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**Corals of the South-west Indian Ocean
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Alcyonacea) from deep reefs on the
KwaZulu-Natal Coast,
South Africa**

by

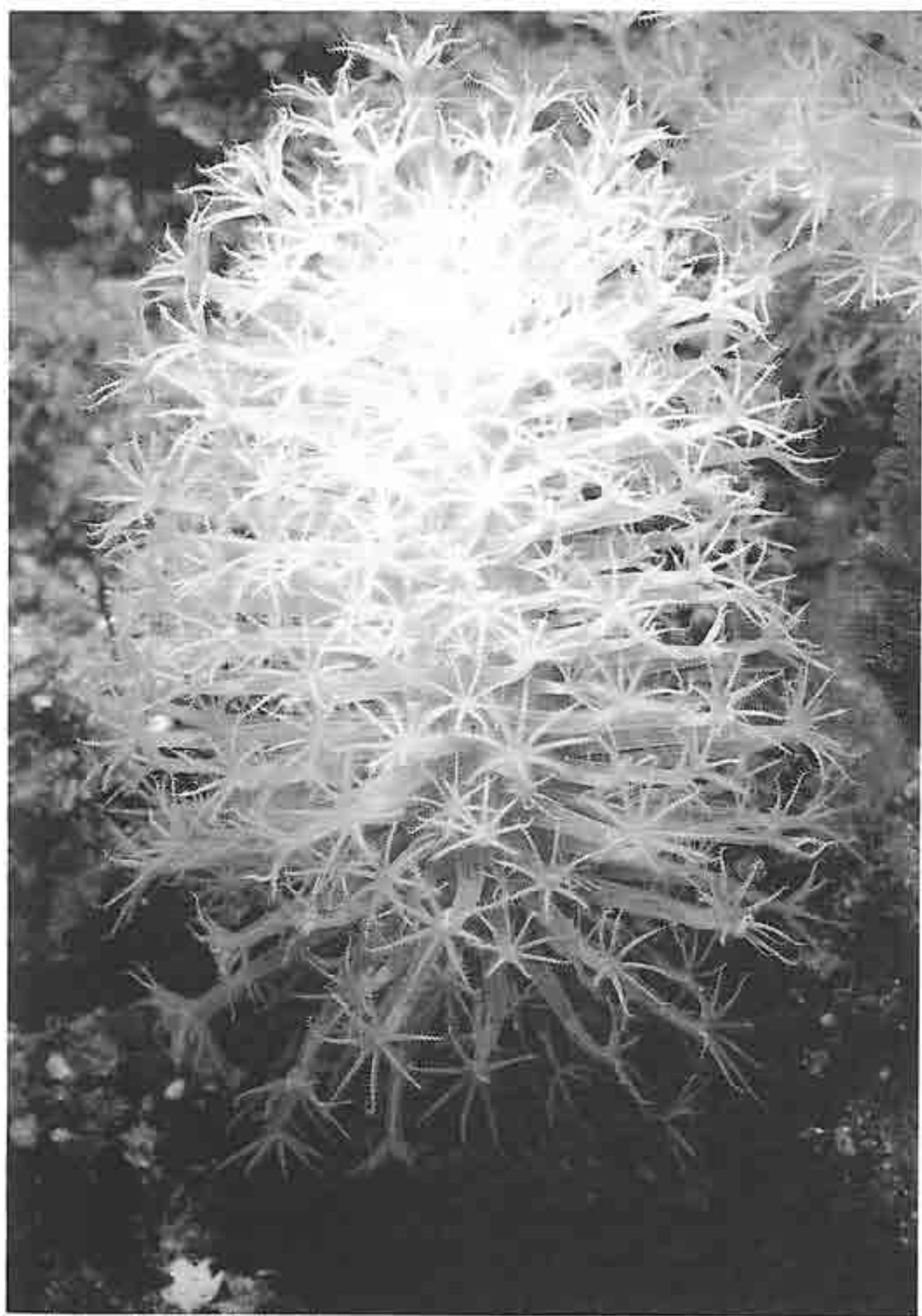
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Frontispiece. Colony of *Eleutherobia aurea* spec. nov. in its natural habitat with its polyps expanded.

***Eleutherobia aurea* spec. nov. (Cnidaria, Alcyonacea) from
deep reefs on the KwaZulu-Natal coast, South Africa**

by

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ABSTRACT

Eleutherobia aurea spec. nov. is a new octocoral species (family Alcyoniidae) described from material collected on deep reefs along the coast of KwaZulu-Natal, South Africa. The species has spheroid, radiate and double deltoid sclerites, the latter being the most conspicuous sclerites and also the most abundant in the interior of the colony.

Keywords: *Eleutherobia*, Cnidaria, Alcyonacea, Octocorallia, coral reefs, South Africa.

INTRODUCTION

The alcyonacean fauna of southern Africa (Cnidaria, Octocorallia) has been thoroughly examined and revised by Williams (1992). The tropical coastal area of northern KwaZulu-Natal has recently been investigated at Sodwana Bay and yielded 37 species of the families Tubiporidae, Alcyoniidae and Xenidiidae (Benayahu, 1993). Further collections conducted on the deeper reef areas of Two-Mile Reef at Sodwana Bay, as well as off Durban Harbour and at Park Rhynie (Fig. 1), yielded specimens belonging to the genus *Eleutherobia* Pütter, 1900 (Alcyoniidae), which differ markedly from any other known species. We have named this new species *E. aurea* to indicate the golden yellow colour of its sclerites and coenenchyme.

