



RECENT ADVANCES IN BIOLOGICAL SCIENCES

VOLUME-1



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K.B.N. COLLEGE

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RECENT ADVANCES IN BIOLOGICAL SCIENCES

Volume 1

PREFACE

We are greatly privileged to organize a National Seminar on "Recent Advances in Biological Sciences" between the 28th and 29th of October 2022 by the Departments of Botany and Zoology, K.B.N College (Autonomous) in collaboration with Krishna University, Machilipatnam. The Departments of Botany and Zoology have been strenuously pursuing, and inculcating research aptitude among the taught and also the researchers, extending meaningful impetus.

In the contemporary period, biology has made great advances that have influenced all major branches of human knowledge. The solutions to major problems, like health and shelter, are expected from the pursuit of biological sciences. The student of biology can acquire a perceptive of all facts of the subject by a proper understanding of the structural and functional organization of plants, animals and man. While learning historical developments and modern trends, the students must be aware of the application and significance of this biological background in daily living. It will help to enter various academic and professional pursuits or to enter life with great satisfaction as regards this knowledge of living surroundings, processes and phenomena.

Biology is one of the most exciting disciplines of science and the thrill of its discoveries should reach the common man. Advances in Biology hold a lot of promise for improvement of the human life; hence we believe that the excitement of this field should be transmitted to the students.

The present book has been developed to meet the above needs. We are grateful to all the contributors for writing informative and authoritative and informative articles for this volume. The publication of the present work could not have been possible without the sincere cooperation and hard work of contributors. We have tried to honour their ideas in the original shape. While dealing with such voluminous work, errors are likely to occur despite our best efforts. However, the onus of technical content rests with contributors.

We pay humble regards to K.B.N College Management and wish to thank all who extended their full cooperation in many invisible ways during the preparation of this book.

Dr. M. RAHAMTULLA
Sri. S. ISMAIEL ALI BASHA

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Study on Zooplankton Diversity and Density in Fish Ponds at Penamaluru and Thotla Valluru Regions of Krishna District, Andhra Pradesh, India

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Abstract

A large number of organisms depend on the Zooplankton which constitutes an important component of freshwater pond biodiversity. The optimum fish production is totally dependent on water quality parameters and plankton population. Species composition of the plankton community is an efficient indicator of water quality. The present study deals with Zooplankton diversity and density for a period of six months from March 2021 to August 2021 in fish ponds of Penamaluru and Thotla Valluru regions of Krishna District, Andhra Pradesh. Intensive culture is practiced at Penamaluru fish ponds and extensive fish culture is practiced in Thotla Valluru fish ponds. Zooplankton diversity was studied in both these systems and the result revealed that the zooplankton was represented mainly by 4 groups viz., Rotifera, Cladocera, Copepod and Ostracoda. 15 different species were observed and recorded. They are 7 Rotifers, 3 Cladocerans, 3 Copepods and 2 ostracods. Of these Rotifers was the dominant group of zooplankton with respect to diversity and population density. Present study revealed the following percentage composition of zooplankton in both types of ponds. It is almost similar with a range of 40 - 42 % rotifers, 29- 34 % cladocerans, 20-16 %, copepods and 12 -10 % ostracods respectively in Penamaluru and Thotla valluru fish ponds.

Keywords: Zooplankton, Fish Ponds, Penamaluru, Thotla valluru, Rotifera, Cladocera, Copepoda, ostracoda.

Introduction

Zooplankton serves as indicators of water quality and plays an important role in fish culture. They constitute the most important link in the energy transfer between phytoplankton and higher aquatic fauna, and contribute significantly to secondary production in fresh water ecosystem (Sharma, 1998). It plays an important role in recycling nutrients as well as cycling energy within their respective environment. These are the main sources of natural food for fish which is directly related to their survival and growth (Miah *et.al.*, 2013). They are the essential food item for fish larvae culture (Alam *et.al.*, 1987). The planktonic study is a very useful tool for the assessment of water quality in any type of water body and also contributes to an understanding of the basic nature and general economy of the water body.

The number and species of plankton serves to determine the quality of water body (Wetzel, 1975). The density and diversity of zooplankton are influenced by physico-chemical parameters of water (Saba and Sadhu, 2015). The fish ponds with extensive culture are getting polluted due to domestic waste, sewage, industrial, aquatic and agricultural effluents where as in intensive fish farming water quality and plankton diversity is maintained. This has a great influence on fish growth and yield. Planktons also prevent the development of macrophytes that are undesirable for fish. Hence the main objective is to maximize the plankton production in fish ponds for optimum yield and economic benefits. However, information on relation between Zooplankton diversity and fish yield fauna is very limited (Ahmad and Siddiqui, 1995, Choudhary and Singh, 1999).

