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SHORT COMMUNICATION

NEW DISTRIBUTION RECORDS OF THREE *SARCOPHYTON* SPECIES (ALCYONACEA: ALCYONIIDAE) IN INDIAN WATERS FROM ANDAMAN ISLANDS

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NEW DISTRIBUTION RECORDS OF THREE *SARCOPHYTON* SPECIES (ALCYONACEA: ALCYONIIDAE) IN INDIAN WATERS FROM ANDAMAN ISLANDS

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Abstract: Three alcyonacean corals—*Sarcophyton acutum* Tixier-Durivault, 1970, *S. latum* (Dana, 1846) and *S. spongiosum* Thompson & Dean, 1931—under the family Alcyoniidae are reported from Andaman Islands as new records to Indian waters. The paper deals with the detailed taxonomic description of these three newly recorded alcyonacean species along with a note on their previously known distribution.

Keywords: Alcyonacean coral, Andaman Islands, new record, *Sarcophyton*.

Coral reefs are one of the beautiful, productive and biologically diverse ecosystems among all marine ecosystems in world's oceans and shelter 25% of the world's marine species (Mulhall 2009). Alcyonacean corals are an important benthic community in the coral reef ecosystem (McFadden & Hochberg 2003). The studies on the alcyonacean corals reveal that they are mostly seen as diversified reef constructor in shallow water of the Indo-Pacific region (Benayahu 1995; Fabricius 1997). Classification and systematics of alcyonacean corals under the subclass Octocorallia signifies the presence of polyps with eight tentacles, which distinguishes these from hexacorallian scleractinian corals. Alcyonaceans are sessile macro invertebrate and in their tissue

contain minute spiny skeletal elements, known as sclerites, which provide morphological support to the colony (Lewis & Wallis 1991). A total of 23 families are recorded from the Indo-Pacific region out of 29 families known from the world's ocean (Fabricius & Alderslade 2001). These are widely distributed from intertidal to sub-tidal regions and often at greater depths (Utinomi 1953, 1954) up to 8,662m (Jamieson 2015), from polar regions to tropical waters, i.e., Indo-Pacific (Dineson 1983; Mignk & Davout 1997), Red Sea (Benayahu & Loya 1981), Mediterranean Sea (Ros et al. 1985), and also Arctic region (Slattery & McClintock 1995). Alcyonacean corals are ecologically important in sessile marine benthic ecosystem as most of the species have an association with other organisms, viz., zooxanthellate algae, molluscs, shrimps, crabs, echinoderms, brittle stars, ctenophores, turtles, or provide shelter and food. The Andaman & Nicobar Islands are located between 6.750–13.683 N & 92.200–93.950 E and the corals reef formation covers from 92.500–94.00 E & 7.00–14.00 N on its continental shelf. Fringing reefs on eastern side and one barrier reef (350km long) on western side are found in Andaman and Nicobar Islands (Pillai 1983). The Andaman Sea is one of the least explored regions

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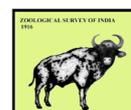
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of Indian Ocean in the context of alcyonacean studies. Venkataraman et al. (2004) listed a total of 61 species of Alcyoniidae corals from Indian waters including 29 species from Andaman & Nicobar Islands. Thomson & Simpson (1903, 1909), Jayasree et al. (1994, 1996), Rao & Devi (2003), Rajendra & Raghunathan (2016), and Rajendra et al. (2017) studied the soft corals under Alcyoniidae family of Andaman & Nicobar Islands and summarized a total of 67 species including a new species i.e., *Sarcophyton andamanensis*. However, in Indian waters 95 species under the family Alcyoniidae were reported. These three newly recorded species of alcyonaceans will increase the database to 98 species in India inclusive of 70 species from Andaman Islands. The present study shows three new distribution records of alcyonaceans from Indian waters with detailed taxonomic descriptions.

MATERIAL AND METHODS

During one of our routine marine faunal exploratory studies with special reference to the soft corals in the Andaman Islands, a total of three *Sarcophyton* species are found to be new records to India. Surveys were carried out through Self Contained Underwater Breathing Apparatus (SCUBA) dive up to the depth of 15m. A small portion of colonies of soft corals were sampled by hand picking for taxonomic analysis.

