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Morphology and Anatomy of *Mesophyllum canariense* (Corallinaceae, Rhodophyta) from the Canary Islands

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Recently, WOELKERLING (1988) has provided a taxonomic and nomenclatural analysis of the genera and subfamilies of nongeniculate Corallinaceae (Rhodophyta) furnishing a database for future research.

WOELKERLING (1988: 224) includes among the researchs that could lead to a better understanding of the taxonomy of coralline, the "studies and reassessment of type collections of species with a view towards clarifying and stabilizing the application of specific epithets to nongeniculate corallines".

At least 16 specific taxa of coralline algae were described from plants collected in the Canary Islands:

Archaeolithothamnion africanum FOSLIE 1906
Corallina lobata (LAMOUROUX 1816)
Goniolithon orotavicum (FOSLIE 1906)
Litholepis sauvageaui (FOSLIE 1905)
Lithothamnion canariense FOSLIE 1906
L. bisporum (FOSLIE 1906)
Lithophyllum hirtum (LEMOINE 1929)
L. applicatum (LEMOINE 1929)
L. lobatum (LEMOINE 1929)
L. oligocarpum (FOSLIE 1906)
L. vickersiae (LEMOINE 1929)
L. illitus (LEMOINE 1929)
L. (Dermatolithon) geometricum (LEMOINE 1929)
Pseudolithophyllum esperi (LEMOINE 1929)
Spongites wildpretii (AFONSO-CARRILLO 1988)
Tenarea adhaerens (LEMOINE 1929)

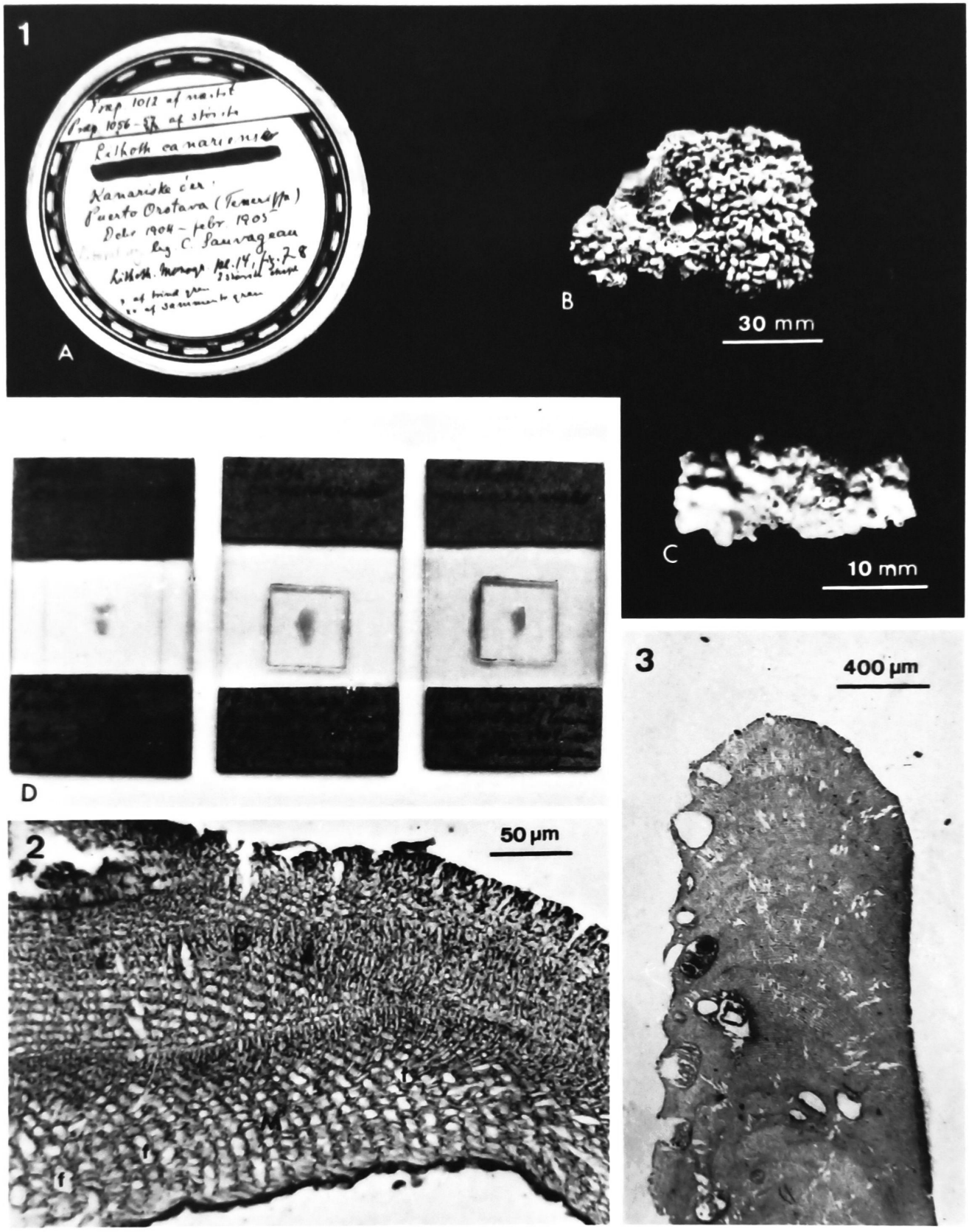
At the moment, detailled information about some of these type collections have not been published. In this work, the type collection of *Lithothamnion canariense* and new material from the Canary Islands are examined in the light of recent taxonomic criteria.