MATERIAL AND METHODS

The material was collected by SCUBA divers, fixed in 4% formalin in seawater, rinsed in freshwater after 24 hours, and then transferred to 70% ethyl alcohol. Sclerites were obtained by dissolving the organic tissues with sodium hypochlorite. Sclerites for scanning electron microscopy were carefully rinsed with double distilled water, dried at room temperature, coated with gold and then examined with a Jeol JSM 840A scanning electron microscope at 25 kV.

Subsamples of tissue were excised for histological examination of the gonads. Some of the latter were dissected out for microscopic measurement and the balance of the tissue was decalcified in a formal-nitric acid solution (Drury & Wallington, 1967). The

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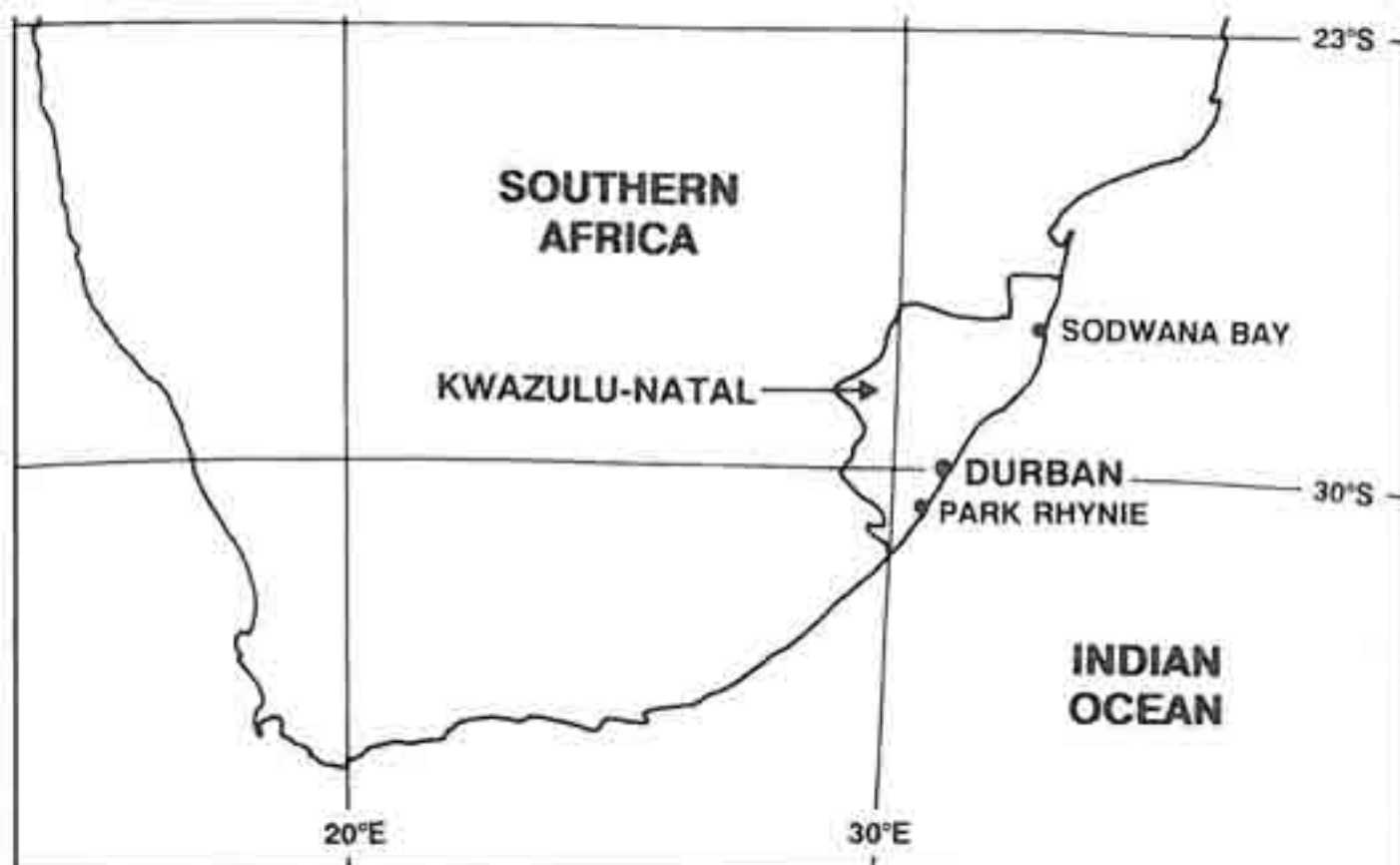


Figure 1. Map of the study area with the type locality and other collecting sites of *Eleutherobia aurea* spec. nov.

subsamples were then passed through methanol, ethanol and isopropanol in a Biorad microwave tissue processor and embedded in paraplast. Sections 5 μ m thick were cut on a microtome, stained with Ehrlich's haemalum and eosin, and examined microscopically.

Description

Eleutherobia aurea spec. nov.

Type Material.— Holotype (ZMTAU Co 28786) and three paratypes (ZMTAU Co 28787, one colony; Co 28788, two colonies) from Sponge Reef at Two-Mile Reef (27° 31' 22" S; 32° 41' 35" E), Sodwana Bay, KwaZulu-Natal, South Africa, depth 36 m, October 1993, leg. M. Schleyer; three paratypes (ZMTAU Co 29265, three colonies) from the Durban outer anchorage (29° 50' 48" S; 31° 6' 4" E), Durban, KwaZulu-Natal, South Africa, depth 27 m, November 1994, leg. M. Bryant; and two paratypes (ZMTAU Co 29266, two colonies) from Lander's Reef, Park Rhynie (30° 19' 55" S; 30° 47' 15" E), KwaZulu-Natal, South Africa, depth 34 m, November 1994, leg. A. Connell.

