The Bioscan
AN INTERNATIONAL QUARTERLY JOURNAL OF LIFE SCIENCES
20(1): 610-613, 2025 www.thebioscan.com

A report on occurrence of freshwater sponge *Eunapius carteri* (Bowerbank,1863) in Pravara River, Maharashtra, India

Geetanjali R. Devdhe[1], Unmesh S. Adkar[2] and Ananta D. Harkal[1]

[1] Department of Zoology and Research Center, New Arts, Commerce and Science College (Autonomous), Ahmednagar, Maharashtra, India – 414001, Affiliated to Savitribai Phule Pune University

[2] Department of Chemistry, B.P.H.E. Society's Ahmednagar College, Ahmednagar, Maharashtra, India-414001, Affiliated to Savitribai Phule Pune University

Corresponding Author: Geetanjali R. Devdhe

Email: devdhegeetanjali@gmail.com

DOI: https://doi.org/10.63001/tbs.2025.v20.i01.pp610-613

KEYWORDS
Freshwater sponges, Eunapius carteri, Pravara river, SEM
Received on:
18-01-2025
Accepted on:
15-02-2025
Published on:
20-03-2025

ABSTRACT

The scientific investigation of Freshwater Sponges showed limited study due to their scarce recorded presence when compared to marine species. A study identifies *Eunapius carteri* in its new discovery from the Pravara River located in Ahilyanagar (Formerly Ahmednagar) district of Maharashtra India. Researchers identified Freshwater Sponges using SEM to analyze both the colony structure and spicule and gemmule appearance. The examination site consisted of Sponges that adhered to underwater plants. This work presents internal morphological views of gemmules through SEM, as it is a key diagnostic feature.

INTRODUCTION

Phylum Porifera comprises the simplest Metazoa which are pore-bearing, sessile, filter-feeding aquatic invertebrates that are divided into three classes based on the types of spicules they possess; Class Calcaria, Class Demospongiae, and Class Hexactinellida. Homoscleromorpha was elevated from a subclass of Demospongiae to a full class. It now includes one order (Homosclerophorida) and two families (Oscarellidae, Plakinidae), representing about 1% of sponge species (Hooper et al. 2021).

The records of diversity and distribution of freshwater sponges in India are patchy and sporadic. According to Lakwal et al. (2018), the Demospongiae contains the majority of extant poriferans and represents 85-90% of sponge fauna globally. India is home to 31 species of freshwater sponges belonging to 11 genera under the family Spongillidae (Soota, 1991). Documenting faunal resources and investigating the distribution patterns of various species will lay the foundation for applied research, informing practical conservation and management strategies. Recently Jakhalekar and Ghate (2016) did an extensive survey of freshwater resources of Western Maharashtra, with detailed taxonomic details of 10 reported species. The identification of sponges represents a difficult task because of their colony characteristics and diverse shape and color patterns. Spicules along with gemmules need precise microscopic examination for sponge identification. The research confirms new findings regarding *Eunapius carteri* distribution which has not been documented before in the Pravara river system along with its specific taxonomic information.

Materials and Methods

Sponge samples were collected from the river Pravara (19° 37' 17.3856" N, 75° 1' 7.5000" E) on 17th November 2024 where they were predominantly observed growing on unidentified submerged plant twigs which were present in sufficient numbers to provide a suitable substrate for their development (Fig 1 B and C). The collection site was notably undisturbed by anthropogenic activities. The sponges were found in the peripheral, region of the river where the water was clear. A total of four live colonies of different sizes ranging from 7cm to 15 cm were found and documented. The colonies were photographed in situ with a digital camera to record their natural state and habitat. The sponges were carefully cut along with the plant twigs they were attached to, ensuring no mechanical damage to the specimens during the process.

A total of 10 gemmules and 25 spicules of each type were examined for measurement.