Rotifers, cladocerans, copepods and ostracods constitute the major groups of zooplankton (Kar and Kar, 2016). So in the present investigation an attempt is made to study the zooplankton species richness and diversity in two different ponds of Krishna District. The literature on Zooplankton diversity in Andhra Pradesh is scarce except a few reports from Lake Kolleru region. Present study was carried out keeping in view of above information and scarcity of literature from Andhra Pradesh

Materials and Methods

Study Area

Fish ponds at penamaluru are located at a distance of 21 Kms from Vuyyuru. The latitude of the ponds is 16.4698 °N and longitude is 80.7257 °E. Ponds are provided with water from an overhead tank with the help of motor. In these ponds pungas, carp and rohu fishes are cultured. Thotla valluru fish ponds are located at a distance of 15km. from Vuyyuru. The latitude of the ponds is 16.3716°N and longitude is. 80.7699°E. The ponds are rain fed and are used for carp and rohu fish culture.

Zooplankton sample collection and preservation:

Zooplankton samples were collected by two methods.

1. By filtering 20-25 liters of water through plankton net made of 0.25mm mesh size. The surface water for this purpose is collected with the help of plastic bucket.
2. Zooplankton is also collected by lowering the net into the surface and subsurface layers of water and moving it horizontally and slowly in upward direction.

The plankton is collected in the small bottle tied to the end of plankton net and is fixed in sterilized vials with 5% formalin. The plankton is collected weekly once usually between 8am and 10 am.

Zooplankton species identification was done following standard literature of Battish (1992); Edmondson (1959); Michael and Sharma (1998); Sharma (1998); Sharma and Sharma (2008, Alfred *et al.*, 1973). The quantitative analysis of planktonic organisms was carried out using Sedgwick Rafter plankton counting cell in according to Welch (1948). For studying the diversity of Zooplankton samples were taken in a Sedgwick-Rafter counting chamber and observed under a light microscope under prerequisite magnification (10 X initially than followed by 40 X) and the specimens were identified following standard literature.

Results

Present study revealed 15 species of Zooplankton in both the fish ponds belonging to the four groups namely Rotifera, Cladocera, Copepoda and Ostracoda. Among all four groups maximum abundance of rotifers (42%) is observed (Table). Seven species of rotifers, three species of cladocerans, three species of copepods and two species of ostracods were observed.

Zooplankton observed and recorded:

1. Rotifers- *Brachionus caudatus*, *B. quadridentatus*, *B. forficula*, *B. falcatus*, *Keratella* sp, *Asplanchna* sps, *Filinia longiseta*
2. Cladocerans- *Moina* sp, *Daphnia* sp, *Ceriodaphnia* sp.etc.
3. Ostracoda- *Cypris*, *Stenocypris*
4. Copepods- *Mesocyclops* sps, *Microcyclops* sps and *Heliodiaptomus* sps.

Monthly distribution of available Zooplankton density in Penamaluru fish pond:

MONTHS	ROTIFERA	CLADOCERA	COPEPODA	OSTRACODA	TOTAL
March2021	7	7	4	3	21
April 2021	7	6	3	3	19
May 2021	6	5	2	2	15
June 2021	9	6	6	2	23
July 2021	12	7	6	3	28

August 2021	13	8	6	3	30
Total	54	39	27	16	136
Percentage	39.7=40%	28.6= 29%	19.8=20%	11.7=12%	

Monthly distribution of available Zooplankton density in Thotlavalluru fish pond:

MONTHS	ROTIFERA	CLADOCERA	COPEPODA	OSTRACODA	TOTAL
March 2021	7	7	4	3	21
April 2021	7	5	3	2	17
May 2021	6	4	2	2	14
June 2021	9	6	2	2	19
July 2021	9	7	3	1	20
August 2021	8	7	3	1	19
Total	46	36	17	11	110
Percentage	41.8=42%	32.7= 33%	15.45=16%	10%	

The results show that there is a slight decrease in plankton density in the month of May, due to high temperatures. As temperature level increases the dissolved oxygen concentration in water also decreases due to the inverse relationship between the two. When dissolved oxygen decreases the density of Zooplankton decreases which is clearly observed in fish ponds. The plankton densities in Penamaluru fish ponds increased slowly or remained constant in the months of July and August due to intensive farming as water quality parameters are maintained. The Plankton density in Thotla valluru fish pond decreased slowly as the physico- chemical parameters of water are not maintained due to extensive fish farming.

Rotifers respond very quickly to environmental changes than other planktonic species. Hence rotifers were dominant both in intensive and extensive culture. Water temperature and availability of food to organisms actually affect the copepod population according to Choubey (1997). High and static density of copepods is observed during July and August in both types of ponds. Cladocerans are mostly observed during the sixth months of study which may be due to favourable temperature and availability of food, nanoplankton, and suspended detritus. The Physico chemical factors like DO, water temperature and turbidity also play crucial role in diversity and density of cladocerans.

Conclusion

The objective of this investigation was to know the zooplankton diversity in a fresh water fish ponds and its effect on fish growth and yield. To develop our knowledge about the biodiversity of fish ponds, endowed with different fauna, especially the zooplankton as they are playing a vital role in the stability and integrity of aquatic ecosystem. The present preliminary study conducted revealed diversity of zooplankton in fish ponds and that Rotifera constitute higher

species abundance. From the studies it is noted that a large number of diverse zooplanktonic forms with rich biodiversity is supporting the pond ecosystem. Further, detailed investigation through regular monthly sampling with more quantitative and qualitative analysis is needed to confirm the exact status of water body which would help to conserve the zooplankton diversity and water quality.

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