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Provisional photographic record of the pink puffball sponge, *Oceanapia sagittaria* (Porifera: Phloeodictyidae), in the dugong conservation reserve, Palk Bay, India

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Short Communication

Abstract

Marine sponges (Phylum Porifera) are vital components of benthic ecosystems, contributing significantly to water filtration, nutrient cycling, and habitat provision (as filter feeders). Documenting marine biodiversity in protected areas is crucial for effective conservation management and for gauging ecosystem health. This short communication reports provisional photographic observation of the pink puffball sponge *Oceanapia sagittaria* (family Phloeodictyidae) recorded within the Dugong Conservation Reserve in Palk Bay, India. The sponge was encountered during a visual survey about 2 km near Manalmelkudi (Pudukkottai District, Tamil Nadu), inside India's newly established Dugong Conservation Reserve. *In situ* morphological observations and underwater photographs revealed a small, prickly pink spherical sponge (~1–2 cm diameter) with a short conical "capitate" stem, a diagnostic feature of *O. sagittaria,* protruding from the seabed. The observed morphology closely matches descriptions of *O. sagittaria* from other Indo-Pacific localities. Evidenced with the photographic record, this finding represents a significant range extension for the species, enriching the biodiversity inventory of the Palk Bay Dugong Conservation Reserve. The presence of this sponge at a seagrass restoration site may indicate improving habitat quality, underscoring the potential ecological success of ongoing conservation and restoration efforts in the region.

Keywords: *Oceanapia sagittaria, Marine Sponge, Dugong Conservation Reserve, Palk Bay, Porifer, seagrass restoration, biodiversity*

Introduction

Marine sponges (Phylum Porifera) are among the oldest metazoans and play critical ecological roles in benthic environments of world oceans, throughout the habitats of different latitudinal extent (Bell, 2008). These sessile invertebrates act as filter feeders, enhancing water quality and nutrient cycling, and they provide food resources for other associated organisms (Wulff, 2001; Bell, 2008). Sponge diversity and abundance are often considered indicators of marine ecosystem health and stability. The association between sponges and seagrass meadows plays a vital role in nutrient cycling and benthic productivity (Cardini *et al*., 2024), highlighting the importance of studies on sponges in seagrass meadows. Despite their importance, the sponge fauna of Indian coastal waters–especially in newly established or understudied protected areas remains incompletely documented, due to lack of taxonomic expertise, requirement of extensive and elaborate field studies, which in turn necessitating more concentrated observations and documentations (Sivaleela and Ragunanthan, 2024).

Oceanapia sagittaria, commonly known as the "pink puffball sponge," is a distinctive Indo-Pacific species characterised by its unusual morphology. *O. sagittaria* typically appears as a small, delicate prickly pink ball (approximately 1-2 cm in diameter) attached to a short conical stalk. Prior records of *O. sagittaria* are largely from Southeast Asia, including coastal Singapore and the Gulf of Thailand. To date, there have been few published reports of this species from the Indian mainland coastline, highlighting a notable gap in its known distribution, this study records the first photographic record of the species in the Palk Bay region.

The Palk Bay region, situated between Tamil Nadu (India) and

northwestern Sri Lanka, is relatively shallow, renowned for rich marine biodiversity and extensive seagrass meadows. These seagrass beds serve as critical feeding grounds for the endangered dugong (*Dugong dugon*), commonly called the "sea cow," which feeds exclusively on seagrasses (Saravanan, 2020). Recognising the ecological significance of Palk Bay and the vulnerability of its flagship species, India declared its first Dugong Conservation Reserve (DCR) in this area in early 2022. The reserve spans roughly 500 km² and is India's first protected area dedicated to dugong conservation. It encompasses a vast shallow coastal zone where seagrass meadows cover over 80% of the seafloor, reflecting the habitat's importance for dugongs. Active seagrass restoration projects are underway here to rehabilitate degraded meadows and enhance ecosystem resilience. In this context, documenting new or rare species within the DCR is important for baseline biodiversity assessments and can serve as an indicator of habitat health.

This short communication documents the observation and provisional identification of *O. sagittaria* from within the Palk Bay Dugong Conservation Reserve. The finding adds a new record to the marine biodiversity of the reserve and provides insight into the species' extended range. It also offers an encouraging sign that the ongoing habitat restoration and conservation efforts may be supporting a broader array of benthic life.

