

Species

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A New Genus for Indian Waters: First Report of *Miralda* (Pyramidellidae) with *Miralda* *scopulorum* (Watson, 1886)

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ABSTRACT

We report the first confirmed record of *Miralda scopulorum* (Gastropoda: Pyramidellidae) from Indian waters, based on two specimens collected from Kalpeni Island, Lakshadweep Archipelago (10°8'24.00" N; 73°37'55.20" E). Morpheme analysis revealed close agreement with type descriptions with the help of stereo zoom microscope. These minuscule ectoparasitic gastropods were retrieved from sandy coral rubble at 4–5 m depth. This study emphasizes the importance of micromolluscan surveys in identifying hidden marine biodiversity and extends the species' known distribution westward into the central Indian Ocean.

Keywords: First record; India; *Miralda scopulorum*; Micro-molluscs; Marine biodiversity; Pyramidellidae.

1. INTRODUCTION

The family Pyramidellidae Gray, 1840 represents one of the most speciose and taxonomically complex groups among marine heterobranch gastropods, with over 6,000 described species worldwide (Schander et al., 1999; Peñas et al., 1999, 2017). These small, mostly ectoparasitic snails typically inhabit sandy or detrital substrates and are associated with invertebrate hosts, including annelids, echinoderms, and cnidarians (Wise, 1996; Mikkelsen et al., 2008). Pyramidellids have historically been underrepresented in Indian marine biodiversity surveys, owing to their small size, morphological similarity, and limited access to regionally applicable taxonomic literature (Subba Rao, 2003; Apte, 2009). Species included in this genus have shells with a moderately high spire, axial ribs that are present but relatively weak and usually marked only in the upper part of the whorls. The genus has been previously discovered in the shallow tropical Indo-West Pacific waters, with species documented from Japan, the Philippines, Indonesia, Papua New Guinea, New Caledonia, and French Polynesia (Odé, 1998; Peñas et al., 2010, 2017; Saurin, 1961; Robba, 2013). However, until now, *Miralda* species have not been formally recorded from Indian waters, reflecting a significant biogeographic gap.

The pyramidellid fauna of India is still little described and is becoming more widely acknowledged as diversified. The Gulf of Mannar, the Andaman and Nicobar Islands, and the Lakshadweep Archipelago have recently been reported as locations for new pyramidellid species and range extensions (Kumar et al., 2022; Kumar et al., 2025), underscoring the possibility of additional discoveries in these relatively unexamined regions. Historically, *Miralda* has been absent from Indian checklists, including early foundational studies such as Melville's (1896–1923), which primarily focused on larger or more prominent gastropods. The Lakshadweep Archipelago, consisting of 36 low-lying coral atolls and reef platforms located in the eastern Arabian Sea, serves as an essential biogeographic connection between the western Indian Ocean and the eastern Indo-Pacific faunal regions (Raghunathan et al., 2004; Apte et al., 2010). Recent marine biodiversity assessments around Kalpeni Island (10°8'24.00" N; 73°37'55.20" E) have yielded several previously undocumented micromolluscan taxa, reinforcing the region's unexplored status and high endemic potential. This study reports the first Indian record of *Miralda scopulorum*, a species originally described from the western Pacific. In 2024, during focused micro-mollusc surveys, specimens were collected from reef flats and shallow lagoonal environments. In order to facilitate accurate identification, a comprehensive morphological analysis of the shell, supported by high-resolution imaging of both the protoconch and teleoconch, is provided here. This discovery significantly extends the known range of *M. scopulorum* into the central Indian Ocean, contributing to our growing understanding of Pyramidellidae diversity in Indian waters.

