New species of *Sarcophyton* and *Lobophytum* (Octocorallia: Alcyonacea) from Hong Kong

Y. Benayahu & L.P. van Ofwegen

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Y. Benayahu, Department of Zoology, George S. Wise Faculty of Life Sciences, Tel Aviv University, Ramat Aviv, Tel Aviv 69978, Israel (yehudaB@tauex.tau.ac.il).
L.P. van Ofwegen, Nationaal Natuurhistorisch Museum, P.O. Box 9517, 2300 RA Leiden, The Netherlands (ofwegen@naturalis.nl).

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New species of the genera *Sarcophyton* and *Lobophytum* (family Alcyonacea), *Sarcophyton tumulosum* and *Lobophytum mortoni*, are described from Hong Kong's coral reefs.

Introduction

During a 10-day collecting trip in Hong Kong (November 1999), approximately 90 samples of octocorals were collected, encompassing the entire variety of taxa found at the explored sites (Benayahu & Fabricius, accepted ms). In this collection two new species of the family Alyconiidae were found and are described below.

Materials and methods

The specimens were photographed and collected by SCUBA. Samples were fixed in 4% formalin in seawater overnight, then rinsed in fresh water and transferred to 70% alcohol. Sclerites were obtained by dissolving the tissues in 10% sodium hypochlorite, followed by careful rinsing in double distilled water, and were then prepared for scanning electron microscopy as follows: the sclerites were dried at room temperature, coated with gold, and examined with a Jeol 6480LV electron microscope operated at 10 kV. Identification of species was facilitated by comparisons with permanent sclerite preparations of type material kept in the Zoological Museum, Department of Zoology, Tel Aviv University, Israel (ZMTAU). The specimens are deposited in ZMTAU and in the National Museum of Natural History, Leiden, The Netherlands (RMNH).

Systematic part

Sarcophyton tumulosum spec. nov.
(figs 1-5)

Material.— ZMTAU Co 30530, holotype and 4 microscope slides, Pak Kwo Chau (North Ninepin reef), 22.273°N, 114.348°E, 6 m depth; 9.xi.1999; 7 paratypes: ZMTAU Co 34503 (3 specimens), same data as above; RMNH Coel. 38998, same data as above, ZMTAU Co. 30556 (3 specimens), Long Ke Wan, 22.370°N, 114.383°E, 10 m; 12.xi.1999. Coll. Y. Benayahu.

Description.— The holotype and some of the paratypes are illustrated in figs 1 and 2 respectively. The holotype (ZMTAU Co 30530) is stiff, quite hard in texture. The polyparium is about 110 mm in diameter (fig. 1a) and all polyps are retracted. The base is wide, 45 mm high, and has both deep and shallow longitudinal grooves (fig. 1b). The margins of the polyparium are plicated, partly divided into flattened semi-circular lobes, slightly projecting beyond the sides of the base (fig. 1). The margins of the polyparium are elevated and its central part is a little deeper, thus forming a dish-shaped colony. The surface of the polyparium bears very distinct and irregularly spaced conical mounds (fig. 1a), 2-3 mm high and 2-3 mm in diameter, with a truncated light-beige tinted tip. Some mounds are found singly on the polyparium, but the majority is arranged in groups, either in rows separated by shallow furrows, or in small clusters. The mounds on the margins of the polyparium, especially on the folds, are smaller and less distinct compared to those found on the central part, but can still be recognized by their bright tip. Most mounds have a single autozooid, generally located on their tip, or on their margins; although some mounds may lack an autozooid. The distance between two adjacent autozooids is variable, ranging between 1 mm to as much as 10 mm. There are numerous, densely placed, small siphonozooids on the polyparium as well as on the surface of the mounds. In some cases >20 siphonozooids can be found between two adjacent autozooids, constituting an exceptionally high number.

The surface layer of the polyparium of the holotype has clubs, 0.12-0.24 mm long, with a warty head and tubercles below (fig. 3a). The interior of the polyparium has pointed spindles, also with tubercles, up to 0.52 mm long, some of which display a median waist, or side branches (fig. 3b). Rod shapes (fig. 3c), shuttles (fig. 3d) and crosses (fig. 3e), up to 0.17 mm long, are also found there. The polyps lack sclerites.

The clubs of the surface layer of the base of the holotype are shorter and wider compared to those of the polyparium (0.12-0.21 mm long); their head displays spines and warty tubercles below, mostly arranged in whorls (fig. 4a). In addition, the surface of the base has some capstan-like sclerites with distinct wart zones (fig. 4b). The interior of the base has oblong sclerites, up to 0.28 mm long (fig. 4c), as well as irregular, rectangular or oblique-angled tuberculate sclerites, up to 0.19 mm in diameter (fig. 4d).

Colour.— In alcohol, the polyparium of the holotype is light brown; tips of the mounds are mostly light beige. The base is brown-beige.

Living features.— The flattened brown-colored specimens possess the distinctive mounds on their polyparium (fig. 5a). They grow in dense clusters on rocky substrate at both collecting sites, Pak Kwo Chau (North Ninepin reef) and Long Ke Wan, which are characterized by strong surges and clear water.

Etymology.— The species name derives from the Latin *tumulus*, full of mounds, hilly, referring to the surface of the polyparium.

Variability.— The preserved paratypes differ in size (fig. 2a-h), and display a variety of light brown-beige tints. The two paratypes illustrated in fig. 2a-b (ZMTAU Co 34503) are with a laterally compressed polyparium. The paratypes illustrated in fig. 2c (ZMTAU Co 34503) and fig. 2d-h (ZMTAU Co 30556) are smaller, and represent juveniles with a shallow cup to compressed polyparium with a distinct stalk. The mounds are visible in all paratypes, including the juvenile colonies.