The spicule preparation was done by dissolving the pieces of live sponge in concentrated nitric acid and further washed with distilled water. The spicules isolated using the above method were washed with absolute ethanol and dried for SEM imaging. Gemmules were dried and cut through the foramen and foraminal tube of the gemmule using a sharp blade. Both intact and sectioned gemmules were treated with absolute ethanol and subjected to hexamethyldisilazane treatment, and then dried as per the protocol given by Nation (1983). The processed spicules and gemmules were mounted on SEM stubs using double-sided

carbon tape. The samples were sputter-coated with gold and then scanned and photographed using a FESEM (FEI Nova NanoSEM NPEP 303) at an operating voltage of 15 kV.

Sponges were identified based on the morphology of their skeletal structures, including megascleres, microscleres, gemmoscleres, and the architecture of the gemmules, as observed under a scanning electron microscope.

To confirm the identity of the sponges, identification keys from four key publications—Annandale (1911), Soota (1991) and Penney and Racek (1968) were employed. Additionally, SEM observations of sponges documented by Jakhalekar and Ghate (2016) were also referenced.

Results and Discussion:

This work presents internal morphological views of gemmules through SEM, as it is a key diagnostic feature. The fresh animals were large, bulbous with varying dimensions and a pungent smell. The surface was irregular with lobous projections. More than one large, rounded oscula in line with the surface. The colour appeared light green in the fresh animals (Fig1 E). Skeleton reticulate with vertical spicular tracts and moderate spongin.

Two types of spicules. Megascleres smooth, stout oxea, slightly curved 318.3 ± 18.83 µm long. Microscleres absent. Gemmoscleres resemble megascleres, slightly curved, smooth oxea but smaller in size, 148.37 ± 27.16 µm long(Fig 3).

Gemmules are numerous, large (719.0 ± 6.46 µm in diameter), spherical, dispersed in the skeleton but aggregated towards the base, i.e., the point at which sponge is attached to the substratum (Fig 1 F). Well-developed, multicellular pneumatic layer with large polygonal air spaces in which the gemmoscleres are embedded tangentially or horizontally (Fig 2 E).

According to Gee (1930) *Eunapius carteri* is widely distributed across various regions of the world. According to Jakhalekar and Ghate (2016), it is distributed across Mozambique, the Sahara, Uganda, Hungary, southern Russia, Iran, Turkey, Kurdistan, Afghanistan, Uzbekistan, the Philippines, Indonesia, Thailand, Malaysia, Southeast China, Myanmar, Sri Lanka, India, Mauritius, and Panama.Carter (1849) initially discovered this sponge on the islands of Bombay, India, and misidentified it as *Spongilla friabilis* Lamarck. Later, Bowerbank (1863) examined Carter's specimen, recognized its distinctiveness, and formally described it as *Spongilla carteri*. The genus *Eunapius* Gray, 1867, initially rejected by Carter (1881), was reinstated as a subgenus of *Spongilla* Lamarck by Annandale (1911), with *Spongilla carteri* Bowerbank designated as the type species by subsequent designation. It was later redefined and elevated to full generic status by Penney & Racek (1968).

The academic value of sponges extends beyond traditional studies because they generate chemical compounds that may provide pharmaceutical benefits that incorporate anti-tumor effects and anti-infective properties together with anti-inflammation characteristics. Jakhalekar and Ghate (2013) advocated the importance of exploring and studying native sponge fauna. Jakhalekar and Ghate (2016) expressed concern about previously reported species from different parts of the country and also highlighted the importance of unambiguous descriptions of freshwater sponge species along with their distribution records. Enhanced research on Indian freshwater sponges becomes necessary through the combination of SEM imaging and DNA barcoding techniques because their natural habitats dwindling rapidly. SEM provides essential taxonomic features that can complement DNA barcoding by serving two main purposes: precise species identification along with cryptic species detection and phylogenetic analysis. Furthermore, studying freshwater sponges is wanting as their microbial symbionts are being researched for novel potential applications (Gaikwad et al. 2016; Laport et al. 2019).

