Original Research

Malacofaunal distribution, abundance and diversity of the Nakana Lake, Dhule (MS) India

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ABSTRACT:

Freshwater Molluscs distribution and diversity status of Nakana Lake, Dhule, were studied during June 2013 to May 2014. The samples were collected at every fortnight from two sites. A total of 13 species were reported, out of which 10 species were Gastropods and three species were Pelecypods; those belonged to four orders, 10 families and 12 genera. The abundance of molluscs was also studied. The average number of animals were indicated per season: i.e. monsoon, winter and summer. Maximum species were collected in the summer season at both the sites. Molluscan diversity were calculated by the various diversity indices such as Shannon-Wiener diversity index (H), Simpson's Dominance index (D), Simpson's index of diversity (I-D), Simpson's Evenness(E) and Pielou's Evenness index (J).

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INTRODUCTION

The mollusca are soft bodied animals. They move on the land and still dependent on a moist ground, in an excess of cold or hot and dry climate they enter in the state of dormancy. The Phylum Mollusca are classified into seven classes viz. Aplacophora, Polyplacophora, Monoplacophora, Gastropoda, Scaphopoda, Pelecypoda, and Cephalopoda. Gastropoda is the largest class more than 80,000 species are recorded throughout the world. (Hyman, 1967).

Mollusca prove immensely beneficial in economic and medicinal values. Like all animals, the molluscs are not considered by men to be either useful or destructive. Gastropod plays an important role in balanceing the nature. The shells were used in Unani and Ayurvedic medicine system for meditation, in the production of humus, in the control of fungi, algae, lichens and also as predators and parasites; but in nature the molluscs are hunted and eaten by predators (Ahirrao, 2003).

In scientific studies, molluscs prove key role in study of drug action on heart, hormones, enzymes and antitoxins-especially in relation to immunological haematology. These are suitable bioindicators for some radio-active and chemical pollution in the coastal areas of water bodies. The snails and slugs are important to man because of the damage they do in agriculture, horticulture and forestry. Furthermore, they are of importance in medical and veterinary practice, since they serve as intermediate host for certain parasitic worms of man and domestic animals viz. Schistosome parasites (Ahirrao, 2003; Ahirrao and Khedkar, 2012).

MATERIALS AND METHODS

Geographical area of Nakana Lake

The present study area is selected from one of the man-made Lake situated on the Panzara River, 6 km away from Dhule city. It runs parallel to the National highway number: 6 (NH-6). Geographical location of the lake is as follows; Longitudes:- 74.7417477 and Latitudes:- 20.9095349. It is an earthen lake having catchment area of 945 m^3, with a maximum height is 18.41 m. It also receives water from Haranmall Lake. The lake water is used for drinking, irrigation and aquaculture purpose. One side of it is covered by a well developed forest with grass trees, herbs and shrubs. The grass starts in the forest drying from the start of post monsoon, frequently cattle grazing is observed in this
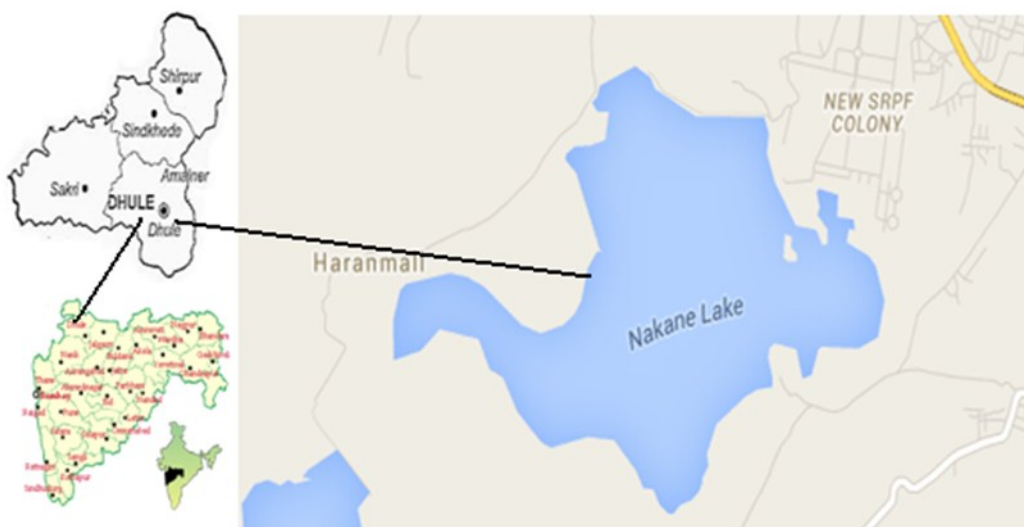