Remarks.— The mounds found on the polyparium of *S. tumulosum* are unique and have not been described in any other *Sarcophyton* species. *S. tumulosum* belongs to Ver-

seveldt's (1982) group I, which includes several species that are cup- or funnel-shaped, like *S. tumulosum*. However, *S. infundibuliformе* Tixier-Durivault, 1958 and *S. roseum* Pratt, 1903 have different clubs (Verseveldt, 1982: 58-59 and 69 respectively). According to McFadden et al. (2006), five additional species have been assigned to *Sarcophyton* since Verseveldt's (1982) revision of the genus: *S. globoverrucatum* (Verseveldt & Benayahu, 1983), *S. furcatum* (Li, 1984), S. *agaricum* (Stimpson, 1885), *S. spinospiculatum* Alderslade & Shirwaiker, 1991, and *S. nanwanensis* Benayahu & Perkol-Finkel, 2004. *S. tumulosum* also differs from all five latter species. Therefore, it is concluded that *S. tumulosum* has unique colony and sclerite features, and does not resemble any congeneric species already described.

During re-examination of a collection of soft corals from Taiwan we discovered this species also to occur at the Penghu islands (ZMTAU CO 33644).

Lobophytum mortoni spec. nov.
(figs 6-10)

Material.— ZMTAU Co 30550, holotype part of a specimen and 4 microscope slides, Fo Shek Chau (Basalt Island), 22.305°N, 114.363°E, 12 m depth; 11.xi.1999; paratypes: ZMTAU Co 30508 (2 specimens and parts of 8 specimens), Breakers Rock, 22.461°N, 114.420°E, 8-10 m depth; 6.xi.1999; ZMTAU Co 30517 (parts of 5 specimens), Long Ke Wan, 22.370°N, 114.383°E, 10 m depth; 12.xi.1999; ZMTAU Co 30546 (parts of 3 specimens), Kung Chau, 22.483°N, 114.373°E, 8-9 m depth; 11.xi.1999; RMNH Coel. 38999, same data as above. Coll. Y. Benayahu.

Description.— The holotype and several paratypes are illustrated in figs 6 and 7 respectively.

The holotype (ZMTAU Co 30550) is part of a specimen exhibiting a stiff texture. The cross-section at its top is 7 × 12 cm. The holotype is 3.5 cm high (fig. 6a). The polyparium is flat and has a radially-directed crest-like lobe, 1.5 cm long, located on its margins. A distinct base is present (fig. 6b). All polyps are retracted and lack sclerites.

The surface layer of the polyparium has clubs, 0.12-0.23 mm long, mostly with a distinct central wart (fig. 8a). The interior of the polyparium has tuberculate spindles, mostly pointed, up to about 0.30 mm long (fig. 8b).

The surface layer of the base has clubs, 0.21-0.33 mm long, many with a central wart (fig. 9a). The interior of the base has pointed spindles and oblong sclerites up to 0.25 mm long (fig. 9b); there are also rods with wart zones, the rods reach up to about 0.15 mm in length (fig. 9c).

Colour.— In alcohol, the holotype is light beige.

Living features.— The specimens grow on the reef as aggregations (fig. 5b), mainly in areas exposed to strong surges. Their shallow distribution is limited to 10 m depth.

Etymology.— The species is named after Prof. Brian Morton, in appreciation of his initiative to conduct this soft coral survey in Hong Kong.

Variability.— The preserved paratypes differ in size and shape of the polyparium (fig. 7). The two paratypes (ZMTAU Co 30508) have elevated edges of the polyparium (fig. 7a, c) and a distinct stalk (fig. 7b). ZMTAU Co 30546 is part of an encrusting colony with crest-like lobes (fig. 7d).

Remarks.— *L. mortoni* belongs to Verseveldt's (1983) group III, which includes species that have in the interior of their base capstans and oblong sclerites, 0.20-0.30 mm

long, and lack spindles longer than 0.30 mm. The colony growth form of *L. mortoni* resembles that of its congenerics which do not exhibit lobes or ridges on the polyparium surface, or only to a small extent, i.e., *L. depressum* Tixier-Durivault, 1966; *L. patulum* Tixier-Durivault, 1956; *L. sarcophytoides* Moser, 1919; *L. schoedei* Moser, 1919; *L. variatum* Tixier-Durivault, 1957 and *L. venustum* Tixier-Durivault, 1957 (for details see Verseveldt, 1983). McFadden et al. (2006) assigned these species, except for *L. depressum* Tixier-Durivault, 1966 (which was not examined in that study), to a distinct genetic clade, differing from the other *Lobophytum* species that are characterized by prominent lobes, ridges or fingers. The holotype and the paratypes of *L. mortoni* possess only a few short ridges, and therefore resemble the former group of species.

L. depressum seems to totally lack any type of lobe (Verseveldt, 1983; personal observations), and the clubs of its polyparium do not have a distinct central wart and thus differ from *L. mortoni*. *L. patulum* has encrusting, dish-shaped colonies, occasionally with some wide crest-like, or surface hillocks (Verseveldt, 1983; personal observations), and the polyparium surface features rods with two zones of warts, not found in *L. mortoni*. *L. sarcophytoides* has numerous marginal folds and the surface layer of the polyparium has small clubs, usually 0.07-0.15 mm long (Verseveldt, 1983; personal observations), and thus it differs from the current newly described species, whose polyparium clubs are longer (fig. 8a). *L. schoedei* also has marginal folds and its clubs of both the surface of the polyparium and the base have a lower size range and possess different heads. The holotype of *L. variatum* has only a few lobes (Verseveldt, 1983) and the surface of its polyparium has smaller clubs (0.08-0.15 mm) compared to *L. mortoni* (fig. 8a). Furthermore, in *L. variatum* the interior of the polyparium displays wide rods and cylinders, usually blunt-ended, whereas *L. mortoni* has mostly pointed spindles (fig. 8b). *L. venustum* has cup-shaped colonies with a distinct high stalk (Verseveldt, 1983; Ofwegen and Benayahu, 1992); and its surface clubs are shorter than those of *L. mortoni* (0.06-0.17 mm *vs*. 0.12-0.23 mm long, respectively). None of the 12 *Lobophytum* species that were described subsequent to Verseveldt's (1983) revision (references in McFadden et al., 2006) have a flattened polyparium with almost no lobes or crests. Hence, we conclude that *L. mortoni* has a unique colony morphology and sclerite features, and does not resemble any congeneric species.

