

**Morphology and Anatomy of *Spongites africanum* comb. nov.  
(Corallinaceae, Rhodophyta) from the Cape Verde Islands**

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12 Figures

Published information on the nongeniculate coralline algae (Corallinaceae, Rhodophyta) from the Cape Verde Islands is very scarce and limited to single records of occurrence (DICKIE 1874, 1877; ASKENASY 1896; FELDMANN 1946; PRUD'HOMME VAN REINE & LOBIN 1986) or description of new taxa (FOSLIE 1908). LEMOINE (1964) compiled data previously published and included new information from herbaria collections housed at Museum d'Histoire Naturelle of Paris. According to LEMOINE (1964) 31 species of nongeniculate coralline algae are present at this African archipelago. Nevertheless, many Cape Verdean species are poorly known and are in need of taxonomic revision.

In this article, *Spongites africanum* (FOSLIE) AFONSO-CARRILLO, CHACANA & SANSON comb.nov. is revised using recent taxonomic criteria (see PENROSE & WOELKERLING 1988; WOELKERLING 1988).

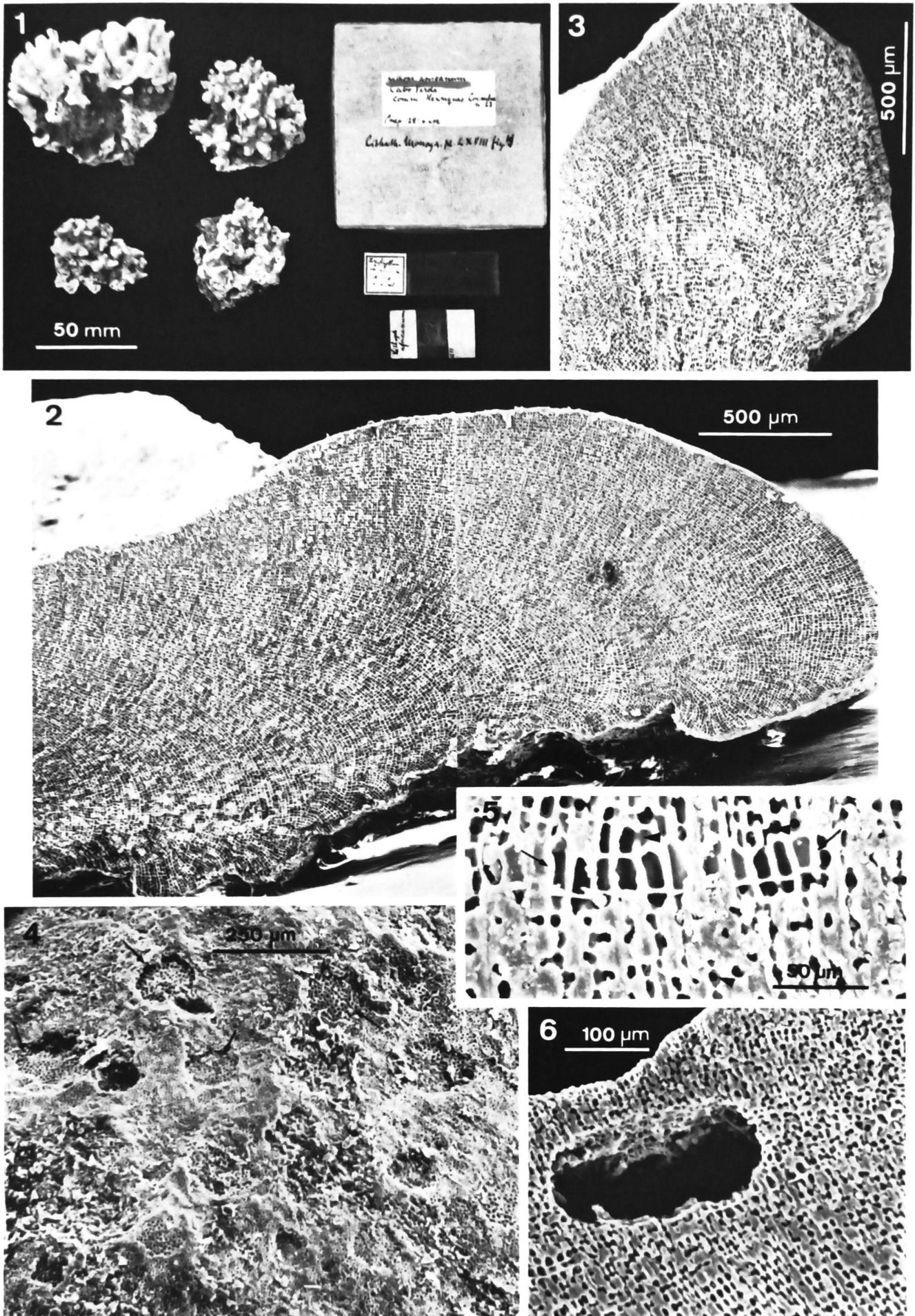
The species was described by FOSLIE (1900) as *Lithophyllum africanum* after plants from the West coast of Africa (Cape Verde, Senegal). It was then regarded as conspecific with *Lithophyllum proboscideum* FOSLIE from California (FOSLIE 1897). Later this species was transferred from FOSLIE (1909) to the genus *Porolithon* (FOSLIE) FOSLIE and has been recorded from other Eastern Atlantic localities: Morocco (LEMOINE 1911, 1924, 1964; HAMEL & LEMOINE

