

Freshwater sponge fauna (Porifera: Spongillidae) from Satara region of Western ghats, India

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ABSTRACT

The present study determines ecological distribution of freshwater sponges, from Krishna, Venna, Urmodi rivers and eleven reservoirs from Satara city. Out of the 31 species reported from India (Soota, 1991), 6 species were reported in this study. They are Ephydatia fluviatilis, Dosilla plumosa, Stratospongilla bombayensis, Spongilla lacustris, Eunapius carteri and Radiospongilla cerebelleta. Remarkable segregation of sampling sites based on lentic and lotic habitat was observed, where Eunapius carteri dominated lentic habitat and Ephydatia fluviatilis preferred lotic habitat. Overall, the results suggest that species distribution in freshwater sponges is based on habitat characteristics.

Keywords: Sponges, taxonomy, ecological distribution, habitat, specific richness

INTRODUCTION

Sponges are aquatic invertebrates, also known as Porifera meaning pore bearer [1], diploblastic, acoelomate Metazoan [2]. They are found in marine, estuarine as well as freshwater habitats and constitute an important component of the ecosystems. Sponges are well adapted to a wide range of environmental conditions. In the literature there are about 8,000 known species of sponges occurred worldwide with fewer than 250 being represented freshwaters [3].

In India since the pioneering work of Annandale [4, 5 and 6], hardly any work was undertaken on this group for more than half a century. The check list based on Penney and Racek's work was published by Khera and Chaturvedi [7]. However, Pattanayak [8] subsequently showed 451 species of marine sponges from India. The number of freshwater species in the world is about 100 and only 31 (under 11 genera) occur in India [1]. A new genus of freshwater sponges from New Caledonia was recorded by Cecilia Volkmer-Ribeiro [9]. In a review on the state of research on Indian sponges, Pattanayak [10] has reported three species from freshwaters of Himachal Pradesh. Soota and Saxena [11] describe some sponges of Rajasthan. Saxena [12] reports distribution and comparison of *Eunapius carteri* to other six species from western Rajasthan.

The present research work was undertaken because few records of sponges were available in Maharashtra; Kakavipure [13] reported occurrence of *Eunapius carteri* at Thane, Maharashtra. Three species were recorded at Medha (Satara) namely *C. caunteri*, *R. cinerea* and *S. sumantrana* by Patil and Talmale [14]. Whereas we had no any findings of whole specimen *S. sumantrana* in any of the sampling stations except in the form of distorted material collected from Mahardare tale reservoir. The perusal of literature reveals distribution and taxonomy of freshwater sponges (Porifera: Spongillidae) in Satara has not received widespread attention, although some notable work exists to limited extent for some regions of Medha (Satara).

MATERIALS AND METHODS

Study Area

The study was undertaken in the Satara region of Western Ghats which is one of the world's most heavily populated Biodiversity Hotspots (Figure-1). The region lies between the north latitudes of 17.5 to 18.11 and east longitude 73.33 to 74.54. The survey was consisting of three river and twelve reservoirs, total eighteen sampling stations (Table-1).

