

Evaluation of Physico-Chemical Parameters of Latipada Dam for Habitat of Fresh Water Sponges

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Abstract: *Phylum porifera and parazoa are the sponges, which represent the first step in the organization of cellular grade of body construction the sponges. They are sessile and permanently attached to rocks, pilings sticks plants and other animals. Sponges gives proof of life by sucking and throwing out water from the body sponges are the filter feeders of water, which helps the environmental protection they consume find food particle along with bacteria from the water .fresh water sponges are the ecological important due to their peculiar characteristics. The species S.Lacustris a moderately, light positive form and tolerates a wide range of environmental conditions. The present work on physico-chemical parameter of latipada dam water was studies to know the water quality required for growth of survival of fresh water sponges. Frederick¹ have reported the habitat of S.lacustris and identified it as a species tolerable for wide range of contaminates.*

Keywords: Fresh water sponge, Physico-chemical parameter, Seasonal variation, water quality

1. Introduction

The total volume of water in the world remains constant as it is being constantly recycled by a system known as water or hydrological cycle. Hydrologists have studied the chemical & physical nature of the water & it's movement both on and below the ground. In terms of total volume 97.50% of world's water is saline with 99.99% of this found in the oceans & remainder making up the salt lakes.

This means that only 2.50% of the total volume of water in the world is a fresh water. However, not all of this fresh water is readily available for use of the human being. Approximately 75% of the fresh water is locked up as ice cap and glaciers, 24% located under ground as ground water & around 1% of the total fresh water is found in lakes, rivers & in the soil which is easily available for human being²

The increasing industrialization, urbanization developmental activities & consequent pollution of water have brought a veritable water crisis. The industrialization is one of the most significant among the causes of pollution of aquatic ecosystem due to a diverse kind of wastes produced.

The physico-chemical parameters of water are indispensable to sustain vital processes of aquatic life & to maintain the ecosystem. Today the existence of the land, water & air ecosystem is threatened with pollution load. Considerable data is available on the water quality of a number of fresh water ecosystem^{3,4}. The hydro biological investigations were also carried out on the lakes in India for identification of the causes responsible for inferior water quality.⁵

2. About the Sponges

For centuries sponges were thought to be plants, but in 1765, an English naturalist John Ellis discovered their animal nature. Ellis observed that the sponges give proof of life by sucking & throwing out water from the body. Sponges are sessile & permanently attached to rocks, pilings, sticks, plants or other animals. They are the filters of the ocean &

consume, fine food particles along with bacteria from the water.

About 10,000 species of sponges were reported⁶, where as fresh water family spongillidae consists of 150 species of which 29 has been reported in India⁷. The present species is identified from Zoology Dept., Institute of Science, Mumhai - 32 according to existing technique⁸.

The present work on physico-chemical properties of Latipada dam water to know the water quality required for growth & survival of fresh water sponge (*S.Lacustris*)

3. Experimental

Material and Methods

The Latipada darn at Pimpalner Dist. Dhule (M. S.) is constructed in 1974. Panzara River originated from the small village Navapada near Mangi-Tungi hills of Western Ghats. The dam is located at the latitude of 20° 55' N and 74°-5' - 30" E at 532 meters above selvel. (MSL).

Monthly water samples were collected in plastic cans from the selected stations of the dam for the period of one-year (May 2015 to April 2016). pH, temperature, and dissolved oxygen of dam water were determined immediately after sampling. Standard methods described in APHA,⁹ were followed for the physico chemical characterization of the dam water like,

pH,

Temperature, DO, Hardness, Nitrates, Phosphates, Calcium, Chlorides, Sulphates, and TDS.

4. Result and Discussion

Seasonal variation in the physico-chemical characteristics of water was observed during the study period (Figures). Table shows the results on the characteristics of the dam water and the ideal characteristics of the water for normal survival and growth of *S.Lacustris*.

pH

The pH of the dam water ranged between 7.1 to 8.4. The general trend of water in the dam is alkaline. Higher pH 8.4 was observed in June during the study period.

Temperature

The temperature varied between 20.4 °C to 31.2 °C during the study period. Seasonal variation in the temperature of water was observed. The temperature was 20.4°C in winter (January) and 31.2 °C in summer season (May).