Acknowledgements

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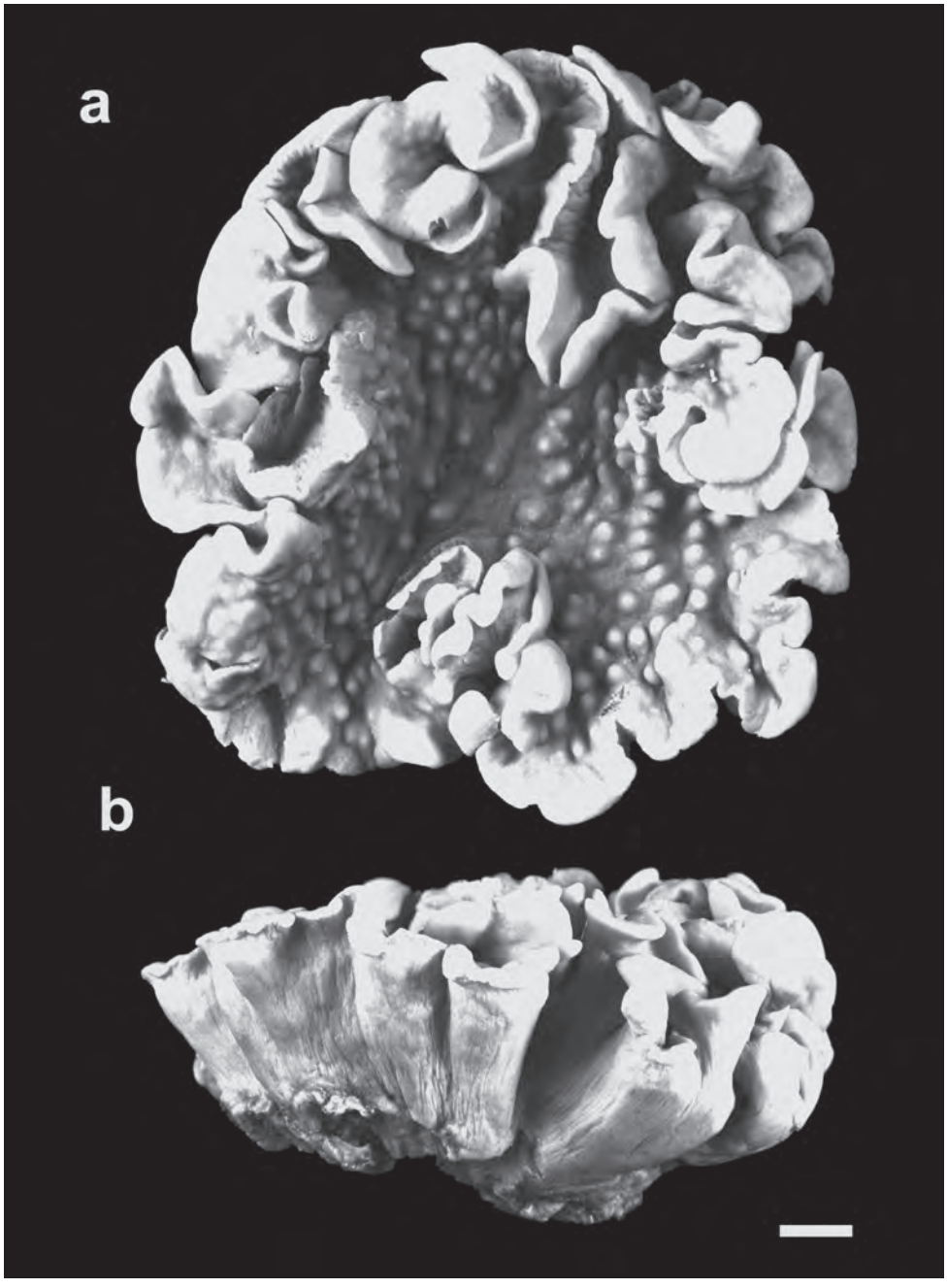

Fig. 1. *Sarcophyton tumulosum*; holotype (ZMTAU Co 30530): a, view of polyparium from above; b, side view of colony. Scale bar 10 mm.