The holotype is illustrated in Fig. 2a at its natural size. It is an upright, rigid, digitiform colony with a short stalk, and a polyparium bearing numerous polyps. It is 57 mm long, tapers distally, and is slightly flattened. The stalk is barren for the first 20 mm and has a maximum width of 25 mm. The polyps are irregularly distributed on the polyparium and are 6–8 mm long; the distance between them is 1–4 mm. The colony surface is transversely grooved in part.

One of the paratypes (ZMTAU Co 28787) is smaller and curved, and is depicted at twice its natural size (Fig. 2b), with its stalk overgrowing a piece of calcareous substratum. The other paratypes from Sodwana Bay (ZMTAU Co 28788) are

composed of a small colony 30 mm long and a large colony which has a short side lobe, illustrated at its natural size in Fig. 2c. The paratypes collected in the outer anchorage off Durban and at Park Rhyne hardly differ from the holotype, except in size; the larger colonies attain a maximum length of 65 mm. Some of these specimens are softer than the material from Sodwana Bay.

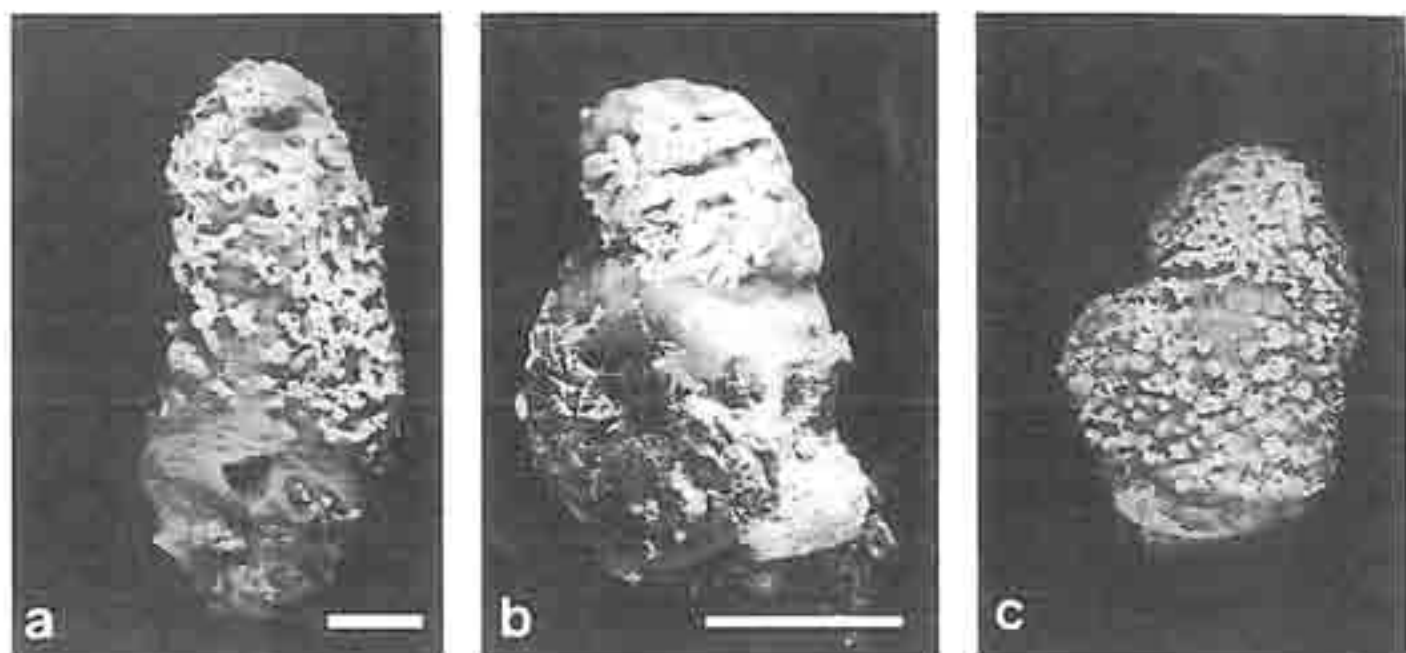


Figure 2. *Eleutherobla aurea* spec. nov. a, holotype (ZMTAU Co 28786); b-c, paratypes (ZMTAU Co 28787, 28788). Scale at 2a 10 mm, applies to 2a,c; scale at 2b, 10 mm.

The majority of the polyps in all of the colonies are expanded. Polyps which are partly retracted leave low papillae on the surface of the polyparium and the surface only becomes smooth when they are completely withdrawn into the coenenchyme.

Sclerites are present throughout the colonies except for the polyps; they are dense in the surface of the stalk and the polyparium but sparser in the interior. Spheroids and ovals 0.058–0.088 mm in diameter or length are common in the surface layer of the stalk and the polyparium and occasionally possess a waist (Figs 3; 4a,b,d–g,i,j,l). In addition, there are radiate sclerites up to 0.087 mm in length, mainly with six asymmetrical processes (Fig. 4c,h,k,m–o). The sclerites in the interior of the colony are similar but the spheroids are scarcer; however, the most remarkable sclerites in the interior are double deltoids up to 0.093 mm in length (Fig. 5). These have a symmetrical structure with smooth arms possessing thorny tips and some have an additional tubercle at the centre of the deltoid. Few of these sclerites are found in the surface.