2. MATERIALS AND METHODS

A comprehensive marine biodiversity survey was conducted, which involved benthic sampling at Kalpeni Island, located in the Lakshadweep Archipelago (10°8'24.00" N; 73°37'55.20" E) in the year 2025 (Figure 1). Sandy substrates with areas of coral debris at a depth of 4-5 meters were observed. The specimens were hand-picked and stored in 70% ethanol after being sieved through a 500 µm filter. The shells underwent inspection with a Carl Zeiss Discovery V25 stereomicroscope after being carefully cleaned with a brush. Comparisons were conducted between previous descriptions and the morphology, sculpture, and protoconch properties of the shell (Odé, 1998; Peñas et al., 2017). Images were captured using a digital microscope camera that was affixed. The Marine Biology Regional Centre of the Zoological Survey of India, located in Chennai, is the designated site for the specimens. This study not only emphasizes the often-overlooked diversity of micro mollusks present in the island systems of India but also illustrates the necessity for targeted sampling methods to identify range expansions and to address regional taxonomic gaps for families like Pyramidellidae.

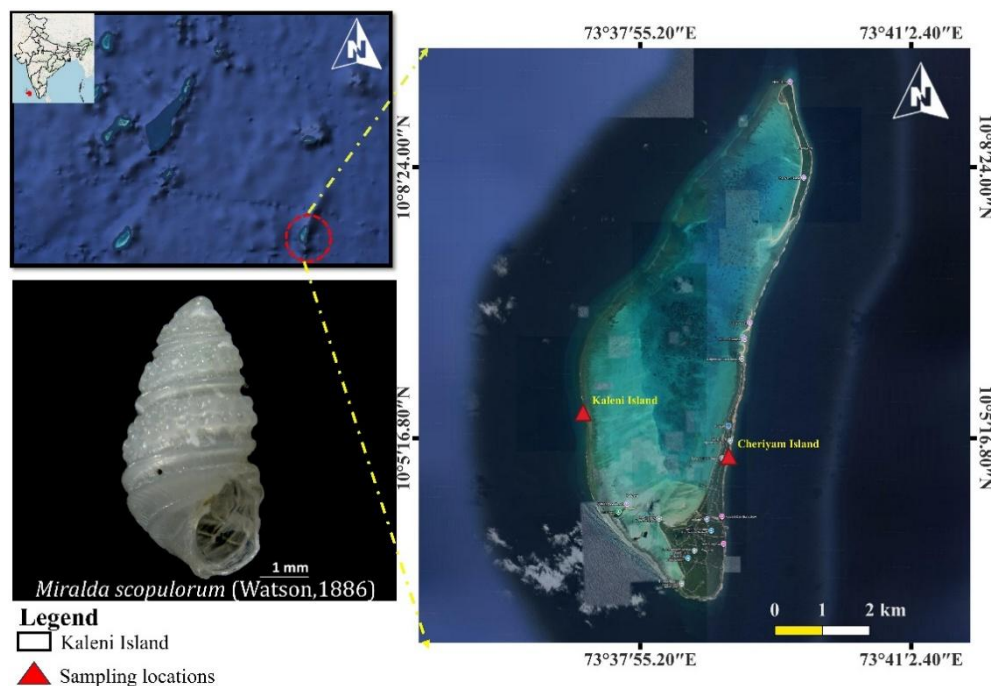


Figure 1. Geographical position of sampling stations

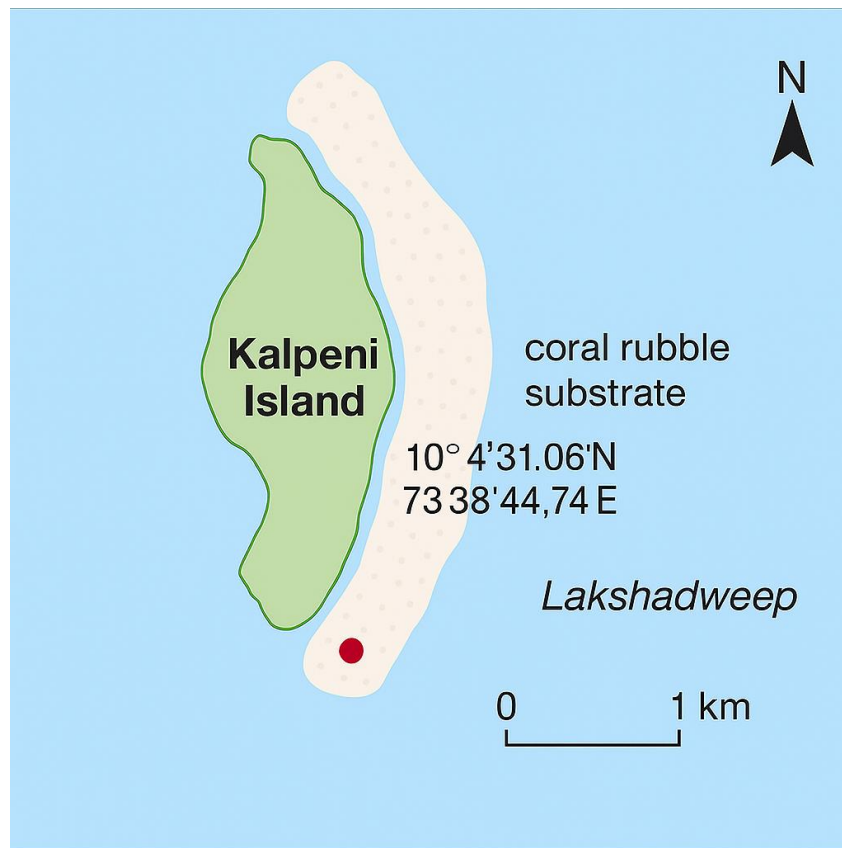


Figure 2. Map representing replicate sampling station Kalpani Island. Scale (0–1 km) and north arrow for spatial orientation

Taxonomic Account

Phylum: Mollusca

Class: Gastropoda

Order: Panpulmonata

Superfamily: Pyramidelloidea