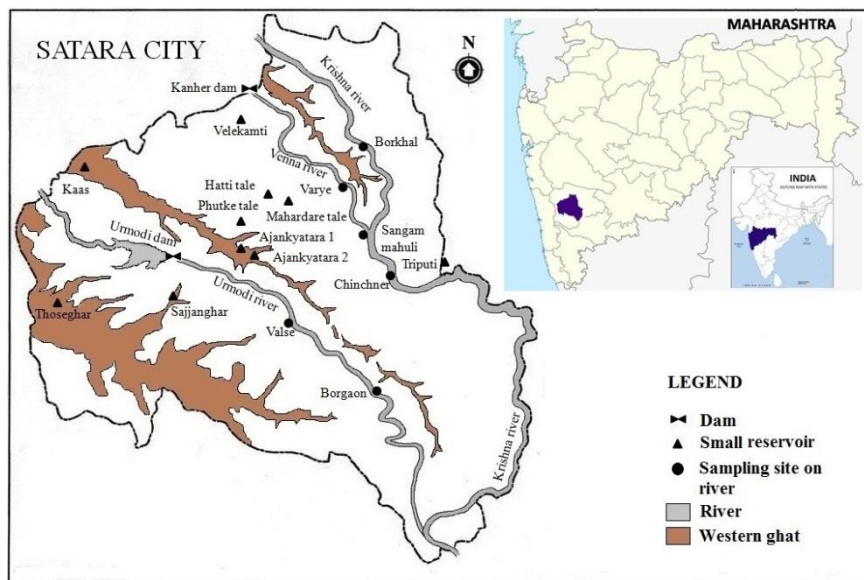


Figure 1. Map showing sampling stations in Satara region

Table- 1. Distribution of sponges among the sampling station with respect to habitat

Sampling station	Habitat	Latitude	Longitude	Elevation (m)	<i>Ephydatia fluviatilis</i>	<i>Dosilla plumosa</i>	<i>Strato Spongilla bombayensis</i>	<i>Spongilla lacustris</i>	<i>Eunapius carteri</i>	<i>Radiospongilla cerebellata</i>
Borkhal	Lotic	17.7247	74.0567	634	9	-	-	-	-	-
Varye	Lotic	17.7116	74.0262	632	7	-	-	-	-	-
Borgaon	Lotic	17.5699	74.0518	612	6	-	-	-	-	-
Phutake tale	Lentic	17.68	73.9916	732	5	-	7	-	11	-
Sajjangarh	Lentic	17.6494	73.9131	989	-	-	-	-	2	-
Mahardare	Lentic	17.683	73.9733	751	-	-	12	-	18	-
Hatti tale	Lentic	17.6817	73.9717	761	-	6	6	-	9	-
Ajinkyatara 1	Lentic	17.6726	73.9941	1002	-	-	-	-	3	2
Ajinkyatara 2	Lentic	17.6708	73.9971	994	-	-	-	-	15	-
Velekamti	Lentic	17.7339	73.8872	691	-	8	-	-	-	-
Kanher Dam	Lentic	17.7444	73.9156	714	-	-	-	5	-	-
Urmodi Dam	Lentic	17.6623	73.9063	713	-	-	-	3	-	-
Sangam Mahuli	Lotic	17.6911	74.0518	635	-	-	-	-	-	-
Valse	Lotic	17.6208	74.0072	647	-	-	-	-	-	-
Kaas	Lotic	17.7196	73.8142	1152	-	-	-	-	-	-
Thoseghar	Lentic	17.6073	73.8932	854	-	-	-	-	-	-
Triputi	Lentic	17.6949	74.1041	684	-	-	-	-	3	-
Cinchner	Lentic	17.6599	74.0913	630	-	-	-	-	-	-

Sponges are found mainly in stagnant water and mere water current possessing rich micro fauna. So, sampling stations were decided depending upon the habitat of the station and their water quality. The temperature range of Satara city is between 11.6 °C to 37.5°C and receives an average rainfall 1426 mm/year. The major rivers flowing through the Satara include Krishna, Venna and Urmodi. The collection of specimens was carried out from May 2008 to May 2010 accompanied by adequate documentation (locality, habitat, surface features etc.) intended for identification. In many species both coloration and morphology may change dramatically after collection and preservation, so adequate color photographs were taken and specimens were sundried. The spicule preparation was done by acid digestion technique followed by imaging of megascleres and gemoscleres under light microscopy. The identification and classification of sponges was done using Nelson Annandale's Fauna of British India and recent nomenclature was adopted from Penny and Racek's [15] comprehensive revision of a worldwide collection of freshwater sponges.

Data Analysis

Bray Curtis cluster analysis were done to estimate species distribution pattern for hierarchical similarity of closest sites using Biodiversity pro [16].

