



Study of Diversity and Population of Zooplankton at Harsholav pond of Bikaner, India

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Abstract

Water is the most essential element of life and without it life cannot exist. The body uses water for digestion, absorption, transporting nutrients, and building tissues and all other activities. Harsholav pond of Bikaner has been studied to evaluate the suitability of water for domestic use and maintaining for drinking, irrigation and other purposes. Bikaner district lies in arid zone of Western Rajasthan and is a part of Thar Desert. The investigations were carried out in Harsholav pond located at Bikaner district from September 2012 to November 2013. Monthly zooplankton samples were collected. Zooplanktons are the primary consumers of the process of food chain. Aquatic ecosystem consists of physical, chemical and biological factors. Physical chemical factors are not alike in all water bodies; they change either due to natural or artificial processes. Zooplanktons are good indicators of the change in water quality because they are strongly affected by environmental conditions and by other living species within water body and respond quickly to changes in water quality. Various zooplanktonic faunal species were found which were typically adapted for the given conditions of existence. Zooplankton population were represented by four genera of Protozoa group, namely, *Paramecium caudatum*, *Euglena sociabilis*, *Amoeba proteus*, *Chilomonas paramecium*, 3 genera of group Rotifera namely *Brachionus calyciflorus*, *Keratella tropic*, *Trychocera longiseta*, 7 genera of Crustacea group 3 cladocerans, namely, *Bosmina* sp., *Daphnia carinata*, *Moina brachiata*, 2 copepods, namely *Mesocyclops leukarti*, *Diaptomus glicialis*, 2 ostracods, namely, *Cypris* sp., *Nauplius* larva, and one insect larvae *Chironomus* larvae. Total zooplankton population were ranged from 320 -1060No./l among them Crustacea constitutes the dominant group throughout the study period, total protozoans were ranged from 40 to 320No./l, total rotifers were ranged from 40 to 240No./l, total crustaceans were ranged from 140 to 440No./l, and total insect larvae from 20 to 60No./l.

Keywords: Water, Harsolav pond, Bikaner, Zooplankton, Genera.

Introduction

North West Rajasthan forms an important part of Great Indian Desert. Harsholav pond of Bikaner city was selected for the proposed research study. Water, a chemical substance with the chemical formula H₂O, is one of the nature's most important gifts to mankind which covers 70% of the earth surface in forms of ponds, swamps, lakes, rivers, and oceans. Water is a key component in determining the quality of our lives. Today, people are concerned about the quality of the water they drink. Biological diversity provides the basis for life on the earth. The fundamental, social, ethical, cultural, and economic values of these resources have been recognized in region and literature from the earliest days. Adequate knowledge of zooplankton communities and their population dynamics is a major requirement for better understanding of life process in a fresh water body. Since eutrophication influences both the composition and productivity of zooplankton. Zooplanktons are small living organisms that float in surface water column of water bodies and whose distribution primarily determined by water waves and current. Zooplankton plays a vital role in aquatic food webs because they are important food for fish and invertebrate predators. They graze heavily on algae, bacteria, protozoans and other invertebrates. These communities are

typically diverse and occur in almost all lakes and ponds. Zooplanktons are highly sensitive to environmental vibrations, sediment input, to other nonliving and living materials. As a result change in their abundance, species diversity or community composition can provide important indication of environmental change. Zooplanktons are represented mainly by protozoans, rotifers, cladocerans, copepods, and insects.

Material and Methods

Present research study was carried out at a fresh water pond of desert region (Harsholav pond, Bikaner) of Rajasthan. Harsholav pond is situated at 5 km west to Bikaner city. The pond is partly natural and partly artificial. It is a kaccha pond and has muddy bottom. This pond is located near locally famous Laxminath ji temple of Bikaner city. People visit there for worship and picnic as well. People use pond water for washing, bathing, and other domestic purposes; Algae are seen floating on the surface water of the pond, making the water green in colour appearance. Many water birds are seen here during rainy season. When pond is full of water local people visit there for bathing, swimming and for picnic. Pond is highly disturbed by people during rainy season. The investigation was carried out from September 2012 to November 2013. For the collection of

