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Occurrence and Diversity of Crustacean Fauna in Some Freshwater Ecosystems in Bikaner Region (North West Rajasthan)

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ABSTRACT

Surface waters in the hot deserts are scarce and stressed resources. Under harsh and hostile environmental conditions of freshwater ecosystem of desert, a variety of faunal species is found. In freshwater planktonic animals are dominated by rotifers and crustaceans. Some crustaceans are also found in sediments of the water bodies. Present study was conducted to assess the abundance, diversity and periodicity of occurrence of crustaceans in some freshwater bodies around Bikaner. Nine crustacean species belonging to four orders namely Cladocera, Copypoda, Ostracoda and Conchostraca were recorded. Physical-chemical limnology of the studied biotopes revealed that all the freshwater bodies were shallow with turbid, alkaline, hard and well oxygenated water. All the species demonstrated no significant correlation with any of the abiotic variables indicating their wide and varied degree of tolerance to physical-chemical conditions.

KEY WORDS

Desert, Ecosystem, Fauna, Diversity, Crustacean

INTRODUCTION

Of all the global water, approximately 3% is considered" fresh water". Only a small portion of freshwater is available as habitats for living organisms. Water is always the most important, scarce and stressed resource in arid regions like North West Rajasthan. In the desert, water is present in the form of ponds, tanks, reservoirs etc. Fresh water ecosystems of the Indian desert offer typical physical - chemical conditions. In the Indian desert freshwater ecosystem a variety of faunal species is found, which are typically adapted for the given conditions of existence. Freshwater habitats are homes for more than 100,000 species of plants and animals. Many hundreds of freshwater species of different groups like Protozoa, Annelida, Arthropoda, Mollusca, Pisces, Amphibia and others spend at least a portion of their lives in freshwater habitats. In freshwater planktonic animals are dominated by rotifers and crustaceans. Protozoans, insects and their larval stages also form an important part of zooplanktons. Zooplanktons are minute aquatic floating or weekly swimming organisms that drift with water currents. Usually they move in the sunlight zone where food resources are most abundant. Some crustaceans are also found in sediments of the water bodies. Due to their small size, delicate body and shorter lifespan, they respond quickly to the changing environmental conditions. They play an important role in recycling nutrients and energy within their use environment. Observing the diversity and dominance of different faunal species in natural waters has always been an interesting field of research. Crustaceans constitute a large group of phylum Arthropoda inhabiting a wide range of habitats. About 822 species of crustaceans have been reported from Indian freshwater habitats (Chandra *et al.*, 2018). Present study was conducted to assess the abundance, diversity and periodicity of occurrence of crustaceans in some freshwater bodies around Bikaner (North West Rajasthan).

AIM OF THE STUDY

1. To assess the abundance of crustaceans in studied water bodies around Bikaner.
2. To ascertain the crustacean diversity of Kolayat lake, Gajner lake and Harsolao pond.
3. To study the periodicity of occurrence of crustaceans in all the three water bodies.
4. To study the physical-chemical characteristics of studied freshwater ecosystems.

STUDY AREA

Bikaner, where the study has been carried out, is a city (28'N and 73.17'E) in the North West of the state of Rajasthan, India. It is surrounded by the Thar Desert.

The study was carried out on three water bodies namely Kolayatlake, Gajner lake and Harsolao pond around Bikaner. Kolayat lake is situated 51 km in the South West of Bikaner. Gajner Lake is situated about 30 km East of Bikaner city while Harsolao pond is situated 5 km West of Bikaner city.

MATERIALS AND METHODS

The exploration were made monthly in each water body for a period of 6 months. Both water and sediment samples were collected from three studies stations in each water body selected on the banks of these shallow waters. The period of study was July 2019 to December 2019. The water samples were collected with the help of a plastic bucket and were transferred to polythylene bottles for the analysis of physical and chemical parameters. Water has been analysed for transparency, pH, alkalinity, and dissolved oxygen. The analysis was made following APHA-AWWA-WPCF (1981).For pH and transparency respective meters were used. The fauna from water was collected with plankton net made up of bolting silk (No.25, 0.3 mm mesh). The mud sample was collected with the help of a quadrate of known dimensions (i.e. 500 cm^2).Then mud was transferred to plastic bucket and some water was added to prepare a suspension. This was filtered through a sieve of 0.5 mm mesh size. The crustacean forms were studied and counted under stereoscopic binocular microscope. The zooplankton were expressed in terms of no./l and bentic forms were expressed as No./m^2. Identification of fauna was made following Edmondson (1966), Michael (1973), Needham & Needham (1978) and Tonapi (1980).