Histological sections revealed that *E. aurea* spec. nov. has no symbiotic zooxanthellae in its tissues. Some of the colonies examined contained oocytes of mean size 160 μ m (S.D. 64 μ m) within their gastrovascular cavities (Fig. 6).

Colour

Living colonies are bright yellow and golden in colour with long white polyps (Frontispiece, Fig. 7a). The specimens become dark yellow in alcohol, while the polyps retain their white colour or become slightly pink.

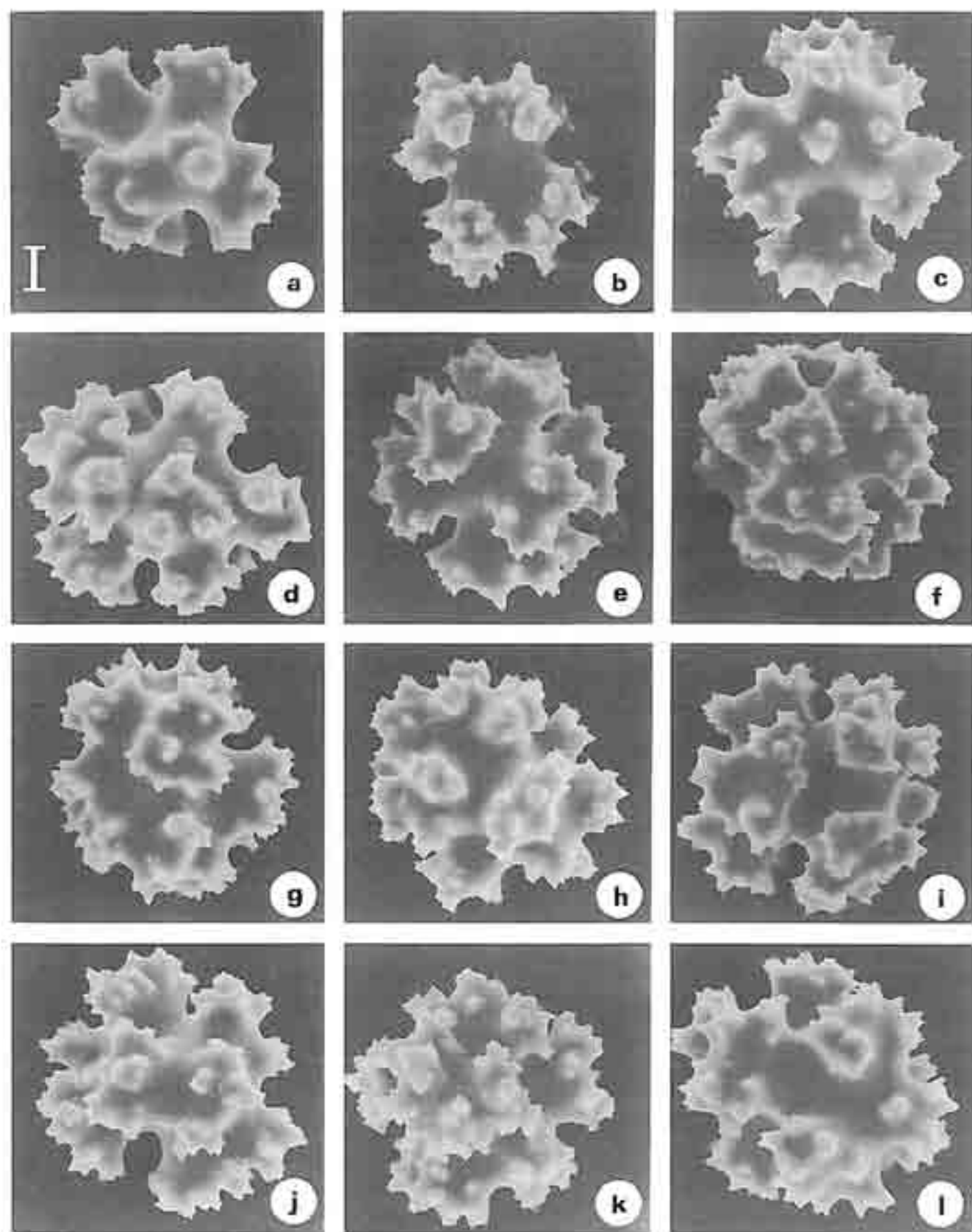


Figure 3. *Eleutherobia aurea* spec. nov., holotype (ZMTAU Co 28786); sclerites of surface layer of the polyparium. Scale at 3a, 0.01 mm, applies to 3a-l.