1953), Cape Verde Islands (LEMOINE 1911, 1964; ADEY & LEBEDNIK 1967), São Tomé (PILGER 1919; PRINTZ 1929; ADEY & LEBEDNIK 1967; STEENTOFT 1967; LAWSON & JOHN 1987) and Bioko and Cameroun (SCHMIDT & GERLOFF 1957; LAWSON & JOHN 1987). Erroneously, LEMOINE (1911) considered *Sporolithon africanum* (FOSLIE) AFONSO-CARRILLO (as *Archaeolithothamnium africanum* FOSLIE), a different species only reported from the Canary Islands, as conspecific with *Lithophyllum africanum* and included the Canary Islands in the distribution of this taxon (see LEMOINE 1929: 20). According to AFONSO-CARRILLO et al. (1985a) *L. africanum* has not been reported from the Canary Islands.

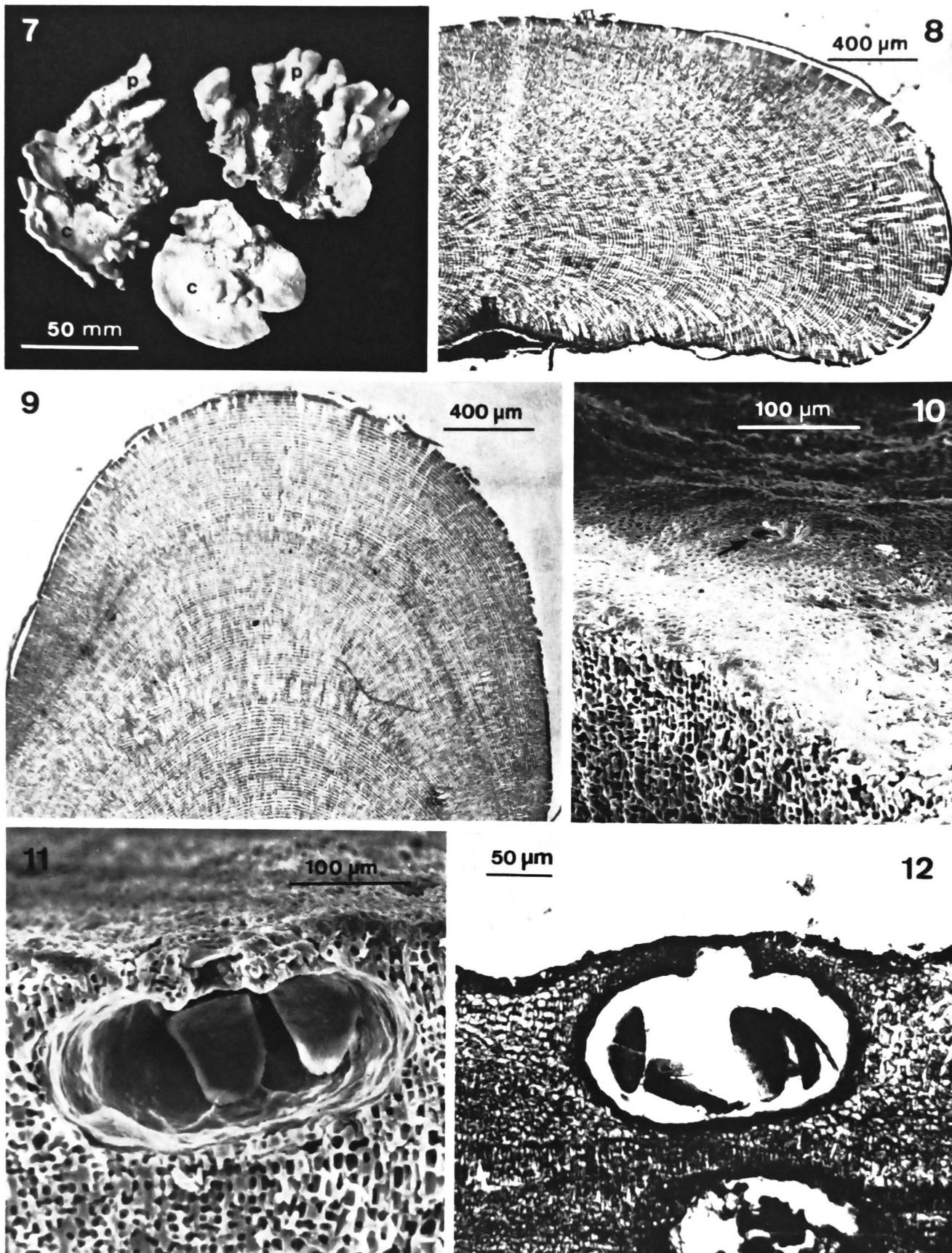
The present investigation was possible due to the new collection from the Cape Verde Islands. An investigation of the type material was undertaken with the purpose of adequately evaluating the characters of this taxon and to found the taxonomic implications of the findings.