zooplankton the water samples were taken from the surface (Secchi disc transparency zone) during morning hours between 7 A.M. to 10 A.M. Zooplanktons collected through the net were transferred into separate plastic bottles/containers. About 50 liters of surface water were filtered through plankton net to collect zooplankton sample. Zooplankton net is made up of bolting silk (no. 25, mesh size 55 μ). Collected sample was fixed and preserved in 4% Formaldehyde. Fixed sample was transferred to duly labeled polythene bottle of 100 ml and brought to the laboratory. Zooplanktons were studied using a plankton counting chamber under a binocular research microscope. The identification and counting of zooplanktons were made following^{1, 2, 3, and 4}.

Results and Discussion

Zooplankton constitutes the major group of an aquatic ecosystem. During the present research study total 15 genera belonging to different groups of zooplankton such as protozoa, rotifera, crustacea (cladocera, copepoda, ostracoda,) and insect larvae were recorded. Among them protozoans were represented by 4 genera namely *Paramecium caudatum*, *Euglina sociobilis*, *Amoeba proteus*, *Chilomonas paramecium*. Among protozoans genera amoeba proteus showed least number ranged from 20 No./l to 60 No./l while *chylomonas paramecium* showed highest number ranged from 20 No./l to 100 No./l paramecium not found in December-12, june-13, October-13, *Euglina sociobillis* not found in November-12, December-12, and October-13, while *chilomonas paramecium* not found in November-12, December-12, and march-13. Rotifers are important indicator organism of water quality and environment changes. Rotifera was represented by 3 genera namely *brachionus calyciflorous*, *keratella tropica*, *trychocerca longiseta*. Among rotifers *brachionus calyciflorus* showed dominant position while *keratella tropica* showed least population on average number basis. Crustacea was represented by 7 genera including 3 cladocerans, namely, *Bosmina sp.*, *Daphnia carinata*, *Moina brachiata*, 2 copepods, namely, *Mesocyclops leukarti*, *Diatomus glicialis*, 2 ostracodes namely *Cypris sp.* and *Nauplius larvae*, while insect larvae represented by a single form *Chironomid larvae*. In copepods between two genera *mesocyclops leukarti* dominated, there population ranged from 20 No./l to 100 No./l among ostracods genera *cypris* were recorded throughout the study period whereas *nauplius* larvae were not found in December-12 and January-13. Table-1 shows the diversity and population of various zooplankton recorded at Harsholav pond from September 2012 to November 2013. Total population of protozoan were recorded from 40 to 320No./l. (figure-1), total rotifers were from 40 to 240No./l. (figure-2), total cladocerans were ranged from 60 to 280 No./l. (figure-3), total copepods were ranged from 40 to 160 No./l. (figure-4), total ostracods were ranged from 40 to 120 No./l. (figure-5), total crustaceans were from 140 to 440 No./l. (figure-6), total insect larvae from 20 to 60 No./l. (figure-7), Total population of zooplanktons were ranged from 320 to 1060 No./l. (figure-8), *Daphnia carinata* (crustacea) showed the highest population