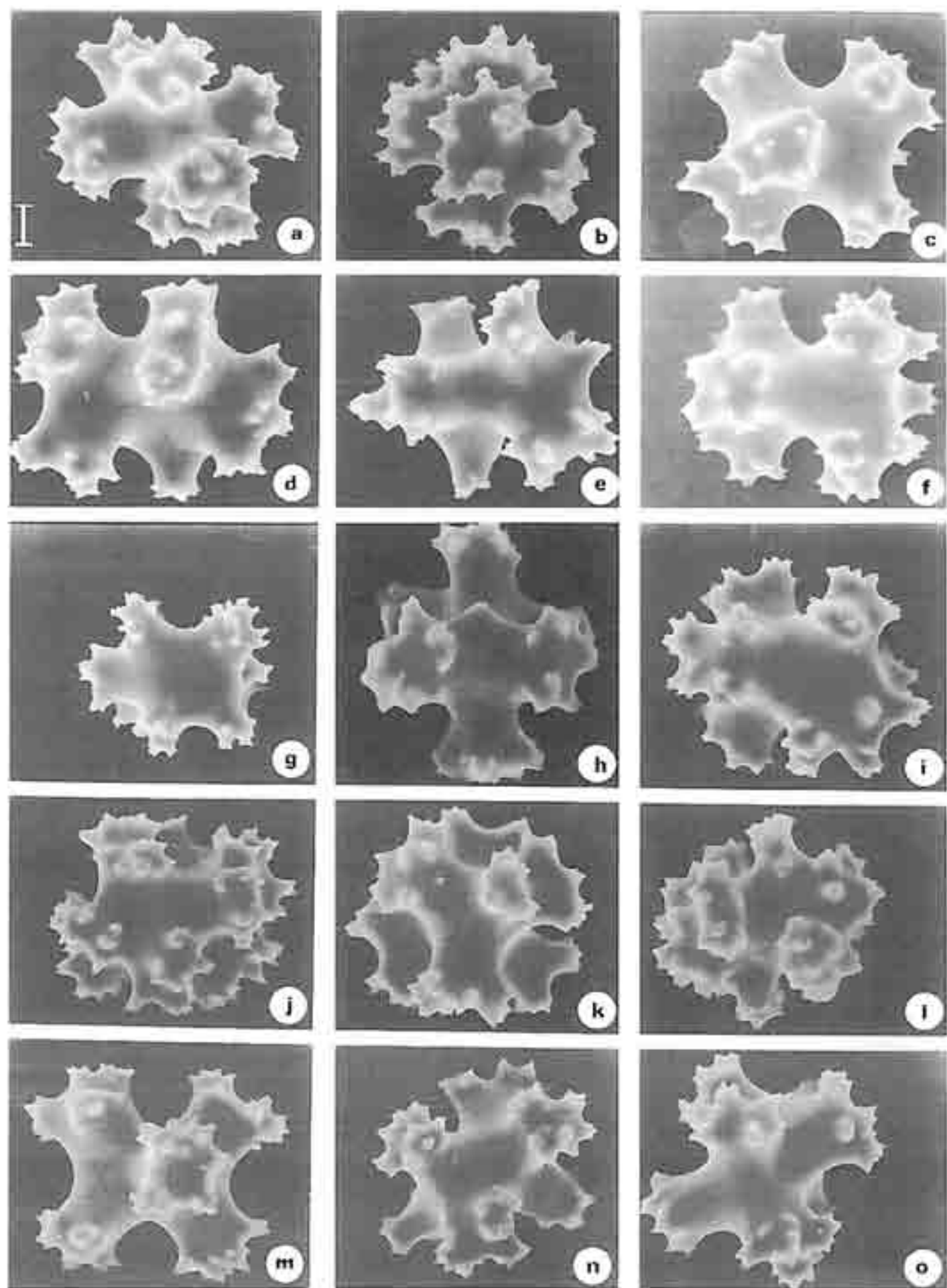


Figure 4. *Eleutherobia aurea* spec. nov., holotype (ZMTAU Co 28786); sclerites of surface layer of the polyparium. Scale at 4a, 0.01 mm, applies to 4a-o.

