

## Population Structure of some Molluscs and Their Dependency on Abiotic Factors, in a Desert Pond of Rajasthan

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### Introduction

Phylum Mollusca comprise diverse group of bivalves, shells etc. having different shape, size, habit and habitat (Subba Rao, 1993). Around 8,765 species of fresh water molluscs are available all over the world, of which 284 species are reported from India and adjacent countries. Among them, 171 species of class Gastropoda are found in India (Punithavela & Raghunathan, 2006).

Fresh water gastropod species have economical and biological importance. Economy of desert state is partially based on dairy farming. Snails act as intermediate hosts for Platyhelminthes parasites, that cause infection to dairy animals and lead to morbidity and mortality in livestock.

Earlier malacological studies in Bikaner region were carried out by Khanam & Singh (2012) who studied the ecology, population density of prosobranch snails.

The aim of the present study was to know the impact of abiotic factors on gastropod population in a desert pond in district Bikaner of Rajasthan.

### Material & Methods

Bikaner, a semi arid region of Rajasthan is at geographical location 28° N and 75° 17'E, MSL 228 m. Study was carried out from September 2010 to November 2011, in the Nal pond located at E 73° 12' and N 28° 4' and MSL 229m, covering an area of 2300 m<sup>2</sup>. This pond is situated in low land, and receives rain water from surrounding areas. For physico-chemical analysis of water samples, APHA-AWWA-WPCF (1981) and Saxena (2001) methodology were followed. For qualitative analysis, a stereo microscope, and for identification the standard keys (Subba Rao, 1989) were followed.

### Results and Discussion

During the study period three gastropod species belonging to two sub-classes viz., Pulmonata and Prosobranchia were recorded. Of which *Gabbia orcula* was observed to be highest contributing, followed by *Digoniostoma pulchella*

(Table 1). The high population of these species can be attributed to their ability to adapt to the variations at water conditions.

The seasonal and monthly variation with respect to abiotic factors of pond and gastropod population show both negative and positive correlation (Table 2). Results indicate that, *Digoniostoma pulchella* show negative correlation with water temperature, Dissolved Oxygen, Free CO<sub>2</sub>, and organic matter. Similar observation was recorded by Gaikwad & Kamble (2014), reporting high temperature and CO<sub>2</sub> became unsuitable for molluscan fauna. Whereas, pH shows positive significant (p<0.05) correlation. Variations in pH directly affects the population density of species.

Electrical conductivity and total dissolved solids of pond soil directly influence (p<0.05) the density of *Gabbia orcula*. This species also showed significant high but negative correlation with water temperature (p<0.01). According to Bath et al. (1999) increase in water temperature, up to certain range, favor the molluscan abundance, and if the water temperature further rise, it inversely affects the population density. This study also revealed negative relation between abundance of species and turbidity, Free CO<sub>2</sub> and total alkalinity. Increase in turbidity lowered down the amount of DO, which may cause depletion in the population density. Sharma (2013) reported direct significant effect of water temperature on population density of this species.

*Indoplanorbis exustus* showed negative correlation with pH (p<0.05). Rathore (2003) reported positive significant correlation between *Indoplanorbis exustus* density and various abiotic factors (DO, water temperature, EC, TDS and hardness), but did not observe any significant correlation with the pH of water. Garg et al. (2009) reported negative correlation between pH and molluscan population. High pH indicates high concentration of electrolyte, which lowered down the molluscan abundance.

Total gastropods population show negative correlation

Table 1. Percentage share of gastropods species in the Nal Bari Pond.

Sub-Class	Species	Population Share (%)
Prosobranchia	<i>Digoniostoma pulchella</i>	37.58
	<i>Gabbia orcula</i>	43.61
Pulmonata	<i>Indoplanorbis exustus</i>	18.79

with Temperature, Dissolved Oxygen, Free CO<sub>2</sub>, water and pH of soil. Hardness and pH must be most important abiotic factors, which directly and indirectly influence metabolic activity (Eleutheradis & Lazaridou-Dimitriadou, 1995). Present investigation indicate that positive ( $p < 0.001$ ) correlation with Electrical Conductivity (EC) and Total Dissolved Solid (TDS) of sediments and significant correlation ( $p < 0.05$ ) with EC and TDS of water. EC and TDS indicate large quantity of dissolved mineral salt (Trivedy & Goel, 1986). A strong relationship exists between the solute composition of water and occurrence of gastropods.

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Table 2. Correlation (r) of gastropods with abiotic factors of water and sediment.

Parameter	GASTROPOD			Total Population
	<i>Digoniostoma pulchella</i>	<i>Gabbia orcula</i>	<i>Indoplanorbis exustus</i>	
Water Temperature	-0.332	-0.659**	0.261	-0.426
Turbidity	0.170	-0.005	0.504	0.243
pH (Water)	0.598*	0.178	-0.602*	0.193
EC (Water)	0.361	0.534	0.534	0.609*
TDS (Water)	0.361	0.534	0.534	0.609*
Dissolved oxygen	-0.137	0.162	-0.218	-0.052
Free CO <sub>2</sub>	-0.100	-0.119	0.189	-0.051
Hardness	0.173	0.504	0.568	0.533
Total Alkalinity	0.098	-0.240	0.334	-0.063
pH (soil)	0.098	-0.483	-0.529	-0.376
EC (soil)	0.546	0.601*	0.474	0.738***
TDS (soil)	0.546	0.601*	0.474	0.738***
Organic Matter	-0.365	0.203	-0.187	-0.132

\*\*\* $P < 0.001$ ; \*\* $P < 0.01$ ; \* $P < 0.05$