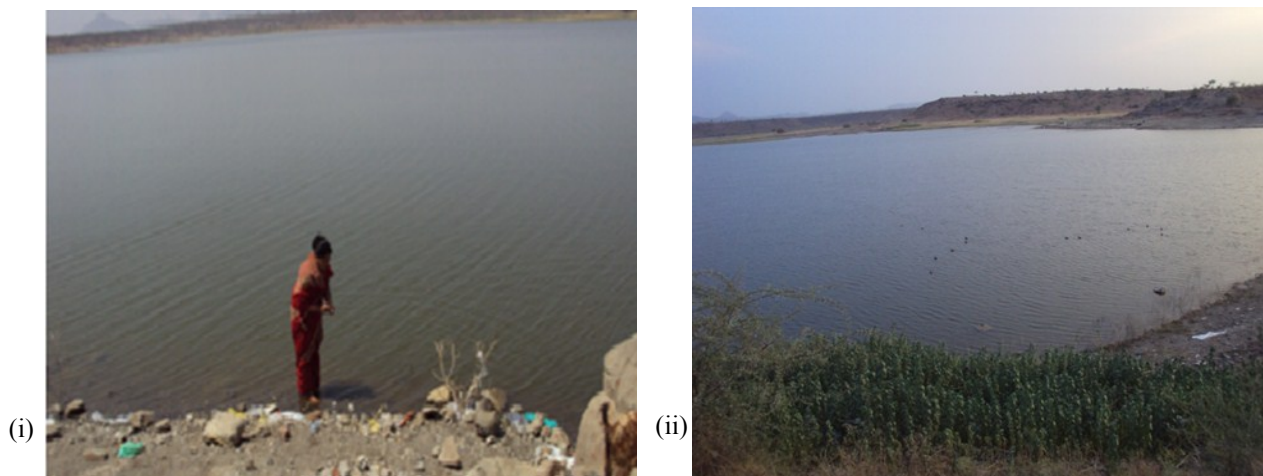**Figure 1. Map Showing Study area, Nakana Lake, Dhule (MS) India**

(i) (ii)

Figure 2. Photographs showing the study areas (i) S-I and (ii) S-II.

area. During present investigation two sites were selected for the study namely S-I and S-II.

Sampling and preservation

The Molluscan species were collected by hand picking method for the big specimens and for the smallest one, a sieve for soil samples were used. All specimens were brought to the laboratory, washed thoroughly, and preserved in 4 % formalin. The shells were dried at room temperature, and then separated in polythene bags. Identification was done on the basis of Preston (1915) Rao (1989) and Tonapi (1980). The unidentified molluscan shells are identified and classified upto the generic and species level by Zoological survey of India, Pune, Maharashtra State, India. Data were collected fortnightly, pooled seasonally viz. monsoon,

winter and summer from June 2013 to May 2014.

Data analysis

Quantitative and qualitative estimation of molluscan fauna were carried out using quadrat method (Micheal, 1984, Subba Rao, 1989). At least four quadrat (1 X 1m) were sampled from each site and the average of these were considerd as density and species richness per m^2 for that area.

Formulae for indices

Total number of species, total number of individual in a sample and different diversity indices. From the present data were calculated using the following indices Shannon-Weiner Index (H) (1949), Simpson's Dominance Index (D), Simpson (1949), Simpson's Index of diversity (1-D), Simpson's reciprocal

Table 1. The Molluscan species richness, abundance and diversity indices of Nakana Lake and Dhule are tabulated.