RESULTS

Six species of Demospongia belonging to six genera namely *Ephydatia fluviatilis* (Image 1,1.1,1.2), *Dosilla plumosa* (Image 2,2.1,2.2), *Stratospongilla bombayensis* (Image 3,3.1,3.2), *Spongilla lacustris*(Image 4,4.1,4.2), *Eunapius carteri* (Image 5,5.1,5.2) and *Radiospongilla cerebelleta* (Image 6,6.1,6.2), were recorded in present study. The identification and classification was done on the basis of its morphological trait and gemmules (Image 1 to 6.2 and Table 2).

In Western Ghats of Satara, Demospongia class is most dominant and abundant. The relationship between the number of species expected and observed for the samples collected gives information about the total distribution of sampled community (Figure 2).

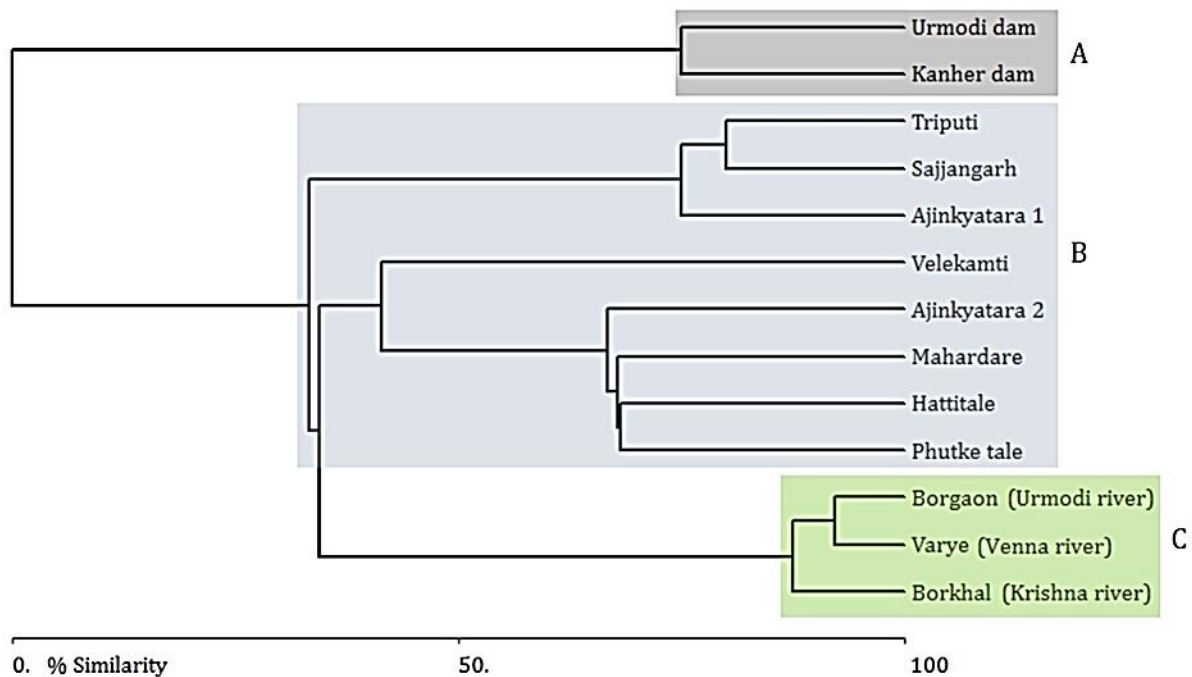


Figure 2. Distribution of sponges in three groups (A, B and C) among the sampling stations by using Bray-Curtis cluster analysis

Three main groups of sampling stations can be recognized at average similarity level of 12.5%. The geographic distribution of sponges clusters are denoted as A, B and C in Figure 2. It can be seen that group 'A' defines sampling stations with lentic habitat for large reservoirs (10-25 ha), representing single species *Spongilla lacustris*. Similarly, group 'B' also denotes lentic habitat for small reservoirs (0.5-10 ha), representing *Dosilla plumosa*, *Stratospongilla bombayensis*, *Spongilla lacustris*, *Eunapius carteri*, *Ephydatia fulviatilis* and *Radiospongilla cerebelleta*. The distribution of these species and their assemblage corresponds very closely relation between sampling stations showing similar habitat of reservoir ecosystem. The group 'C' represents unaltered natural rivers with lotic habitat having slow water flow (10-15 m/min) dominated by *Ephydatia fluviatilis*.