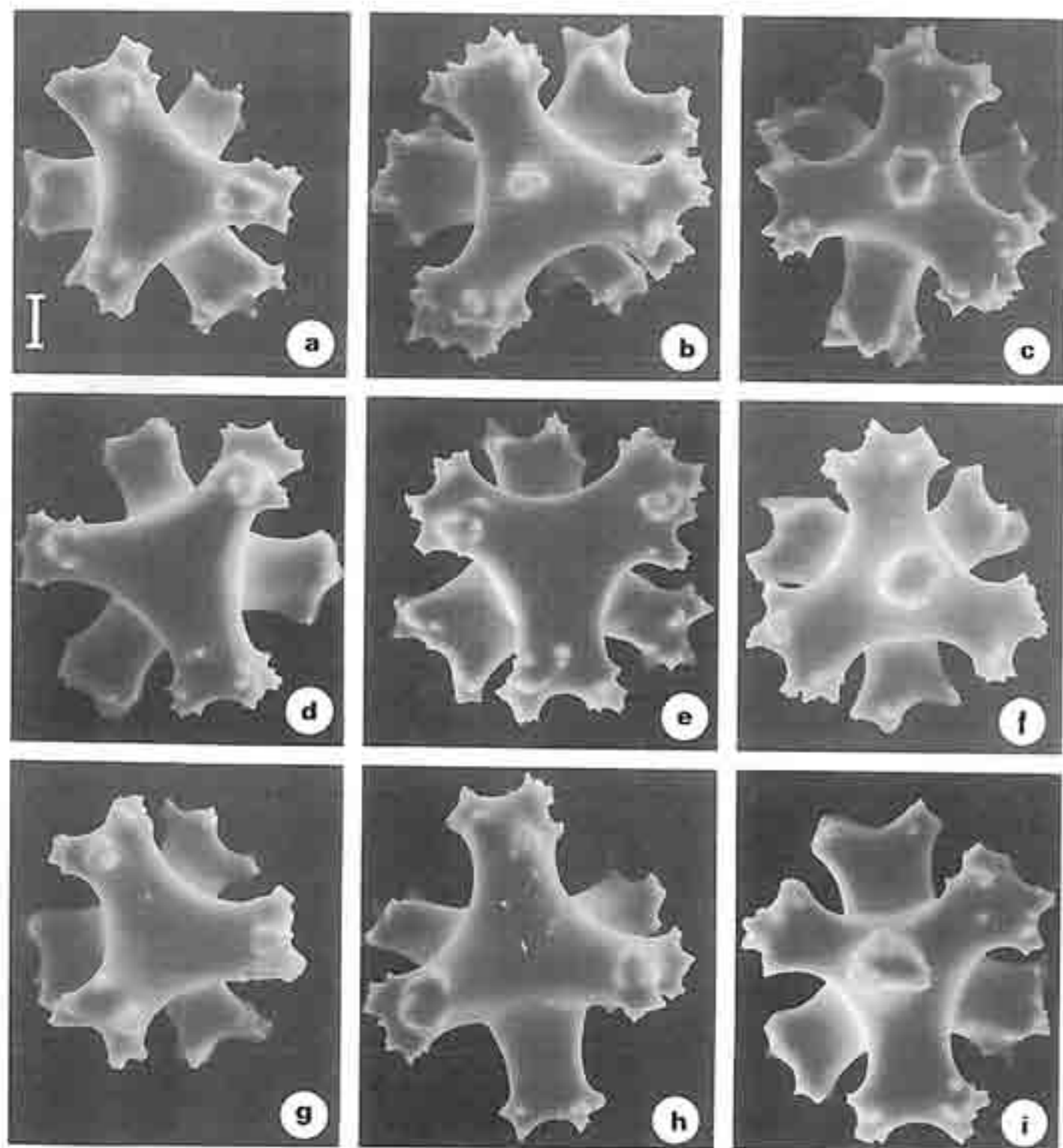


Figure 5. *Eleutherobia aurea* spec. nov., holotype (ZMTAU Co 28786); sclerites from the interior of the polyparium. Scale at 5a, 0.01 mm, applies to 5a-i.

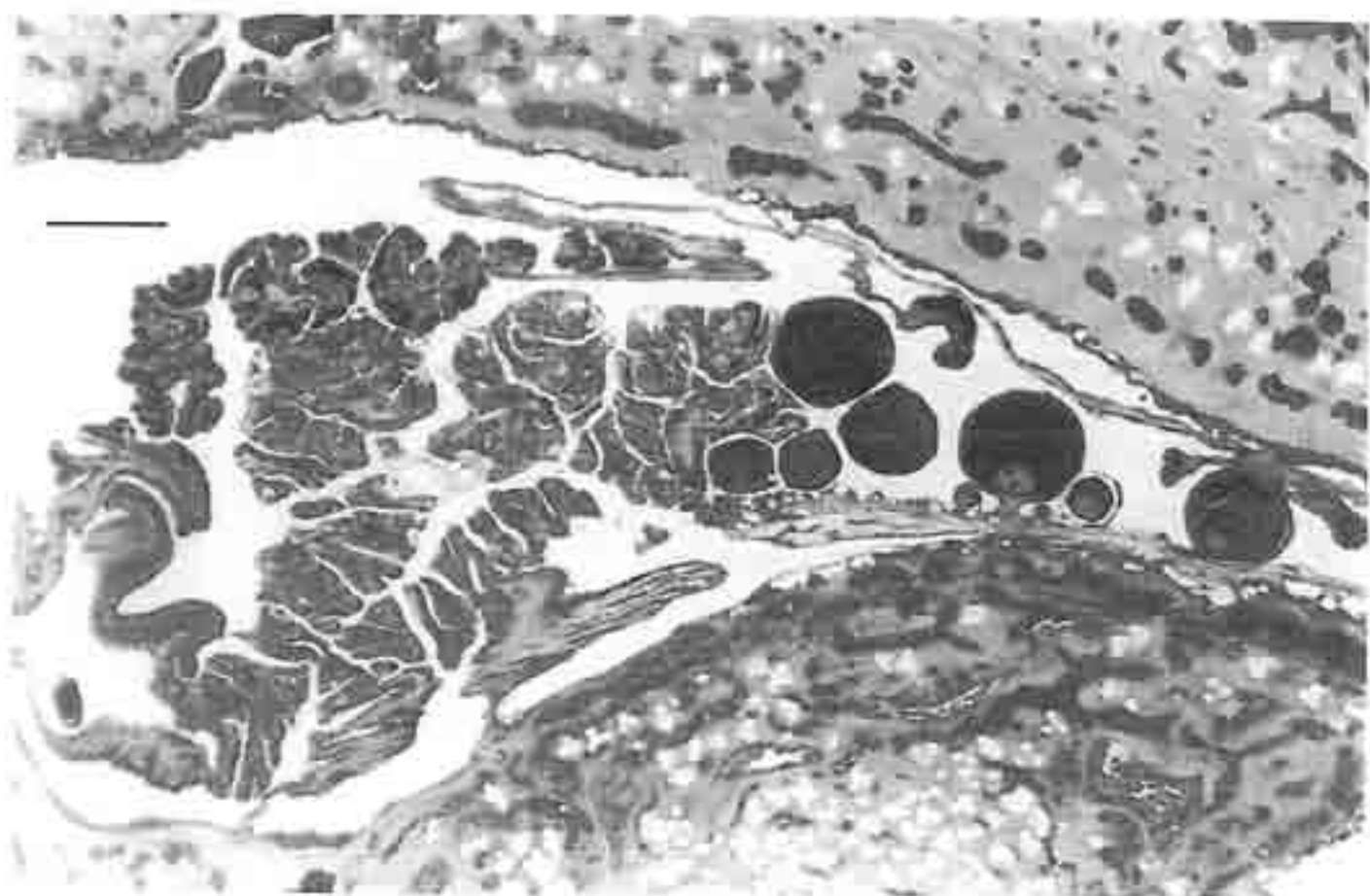


Figure 6. Histological section of *Eleutherobia aurea* spec. nov. with oocytes in the polyp cavity. Scale 200 μ m.