73.33No./l while *chironomus larvae* (insecta) showed the lowest population 24No./l on average number basis throughout the study period, i.e., September 2012 to November 2013. Highest population of protozoa 320No./l recorded in the month of July-13 and lowest population of protozoa 40No./l were recorded in the month of December-12 and March-13, highest population of rotifera were recorded 240No./l in the month of July-13 and lowest population 40No./l of rotifera were recorded in the month of October-13, highest population of crustacea were recorded 440No./l in the month of September-12,july-13and august-13, and lowest population of crustacea were recorded 140No./l in the month of may-13 and june-13, highest population of insect larvae 60No./l were recorded in the month of July-13 and lowest population of insect larvae were found in the month of October-12 November-12, January-13, February-13, April-13, May-13, August-13, September-13 and October-13. Four genera of Zooplankton namely *Monostylabulla*, *Mesocyclops leukarti*, *Daphnia carinata*, *Ceriodaphnia carinata*, in Beechwal reservoir were recorded⁵. 22 zooplankton genera in different water bodies located in Bikaner region were recorded⁶. Study on Zooplankton of sewage water located in the same area was made⁷. Diversity of aquatic fauna was recorded in the same region⁸. Nine species of zooplankton namely *Paramecium caudatum*, *Brachionus bidentata*, *Keratella tropica*, *Ceriodaphnia carinata*, *Daphnia carinata*, *Moina brachiata*, *Mesocyclops leukarti*, *Diatomus glicialis*, *Stenocypris malcomsoni* and two larval forms namely *Nauplius larvae*, and *Culicoides larvae* in the Beechwal reservoir of Bikaner and total population of zooplankton from 1.5No./l to 3.2No./l were recorded⁹. A planktonic study on a desert pond was made¹⁰. In a planktonological study in the same region recorded Eight species of zooplankton, namely, *Brachionus bidentata*, *Brachionus calyciflorus*, *Ceriodaphnia carinata*, *Daphnia carinata*, *Mesocyclops leukarti*, *Diatomus glicialis*, *Stenocypris malcomsoni*, *Eubranchipus* in water of norangdesar vitrica , branch of Indira Gandhi nahar project, Hanumangarh and ten species of zooplankton namely *Brachionus plucatilis*, *Brachionus bidentata*, *Diphanosoma*, *Daphnia carinata*, *Ceriodaphnia carinata*, *Mesocyclops leukarti (female)*, *Diatomus glicialis*, *Mesocyclops leukarti (male)*, *Cypridopsis*, *Stenocypris malcomsoni* in Chohilanwali village pond of Hanumangarh were recorded¹¹ and observed that during the month of April in both water bodies highest population of zooplankton were recorded. Total population of zooplankton were ranged from 0.9 No./l to 3.1 No./l in Norangdesar vitrica and from 1.4 No./l to 14.5No./l in Chohilanwali village pond¹¹. Different zooplankton group at Harsholav pond of Bikaner showed the following order of dominance on the basis of diversity and number. Crustacea > Protozoa > Rotifera

Conclusion

It is concluded that the diversity and number of zooplankton communities were found in sufficient amount at Harsholav pond, Bikaner. The diversity and number of zooplankton communities are dependent on favorable ecological conditions

and suitable habitat. Since zooplanktons are the important living organism of aquatic ecosystem therefore conservation of the diversity and density of zooplankton should be considered as one of the major objective for proper management of a water body.

Table-1
Monthly values of zooplankton population (No./l) at Harsholav pond of Bikaner. (From September 2012 to November 2013)

Months → Zooplankton ↓	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept	Oct.	Nov.	Average
Protozoa																
<i>Paramecium caudatum</i>	80	40	40	-	40	60	20	40	20	-	80	60	40	-	20	36
<i>Euglina sociabilis</i>	40	20	-	-	20	40	20	40	60	20	80	20	20	-	20	26.66
<i>Amoeba proteus</i>	-	40	20	40	40	20	-	-	40	40	60	40	40	40	-	28
<i>Chilomonas paramecium</i>	60	40	-	-	20	20	-	20	40	60	100	40	40	40	20	33.33
Total protozoans	180	140	60	40	120	140	40	100	160	120	320	160	140	80	60	124
Rotifera																
<i>Brachionus calyciflorus</i>	60	40	-	80	-	60	-	40	20	40	100	40	60	20	40	40
<i>Keratella tropica</i>	40	80	60	40	40	40	60	-	40	20	60	-	40	-	20	36
<i>Trychocera longiseta</i>	40	40	-	20	20	60	40	40	-	-	80	60	60	20	20	33.33
Total rotifers	140	160	60	140	60	160	100	80	60	60	240	100	160	40	80	109.33
Crustacea: Cladocera																
<i>Bosmina sp.</i>	100	80	40	20	-	80	-	40	40	20	60	100	80	40	20	48
<i>Daphnia carinata</i>	80	100	100	80	40	60	100	80	20	40	80	120	80	60	60	73.33
<i>Moina brachiata</i>	40	40	20	-	-	20	40	60	20	-	80	60	40	60	40	34.66
Total cladocerans	220	220	160	100	40	160	140	180	80	60	220	280	200	160	120	156
Crustacea: Copepoda																
<i>Mesocyclops leukarti</i>	100	40	80	60	60	-	40	20	-	-	60	40	60	80	40	45.33
<i>Diaptomus glicialis</i>	60	40	80	60	-	-	20	60	-	40	60	40	40	20	80	40
Total copepods	160	80	160	120	60	-	60	80	-	40	120	80	100	100	120	85.33
Crustacea: Ostracoda																
<i>Cypris sp.</i>	40	40	40	20	60	20	40	20	20	20	60	40	40	20	40	34.66
<i>Nauplius larva</i>	20	40	60	-	-	40	40	20	40	20	40	40	80	60	40	36
Total ostracods	60	80	100	20	60	60	80	40	60	40	100	80	120	80	80	70.66
Total crustaceans	440	380	420	240	160	220	280	300	140	140	440	440	420	340	320	311.99
Insecta																
<i>Chironomus larvae</i>	40	20	20	40	20	20	-	20	20	-	60	20	20	20	40	24
Total insect larvae	40	20	20	40	20	20	-	20	20	-	60	20	20	20	40	24
Total Zooplankton Population	800	700	560	460	360	540	420	500	380	320	1060	720	740	480	500	569.33