**Materials and methods**

Data were obtained from plants collected in the Cape Verde Islands and deposited at TFC (Departamento de Biología Vegetal, Universidad de La Lagu-



Figs 1-6. Holotype of *Lithophyllum africanum*. - 1: Holotype collection from TRH. 2: Radial longitudinal fracture of the crust showing the lower portion occupied by a non-coaxial core of filaments. 3: Longitudinal frac-



Figs 7-12. *Spongites africanum* from the Cape Verde Islands (TFC Phyc 5294). - 7: Habit. Note crust (C) and protuberances (P). 8: Radial longitudinal section of the crust. 9: Longitudinal section of protuberance. 10: Surface view of a tetrasporangial conceptacle. Note the ostiole (arrow). 11 and 12: Longitudinal fracture and section of conceptacle showing tetrasporangia.

ture of protuberance showing a central core of non-coaxial filaments. 4: Thallus surface showing positions of groups of trichocytes (arrows). 5: Fracture of thallus showing a row of trichocytes (arrows). Note fusion (arrow heads) between cells of contiguous filaments. 6: Fracture of thallus showing an empty conceptacle.

na, Canary Islands) with the number 5294, and the type collection of *Lithophyllum africanum* housed at TRH (Trondheim, Norway). Anatomical studies were carried out on selected fragments fixed in 4% formalin in sea-water, decalcified in Perenyi's solution and embedded in paraffin. Sections, 8 µm thick, were cut and stained in Ehrlich's haematoxylin - eosine (AFONSO-CARRILLO et al. 1984).

Scanning electron microscopy procedures are outlined in AFONSO-CARRILLO et al. (1985b). Selected dried fragments were sectioned with a scalpel and rinsed under distilled water. After air drying, fragments were coated with gold and viewed in a Hitachi S-450 Stereoscan Microscope.

### Results and discussion

*Spongites africanum* (FOSLIE) AFONSO-CARRILLO, CHACANA & SANSON comb.nov.

Basionym: *Lithophyllum africanum* FOSLIE, K. Norsk. Vidensk. Selsk. Skr., 1900 (1): 1-6, 1900.

Syn.: *Porolithon africanum* (FOSLIE) FOSLIE, K. Norsk. Vidensk. Selsk. Skr., 1909 (2): 1-63.

Holotype: Cape Verde (Senegal), leg. HENRIQUES, without date.

Description of the holotype: The original collection (Fig. 1) consists of 4 fragments each composed of more or less subhemispherical masses of an extensive branched system of compressed and confluent protuberances arising from a comparatively inconspicuous crustose portion. The largest fragment is up to 90 mm long and 70 mm high; whilst the smallest is up to 50 mm long and 40 mm high.

The crustose base is anatomically organized in a dorsiventral manner and consists of numerous contiguous filaments derived from a unistratose meristem situated just beneath of the epithallium (Fig. 2). The lower portion is occupied by a non-coaxial core of filaments with cells 10-22 µm long and 5-10 µm diameter. Some filaments or their derivatives curve outwards to form a more peripheral dorsal region with shorter cells, 8-5 µm long and 4-5 µm diameter (Fig. 2). Adjacent filaments are interconnected with cell fusions (Fig. 5). Longitudinal fractures of protuberances (Fig. 3) show a central core of non-coaxial filaments whose distal portions curve towards the thallus surface. Cell dimensions are similar to those described for crustose base.