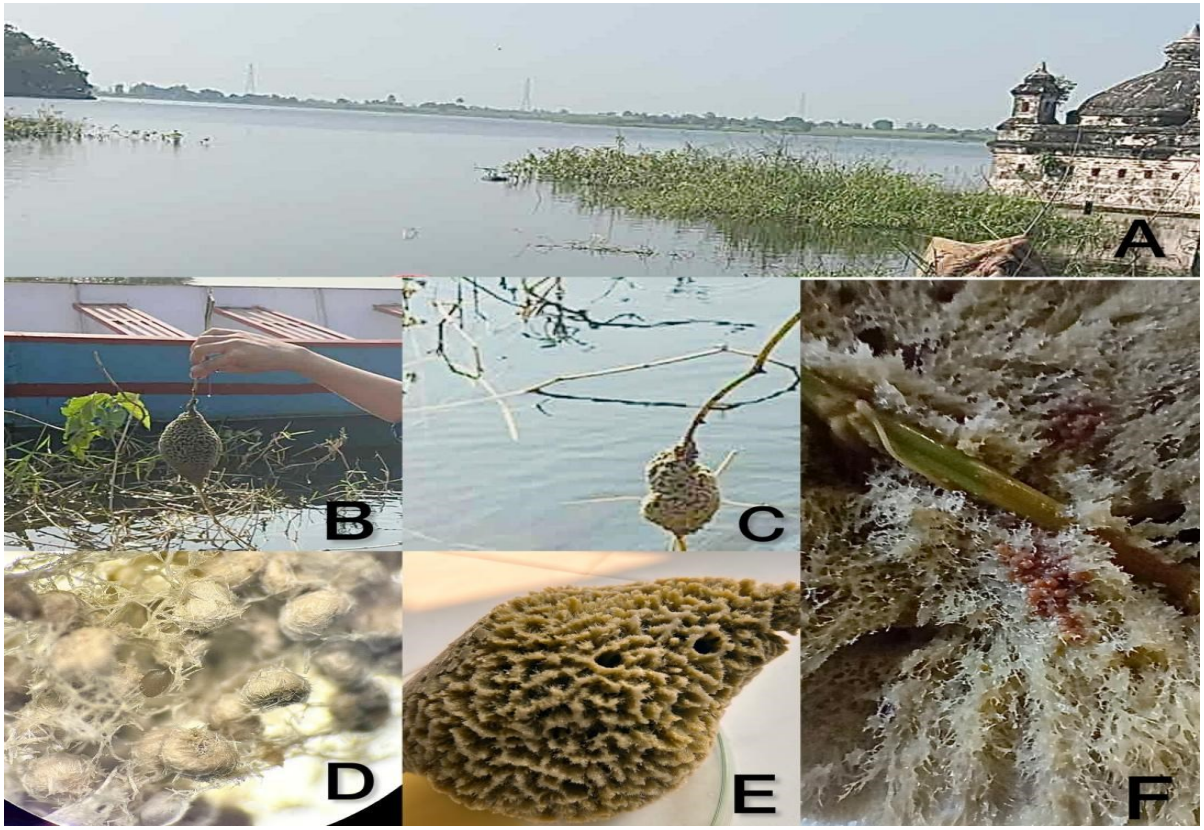

Fig. 1: A-Collection site **B, C, E-** Live sponge attached to submerged plant twigs **D**-Gemmules embedded in the skeleton under dissecting Microscope at 4X magnification **F**-Section of the colony showing gemmules attached to the sponge body