Etymology

The specific name *aurea* (Latin *aureum* = golden) refers to the colour of the colonies and their sclerites.

Distribution and habitat

E. aurea spec. nov. is found at 27 m and deeper on Sponge Reef, Sodwana Bay, where the relief of the reef is mostly flat. Light penetration is rather poor at this depth and zooxanthellate cnidarians, such as stony and soft corals, are thus scarce. The local fauna is composed mostly of diverse sponges with gorgonians, tunicates, antipatharians and azooxanthellate soft corals of the genus *Dendronephthya*. Colonies of *E. aurea* spec. nov. have been observed with their polyps fully expanded during the early morning hours at this locality (Frontispiece, Fig. 7a), while they are retracted later in the day (Fig. 7b).

Relative to Sodwana Bay, *E. aurea* spec. nov. is more abundant where it has been sampled further to the south. It has been observed in particular abundance at Aliwal Shoal (30°15'S; 30°50'E) near Park Rhyne, where it is also found under rocky overhangs. The turbidity on the reefs is greater at these southern localities and the polyps here are generally expanded throughout the day.

Discussion

The status of unbranched, truly digitiform to cylindrical soft corals with monomorphic polyps, has not yet been completely resolved. Within the family

Alcyoniidae, the genera *Bellonella* Gray, 1862, and *Eleutherobia* Pütter, 1900, have monomorphic polyps and are usually unbranched, finger-like colonies (Verseveldt & Bayer, 1988), while there are also several digitiform species in the genus *Alcyonium* Linnaeus, 1758 (Williams, 1992).

The diagnosis of the genus *Alcyonium* has been discussed and revised as a result of intensive octocoral surveys, mainly along the southern African coast (Williams, 1986a,b; 1988; Verseveldt & Williams, 1992; Verseveldt & Ofwegen, 1992). According to Williams (1992) its characteristics are:

"Colonial growth form highly variable: colony may be upright, with a definite basal stalk, and with a multi-lobed, digitate, capitate, digitiform, or disc-shaped polyparium; or colony prostrate, without a definite stalk, with a membranous to encrusting or globular polyparium. Polyps monomorphic. Sclerites are often tuberculate spindles; capstans, rods, clubs, and needles also common".

Verseveldt & Ofwegen (1992) changed the last line of a previous diagnosis of Williams (1986a) to read:

"Sclerites spindles, rods, clubs, capstans or irregular-shaped bodies".

These references describe the wide range of colony morphology and variation in sclerite shape found in this genus, which would strongly suggest that it is paraphyletic.

The material examined in this study possesses, amongst its sclerites, spheroids and ovals which are quite similar to those found in other southern African *Alcyonium*