Trichocytes are abundant (Fig. 4), occurring in dense, more or less circular groups which apparently became buried as the thallus grew. In fractures through the thallus (Fig. 5), trichocytes appeared to occur in distinct horizontal rows and are distinguished from other cells by their larger size (15-24 µm long and 10-24 µm diameter). Only one empty uniporate conceptacle, which has a chamber 216 µm in diameter, 86 µm high and a roof containing ca. 8 layers of cells, was seen (Fig. 6).

Cape Verde Islands plants: *Spongites africanum* is common in the lower intertidal zone of Caleta Mosquitos (Santiago) forming adjacent subhemispherical masses. Individual plants consist of crustose base, 1-3 mm thick, irregular or with various individual lobate or fan-shaped expansions largely free from the substrate up to 40 mm long, with non attenuate margins; and erect protuberances compressed, rarely subterete,

3-7 mm thick and up to 60 mm high (Fig.7). Protuberances are firstly simple, short and wart-like, and later branched, palmate and variously anastomosing, with obtuse apices (Fig. 7).

Crustose base and protuberances show a vegetative anatomy and cell dimensions similar to previously described in the holotype (Figs. 8, 9). Uniporate tetrasporangial conceptacles are common on the dorsal surface of crustose base and laterally on the protuberances. Conceptacles are flat or with a convex roof protruding only slightly above the surrounding thallus surface (Fig. 10). In section, tetrasporangial conceptacles measure 192-264 µm in diameter by 84-120 µm high; the chamber is more or less ovoid with a pronounced ostiole (Figs. 11, 12). 6-8 layers of cells are present in the conceptacle roof. Ostioles are 30-60 µm in diameter with a more or less long canal (36-72 µm) that projects into the interior of the surrounding cells. Tetrasporangia, 72-96 µm long by 30-67 µm in diameter, devoid of apical plug. Columella occasionally observed.

Gametangial plants not observed.

Three of the five characters used by PENROSE & WOELKERLING (1988) to circumscribe *Spongites* KÜTZING are present in the holotype of *Lithophyllum africanum*:

- a) cells of contiguous filaments interconnected by cell fusions;
- b) thallus composed of numerous layers of cells and normally over 200 µm thick;
- c) thallus devoid of a coaxial core of filaments.

Uniporate tetrasporangial conceptacles and tetrasporangia devoid of apical plugs, are the only characters not apparent in the holotype. Nevertheless, these characters are evident in the material examined from the Cape Verde Islands and permits the inclusion of this taxon in the genera *Spongites*.

The relationships of *S. africanum* to other species of the genus remain uncertain. *S. africanum* may be related with others *Spongites* species, assigned by FOSLIE (1909) to *Porolithon* (FOSLIE) FOSLIE, characterized by present erect protuberances and fields of trichocytes, at least in sporangial plants. *P. antillarum* (FOSLIE & HOWE) FOSLIE, *P. aequinoctiale* (FOSLIE) FOSLIE, *P. coartatum* (FOSLIE) FOSLIE, *P. gardineri* (FOSLIE) FOSLIE, *P. sandvicense* (FOSLIE) FOSLIE and *P. praetextatum* (FOSLIE) FOSLIE belong to this group. Nevertheless, until comparative studies of all type collections are undertaken, the relationships of *S. africanum* to these taxa are not clear.

### Summary

On the basis of critical studies on the morphology and anatomy of the holotype collection and new material from the Cape Verde Islands, *Lithophyllum africanum* FOSLIE [= *Porolithon africanum* (FOSLIE) FOSLIE] is transferred to the genus *Spongites* KÜTZING. Plants of *Spongites africanum* (FOSLIE) AFONSO-CARRILLO, CHACANA & SANSON comb. nov. form subhemispherical masses, about 10 cm diameter, with a crustose portion and numerous compressed and confluent erect protuberances. Three of the five characters used to circumscribe *Spongites* are present in the holotype of *Lithophyllum africanum*: cells of contigu-

ous filaments interconnected by cell fusions, thallus composed of numerous layers of cells and normally over 200 µm thick and thallus devoid of a coaxial core of filaments. Uniporate tetrasporangial conceptacles and tetrasporangia devoid of apical plugs, are the only characters not apparent in the holotype, but its are evident in the material examined from the Cape Verde Islands.

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