Dissolved oxygen (DO)

Monthly variation in DO was observed during the study period. DO of dam water ranged between 4.5 to 10.0 mg/L, higher DO was the characteristic of winter season.

Hardness

Hardness ranged between 110 to 244 mg/L. The higher values of hardness were recorded in July and August and lower in October. Hardness was lower in the winter compared to summer and rainy seasons.

Nitrate

Nitrates ranged between 0.2 to 0.92 mg/L during the study period. The lowest 0.2 mg/L was recorded in September and highest 0.92 mg/L was recorded in February of the study period.

Phosphate

The phosphate content ranged between 0.31 to 0.89 mg/L. The lowest phosphate content was observed in September, (0.31 mg/L) and highest in October, (0.89 mg/L) in the study.

Calcium

Calcium content in the dam water was low in July, (30.88 mg/L) and high in December, (64.61 mg/L) during the study period. In winter season the calcium content was higher than the other seasons.

Chloride

Chlorides were ranged between 11.36 to 45.44 mg/L. It was highest in July, (45.44 mg/L) and lowest in August, (11.36 mg/L). Pre-monsoon period was characterized by higher chloride content.

Sulphate

The sulphate content ranged between 0.12 to 1.11 mg/L during the study period. It was higher in March, (1.11 mg/L) but lower in January, (0.12 mg/L). It was lower in the winter than the other seasons.

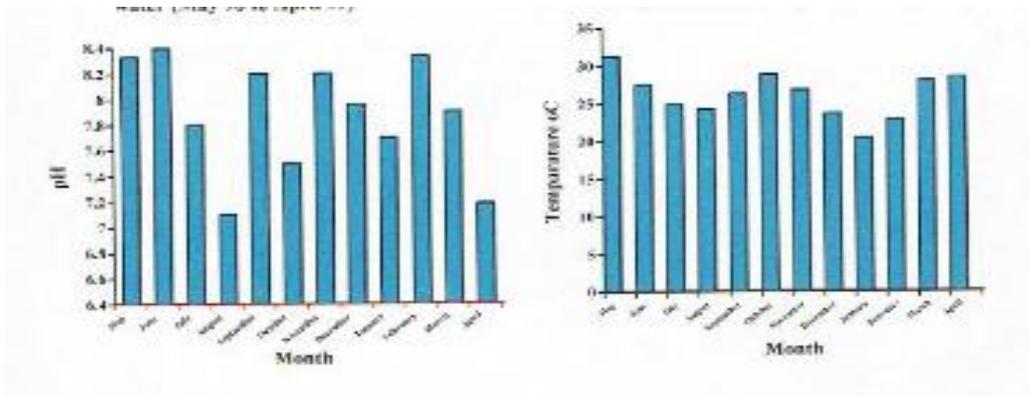
Total dissolved solid

TDS content ranged between 110 to 930 mg/L. The highest value was observed in January and lowest in February during the study.

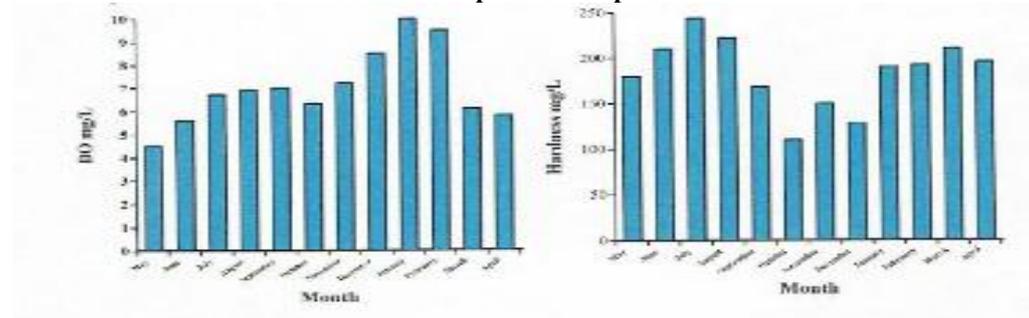
Seasonal variation in the physical characters of water was observed during the study period. (fig. no. 1 to 10) shows the results on the characteristics of the dam water & the ideal characteristics of the water for normal survival & growth of *S.Lacustris*.

pH is one of the most important factor that serve as an index for pollution. The dam water was alkaline during the study period. Most of the aquatic animals are tolerable for wide pH ranges.