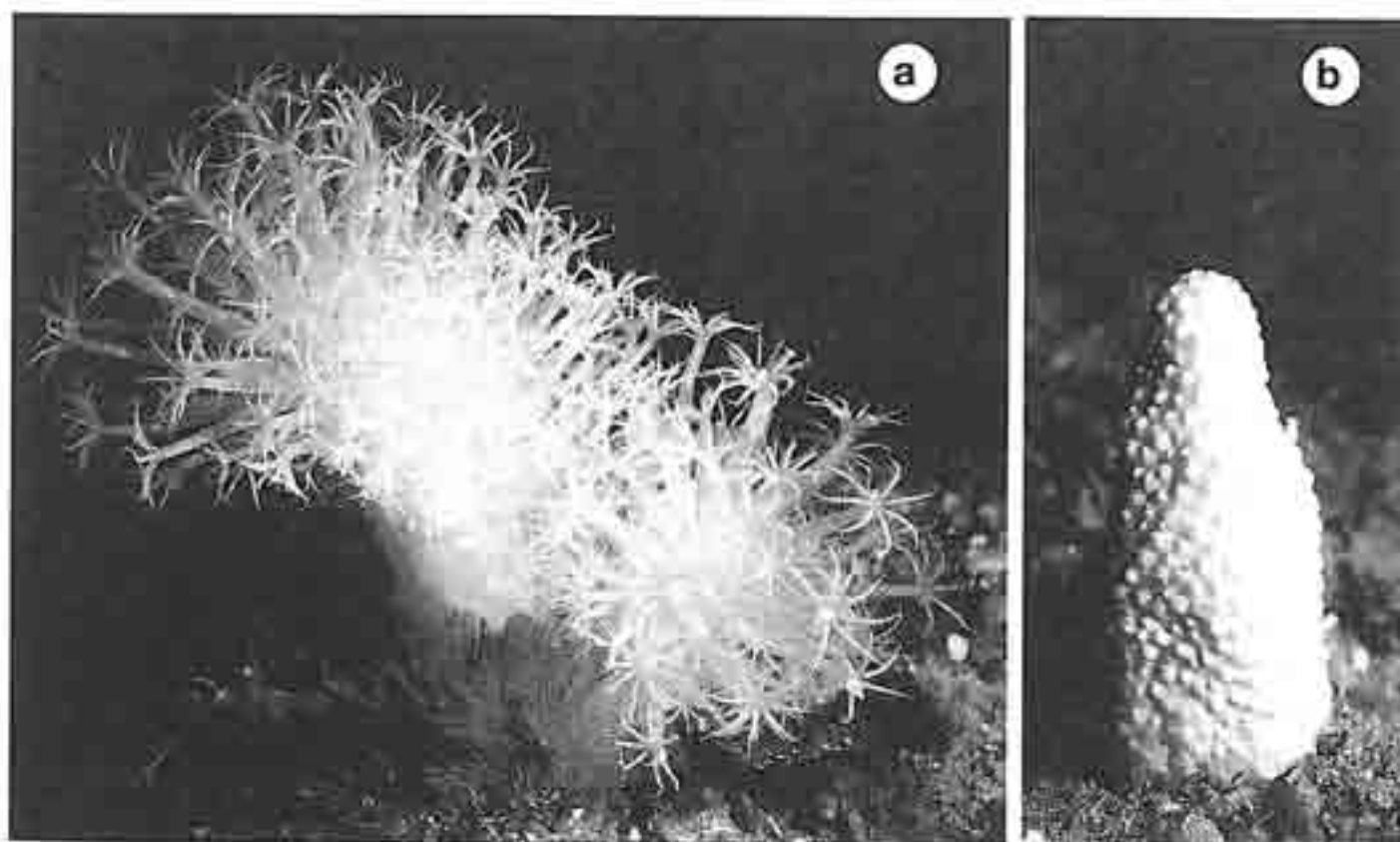


Figure 7. Colonies of *Eleutherobia aurea* spec. nov. in their natural habitat with a) polyps expanded and b) polyps retracted. The left hand specimen is unusual in that it is bi-lobed.

species, e.g. *A. distinctum* Williams, 1988; *A. foliatum* Thomson, 1921; *A. moriferum* (Tixier-Durivault, 1954), and *A. valdiviae* Kükenthal, 1906 (Williams, 1992). However, Williams (1992) examined ten southern African *Alcyonium* species and discussed six that have been described or recorded by others; none of these have the double deltoid sclerites found in *Eleutherobia aurea* spec. nov. (Fig. 5). The close resemblance in colony shape, colour and, in part, the sclerites of the present material to *A. moriferum* (Tixier-Durivault, 1954) even led us to examine specimens of the latter on loan from the South African Museum (SAM-H 1581, 3826, 3827) and Museum National d'Histoire Naturelle, Paris (MNHN afr. 1028; see Williams, 1992:284); no double deltoids were found in these specimens. It is concluded, therefore, that the establishment of a new species is justified owing to the presence of the remarkable double deltoid sclerites not found in any other soft coral. However, we refrained from assigning our material to the genus *Alcyonium* since a typical *Alcyonium* should, *sensu stricto*, be lobed or branched and possess interior sclerites in the form of spindles and rods as found, for example, in *A. digitatum* Linnaeus, 1758, *A. palmatum* Pallas, 1766 and *A. acaule* Marion, 1878.

The specimens examined in this study do not have the calyces characteristic of the genus *Bellonella*, nor again do they possess the spindles and/or club-shaped sclerites characteristic of this genus (Verseveldt & Bayer, 1988) and hence cannot be assigned to it.

The diagnosis of the genus *Eleutherobia* given by Verseveldt & Bayer (1988) is as follows:

"Alcyoniidae with cylindrical polyparium, rarely branched. Polyps monomorphic. Anthocodiae retractile within calyces. Sclerites of polyparium, calyces and stalk are eight-radiates, capstans and other double-heads, rarely tuberculate spheroids, all less than 0.15 mm in length or diameter; spindles and/or rods also present".

There is again so much variability that this genus is also likely to prove paraphyletic. Nevertheless, the colony shape and the sclerites of *E. aurea* are compatible with this diagnosis and only the absence of distinct calyces in some of our material is an issue. However, examination of photographs of the types of *Eleutherobia* species found in Verseveldt & Bayer's (1988) revision of the genus indicates that some species do possess calyces, e.g. *E. splendens* (Thomson & Dean, 1931), *ibid.* p.87, Fig. 18a, and *E. rigida* (Pütter, 1900), *ibid.* p.95, Fig. 26, while others only have low surface elevations, e.g. *E. flava* (Nutting, 1912), *ibid.* p.87, Fig. 18d, and *E. studeri* (Thomson, 1910), *ibid.* p.104, Fig. 36a, b. Furthermore, in their description of *E. grayi* (Thomson & Dean, 1931), Verseveldt & Bayer state that the calyces of one of their comparative specimens are so low that the surface of the polyparium appears almost smooth (*ibid.* p.34). Williams (1986a) earlier suggested that most digitiform species without permanent calyces should probably be assigned to the morphologically diverse genus *Alcyonium*. However, in view of the foregoing, it seems preferable to assign our material to the genus *Eleutherobia* at present.

Williams (1991) redescribed two *Eleutherobia* species in southern Africa: *E. rotifera* (Thomson, 1910) and *E. studeri* (Thomson, 1910). In addition, he considered a colony identified as *Alcyonium glomeratum* (Hassall, 1843) to be another undetermined species of *Eleutherobia*. *E. aurea* spec. nov. is thus the fourth southern African species to be assigned to this genus.

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