Material and methods

Study area

The observation was made about 2 km from the coast near Manalmelkudi (Fig. 1) in Pudukkottai District, Tamil Nadu, India. The site lies within the Palk Bay Dugong Conservation Reserve (DCR)–a marine protected area notified in 2022 to safeguard dugongs and their seagrass habitat. The DCR covers approximately 448–500 km² of shallow coastal waters in Palk Bay. Notably, over 82% of the reserve's area is carpeted by seagrass meadows, which sustain the region's dugong population. The specific study site was adjacent to an active seagrass restoration plot, part of ongoing conservation initiatives by local authorities and NGOs to restore degraded seagrass beds. This provided an opportunity to observe any recolonisation of invertebrate fauna in the recovering habitat.

Field observation and Identification

The *O. sagittaria* specimen was encountered opportunistically during a routine benthic survey in July 2025 (daytime). Divers conducted a visual inspection of the seafloor at approximately 3 m depth, documenting marine life with an underwater camera (Olympus TG7). The species was observed during the survey following the observations of its characteristic traits. High-resolution photographs of the sponge were taken *in situ* for identification purposes. No physical collection was done, in compliance with the Reserve's non-invasive research guidelines, as permission for collection had not been acquired. The observation was opportunistic, and the specimen collection was avoided to prevent habitat disturbance.

No specimens were collected or harmed. The identification was later verified using reference images from Southeast Asian records (Lim *et al*., 2008) and WoRMS (2024).

Results

Identification was based on external morphological features captured in the photographs, compared against published descriptions and images of *O. sagittaria* in the literature and reliable marine life databases. Key diagnostic characters noted included the sponge's tiny globular pink body (~1–2 cm across) studded with fine protrusions (giving a prickly appearance) and a short conical basal stalk (capitate stem) connecting the orb to the substrate. This stalk corresponds to the oscular chimney through which the sponge expels filtered water. This visible pink "puffball" is merely the emergent apex of a larger bulbous body buried beneath the substrate. The exposed round portion, termed the *capitate structure*, functions as the sponge's osculum through which water is expelled. The exposed portion measured approximately 1.5 cm in diameter and had a vibrant pink to maroon colouration, matching descriptions of this species in other locales.

Based on the visible morphological features captured in the photographs, particularly the capitate pink spherical body and short stalk, the specimen is provisionally identified as *O. sagittaria*. This identification is based solely on external

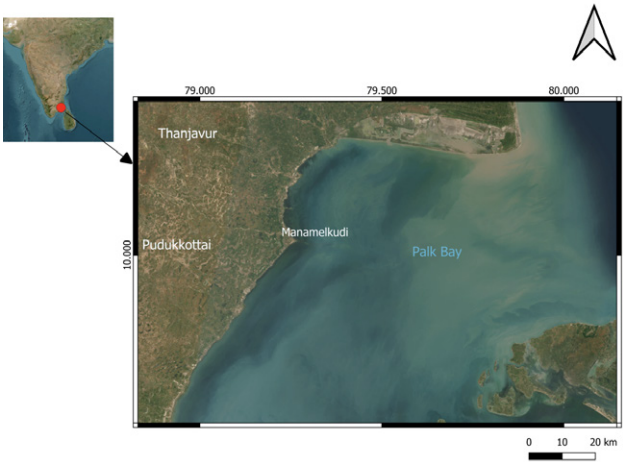

Fig. 1. Map showing the sighted location–Manamelkudi coast

traits and comparison with literature and online databases (Lim *et al.*, 2008). However, no physical specimen was collected or examined under microscopy; therefore, this identification should be regarded as tentative pending spicule analysis and taxonomic confirmation.

Few individuals were observed in the immediate area, and it was partly nestled between the shoots of seagrasses. The sponge did not form any large encrustations or mats; it maintained the characteristic small "puffball" form. Surrounding benthic fauna was sparse, with a few macroalgae and seagrass fronds; no other sponges of this or other species were noted nearby. Fig. 2, 3 and 4 provide a photographic view of the specimen *in situ*.

Fig. 2. *In situ* photograph of *O. sagittaria* sponge's spherical pink puffball (~1.5 cm across) and its short stalk (capitate osculum)

Fig. 3. Close-up view of *O. sagittaria* showing its surface texture and colouration

Fig. 4. Multiple *O. sagittaria* individuals observed *in situ* at the study site, illustrating their small size and solitary occurrence on the seabed

Discussion

This study documented and tentatively identified *O. sagittaria*, in the dugong conservation reserve in northern Palk Bay with *in situ* photography. The first provisional photographic record of the species in the study site, not a confirmed taxonomic report. Previously, confirmed occurrences of this species were largely confined to Southeast Asia (Asa *et al.*, 1998; Xu *et al.*, 2022). Although prior records in India are minimal (Sivaleela and Raghunathan, 2024), our finding fills the gap in the biogeography of *O. sagittaria*. Due to limitations in the collection of specimens and the observation being opportunistic, this study recommends that future surveys include systematic specimen collection following appropriate ethical protocols. Such efforts can strengthen taxonomic confirmation and improve the accuracy of species identification beyond photographic records.