| S. No.	Index	Site -I			Site-II		
		M	**W**	**S**	**M**	**W**	**S**
1	Species Richness (S)	13	13	13	12	12	12
2	Species abundance(N)	54	80	137	37	50	104
3	Shannon-Weiner Index(H)	3.8134	3.0866	6.5137	3.058	2.2611	5.2641
4	Simpson's Dominance Index (D)	0.0887	0.1183	0.1212	0.1216	0.1461	0.1376
5	Simpson's Index of Diversity (1-D)	0.9113	0.8817	0.8788	0.8784	0.8539	0.8624
6	Simpson's reciprocal Index (1/D)	11.273	8.453	8.2508	8.2226	6.8446	7.2674
7	Simpson's Evenness (E)	0.8671	0.6502	0.6346	0.6853	0.5703	0.6056
8	Pielou's Evenness (J)	1.4867	1.2033	2.5395	1.2306	0.9099	2.1184
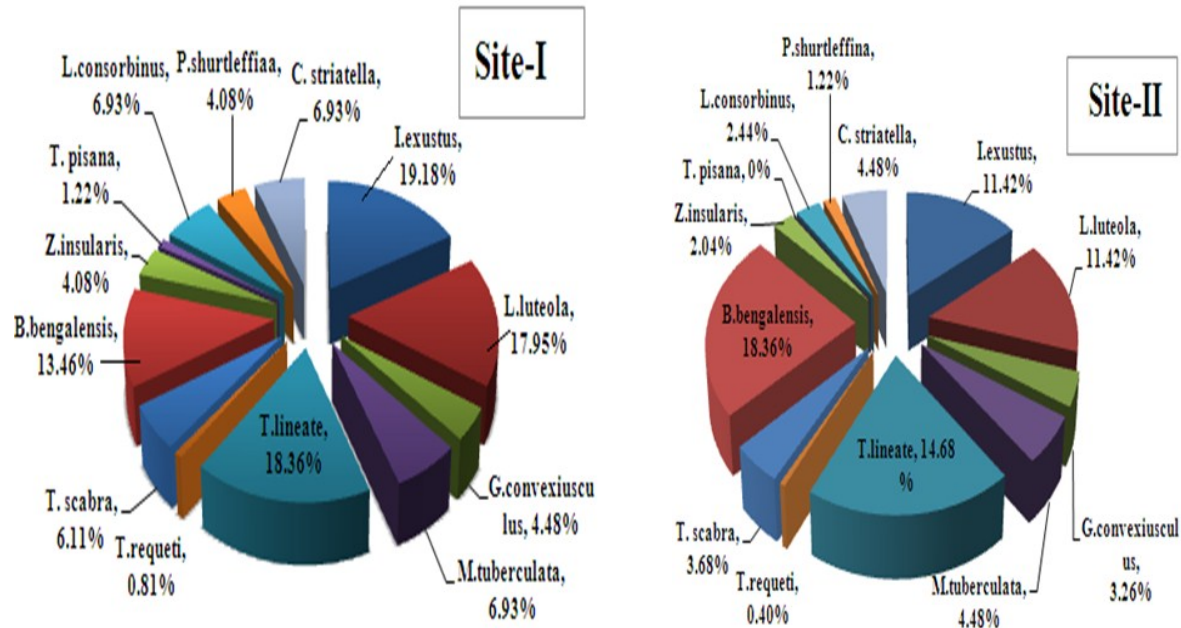
Figure 3. Pie Charts showing percentage of annual distribution of species at two sites: S-I and S-II respectively

Index (1/D), Simpson's Evenness (E) and Pielou's evenness Index (J) Pielou(1975). The following index values were used for calculation.

1. Shannon – Weiner Index (H): H= -∑Pi (Ln Pi),

2. Simpson's Dominance Index (D): D = ∑ n(n-1)/N(N-1),

3. Simpson's Index of Diversity (D_1): D_1 = 1-D,

4. Simpson's reciprocal Index (D_2): D_2 = 1/D,

5. Simpson's Evenness (E): E = D_2/S

6. Pielou's evenness Index (J): J = H/Ln*S

Where,
S = Number of species.
N = Total number of individual of all species.
Pi = A/T where A is number of each species in the sample,
T = Total number of individual of all species in the sample.
n = Total number of individuals of particular species.

RESULTS AND DISCUSSION

Seasonal variations

In the present investigation 462, samples were collected during June 2013 to May 2014 from the both sites i.e. Site I (Nakana Lake) and site II (Dhule). Totally, 13 species were recorded, which belongs to 4 orders, 10 families and 12 genera. Among them

Gastropods found to be dominant over Pelecypods, it contributes 86.14% and 13.65 % respectively. Sharma *et.al*. (2009), recorded similar predominance of Gastropoda over Pelecepoda. From Site I =13 species, and from Site II =12 species were recorded. This is shown in Fig.3.

Density of Mollusca at Site-I ranges between 54 organism/m^2 in monsoon , 80 org./m^2 in winter and 137 org./m^2 in summer season, whereas at Site-II, least 37 org./m^2 in Monsoon, moderate number 50 org./m^2 in Winter and maximum i.e. 104 org./m^2 in Summer.

Observations showed that highest population of Molluscs were recorded during summer from both the sites that are corresponding with Hussein *et al*.,(2011). He reported March-May pick in his study. The snail abundance was maximum during the summer which might be due to ecological conditions like warm temperature, activates the process of decomposition. A large amount of decomposers is responsible for the deposition of organic matter and macrophytes at the bottom of the lake.