RESULTS AND DISCUSSION

Physical-chemical limnology of the studied biotopes revealed that all the water bodies were shallow with turbid, alkaline, hard and well oxygenated water (Table 1).

During present study on some freshwater bodies in desert region crustaceans were noted both in water column as planktons and in sediments as benthos. In Rajasthan, Nayar (1971), Deb (1973), Jakher *et al.* (1981), Tiwari (1996), Arora & Saxena (1997), Pareek (1997), Dadhich & Saxena (1999), Srivastava & Saxena (2007) carried out extensive work on crustaceans.

During present study nine species of crustaceans belonging to four orders namely Cladocera (3), Copepoda (3), Ostracoda (2) and Conchostraca (1) were recorded (Table 2). Rathore (2012) recorded three ostracods, cladoceran and three copepod species along with larvae Nauplii in a desert pond ecosystem at Churu. Jai Lal & Srivastava (2016) explored zooplankton community of Badrana Johra (Laxmangarh, Rajasthan) and documented 9 species of crustacea.

Order Cladocera, popularly known as water fleas, form an important constituent of the plankton community in freshwater bodies of Rajasthan (Tiwari, 1996). During present study three cladocerans *namely Daphnia carinata*, *Bosmina longicornis* and *Moina brachiata* were recorded, of which the first one predominated. Saxena (2008) documented 22 cladoceran species belonging to three families in Rajasthan.

Among all the zooplankton, copepods have the toughest exoskeleton. They have the longest and strongest appendages which help them to swim faster than any other zooplankton. Copepods are carnivorous or omnivores. Their physical structures and versatile feeding habits ultimately assist them to hold up harsher environmental conditions.

Order Copepoda was represented by three species- *Cyclops sternus, Diaptomus glacialis* and *Mesocyclops leukarti. Diaptomus glacialis* was not found in Harsolao pond. All these species are also documented among different waters in the region (Saxena, 2008). Ostracods are mainly bottom dwellers of lakes and live on detritus and dead phytoplanktons. These organisms are food of fish and benthic macroinvertebrates. Ostracoda were represented by two species *Eucypris* sp. *and Stenocypris malcomsoni*. *Stenocypris malcomsoni* was the most abundant crustacean in the sediments of all the water bodies investigated. At the same time it showed the longest periodicity of occurrence placing it as the most resistant crustacean. Rukasana and Srivastava (2015) noted three ostracod species in a desert pond ecosystem at Churu, Rajasthan.

Conchostracan *Eocyzicus politus*, which is rare in region, was noted in a single pond Harsolao. Saxena (2008) documented nine species as common conchostracan from Rajasthan.

Nauplii, the larval forms of many crustaceans, occurred in all the water bodies during the months of moderate temperature. Post monsoon season is most favourable period for growth of crustacean population and this may be due to rise of phytoplankton population. This feature has been also reported by Kumar (2001) in some lakes of Tamil Nadu.

All the species demonstrated no significant correlation with any of the abiotic variables indicating their wide and varied degree of tolerance to physical chemical conditions.

Table 1- Physical-chemical variables at three water bodies, Bikaner during July 2019 to December 2019. Values are averages of six months of three study stations in each water body.

Variables	Kolayat Lake	Gajner Lake	Harsolao Pond
Transparency (m)	0.50	0.70	0.45
pH	8.30	8.50	8.23
Dissolved Oxygen (mg/l)	9.34	10.60	8.13
Total Alkalinity (mg/l)	100.30	116.0	130.80
Hardness (mg/l)	104.50	100.0	113.60

Table 2- Diversity, population density and periodicity of occurrence of crustacean fauna at three water bodies, Bikaner during July 2019 to December 2019. Values of population density are averages of six months of three study stations in each water body and are expressed as no./lit., those marked with * as no./m^2.

Crustacean Fauna	Kolayat Lake		Gajner Lake		Harsolao Pond	
	Population Density	Periodicity of Occurrence	Population Density	Periodicity of Occurrence	Population Density	Periodicity of Occurrence
Daphnia carinata	8.33	2	18.33	3	20	4
Bosmina longicornis	-	-	13.33	2	5	1
Moina brachiata	-	-	-	-	20	5
Cyclops sternus	20	4	16.66	5	18	4
Diaptomus glacialis	3.33	2	6.66	3	-	-
Mesocyclops Leukartie	30	5	20	3	33.33	4
*Eucypris sp.**	580	5	600	4	720	5
*Sternocypris malcomsoni **	916.66	6	833.33	6	1066	6
*Eocyzicus politus**	-	-	-	-	66.66	3

CONCLUSION

Moderate value of species diversity and periodicity of occurrence of crustaceans depicts that all the studied water bodies have favourable physical chemical conditions and sufficient food for crustaceans.

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