Family: Pyramidellidae Gray, 1840

Genus: *Miralda* A. Adams, 1860

Species: *Miralda scopulorum* (Watson, 1886)

Odostomia scopulorum Watson, 1886 Chall.Rep.Zool.,15;485, pl.31, fig.5

Odostomia (Miralda) scopulorum Pilsbry, 1918;319

Miralda scopulorum Kay, 1979;410

Miralda scopulorum Bosch et al., 1995; 176.fig. 801

Miralda scopulorum Hori in Okutani, 2000; 729, pl. 363 .fig. 156

Material examined:

2 specimens (1shell height: 3.6mm), Kalpeni Island, Lakshadweep (10°8'24.00" N; 73°37'55.20" E), depth 4–5 m, coral rubble substrate; coll. Rajendar Kumar, 2025.

Description

The shell is minute, sub-oval, solid, and glossy white, with a height of 3.6 mm. It is classified as a Type C protoconch, consisting of approximately six whorls and featuring a spiral sculpture on the spire whorls created by three spiral cords. The teleoconch whorls display fine, rounded axial ribs that are crossed by subtle spiral threads, resulting in a delicate cancellate sculpture. Three spiral keels

are more pronounced, leading to the formation of weak nodules at their intersections. Additionally, there are more faint spiral striae located at the base of the final whorl. The aperture is ovate; the outer lip is thin; and the columellar fold is faint.

Table 1. Shell Morphometrics of *Miralda scopulorum*

Specimen	Shell Height (mm)	Aperture	Colour
1	3.6	Suture deep	Glossy white
2	2.4	Suture deep	Glossy white

The table 1 represents the morphometrics of 2 shells of the same species.

Table 2. Distribution of selected *Miralda* species across the Indo-Pacific region, Lakshadweep.