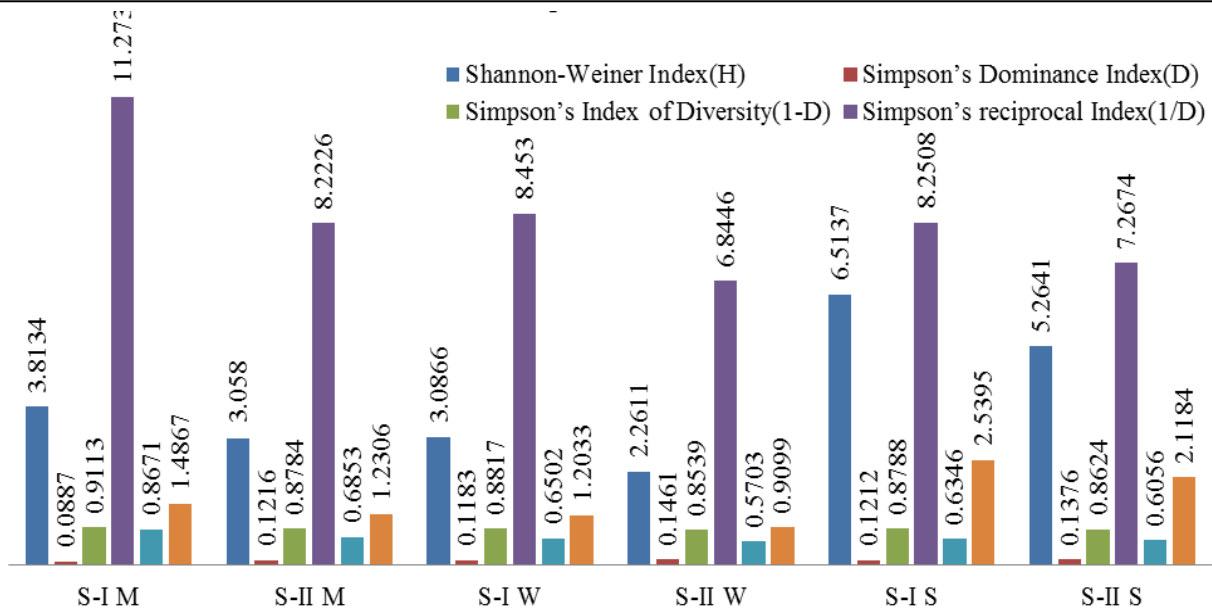Total decline in molluscan population was

Figure 4. The column chart shows comparison amoung different diversity indices of recorded molluscan species, at Nakana Lake, Dhule.

observed at monsoon season due to self dilution of the body fluid. The sensitive molluscs could not adjust the fluctuating osmotic balance suddenly hence the mortality was very high during the period of monsoon season. The salinity and temperature dropped down which is made the condition adverse for the animal because of heavy rainfall, Patole (2010).

In winter at both sites population of molluscs found to be moderate in number, because of the suitable ecosystem but molluscans are poikilotherms, and they cannot tollerate tolerate an excess cold environment and hence they may enter in to the state of hibernation. On the other hand El-Kady *et al*., (2000) was recorded low number of snails during winter (Jan and Feb) in Sinai Peninsula.

Biological indices

The diversity of molluscs mainly depends up on biotic, abiotic factors and stability of the ecosystem. Molluscan diversity is calculated by the diversity status, richness, abundance, habitat and various diversity indices. Values are shown in table no. 1.

For proper understanding the Biotic community, it is essential to work out some indices Sharma *et al*.,

(2010). There has been quite large fluctuation between the level of abundance and showed great diversity of molluscs during the one year study period. The Nakana Lake shows Shannon-Weiner Index (H) varied from 6.5137 to 3.0866 at Site-I and at Site –II in between 5.2641 to 2.2611. Simpson's Dominance Index (D) fluctuated in between 0.0887 and 0.1216 in Monsoon, 0.1183 and 0.1461 in Winter and 0.1212 and 0.1376 in Summer, where, Sit-II was found to be dominant over Site-I. Values of Simpson's Index of Diversity at site –I is found to be varied i.e. 0.9113 in Monsoon, 0.8817 in Winter and 0.8788 in Summer Whereas, 0.8784 in Monsoon, 0.8539 in Winter and 0.8624 in Summer, at Site II. Simpson's reciprocal Index (1/D) was highest in Monsoon 11.273 and 8.2508 at Site-I and at Site-II and least in Winter 8.453 and and 6.8446 respectively. Simpson's Evenness (E) maximum in Monsoon 0.8671 followed by Winter 0.6502 and Summer 0.6346 at Site-I and at site II maximum recorded in Monsoon 0.6853 followed by 0.6056 in Summer, 0.5703 in Winter. Pielou's Evenness (J) ranges in between 2.5395 to 2.1184 in Summer season at Site-I and Site-II respectively while 0.9099 to 1.2033 in Winter and

1.4867 to 1.2306 in mosoon. The present investigation resemble with the observation made by so many workers on the occurrence of molluscan diversity in different water bodies (Dolikar *et al*., 2014, Mohan *et al*., 2013).

CONCLUSION

In general, the present study revealed that species richness, abundance, density and diversity of molluscans depend upon rich ecosystem of Nakana Lake. All recorded molluscan species are indigenous. There found a considerable difference within the study localities.

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