DISCUSSION

The present study reveals distribution of sponges in various habitats from Western Ghats of Satara. The *E. carteri* is most abundant and dominant species in lentic habitat while *E. fluviatilis* showed its presence in lotic water bodies like Krishna, Venna and Urmodi rivers. It seems to prefer lotic habitat while rarely found in lentic habitat. Whereas, *R. cerebellata*, *D. plumosa* and *S. lacustris* were seen seasonally as water bodies are intermittent. Some sampling stations like Sangam-mahuli, Valse, Kaas, Thoseghar and Chinchner were monitored seasonally none of the species showed their presence at these sampling stations. The absence of sponges in these regions could be plausible due to environmental stress or anthropogenic activity. The evidence of *S. sumantrana* was noted at Mahardare tale after Patil and Talmale's record at Medha in 2005.

Evidence for Occurrence of *Stratospongilla sumantrana* spicule in Mahardare tale.

The scraped sample collected from Mahardare tale reservoir showed presence of *Stratospongilla sumantrana* (Image 7 I & II). Since, we do not found complete specimen, species confirmation based on structure of megascleres is doubtful.

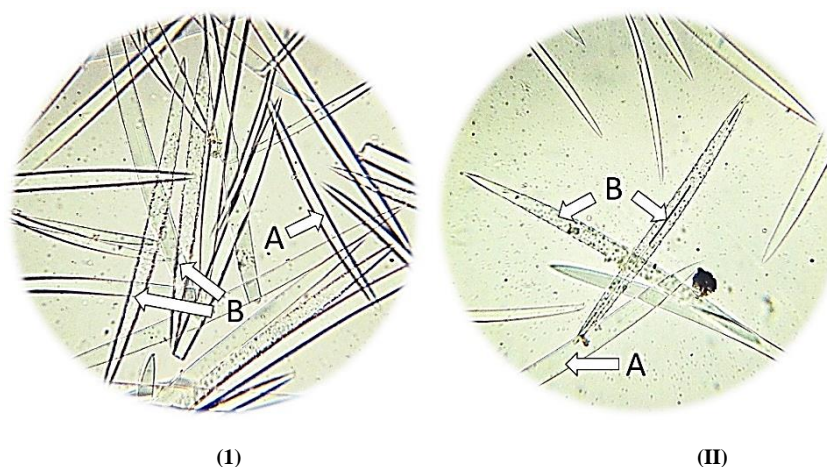


Image 7. Microphotograph of Megascleres found in Mahardare tale reservoir (I & II) showing occurrence of *Eunapius carteri* spicules(A) with *Stratospongilla sumantrana* spicules(B).

The spicules of *Eunapius carteri* (Image 7 I & II-A) resembling to *Stratospongilla sumantrana* (Image 7 I & II-B) were differentiated with stout, completely smooth and slightly curved amphioxea as compared to straight, short spines and sharply pointed amphioxea. Thus occurrence of megascleres of these species differentiated accordingly shows the evidence for presence of *Stratospongilla sumantrana* in Western Ghats.

The present study of sponges represents new records in Western Ghats. These records should not be considered range extensions or changes in habitats where they were found, but rather, simply an initial assessment for ecological distributions of sponges in the Satara city. Sponges are not currently listed in the IUCN Red List, although official threatened species lists of few countries report on freshwater sponges. Considering the relative ease with which these organism can be found, the paucity of studies on these organisms does not suggest that they have a limited distribution, but rather that they have not been studied yet.