Measurement of the colonies were made by using Vernier caliper scale (Model: Aerospace 074 15376). The specimens were fixed by 4% formalin for 24 hours and rinsed in freshwater before preserving them in 70%

ethanol (Benayahu & van Ofwegen 2009). Sclerites were extracted by dissolving surface and interior of both polyparium and stalk of the colony 5% sodium hypochlorite (NaClO) (Bayer 1961) and examined under stereozoom microscope (LEICA M 205A) for taxonomic studies. Samples were identified based on morphological characters and sclerites structures in conjunction with Verseveldt (1982). All the identified specimens were deposited at National Zoological Collections, Zoological Survey of India, Port Blair (ZSI/ANRC).

RESULTS

Three species of alcyonacean corals were identified as new distributional records to Indian waters from Andaman Islands. The comprehensive morphological features are described below.

Phylum: Cnidaria Verrill, 1865

Class: Anthozoa Ehrenberg, 1834

Sub-class: Octocorallia Haeckel, 1866

Order: Alcyonacea Lamouroux, 1812

Sub-order: Alcyoniina

Family: Alcyoniidae Lamouroux, 1812

Genus: *Sarcophyton* Lesson, 1834

1. *Sarcophyton acutum* Tixier-Durivault, 1970 (Images 1–3)

Sarcophyton acutum Tixier- Durivault, 1970a, 237 (Fig: 73-76).

Sarcophyton acutum, J. Verseveldt, 1982, 15 -16 (Fig: 1, Pl: 1).



Image 1. *Sarcophyton acutum* Tixier-Durivault, 1970 - preserved specimen

Material examined: ZSI/ANRC 12402, five colonies were collected at Lamia Bay (13.175 N & 93.051 E), North Andaman, 15m.

Diagnostic characters: The colony has dimorphic polyps, without high erect folds and contains a sterile stalk. The capitulum of the colony is cup-shaped extending outward from the stalk and peripheral of capitulum forms slightly folds which is thicker than the centre. Both autozooids and siphonozooids are fully retracted. The distances between the two autozooids is 1.0–1.70 mm and between the siphonozooids 0.30–0.45 mm. The distance between autozooid and siphonozooid is 0.5–0.7 mm. The surface layer of the disc contains club shaped sclerites, measuring up to 0.12–0.26 mm. These clubs are slender shaped. They have weakly developed heads and the arrangement of spines on the body of the club is poorly developed. The longer clubs measure up to 0.44mm. The shape of these are straight or curved, some are irregularly shaped prominences. The surface layer of the stalk also has clubs that are more slightly developed than the capitulum surface. Shorter sclerites are up to 0.10–0.26 mm with many warts which are accumulated at the head of the club. The coenenchyme

of the capitulum contains usually straight or curved needles. The spiny or smooth needles measures about 0.63mm in length and very rarely up to 0.71mm. The sclerites of the interior of the stalk are spindle-shaped and measure about 0.45–1.2 mm. The larger spindles contain more spiny constructions on the surface of the body and there is no wart like structure, some spindles are smooth structure. The smaller spindles are spinier on the surface of the body. Colony colour is grey in life, dark grey after preservation.

Distribution: India (Andaman Islands), New Caledonia.

Remarks: New distributional record to Indian waters. *Sarcophyton acutum* shows a morphological resemblance with *Sarcophyton tortuosum* Tixier-Durivault, 1946 and *Sarcophyton crassum* Tixier-Durivault, 1946. In *S. acutum* and *S. tortuosum* the edge of the colony is strongly folded but in *S. tortuosum* folds completely, covering the centre of the capitulum. In the capitulum and coenenchyme of the internal skeleton of the colony, sclerites are structurally similar but differ in measurements. In *S. tortuosum* the surface of the sclerites are slender clubs measuring between 0.09–0.27 mm little similar to the surface layer of the capitulum of *S. acutum* i.e., 0.12–0.26 mm but contain longer clubs up to 0.46mm. In *S. tortuosum*, the coenenchyme of the disc has straight spindles measuring 0.55mm length or rods but *S. acutum* contains needles, 0.71mm in length. *S. crassum* has surface clubs with narrow heads (0.09–