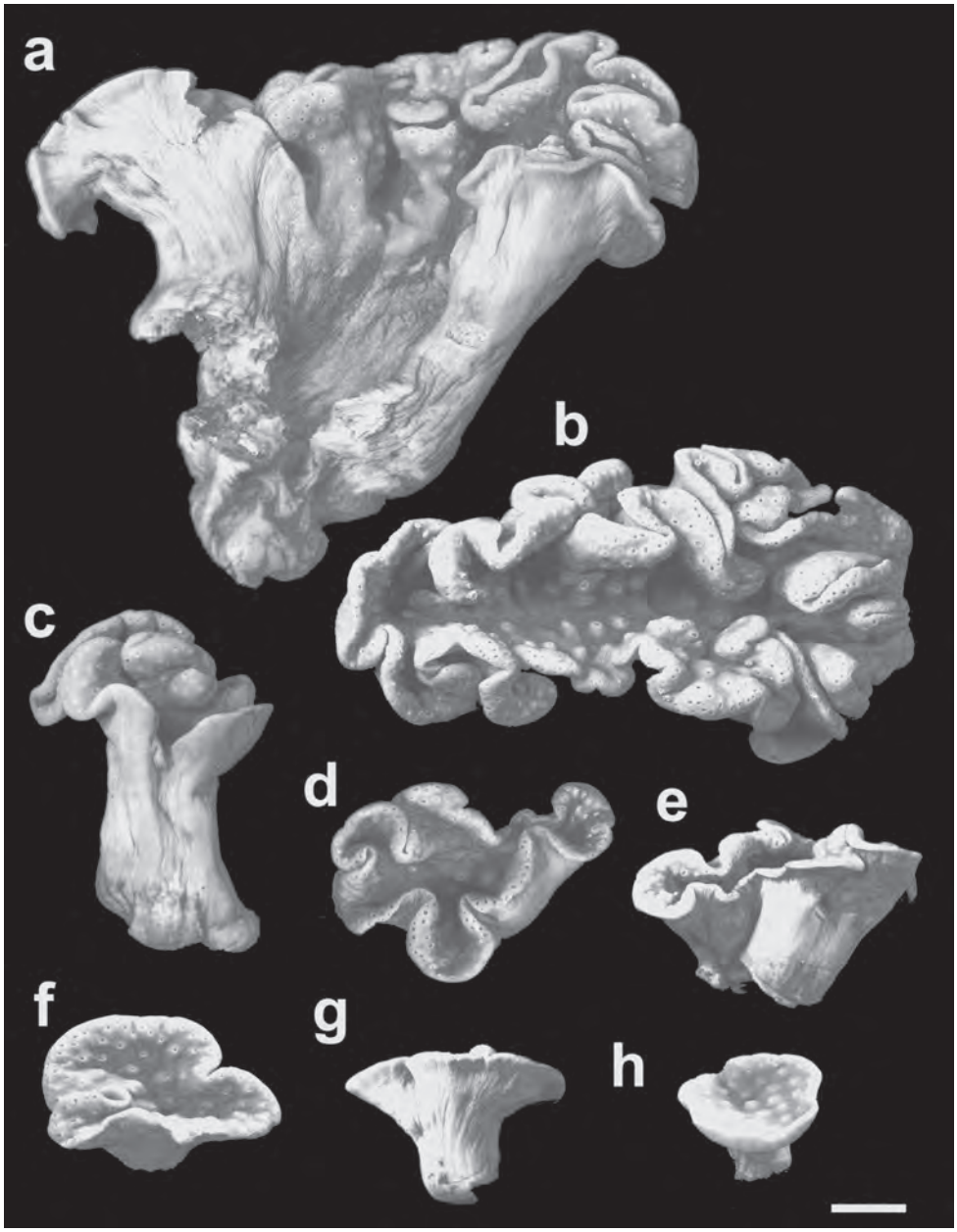

Fig. 2. *Sarcophyton tumulosum*; paratypes: a-c (ZMTAU Co 34503); d-h (ZMTAU Co 30556): d, f, view of polyparium from above; e, g, side view of respective colonies; h, juvenile colony. Scale bar 10 mm.

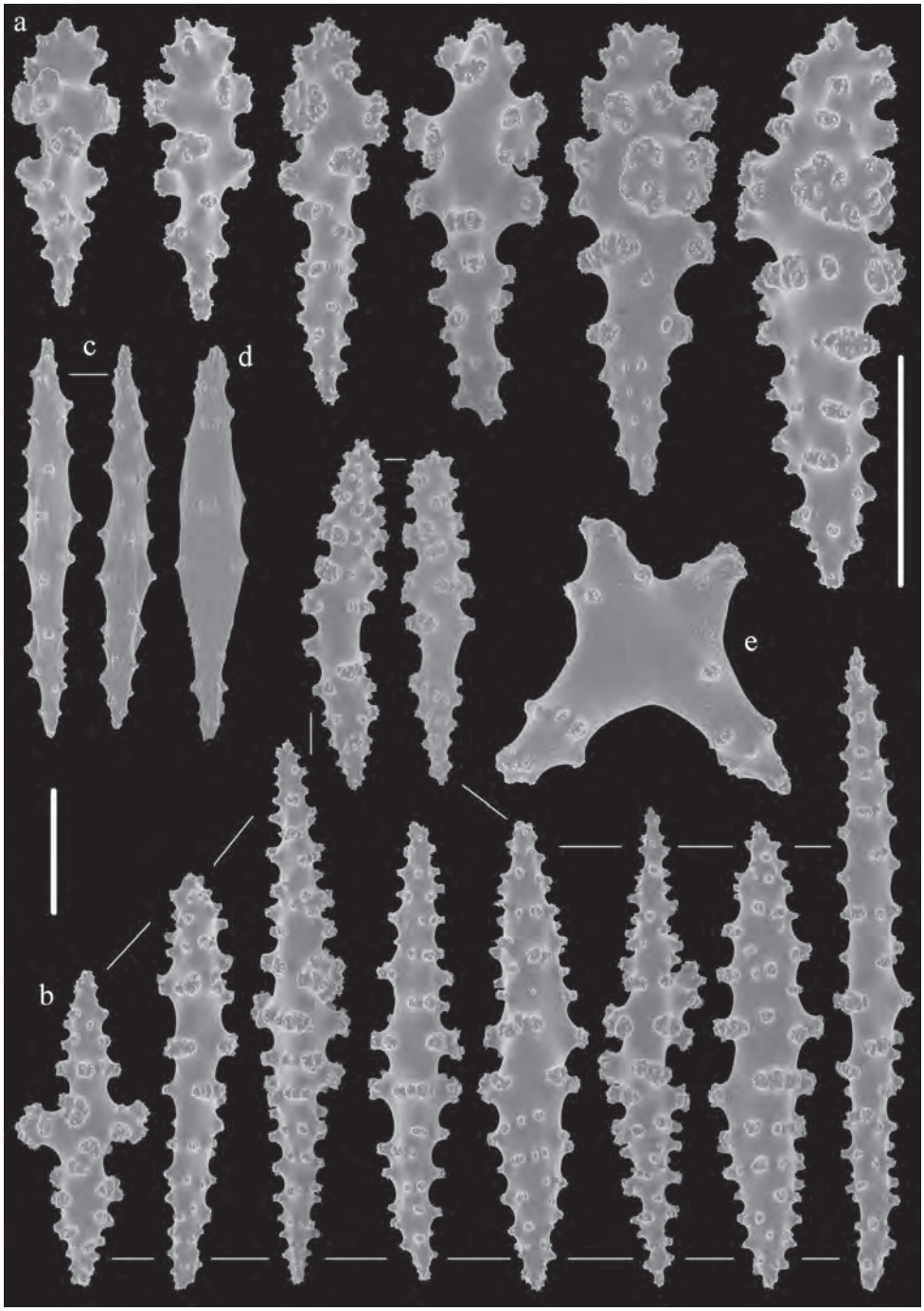

Fig. 3. *Sarcophyton tumulosum*; holotype (ZMTAU Co 30530); a, clubs of surface of polyparium; b-e, interior of polyparium; b, spindles; c, rod shapes; d, shuttle; e, cross. Scale 0.10 mm.