Species	Known Distribution	New Record (Present Study)	References
<i>Miralda scopulorum</i>	Solomon Islands, Fiji, Japan		Peñas et al., (2017); Present study
<i>Miralda diadema</i>	Vietnam, Philippines	–	Saurin (1961); Robba (2013)
<i>Miralda revincta</i>	Philippines	–	Peñas et al.,2010.
<i>Miralda umeralis</i>	Solomon Islands	–	Peñas et al., (2017);
<i>Miralda senex</i>	Australia	–	Peñas et al.,2010;
<i>Miralda sitizoi</i>	Japan	–	(Nomura, 1937)
<i>Miralda protogalea</i>	Solomon Islands	–	Peñas et al., (2017);
<i>Miralda fenestrata</i>	Fiji, Tonga	–	Peñas et al., (2017);

3. RESULTS AND DISCUSSION

This study reports *Miralda scopulorum* (Watson, 1886) from Indian waters for the first time, based on specimens collected from Kalpani Island, Gulf of Mannar. Previously, this species was known only from the Solomon Islands, Fiji, and Japan (Peñas et al., 2017). The present record extends its known range westwards within the Indo-Pacific (Table 2). Other *Miralda* species examined (*M. diadema*, *M. revincta*, *M. umeralis*, *M. senex*, *M. sitizoi*, *M. protogalea*, and *M. fenestrata*) were not found during the survey, and their distributions remain as previously documented. Table 2 summarizes the known ranges of selected *Miralda* species, showing that *M. scopulorum* is the only taxon with a newly recorded locality in this study. This addition helps fill a distributional gap for the genus and highlights the Gulf of Mannar as an important range extension zone for pyramidellid gastropods. Sampling was carried out at replicate stations around Kalpani Island (Figure 2), within a 0–1 km ranges from the shore. The collected shells were minute, measuring approximately 1.5–2.0 mm in length. Figure 3 shows the morphological details of *M. scopulorum*.

Ecological Notes:

At a depth of approximately 4 to 5 meters, the specimens were collected from shallow coral rubble environments characterized by coarse sand. Although no direct host association was identified, pyramidellids are generally known to be ectoparasites on polychaetes or cnidarians. The warm, oligotrophic lagoonal habitat fostered by monsoonal currents likely facilitates the dispersal of larvae across the Indo-Pacific.