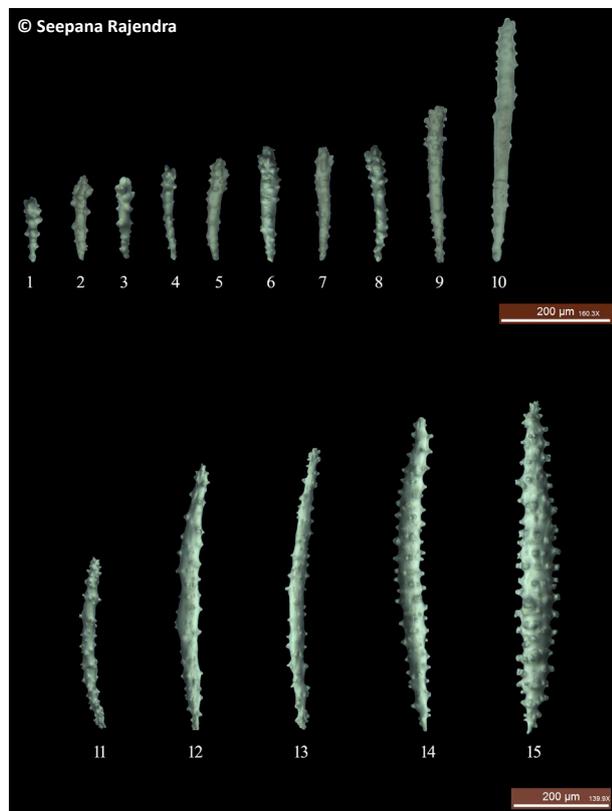


Image 2. *Sarcophyton acutum* Tixier-Durivault, 1970 (1–10 Sclerites of exterior of capitulum, 11–15 Sclerites of coenenchyme of the capitulum)

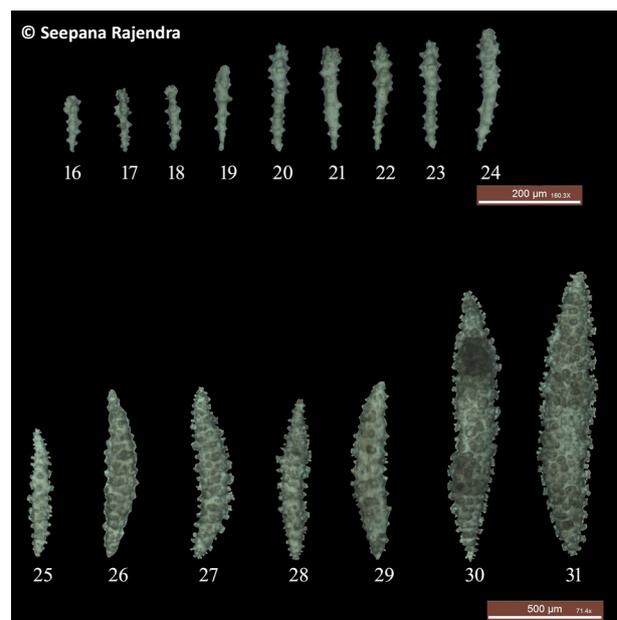


Image 3. *Sarcophyton acutum* Tixier-Durivault, 1970 (16–24 Sclerites of exterior of stalk, 25–31 Sclerites of interior of the stalk)

0.31 mm), interior of stalk contains curved spindles (up to 0.10mm), which are fairly similar but the size measurements are significantly different from *S. acutum*.

2. *Sarcophyton latum* (Dana, 1846) (Images 4–6)

Alcyonium latum Dana, 1846, 623-624, pl.58 figs 6a-7.

Sarcophyton latum, Tixier-Durivault, 1946. 167-168, (Figs: 167–168).

Sarcophyton latum, J. Verseveldt, 1982, 60-64, (Fig: 24, Pl: 16).