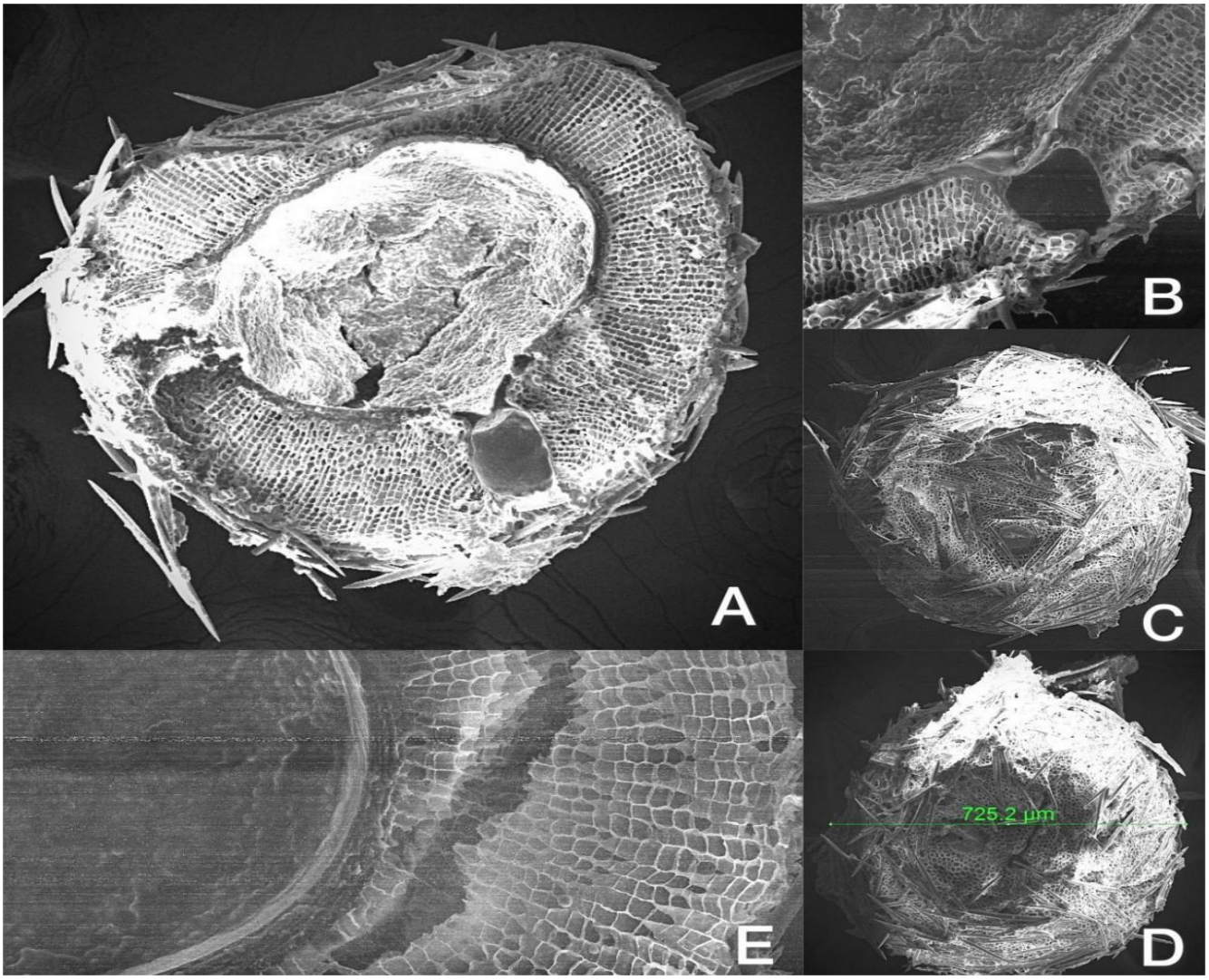

Fig. 2: Scanning Electron Micrographs of *Eunapius carteri* Gemmules. A-Cross-section of a gemmule showing thesocytes in the center; B-Close-up of cut gemmule showing foraminal tube; C-D Intact Gemmule; E-thick, cellular pneumatic layer.