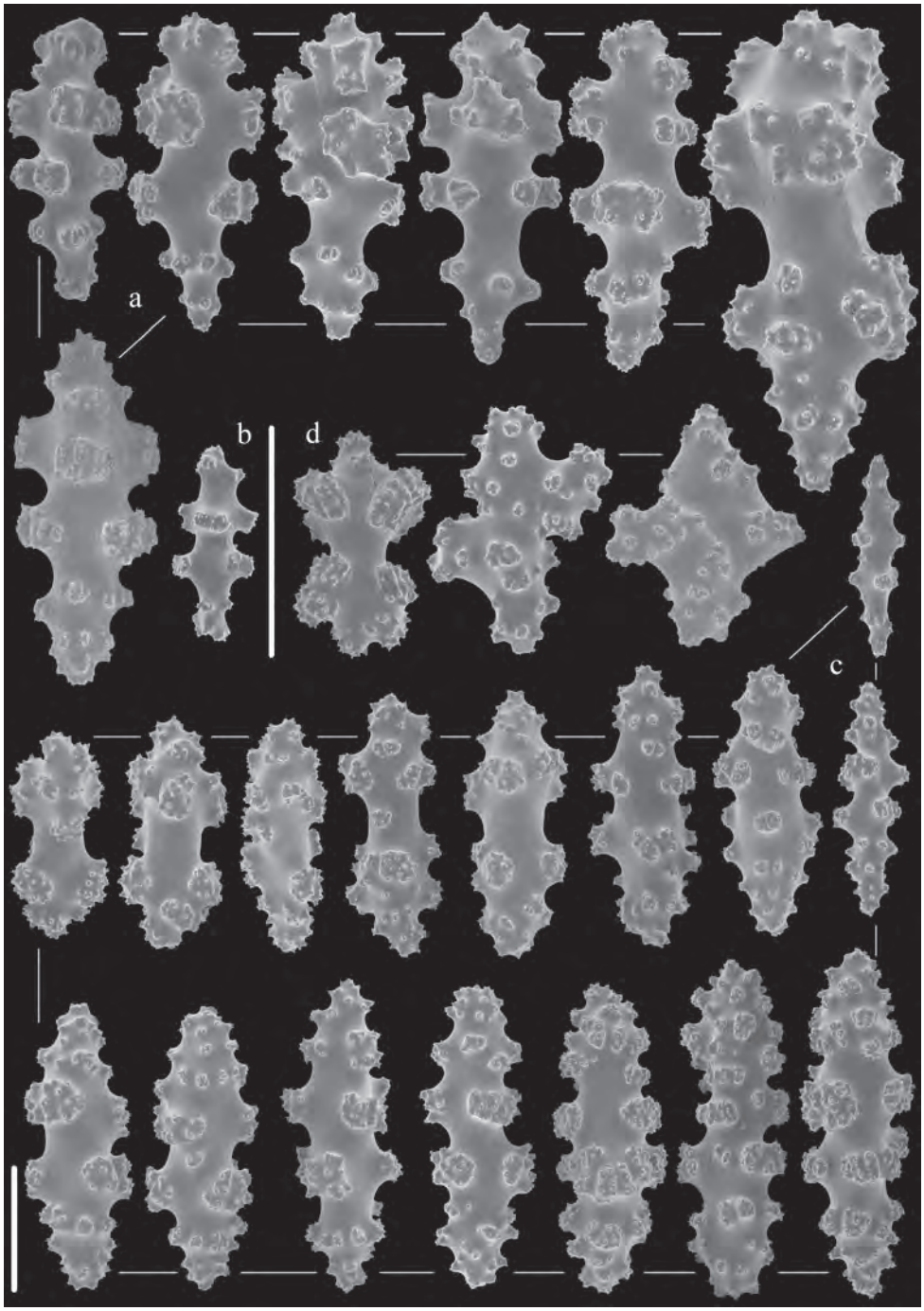

Fig. 4. *Sarcophyton tumulosum*; holotype (ZMTAU Co 30530); a, clubs of surface of base; b-d, interior of base; b, capstan; c, oblong sclerites; d, rectangular oblique-angled sclerites. Scale 0.10 mm.