Material examined: ZSI/ANRC- 12403, eleven colonies were collected at Trilby Island (13.413 N & 93.067 E).

Diagnostic characters: The colony is greenish-brown, cup shaped with dimorphic polyps. The capitulum has folds at the periphery of the disc. The colony is with low stalk while the capitulum is broad in structure with undulating and thick margin. Autozooid polyps are not retracted or not fully expanded out of the capitulum. There are one siphonozooid present in between two autozooids. The distances of the autozooids and siphonozooids were measured at the peripheral region of the colony (between autozooids: 1.19–1.82 mm; between siphonozooids: 0.25–0.39 mm; between autozooid and siphonozooid: 0.55–0.83 mm). The surface layer of the capitulum contain club shaped sclerites measuring 0.09–0.22 mm but frequently longer clubs measuring up to 0.38mm can be seen. Smaller clubs contain compressed head like structure with small warts and rounded tubercles. Longer clubs are with

developed head but centre of the club contains less spiny warts in comparison with the portions of the sclerite. Coenenchymal has slender, straight or curved, pointed, spiny rods. Warty spindle shaped sclerites are 0.33–0.72 mm in length and has compact structure on surface of the spindles. Surface of the stalk has club shaped sclerites measuring 0.09–0.38 mm and while structure of clubs resembles to surface layer of capitulum. Interior of the stalk contains thick, pointed, straight or curved spindles measuring up to 1.2mm and densely packed with small warts and rarely with pointed slender spindles. The spindles are found with compact, small spiny warts. Colour of the colony is greenish brown in live condition while greenish-brown after preservation.

Distribution: India (Andaman Islands), Fiji Island, Salomon Island, Palawan (Philippines), Australia, Comores, Nosy Be, Mascarene Islands (Madagascar), Red Sea and New Caledonia.

Remarks: New distributional record to Indian waters. Morphological studies of colony showed that *Sarcophyton latum* is similar to *Sarcophyton ehrenbergi* von Marenzeller, 1886 in respect to shape of the capitulum. The sclerites of these two species differ in structure and measurement. Disc and stalk surface of clubs have round prominences in *S. ehrenbergi* while *S. latum* has slender clubs. Coenenchymal sclerites are with slender spindles measuring up to 0.50mm in *S. ehrenbergi* but in *S. latum*, it is 0.72mm in length.

3. *Sarcophyton spongiosum* Thomson & Dean, 1931 (Images 7 & 8)