Finding *O. sagittaria* within the Dugong Conservation Reserve carries ecological implications beyond a range extension. Marine sponges are integral to benthic ecosystem function — they filter water, recycle nutrients, and provide microhabitats. The establishment of *O. sagittaria* adjacent to the seagrass restoration area suggests that habitat restoration is important for the return or recruitment of sensitive, cryptobenthic species. The ongoing seagrass restoration in Palk Bay aims to rehabilitate ecosystem structure and services, and the presence of this sponge may serve as a bioindicator of the improved water quality and ambience. As the seagrass meadows disperse over a wide spatial extent, they likely create more favourable microenvironments (stabilised sediments, enhanced food availability) for filter feeders like sponges. The sponge's occurrence thus underscores that the restoration site is becoming ecologically functional enough to support a broader spectrum of benthic life, including species previously unrecorded in the region.

This study highlights the importance of India's first dugong conservation reserve, which is not only to protect dugongs but also to conserve the associated marine communities of the seagrass ecosystem. Each new species record contributes to a more complete understanding of the reserve's fauna, which is essential for monitoring and management. Sponges can be useful indicators of environmental change (*e.g.*, shifts in water quality or substrate conditions). Therefore, the photographic record of *O. sagittaria* now establishes a reference point for this species in Palk Bay. Future work in the Dugong Conservation Reserve should include targeted benthic surveys to determine whether *O. sagittaria* is an isolated occurrence or part of a possibly overlooked sponge community in Palk Bay. Additionally, long-term monitoring of *O. sagittaria* populations could be implemented as part of the restoration assessment: an increasing trend might indicate sustained recovery of benthic conditions, whereas any disappearance could flag emerging issues. To conclude the distribution of the species in a wider spectrum, the present work recommends further studies based on a more compelling manner, including specimen collection and molecular analysis, which can effectively bridge the gap.

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Author contributions

Conceptualisation: BV, Methodology: UU, Investigation (Field Survey): BV, UU Data Analysis: AP. Writing-Original Draft: BV, Writing-Review & Editing: UU, AP, Supervision: BV, MG

Data availability

The data (observational notes and photographs) supporting this study are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflicts of interest, financial or otherwise, that could have influenced the outcomes of this work.

Ethical statement

No ethical approval was required for this study, as it involved only non-invasive observation and photography of a marine invertebrate in its natural habitat. The work did not entail any collection of specimens or disturbance of protected species/habitats. All activities were conducted in accordance with the regulations of the Dugong Conservation Reserve and wildlife protection laws, ensuring minimal impact on the ecosystem.

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References

Asa, S., T. Yeemin and N. Ruengsawang. 1998. Ecology of a marine sponge, *Oceanapia sagittaria* in coral communities in the gulf of Thailand, AGRIS – International System for Agricultural Science and Technology, p. 430-431.

Bell, J. J. 2008. The functional roles of marine sponges. *Estuarine, coastal and shelf science*, 79 (3): 341-353.

Cardini, U., L. M. Montilla, G. Zapata-Hernandez, J. Berlinghof, E. Guarcini, M. Furia, F. Margiotta, T. B. Meador, C. Wild, S. Fraschetti and I. Olive. 2024. Reciprocal nutritional benefits in a sponge-seagrass association. *bioRxiv*, 12 pp.

Lim, S. C., N. J. de Voogd and K. S. Tan. 2008. A Guide to Sponges of Singapore. Science Centre Singapore. 173 pp.

Saravanan, R. 2020. Marine biodiversity and its conservation methods in Gulf of Mannar and Palk Bay, CMFRI, p. 100-108.

Sivaleela, G. and C. Raghunathan. 2024. Fauna of India Checklist Porifera Version 1.0. Zoological Survey of India. DOI: https://doi.org/10.26515/Fauna/1/2023/Porifera

WoRMS Editorial Board, 2024. *Oceanapia sagittaria Lévi & Lévi, 1983. In: World Register of Marine Species.*

Wulff, J. L., 2001. Assessing and monitoring coral reef sponges: why and how? *Bulletin of Marine Science,* 69: 831-846.

Xu, M. J., L. J. Zhong, J. K. Chen, Q. Bu and L. F. Liang. 2022. Secondary metabolites from marine sponges of the genus *Oceanapia*: chemistry and biological activities. *Marine Drugs*, 20 (2): 144.