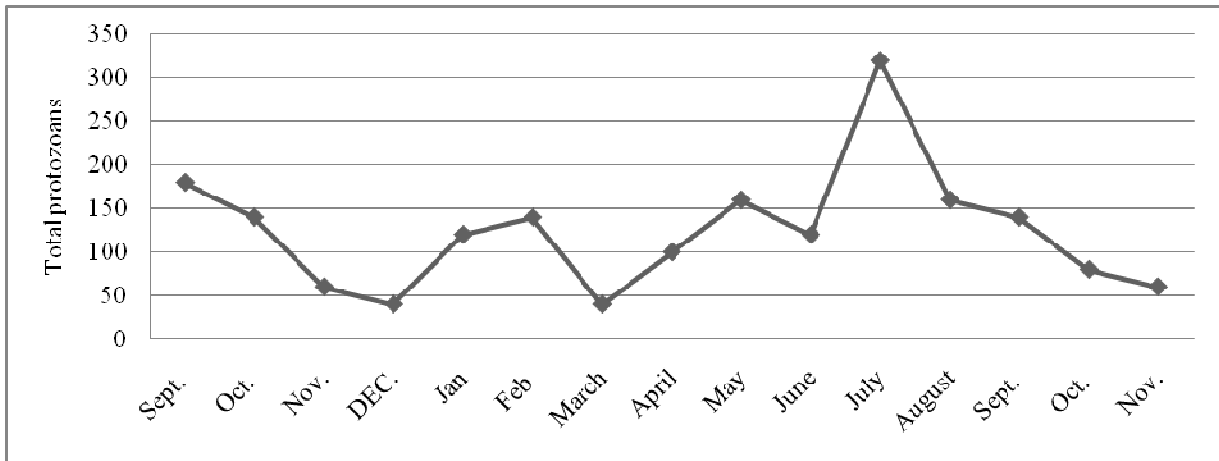


Figure-1
Total Protozoans (No./l) at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