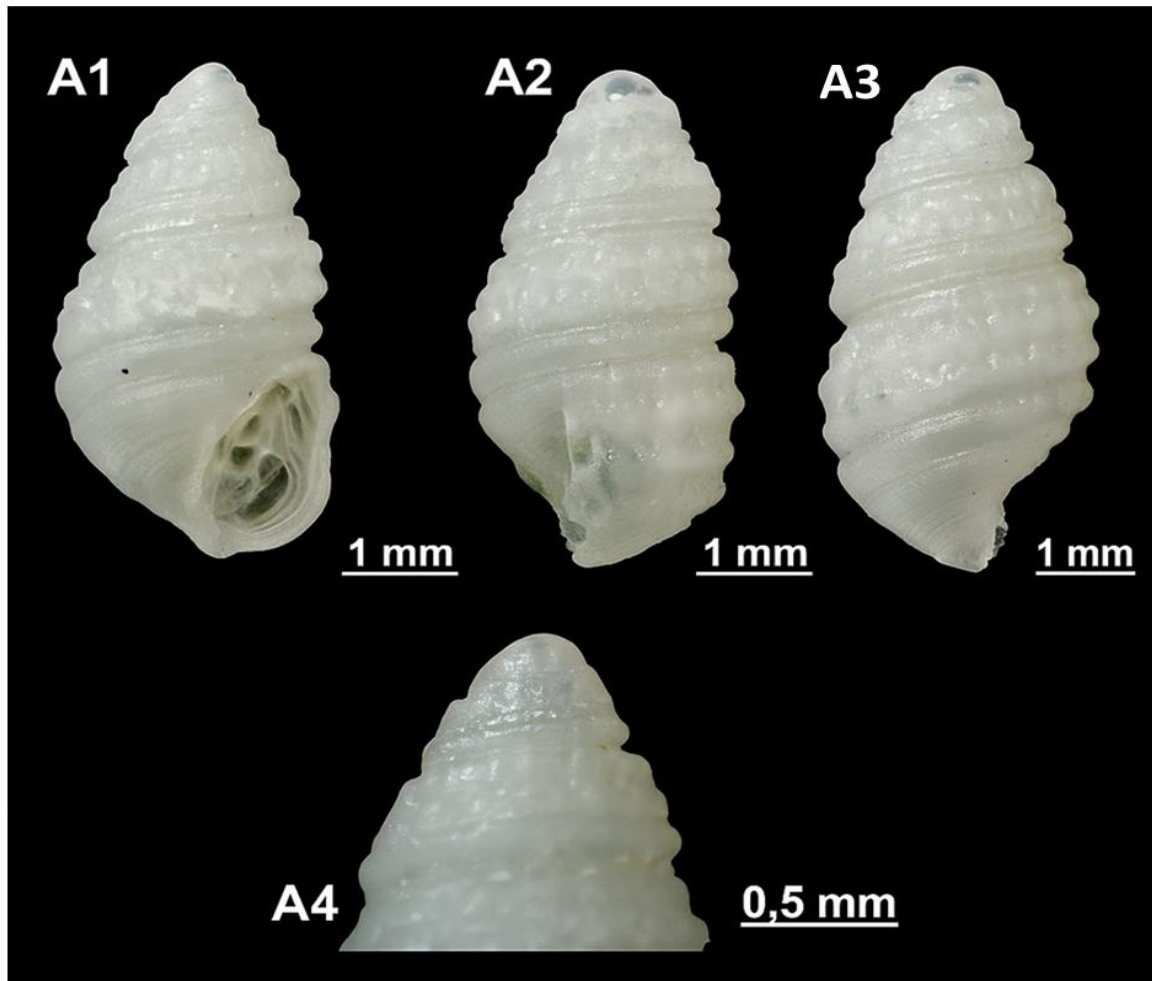


Figure 3. Shell morphology of *Miralda scopulorum* A1. Apertural view A2. Lateral view A4. Scale bars = 1mm and Protoconch close-up Scale bars = 0.5 mm

4. CONCLUSION

The present study documents the inaugural confirmed sighting of *Miralda scopulorum* (Gastropoda: Pyramidellidae) in the Indian seas, specifically from the shallow reef environments of Kalpeni Island in the Lakshadweep Archipelago. This discovery significantly broadens the known distribution of the species, which was previously confined to locations in the western Pacific, extending into the central Indian Ocean. The presence of *M. scopulorum* in the Lakshadweep Islands indicates a more extensive Indo-Pacific distribution than was previously acknowledged, highlighting the necessity for ongoing focused surveys of micromolluscs in less-explored reef ecosystems. Morphological analysis shows alignment with the initial species description regarding protoconch sculpture, teleoconch ornamentation, and overall shell shape, thereby reinforcing the identification. Besides augmenting India's Pyramidellidae fauna, this finding underscores the Lakshadweep archipelago as a vital region for biogeographic connections between the Pacific molluscan fauna and the western Indian Ocean. The true diversity and phylogeographic trends of micromolluscs in this biodiversity-rich region can only be revealed through continued taxonomic documentation and molecular methodologies.

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Conflict of Interest

The author declares that there are no conflicts of interests.

Informed consent

Not applicable.

Ethical approval & declaration

In this article, the animal regulations for Mollusca are followed as per the ethical committee guidelines of Marine Biology Regional Centre, Zoological Survey of India, Chennai, Tamil Nadu, India; the authors observed the new genus from Indian waters as a first report of *Miralda* (Pyramidellidae) with *Miralda scopulorum* (Watson, 1886). The Animal ethical guidelines for Mollusca are followed in the study for species observation, identification & experimentation.

Data and materials availability

All data associated with this study are present in the paper.

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