Sarcophyton spongiosum Thomson & Dean, 1934, 64

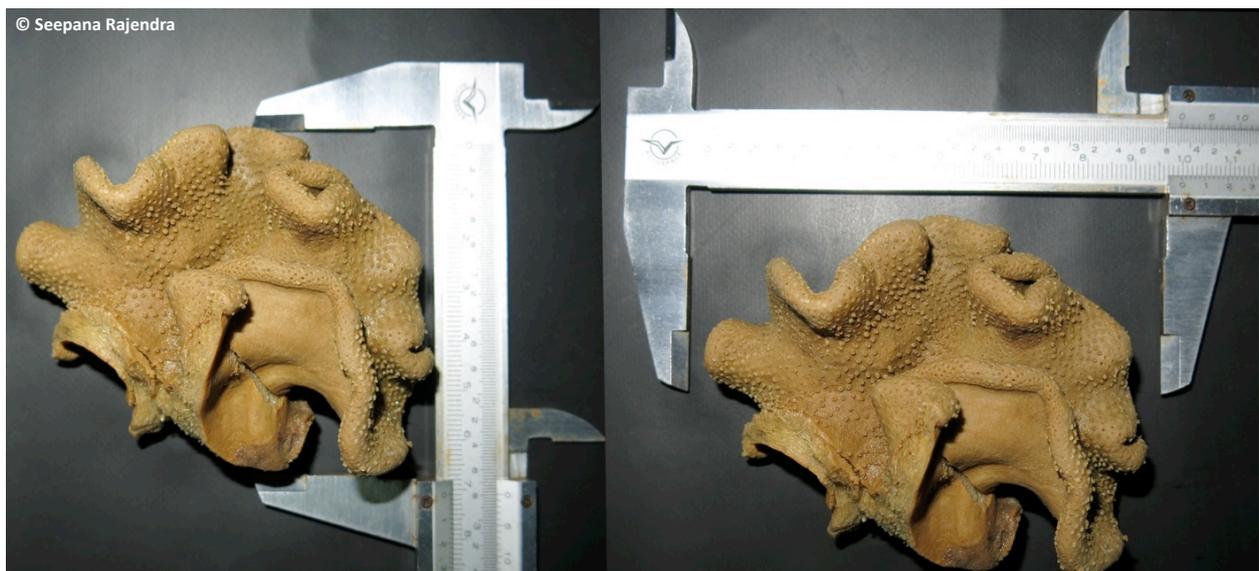


Image 4. *Sarcophyton latum* (Dana, 1846) - preserved specimen

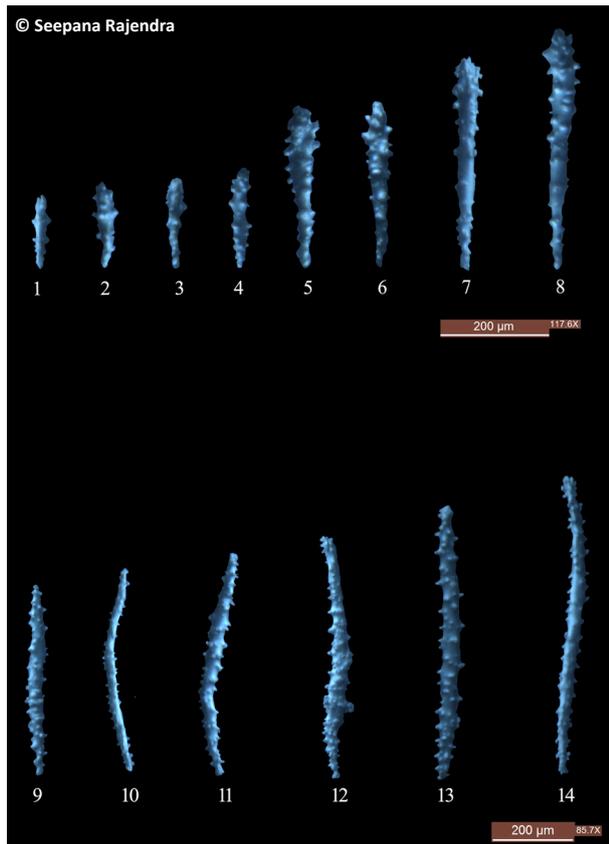


Image 5. *Sarcophyton latum* (Dana, 1846) (1–8 Sclerites of exterior of capitulum, 9–14 Sclerites of coenenchyme of the capitulum)

(pl.21; figs: 3, 4).

Sarcophyton spongiosum, J. Verveveldt, 1960, 227–229 (figs: 227–229)

1982. *Sarcophyton spongiosum*, J. Verveveldt, 74–76 (Fig: 31, pl 1: fig: 3).

Material examined: ZSI/ANRC- 12404, six colonies were collected at Butler Bay (10.658 N & 92.580 E).

Diagnostic characters: The colony is mushroom shaped with dimorphic polyps. The broadly flat capitulum expanded outwards of the stalk. Most of the polyps from autozooids not retracted at the centre of the disc. The distance between two autozooids is 1.0–1.5 mm; in between autozooid and siphonozooid is 0.40–0.60 mm. There are one to two siphonozooids present in between two autozooids. In central part of disc there are three or four siphonozooids in between two autozooids. Exterior lobe contains club shaped sclerites. The smaller clubs are 0.09–0.19 mm and longer clubs are up to 0.32mm in length. These contain ill-defined heads. Smaller clubs are cone shaped with a median girdle of warts and some of have leaf like prominences directed to upwards. Longer sclerites are devoid of separate head like structure but spines are present on the surface of sclerite body which