Table 2. Structural variation in sponges distinguishing species

	Megascleres (mm)		Microscleres (mm)		Gemmoscleres (mm)		Gemmules (mm)
	Length	Width	Length	Width	Length	Width	Diameter
<i>Ephydatia fluviatilis</i>	2.77 ± 0.34	0.05 ± 0.35	-	-	0.20 ± 0.01	0.03 ± 0.01	2.86 ± 0.09
<i>Eunapius carteri</i>	2.68 ± 0.27	0.08 ± 0.01	-	-	1.34 ± 0.11	0.04 ± 0.006	3.02 ± 0.42
<i>Stratospongilla bombayensis</i>	2.22 ± 0.25	0.06 ± 0.007	0.41 ± 0.03	0.08 ± 0.13	0.24-0.30	0.08-0.10	4.08 ± 0.12
<i>Dosilla plumosa</i>	3.62 ± 0.77	0.09 ± 0.02	(r) 0.11 ± 0.03	0.01 ± 0.004	0.48 ± 0.05	0.04 ± 0.02	4.53 ± 0.05
<i>Radiospongilla cerebellata</i>	2.81 ± 0.33	0.07 ± 0.01	-	-	0.53 ± 0.03	0.03 ± 0.003	3.39 ± 0.02
<i>Spongilla lacustris</i>	1.85 ± 0.12	0.04 ± 0.01	-	-	0.46 ± 0.04	0.04 ± 0.007	5.98 ± 0.05



Image 1. *Ephydata fluviatilis*

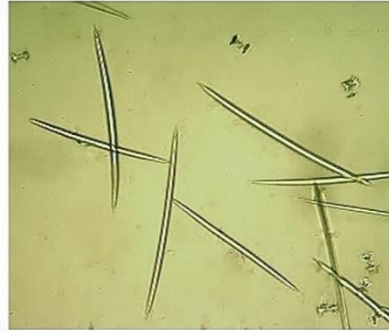


Image 1.1 Megascleres



Image 1.2 Gemmoscleres



Image 2. *Dosilla plumose*



Image 2.1 Megascleres

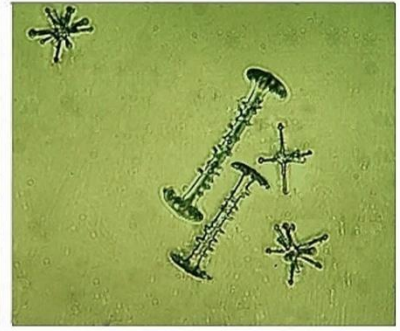


Image 2.2 Microscleres and gemmoscleres



Image 3. *Stratospongilla bombayensis*



Image 3.1 Megascleres

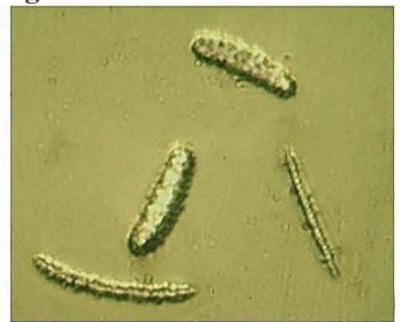


Image 3.2 Microscleres and gemmoscleres



Image 4. *Spongilla lacustris*



Image 4.1 Megascleres



Image 4.2 Microscleres and gemmoscleres

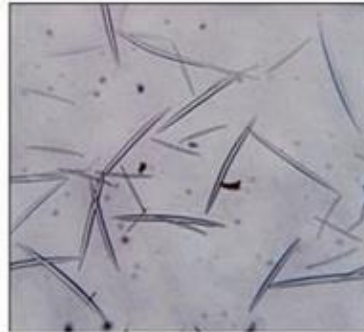
Image 5. *Eunapius carteri*

Image 5.1 Megascleres



Image 5.2 Gemmoscleres

Image 6. *Radiospongilla cerebelleta*

Image 6.1 Megascleres



Image 6.2 Gemmoscleres

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