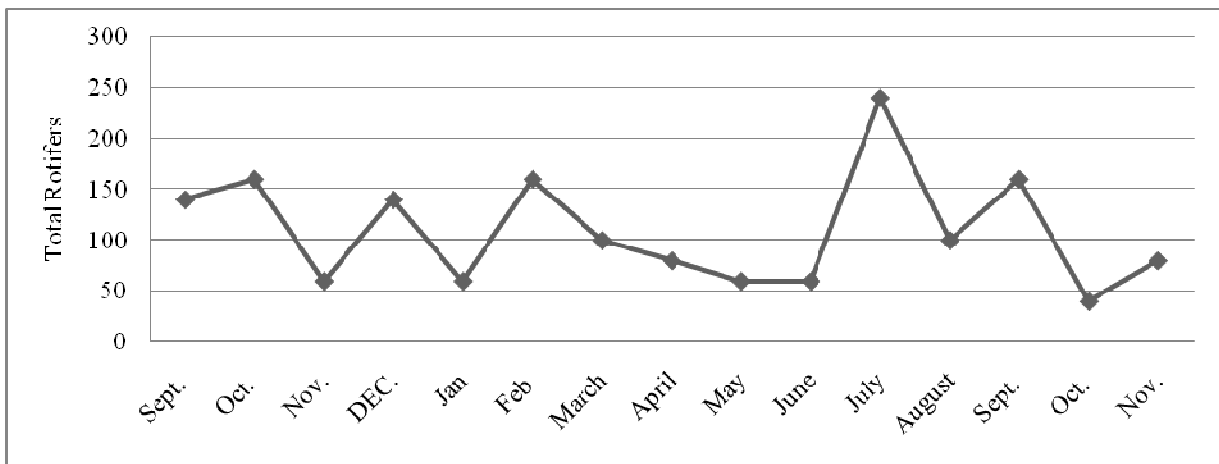


Figure-2
Total Rotifers (No./l) at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

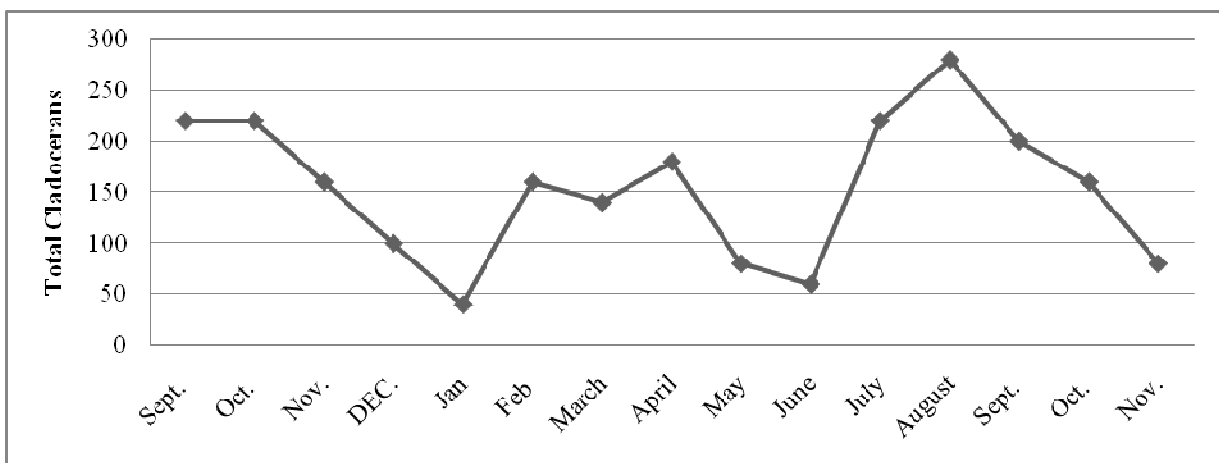


Figure-3
Total Cladocerans (No./l) at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

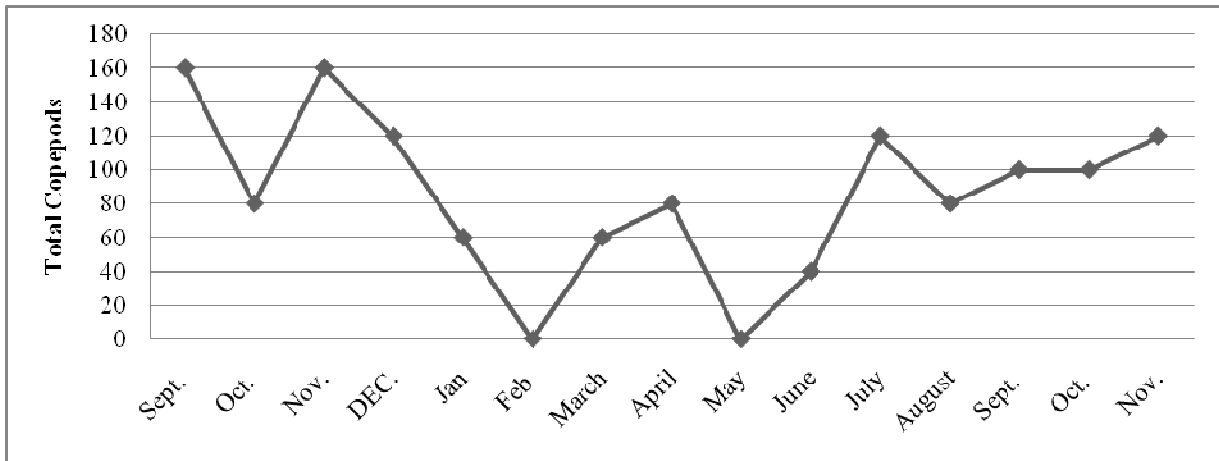


Figure-4
Total Copepods (No. /l) at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