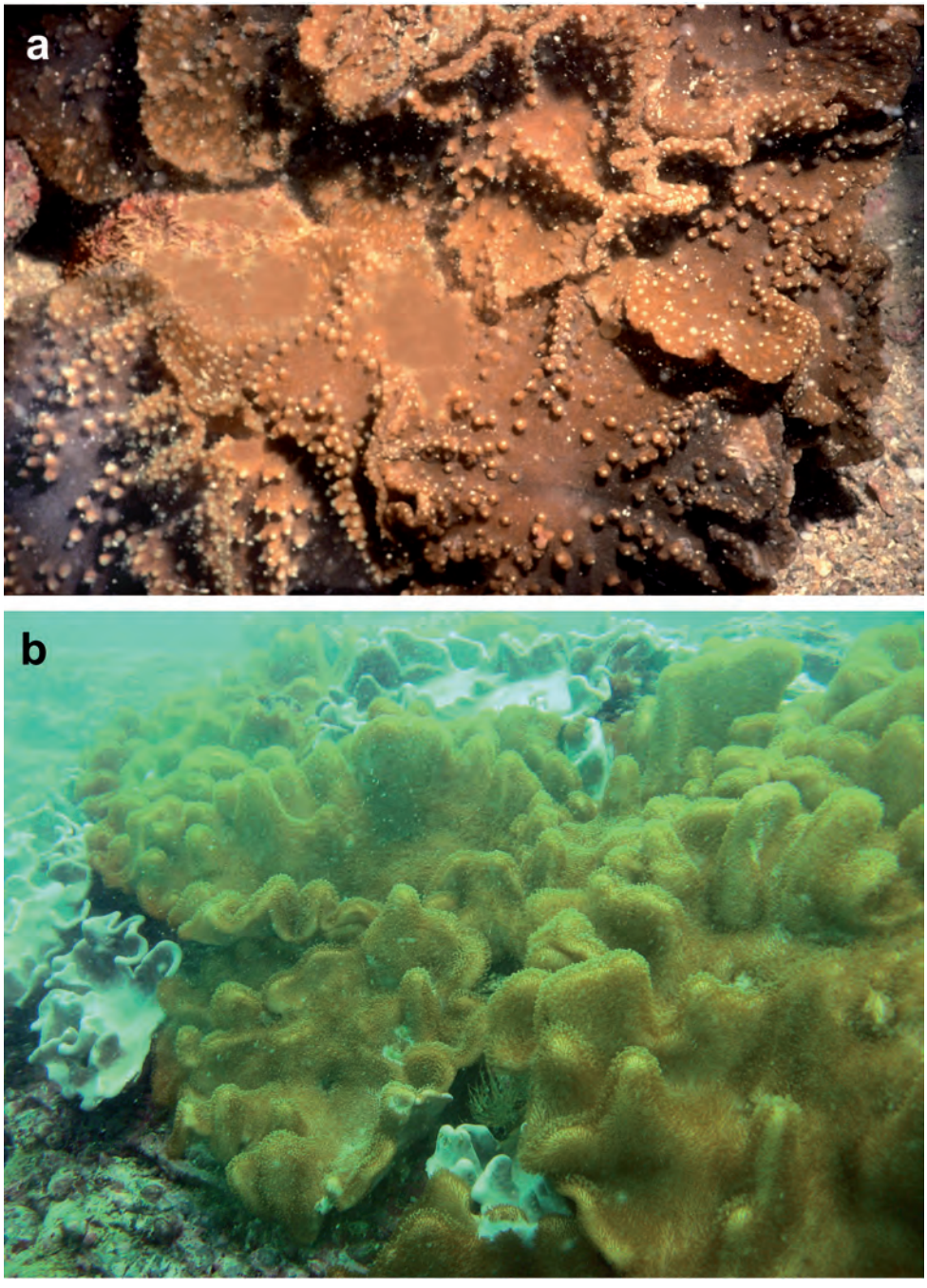

Fig. 5. Underwater photographs of a, cluster of *Sarcophyton tumulosum* colonies and b*, *Lobophytum mortoni* in their natural habitat. *Courtesy of Mr Yeung Cheng Wing.

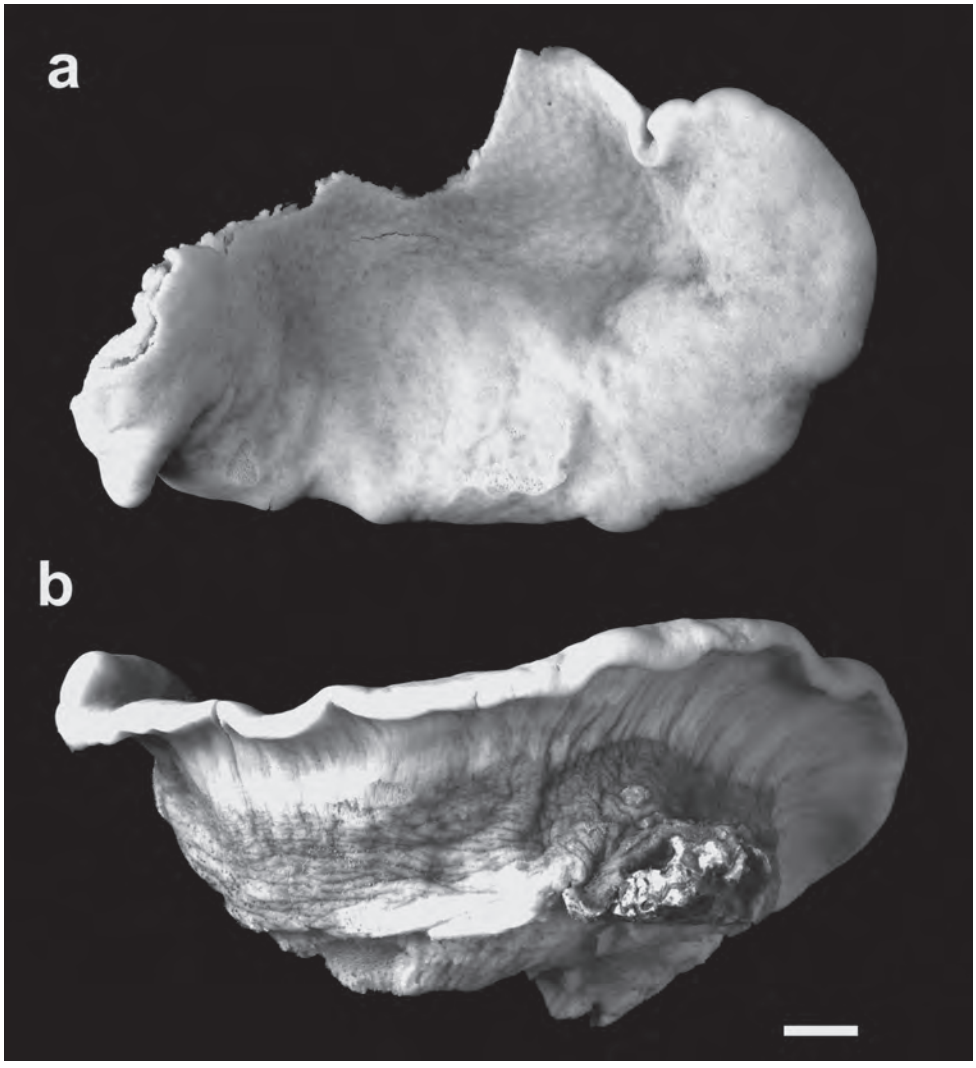

Fig. 6. *Lobophytum mortoni*; holotype (ZMTAU Co 30550): a, view of polyparium from above; b, side view of colony. Scale bar 10 mm.

