

Crustacean and Its Ecological Features in Kot Bandh (Dam) in the Northern Aravalli Range Bordering Indian Desert

Paper Submission: 15/11/2020, Date of Acceptance: 25/11/2020, Date of Publication: 26/11/2020



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Abstract

The Kot bandh (dam), where the present study has been under taken is present on the western fringe of the Aravalli range, in Jhunjhunu district of Rajasthan. Being present towards the Indian desert region, the area typically represents an arid climate. In this region the average annual rainfall ranges from 25 to 35 cm. It holds water that has narrower and lower ranges of temperature, pH, EC, TDS and alkalinity as compared to the surface waters in the Indian desert. It has better light penetration and dissolved oxygen and reveals considerably narrow range of seasonal thermal fluctuations.

Among arthropods crustaceans were noted both in water column as plankton and in sediments as benthos. Crustacean fauna in the dam, studied for 15 months, was represented by 4 species belonging to orders Members of Crustacea belonged to Copepoda (2), Cladocera (1), and Ostracoda (1), apart from nauplius larvae. A single cladoceran, *Daphnia carinata* was recorded. Its population varied from 1 to 4/l and it was found to be highly sensitive to extreme cold and hot weather. The seed shrimp (Ostracoda) *Stenocypris malcomsoni* inhabited the sediments of the dam and it was noted as the only perennial crustacean. Poor during extreme thermal conditions, the shrimp was abundant during monsoon. Copepods were represented by one cyclopoid (*Mesocyclops leuckarti*) and one calanoid (*Diaptomus glacialis*). Of these, latter was relatively greater in number with wider tolerance as reflected from its better periodicity of occurrence.

The dam shows many a species common with those in desert waters, however, some of them differ in their population and seasonality of occurrence.

Keywords: Western foot-hills of Aravali, Kot bandh, Fauna, Ecological Parameters, Biotope.

Introduction

The Aravalli is one of the oldest mountain ranges of the country. Running from *Khetri* in the east to *Sirohi* in the south, it bisects the state of Rajasthan into two unequal parts. The region northwest to the range constitutes the major part of the Indian desert while the southeast plains are relatively fertile lands. Making a fringe between two diverge land ecosystems, it acts as an ecotone representing a blend of flora and fauna of both the regions (Saxena, 1997).

Although the desert region of the state is devoid of major and perennial bodies of water but the western slopes of the Aravalli hold quite a good number of perennial waters, particularly lakes and reservoirs. As of land, the community of aquatic ecosystems in the Aravalli range was supposed to be characteristic, demonstrating the edge effect. Therefore, the diversity and population dynamics of fauna of the Aravalli waters, as compared to those of western and eastern diverge regions, was expected to project a characteristic picture.

In view of the above facts, the present study was undertaken to explore the diversity, population density and dynamics, and related ecological aspects of the fauna in Kot Dam situated in the northern Aravalli range in *Jhunjhunu* district, Rajasthan.

Review of Literature

Limnology continued to develops as a field of study and expanded its geographical base during the first half of the 20th century. The study of progressive limnology begins the foundation of knowledge among the

physical, chemical and biological characteristics of lakes. Hydro biological studies of a tributary of Srihind canal at Sangrur(Punjab, India) was studied by Jindal and Vasisht(1981). Limnological studies on a desert reservoir was carried out by Saxsena and Bhargava(1982). Sharama(1992) compare the ecology of a lake and village pond near Bikaner. Nama(1993) evaluated physical-chemical features of takhatsagar lake, Jodhpur. Sharma (2003) reviewed the physical-chemical limnology of some desert waters around Bikaner. Srivastava et al. (2003) investigated physio- chemical characteristics of water bodies around Jaipur. Khwajaet. Al.(2013) carried out limnological studies of Narsinh Mehta lake, Junagarh (Gujrat). Sharma et. Al.(2012) carried out limnology study of 2 water sheets in the Thar Desert with special reference to invertebrate diversity. Shib(2014) recorded seasonal variations in physio- chemical characteristics of RudraSagar wetland (Tripura). Ruksana and Srivastava(2018) investigated Physico-chemical characteristics of a desert pond ecosystem in Churu Rajasthan. Jatelly(2019) observed pollution impact of households on physio-chemical properties and faunal diversity of gang canal and its minor of Sri Ganaganager.

Aim of the study

The present study aim to explore the invertebrate faunal diversity of lentic ecosystem in Indian desert region.

Objective of the study

Faunal diversity of the ecosystem is characterized by the climatic geochemical, geomorphological, biotopic, and pollution conditions. Population of every species found in the dam is dependent on others for the food and shelter.