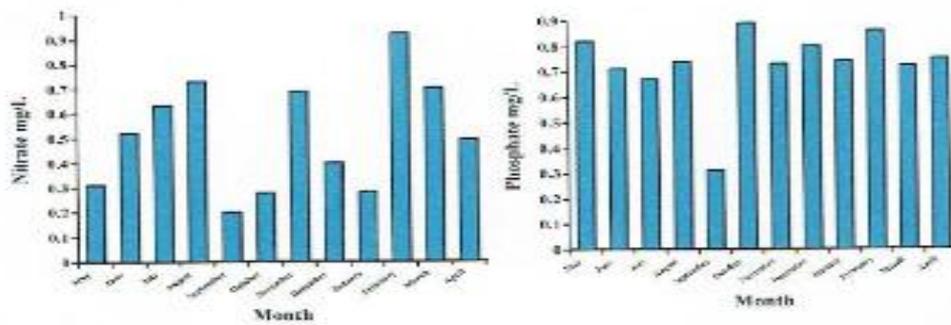
Water quality of latipada dam during 2015-16



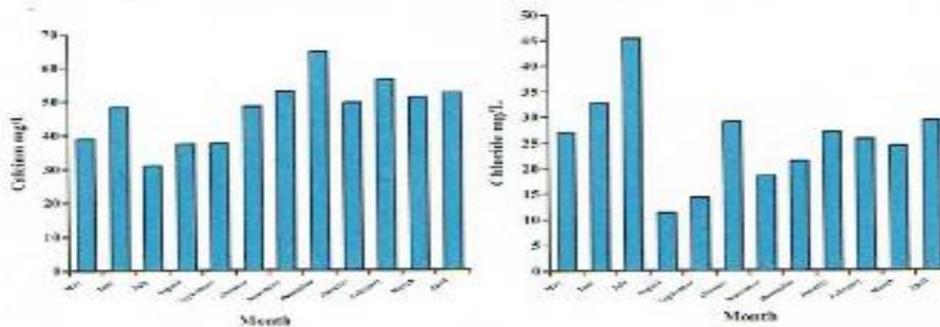
Variation of pH and Temperature



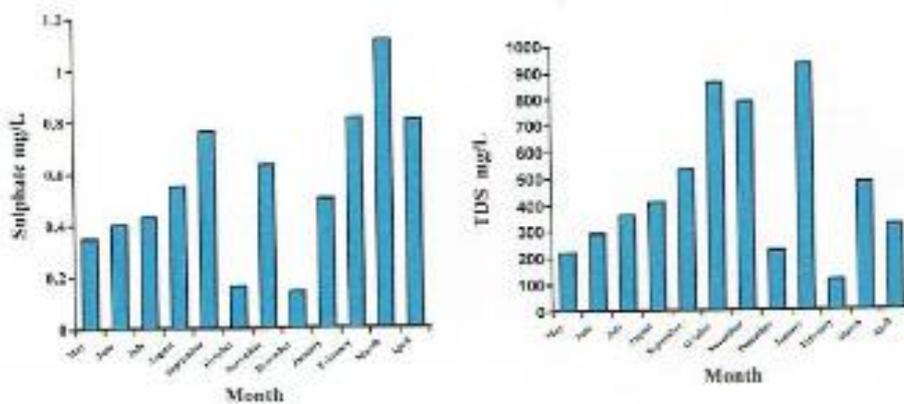
Variation of Dissolved oxygen and Hardness