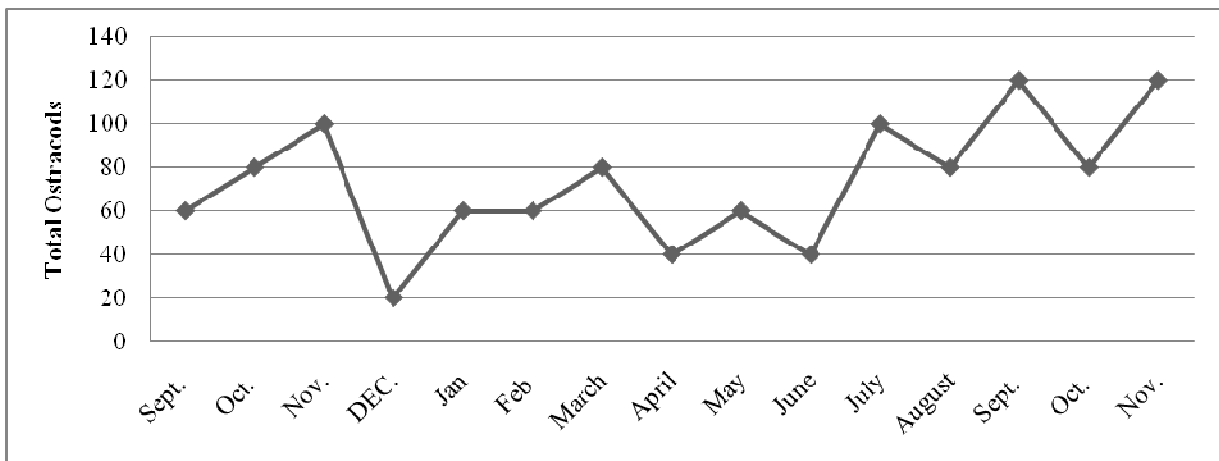


Figure-5
Total Ostracods (No. /l) at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