Material and Method

The Kot bandh (dam), where the present study has been under taken is present on the western fringe of the Aravalli range, in Jhunjhunu district of Rajasthan. Being present towards the Indian desert region, the area typically represents an arid climate. In this region the average annual rainfall ranges from 25 to 35 cm. Scarcity of water and food, intense radiation, dry violent winds, strong dust storms, wide diurnal and seasonal variation in temperature are the common characteristic features of the area. Most of the rainfall occurs in the months of July and August in short and stormy showers with a relatively high intensity. The three monsoonal months, i.e. July to September, however, provide 75% to 90% of total rainfall.

The Kot bandh (dam) is situated in the village Kot (75°13' E 27°28' N) which is about 40 km from Jhunjhunu. It is also popularly known as SarjuSagar Bandh. It was built in the year 1924. The dam has Satambhri temple on its bank, which is revered in the region. The dam was built by Raja Bhoop who ruled the region.

The average annual rainfall in the area is 50.8 cm of which average monsoon rainfall alone is 45.72 cm. This rainfall contributes 2.82 mcm water in the dam. This volume of water is derived from a gross catchment area of 11.65 km².

The surface water spread of the dam, when full, is 14 km². While the maximum water level of the dam is 39.31 m, the full tank level is 38.10 m from MSL. The gross command area of the dam is 52 hectares in which crops of wheat, gram and mustard are generally raised.

The study was undertaken fortnightly for a period of 15 months, i.e., from November 2008 to January 2010, covering all the three seasons and an overlapping period of three months. Water samples were collected from a depth of 0.5 m at fortnightly intervals from three study stations. Since the water was shallow, no samples could be collected from greater depths.

The microfauna from water was collected with plankton net made up of bolting silk (No. 25, 0.3 mm mesh). With the help of plankton net both macroscopic and microscopic forms were collected. From the net, sample was transferred to duly label plastic bottles of 100 ml capacity. Formaldehyde was added to preserve the faunal sample. Lateron these samples were used for identification of different animal forms.

Result and Discussion

Biotope

Unlike the thermal trend of desert, the seasonal fluctuations in water temperature were moderate, accounting for only 7°C. The narrow magnitude of water temperature was found not to influence much the other variables of water as evident from its insignificant correlations. The water was clear with the Secchi disc transparency ranging between 0.9 to 2.0m, averaging 1.66m. No great deviation was observed in transparency. This feature was again in contrast to that of desert waters which are mostly shallow and turbid. The water was alkaline, showing a pH in the range of 7.0 to 8.5. The annual average pH was noted as 7.8. EC of water was low, ranging between 0.2 to 0.5 mmho/cm, its annual average was noted as 0.31 mmho/cm. The TDS presented a precisely similar trend as that of EC. The TDS values ranged from 200 to 500 mg/l with an annual average of 312.66 mg/l. The two parameters were also observed to be lesser compared to many of the Indian desert waters. Dissolved oxygen ranged from 2.0 to 10.45 mg/l and it presented a negative correlation with temperature, EC, TDS, free CO₂ and hardness of water. Free carbon dioxide was absent in a few months and its maximum value was noted in extreme summer month. The water was moderately alkaline. The total alkalinity ranged from 90 to 173 mg/l with an average of 133.8 mg/l. Similarly the hardness of water was also moderate and presented a trend as that of alkalinity. It ranged from 92 to 400 mg/l, with an annual average of 171.26 mg/l. The two parameters presented strong positive correlations with EC and TDS. Sediments of the dam were also alkaline, the pH of sediment ranged from 8.0 to 8.6, the annual average being 8.2. EC of sediment ranged from 0.2 to 0.5 mmho/cm with an annual average of 0.36 mmho/cm. The organic matter in the sediment was high, ranging from 4.07 to 29.34 mg/l, with a peak during monsoon months.

Crustacea

Except for a few forms of moist soil, crustaceans are essentially the denizens of the aquatic environment. They vary from minute planktonic forms to large nektonic crabs and lobsters.

Crustacean fauna in desert waters of Rajasthan are known through the works of Lindburg (1942), Mathur & Sidhu (1957), Baid (1958), Biswas (1964, 1965, 1971), Tiwari (1951), 1958, 1962a, 1965a, 1966, 1996), Deb (1973), Bhargava & Alam (1980), Jakhar et al. (1981), and Saxena (2008b).