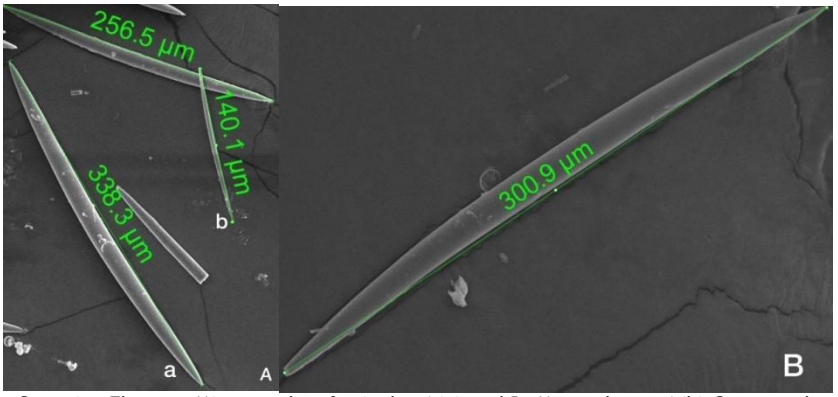

Fig. 3: Scanning Electron Micrographs of spicules A(a) and B -Megascleres; A(b) Gemmosclere

REFERENCES

- Annandale, N. 1911. Freshwater Sponges, Hydroids & Polyzoa: *The Fauna of British India Including Ceylon and Burma*. Taylor & Francis.
- Bowerbank, J.S. 1863. A Monograph of the Spongillidae. *Proceedings of the Zoological Society of London*. 440–472, pl. xxxviii.
- Carter, H.J. 1849. A descriptive account of the freshwater sponges (genus Spongilla) in the Islands of Bombay, with observations on their structure and development. *The Annals and Magazine of Natural History*. 2(4): 81–100, pl. iii–v.
- Carter, H.J. 1881. History and classification of the known species of Spongilla. *The Annals and Magazine of Natural History*. 5(7): 77–107, pls. v–vi.
- Gaikwad, S., Shouche, Y. S., & Gade, M. N. (2016). Microbial community structure of two freshwater sponges using Illumina MiSeq sequencing revealed high microbial diversity. *AMB Express*, 6, 40. https://doi.org/10.1186/s13568-016-0211-2

- Gee, N. G. (1930). Notes on the freshwater sponges from the Dutch East Indies. II. Descriptions. *Treubia*, 12, 67–114.
- Hooper, J. N. A., Wörheide, G., Hajdu, E., Erpenbeck, D., de Voogd, N. J., & Klautau, M. (2021). Phylum Porifera: Zootaxa 20 years. *Zootaxa*, 4979(1), 38–56. https://doi.org/10.11646/zootaxa.4979.1.8
- Jakhalekar, S.S. and Ghate, H.V. 2013. A note on five freshwater sponges (Porifera: Spongillina: Spongillidae) from Pune, Maharashtra, India. *Journal of Threatened Taxa*. 5(9): 4392–4403.
- Jakhalekar, S.S. and Ghate, H.V. 2016. Taxonomy of freshwater sponges of Maharashtra, India, with illustrated descriptions and notes on ecology and habitats (Porifera: Spongillida: Spongillidae). *Zootaxa*. 4173(6): 501–529.
- Lakwal, V.R., Kharate, D.S., and Mokashe, S.S. 2018. Diversity and distribution of intertidal marine sponges from Ratnagiri coast of Arabian Sea, (M.S.) India. *Flora and Fauna*. 24(1): 207–216.
- Laport, M. S., Pinheiro, U., & Rachid, C. T. C. d. C. (2019). Freshwater sponge Tubella variabilis presents richer microbiota than marine sponge species. *Frontiers in Microbiology*, 10, 2799. https://doi.org/10.3389/fmicb.2019.02799
- Nation, J.L. 1983. A new method using hexamethyldisilazane for preparation of soft insect tissues for Scanning Electron Microscopy. *Stain Technology*. 58(6): 347–351.
- Penney, J.T. and Racek, A.A. 1968. Comprehensive revision of a worldwide collection of freshwater sponges (Porifera, Spongillidae). *Bulletin of the United States National Museum*.
- Soota, T.D. 1991. *Freshwater Sponges of India*. Occasional Paper No. 138. Records of the Zoological Survey of India. Zoological Survey of India, Calcutta. 116 pp.