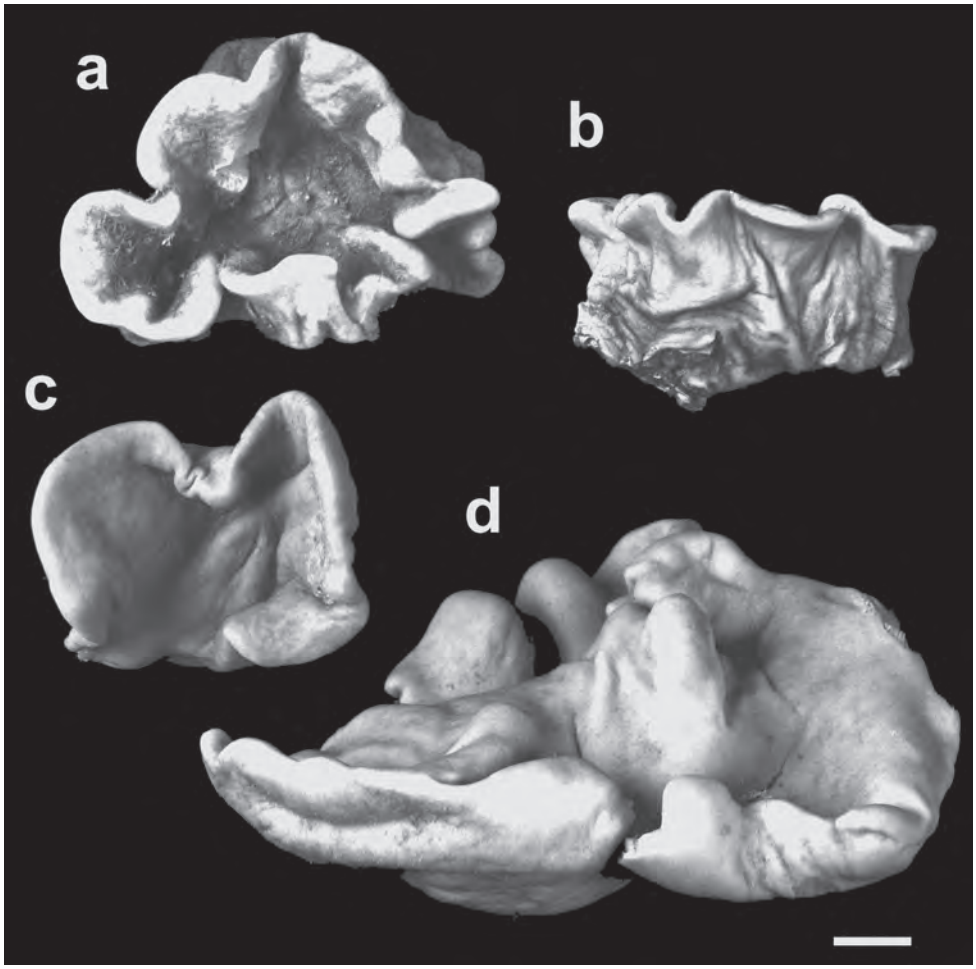

Fig. 7. *Lobophytum mortoni*; paratypes (ZMTAU Co 30508); a, view of polyparium from above; b, side view of the same colony; c, polyparium from above; (ZMTAU Co 30546); d, part of encrusting colony. Scale bar 10 mm.