The crustacean fauna during present study comprised the following:

Sub class	Branchiopoda (Phyllopora)
Division	Oligobranchiopoda
Order	Cladocera
Family	Daphniidae
Genus & Species	<i>Daphnia carinata</i> King
Sub class	Ostracoda
Order	Podocopa
Family	Cypridae
Genus & Species	<i>Stenocypris malcomsoni</i> (Brady)
Sub Class	Copepoda
Order	Eucopopoda
Family	Diaptomidae (Calanoid copepod)
Genus & Species	<i>Diaptomus glacialis</i> Lilljeborg
Family	Cyclopoidae
Genus & Species	<i>Mesocyclops leuckarti</i> Claus

Cladocerans, popularly known as water fleas, form an important constituent of the plankton in temporary freshwater bodies of Rajasthan (Tiwari, 1996). During present study, a single cladoceran, *Daphnia carinata* was recorded. The form, besides many other cladocerans, is also documented from the waters of Rajasthan by other workers (Saxena, 2008 b; Srivastava, & Saxena, 2010). Its population varied from 1 to 4/l and it was found to be highly sensitive to extreme cold and hot weather as being totally absent during such periods.

Tonapi (1980) reported 45 species of cladocerans from India. In the temporary water bodies of Rajasthan desert, 41 species of water fleas have so far been recognised by Michael & Sharma (1988). Earlier, Biswas (1971) and Nayar (1971) recorded 44 and 17 species respectively from different parts of Rajasthan. Michael & Sharma (op. cit) in the 'Fauna of India: Cladocera' have merged some of these species with earlier ones and reduced the tally to 41 species. Lately, Saxena (2008 b) documented 22 cladoceran species belonging to three families from Rajasthan. Present species (*Daphnia carinata*) is also documented by Tiwari (1996). Tonapi (1980) reported the flea *Daphnia* as the most common zooplankton of fresh water, in India mainly represented by species *carinata*, *lomholtzi*, *magna* and *longispina* that measured from 0.2 to 0.3 mm.

The seed shrimp (Ostracoda) *Stenocypris malcomsoni* inhabited the sediments of the dam and it was noted as the only perennial crustacean. Its population ranged from 1 to 18/m² with an annual average of 8/m². Poor during extreme thermal conditions, the shrimp was abundant during monsoon. Srivastava (2009) recorded this species as the most abundant (500-884/m²) crustacean in the

sediments of all the village ponds investigated. At the same time it showed the longest periodicity of occurrence placing it as the most resistant crustacean. Chadha (1999) noted this seed shrimp to be frequent and perennial in a village pond in the Rajasthan desert. Sidhu (1959) recorded a single ostracod *Candonocypris bicornis* from Pilani (Rajasthan). A good, illustrated account of 20 species belonging to eight genera from the western Rajasthan was given by Deb (1973). Saxena (2008b) noted only two ostracodan species including the present one, among common aquatic invertebrates of Rajasthan.

Copepods were represented by one cyclopoid (*Mesocyclops leuckarti*) and one calanoid (*Diaptomus glacialis*). Of these, latter was relatively greater in number with wider tolerance as reflected from its better periodicity of occurrence. The two species are also documented among different waters in the region (Saxena, 2008 b), and former is emphasized as a vector of guineaworm (Roonwal, 1982; Saxena, 1988). Chadha & Saxena (1999) noted the low calanoid to cyclopoid plus cladoceran ratio as indicator of high organic load in water. In the present investigated dam, the said ratio is found to be 1.4 which is moderate as compared to the records of Chadha (1999) who noted the same is the range of 0.08 to 1.9 among different waters in the same region, lowest values depicted by temple tanks showing greater organic load.

The crustacean population ranged from 3 to 58/l with an annual average of 23/l. Like other forms, crustaceans were also richer during monsoon and winter. These forms were found to be less affected by the physical-chemical variables as compared to insects. Srivastava & Saxena (2010) in their study on crustacean diversity of Indian desert also observed that none of the species demonstrated significant correlation any of the abiotic variables indicating their wide and varied degree of tolerance to physical-chemical conditions. However, total crustacean population presented positive correlation with water temperature and negative one with pH.

The number of nauplius larvae, indicating the breeding among crustaceans, increased with water temperature, DO, and free CO₂ while increased alkalinity presented a suppressing effect. Srivastava (2009) in some desert village ponds recorded nauplii during the months of moderate temperature while Chadha (1999) noted their infrequent number in a temple tank in the same region with, however, perennial occurrence.

Conclusion

Present dam situated at western foot-hills of Aravalli bordering the Indian desert, hold water that has narrow and lower range of temperature, pH, EC, TDS and alkalinity as compared to the surface waters in the Indian desert. It has better light penetration and dissolved oxygen and reveals considerably narrow range of seasonal thermal fluctuations. Its faunal components includes arthropods specially Crustaceans (4). It shows many a species common with those in desert waters, however some of them differ in their population and seasonality of occurrence.

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