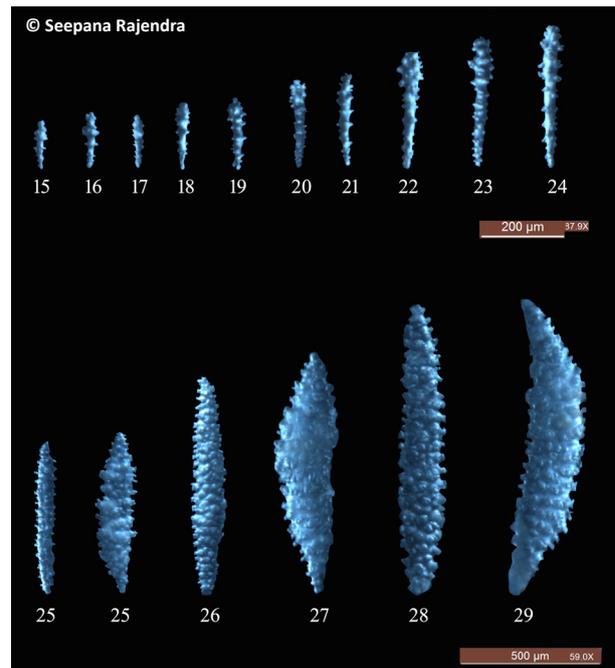


Image 6. *Sarcophyton latum* (Dana, 1846) (15–24 Sclerites of exterior of stalk, 25–29 Sclerites of interior of the capitulum)

form head like structure. Coenenchyme of the disc has straight or curved slender, spindles shaped sclerites with small spine like structure on the body surface. Maximum sclerites are 0.30–0.43 mm but few are up to 0.57mm in length. Exterior of stalk contain club shaped sclerites which are leaf like prominences directed to upwards but varies in measurement 0.08–0.17 mm while longer clubs are up to 0.25mm. The stalk contains oval shaped and more or less fusiform shaped sclerites, measuring 0.20–0.38 mm in length in interior portion. Most of the sclerites have five girdles the end portion which is also covered with warts. Few are with median contraction which separates two terminal warts which are thicker in structure. Some have irregularly surrounded with big spiny warts.

Distribution: India (Andaman Islands), Obi Major (Molluccas), Ennadi and N. Qula'an (Red Sea).

Remarks: New distributional record to Indian waters. *Sarcophyton spongiosum* Thompson & Dean, 1931 shares characters with *Sarcophyton tenuispiculatum* Thompson & Dean, 1931 and *Sarcophyton trocheliophorum* Von Marenzeller, 1886. The disc clubs are up to 0.36mm with no differentiation in head or cone shaped clubs but *S. tenuispiculatum* has same structure of clubs with high warts measuring up to 0.45mm and *S. trocheliophorum* has 0.24mm in size. Coenenchyme in *S. spongiosum* are with long spindles, measuring 0.43mm (rarely 0.57mm) whereas 0.55mm in *S. tenuispiculatum* and *S.*