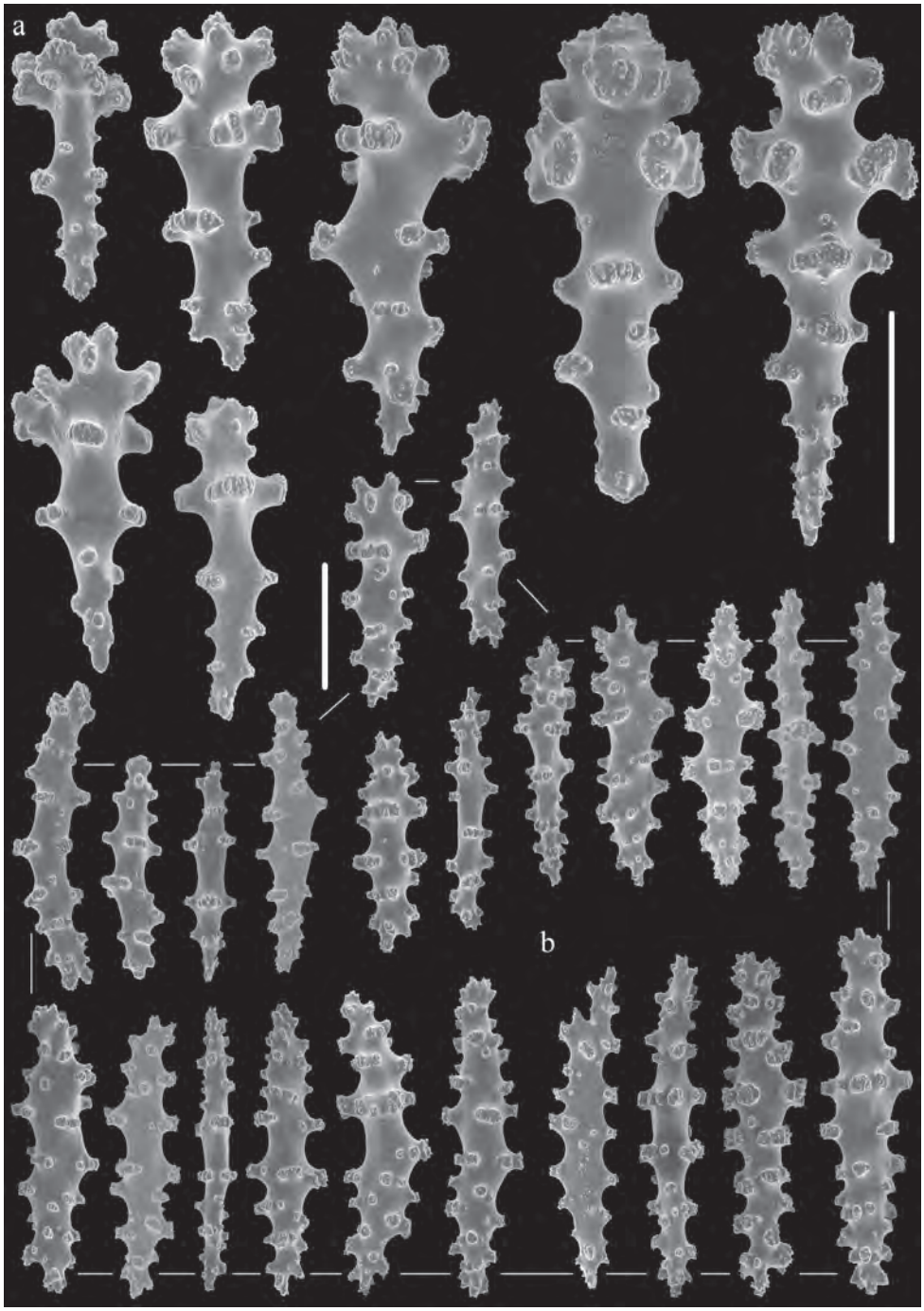

Fig. 8. *Lobophytum mortoni*; holotype (ZMTAU Co 30550); a, clubs of surface of polyparium; b, spindles of interior of polyparium. Scale 0.10 mm.

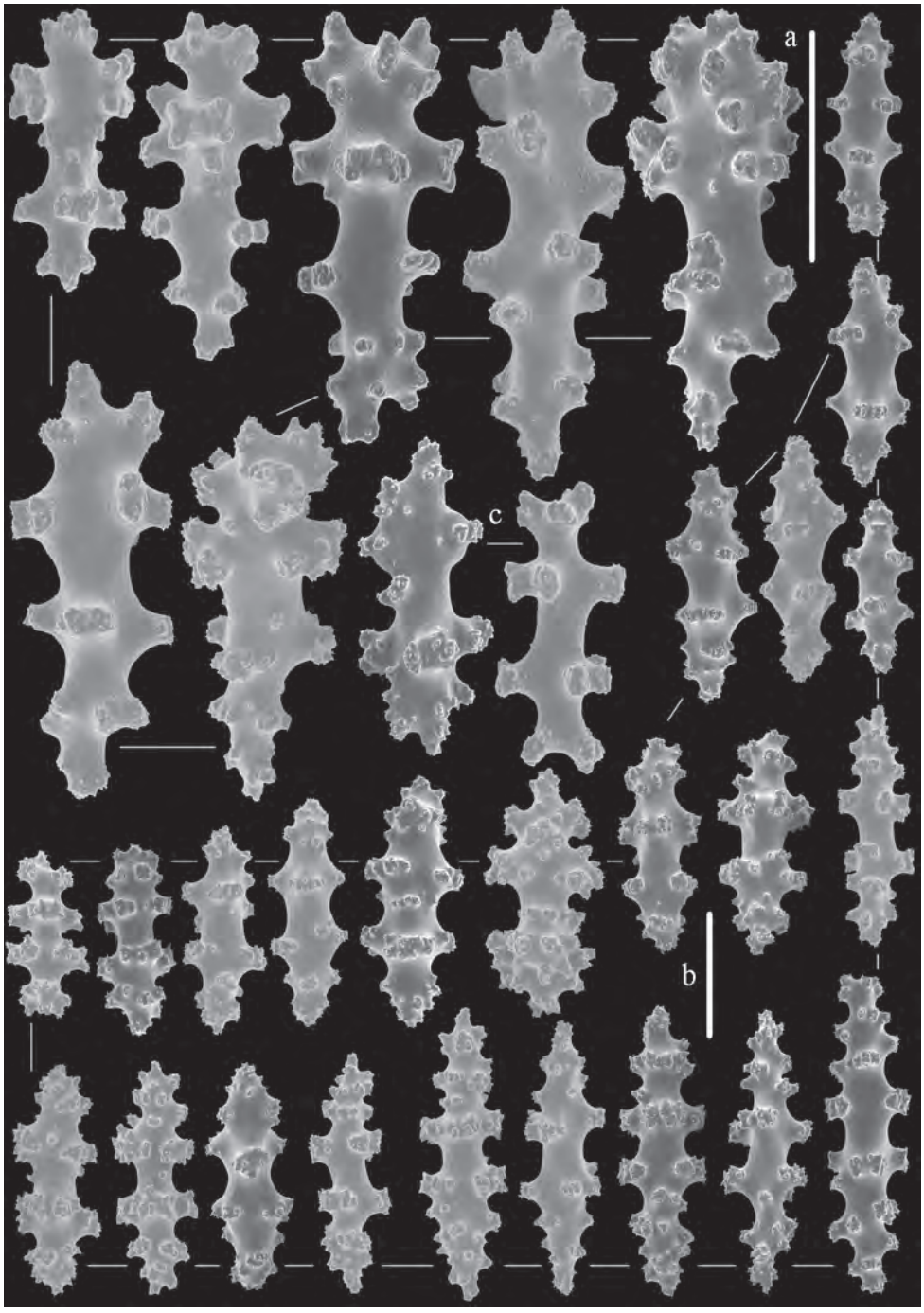

Fig. 9. *Lobophytum mortoni*; holotype (ZMTAU Co 30550); a, clubs of surface of base; b-c, interior of polyparium; b, spindles; c, rods. Scale 0.10 mm.