Variation of Nitrate and Phosphate



Variation in Calcium and Chloride



Variation in Sulphate and total Dissolved solid

(6.7 to 8.4)^{10,11,12} The fresh water sponge *S.Lacustris* inhabiting the dam water can tolerate a wide range of pH although they fare better under alkaline condition. *S.Lacustris* were present in the pH range 5.3 to 9.0¹. Water temperature plays an important role in influencing the periodicity, occurrence & abundance of aquatic organisms^{13,14}. The *S.Lacustris*, which abides with algae and germinates at any time in the temperature range of 15°C to 25°C⁷. The water temperature range between 12°C to 37°C and was favorable to *S.Lacustris*¹. In winter thick pollution of *S.Lacustris* was observed in the Latipada dam.) The DO content is one of the most important parameters to indicate the water quality. In present studies higher DO was observed in winter, it was ranged between 4.5 to 10.0 mg/L. The prevailing higher DO & low temperature during winter makes the aquatic environment conducive for healthy growth & germination of the *S.Lacustris*. According to Frederick¹ *S.Lacustris* occurs between a wide range of dissolved oxygen though it is sensitive to the change in the temperature.

Water hardness is an important parameter for the growth of *S.Lacustris*. The salts like Calcium and Magnesium contribute to total hardness⁵. The anions responsible for hardness are utilized by *S.Lacustris* as nutrients for construction of their body tissues. Appreciable amount of hardness 110 to 244 mg/l was observed during the study period in the dam water. The Nitrate values showed a decrease in Sept. & Oct., which helps for the germination of the sponge. Low nitrate content may be due to its utilization by a dense population of phytoplankton as observed¹⁵.

In case of phosphate it is an important micronutrient to control the algal production. In the present study comparatively higher phosphate concentrations were observed during the summer season. Winter & Summer seasons were characterized by the lower phosphate concentrations¹⁶. Frederick¹ observed the presence of *S.Lacustris* in the water having 0.028 to 4.34 mg/l phosphate concentration.

Calcium is an important element of the ecosystem & plays a potential role in the metabolism & growth. In present study

the range of calcium content was observed 30.88 to 64.61 mg/L. It was lowest in July & highest in December. *S.Lacustris* is made up of calcareous skeleton, which is rich in calcium content. In July *S.Lacustris* germinates & accumulates the calcium front surrounding water bodies. Most of the common aquatic species regularly occur in water with less than 12.0 mg/L of calcium. The water of Latipada dam was rich in calcium during the study period *S.Lacustris* occurs in water bodies having wide calcium range between 0.16 to 178.00 mg/L¹.

Chlorides occur naturally in all types of water but in natural fresh water it's concentration is quite low. In present study higher amounts of chlorides was observed in July & minimum in August. Munawar¹⁷ suggested that higher concentration of chloride in water is an index of pollution of animal origin and there is a direct correlation between chloride concentration and pollution level. Sulphate is occurring naturally in all kinds of natural waters in arid and semi arid regions. It is found particularly in higher concentrations due to the accumulation of soluble salts. Sulphate is an important constituent of hardness with calcium and magnesium⁵. In present study *S. lacustris*, which is richer in calcium content is able to digest the Sulphate for germination purpose.

The total dissolved solids (TDS) denotes mainly the various kinds of minerals present in the water¹⁶. In present studies TDS was higher in January (930 mg/L) but lower in February (110 mg/L). The dissolved solids are composed mainly of carbonates, bicarbonates, chlorides, sulphates, phosphates etc. The TDS was lower in summer as compared to winter & rainy seasons. The sponges can filter & strain the fine particles from water efficiently⁷. In summer the activity of fresh water sponges was quite, slower than rainy & winter seasons. The slower activity may be due to the higher temperature as observed in the summer season.

5. Conclusion

Sponges are distributed in both marine & fresh water ecosystem. Though very few species are present in the fresh water ecosystem due to their peculiar characteristics are important in maintaining the ecological balance. These are the filter feeders & filters large quantities of water. The nutrient & food is consumed by these filter feeders during the process. Fresh water sponges prefer clean ponds, lakes, streams & rivers for their growth and survival. Sponges are observed in a particular habitat, physical chemical & biological change in the habitat affects adversely on the sponges.

Fresh water sponges are ecological important due to being filter feeders helps in environmental protection & tolerates wide range of pollutants hence some of important in toxicological research. Sponges' species grown on coral reef are beautifully coloured & used as ornamental species. They acts as food for mollusks, fish and crustaceans, some species are carrying medicinal value and hence are marketable.

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