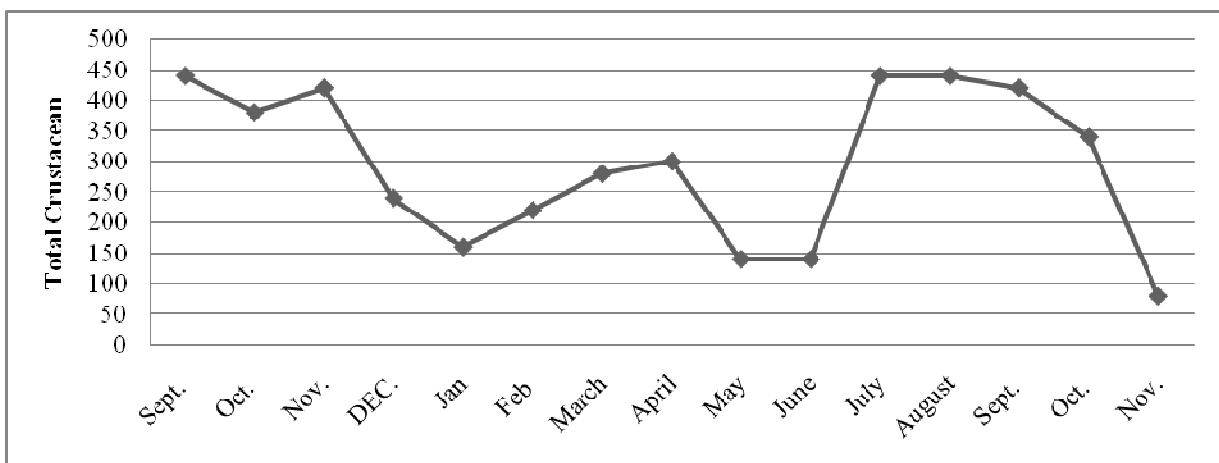


Figure-6
Total Crustaceans (No. /l) at Harsholav Pond at Bikaner

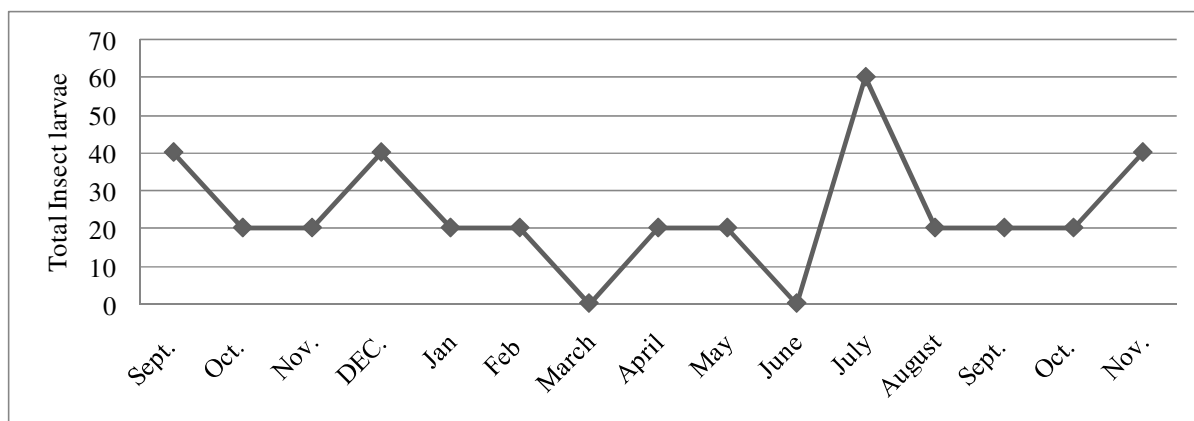


Figure-7
 Total Insect larvae (No./l) at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

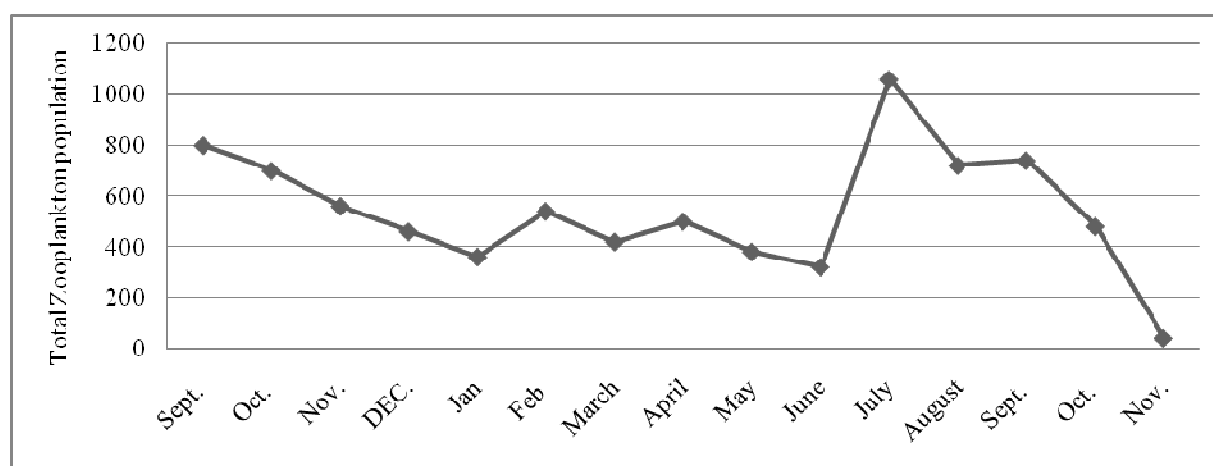


Figure-8
 Total Zooplankton population (No./l) larvae at Harsholav Pond of Bikaner from Sept 2012 to Nov. 2013

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