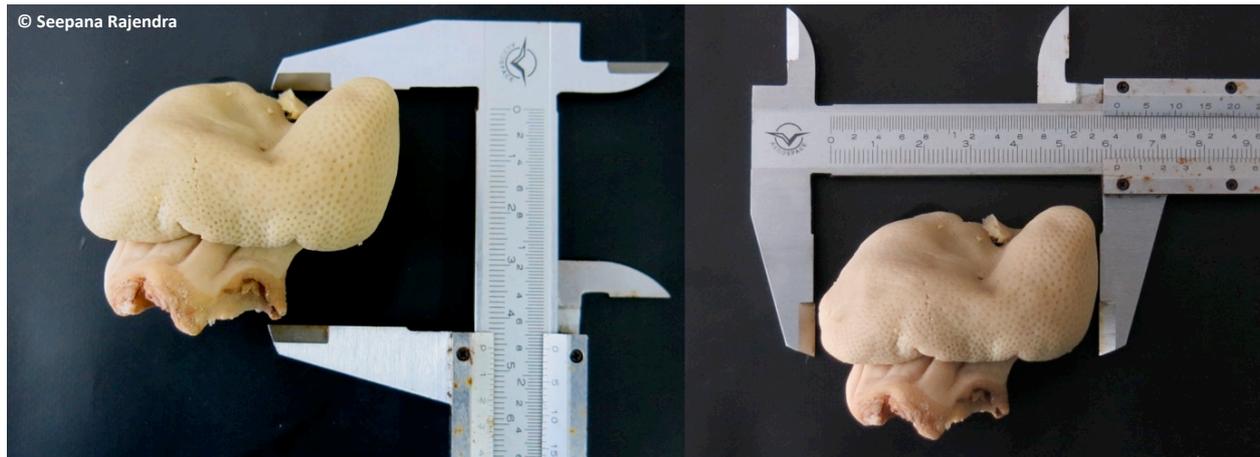


Image 7. *Sarcophyton spongiosum* Thompson & Dean, 1931

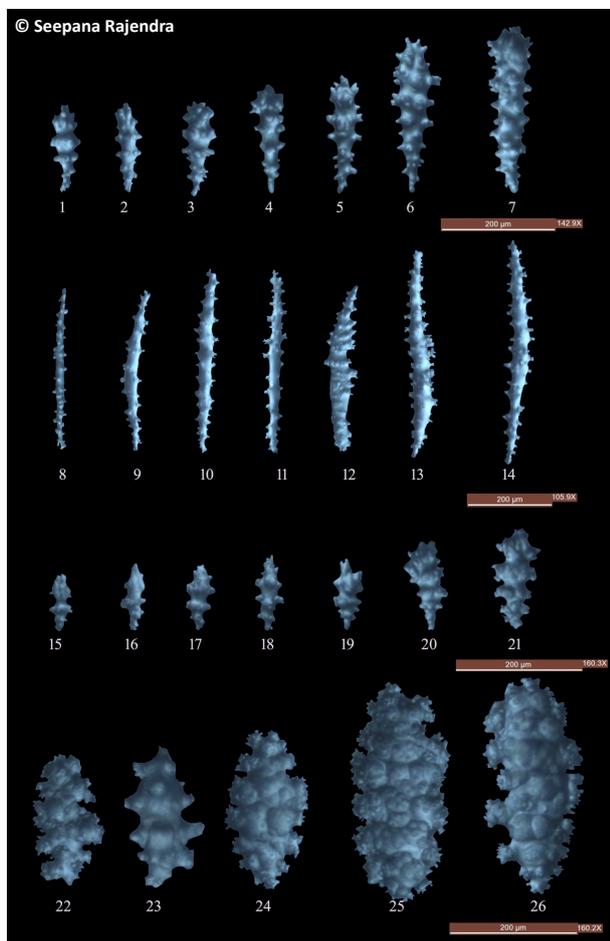


Image 8. *Sarcophyton spongiosum* Thompson & Dean, 1931. (1–7 Sclerites of capitulum exterior, 8–14 Sclerites of coenenchyme of the capitulum, 15–21 Sclerites of stalk exterior, 22–26 Sclerites of interior of the stalk.)

trocheliophorum. The structures of the interior sclerites of stalk have oval shaped sclerites in all three species but sclerites sizes vary and *S. spongiosum* coenenchymal tissue is softer than others. There are no spindles and thin rods in *S. spongiosum*. *S. spongiosum* can be differentiated from *Sarcophyton pauciplicatum* and *Sarcophyton pulchellum* (Tixier-Durivault, 1957) by the absence of strong folds on the surface of the capitulum, sclerites structure and measurements.

The present work reports the occurrence of three species of Alcyoniidae soft corals, namely *Sarcophyton acutum* Tixier-Durivault, 1970, *Sarcophyton latum* (Dana, 1846) and *Sarcophyton spongiosum* Thompson & Dean, 1931 from Andaman Islands which are new distribution records to Indian waters.

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Communications

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On the occurrence of the Black Spine-cheek Gudgeon *Eleotris melanosoma* Bleeker in Sri Lankan waters, with comments on the Green-backed Guavina *Bunaka gyrinoides* (Bleeker) (Teleostei: Eleotridae)

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