copepods during the year 2015 (Jan-Dec). Identification and enumeration was done with the help of sedgewick-rafter chamber (S-R cell). Maximum population density of cyclopoid copepods i.e. 1664.00±3.6/L was observed in the month of August in GADVASU fish ponds followed by Atta village pond i.e. 603.00±7.9/L observed in the month of September and least population density was observed in paddy fields when compared with other water bodies, whose maximum density was recorded in the month of September i.e. 64.33±0.33/L. Growth of cyclopoids were maximum in summer and minimum in winter which might be due the fluctuations in light intensity and temperature, in turn affecting the food supply of zooplanktons.

INTRODUCTION

Copepods are a diverse group of small crustaceans. In terms of their size, diversity and abundance, they are often present in common with many other small crustacea. A vast majority of copepods are confined to marine and salted waters, only a small fraction inhabit freshwaters. There are approximately13,000 species of copepods which are arranged in 8 major orders. Main suborders of copepods found in freshwater are calanoids, harpacticoids and cyclopoids. Kocher *et al*. (2014) have reported large population of copepods in commercial fish ponds in comparison to other standing water bodies. Copepods have a complex life cycle with six naupliar, five copepodid stages and then adult (Marten *et al.* 2000). Beside their importance as fish food, the specific type of copepods i.e. cyclopoids are also good predators of mosquito larvae which are responsible to spread different deadliest diseases like malaria, dengue and chickungunia (Marten 2000). Cyclopoid have been used to control mosquito larvae of public health importance in artificial containers (Nam *et al* 2005, Marten and Reid 2007).The aim was to study the seasonal variation of copepod population in different types of water bodies of Punjab (Ludhiana).

MATERIAL AND METHODS

Selection of sites

Fish ponds at Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, Atta village ponds located at 34.3 kms away from Ludhiana city and paddy fields adjoining Ludhiana were selected to record the population of cyclopoid copepods.

Collection of cyclopoid copepods

Regular monitoring of cyclopoid copepods in fish and village ponds was carried out at monthly intervals from January to December 2015 and in paddy fields from July to September, 2015. Zooplankton net having mesh size 60 µm was used for the collection of zooplanktons. Water was sieved at 5 sites /fish and village ponds (approx.50L i.e. 10L/site) and 3 sites/paddy field (approx. 3L i.e. 1L/site) through the zooplankton net.

Identification and enumeration of cyclopoid copepods

Copepods were identified up to genus level on the basis of their morphological characters given by Battish (1992) and Jamwal (2015). Copepod counting was done by following formula:

$$\text{Number of copepods/ ml} = \frac{C \times 1000}{A \times O \times F}$$

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Where,
C = Number of copepods counted
A= Area of field = 1.369 mm2
D = Depth = 1 mm
F = Number of fields observed

$$\text{Number of copepods/L} = \frac{M \times v}{V}$$

Where,
M = Number of copepods/ ml
v= Volume of concentrated sample
V= Volume of filtered water

Statistical analysis

Data was statically analysed by using Kruskal wallis test by comparing population of cyclopoids within months among different types of water bodies

RESULTS AND DISCUSSION

GADVASU fish ponds

Monitoring of cyclopoid copepod population at regular monthly intervals during the year 2015 showed an average population of 63±2.64 copepod/L during the month of January, Average copepod population i.e. 67.33±1.15/L was recorded in the month of February. During the months of March, April, May and June there was slight increase in population abundance of copepods i.e. 76.83±0.76/L, 110.66±1.52/L, 212.66±2.51/L and 360.33±1.52/L respectively. An abrupt increase in the population count of cyclopoid copepods was recorded in the month of July i.e. 1231±3/L and in the month of August the population count was 1664±3.60/L which was found to be maximum during the entire study period. Population count of cyclopoid copepods was 505±3.60/L recorded in the month of September. Then a sudden decline in population count of cyclopoid copepod population was observed in the months of October and November i.e. 23.65±3.21/L and 13.33±3.05/L respectively. Least population count i.e. 4.33±2.08/L was recorded in the month of December (Table 1).

Researchers have reported a general trend of high zooplankton growth during summer and less during winter season (Trivedi *et al.* 2003, Krishnamoorthi & Selvakumar 2012, Bashar *et al.* 2015).

Atta village ponds

Cyclopoid copepod population /L at monthly intervals during the study period from Atta village pond showed an average count of 42.33±3.2 in the month of January. Population count was found to be 57.66±7.50/L in February and further increase was observed in population of copepods/L i.e. 81.33±5.03, 115.66±5.50, 178.6±2.51 and 238.66±1.52 during the months of March, April, May and June respectively. In the months of July and August population count of cyclopoid copepod/L was found to be 481±5.56 and 540.66±9.01. Maximum population count was observed in the month of September i.e. 603±7.93/L. In the month of October it was found to be 576.6±9.01/L. Then the population suddenly falls in the months of November and December i.e. 39±3.60/L and 35.66±6.02/L respectively (Table 1). Similar observations for zooplankton were made by Bhuiyan and Gupta (2007), Park & Shin (2007) and Rajagopal *et al* (2010). Therefore, copepod production density was reported to be low during the winter months having very low temperature (Jan and Dec).

Paddy fields

Population abundance of cyclopoid copepods recorded at monthly intervals from June to September from paddy fields showed the average population count of 26.66±0.57/L in the month of June and 34.66±0.57/L in the month of July. Minor increase in population count was observed in the month of August i.e.51.38±1.0/L. Maximum population count i.e. 64.33±0.33/L was recorded in the month of September. Afterwards no population was recorded as the water in paddy fields dried out (Table 1). Population density of diverse types of zooplankton varies considerably between locations, stages of crop development and sampling methods as reported by Simpson *et al* (1994).

Table 2 Test Statistics[a,b]

	Fish pond	Village pond	Paddy fields
Chi-Square	7.200	7.261	.000
df	2	2	2
Asymp. Sig.	.027	.027	1.000

a. Kruskal Wallis Test
b. Grouping Variable: months

Table 1 Population density of cyclopoid copepods/L during January to December 2015 in different types of water bodies

GADVASU, fish pond											
January	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
63.00±2.64	67.33±1.15	76.83±0.76	110.66±1.5	212.66±2.51	360.33±1.52	1231.0±3.0	1664.00±3.6	505.00±3.6	23.66±3.21	13.33±3.05	4.33±2.08
Atta Village pond											
42.33±3.21	57.66±7.50	81.33±5.03	115.66±5.5	178.6±2.51	238.66±1.52	481.0±5.56	540.66±9.01	603.00±7.9	576.6±3.21	39.00±3.60	35.66±6.02
Paddy fields											
NC	NC	NC	NC	NC	26.66±0.57	34.66±0.57	51.38±1.00	64.33±0.33	NC	NC	NC

Values are Mean ± SD
* NC represents not collected

CONCLUSION

Cyclopoid copepods were found to be predominant in fish ponds > village ponds > paddy fields during the summer season however least population was observed during winter season in all type of water bodies which might be due the favourable environmental conditions during summer season due to the absence of inflow of water that brings stability to the water body as well as availability of food, rich organic matter and decomposition in fish ponds etc. might contributes for higher cyclopoid density.

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