Lithothamnion canariense was described by FOSLIE (1906) from plants collected by SAUVAGEAU at Puerto Orotava (now Puerto de la Cruz) in Tenerife (Canary Islands). LEMOINE (1928) transferred this species to *Mesophyllum* LEMOINE where it remains until today.

MAY (1912) collected this species (as *Lithothamnion canaricae*) in La Gomera (Canary Islands) and LEMOINE (1929) recorded it from the type locality and from Playa de las Canteras and Bahía del Confital, Gran Canaria. Later it has been found also outside the Canary Islands, from São Tomé and Gulf of Guinea (STEENTOFT 1967; ADEY & LEBEDINK 1967; LAWSON & JOHN 1987), from Japan (MASAKI 1968) and from Madeira (LEVRING 1974).

Materials and methods

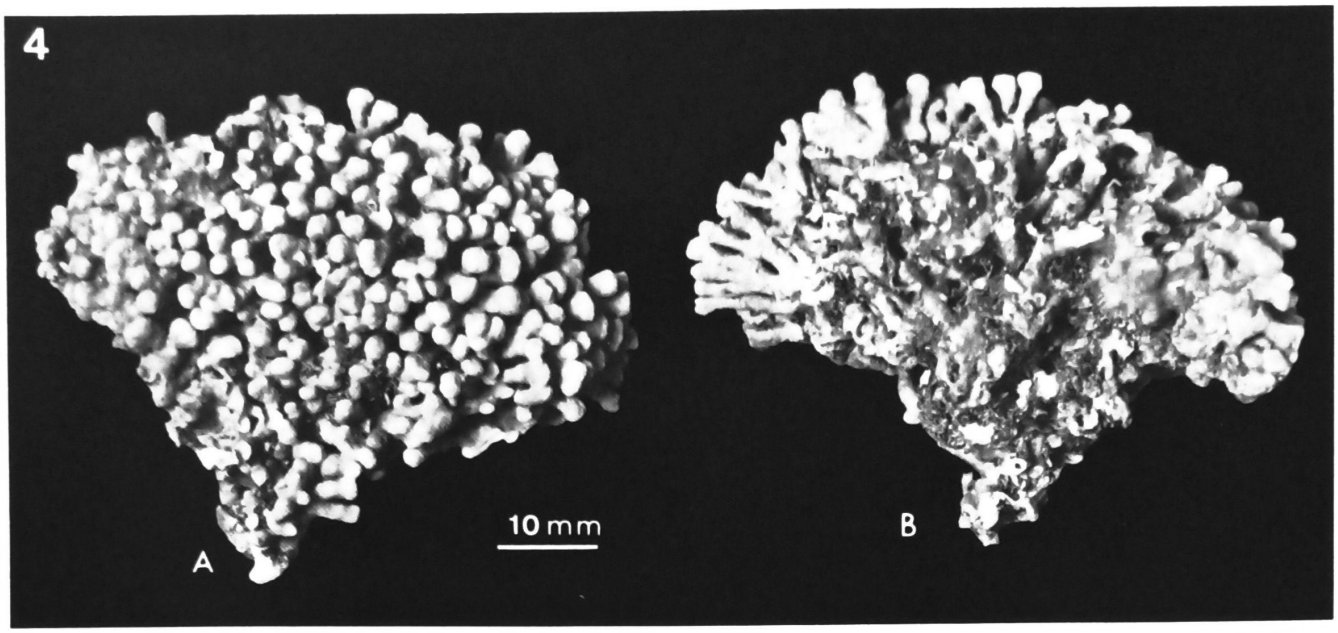
Data were obtained from the type specimen of *Lithothamnion canariense* at TRH (Trondheim, Norway) and from plants collected in the Canary Islands and deposited at TFC (phyc. No. 5253 & 5631).



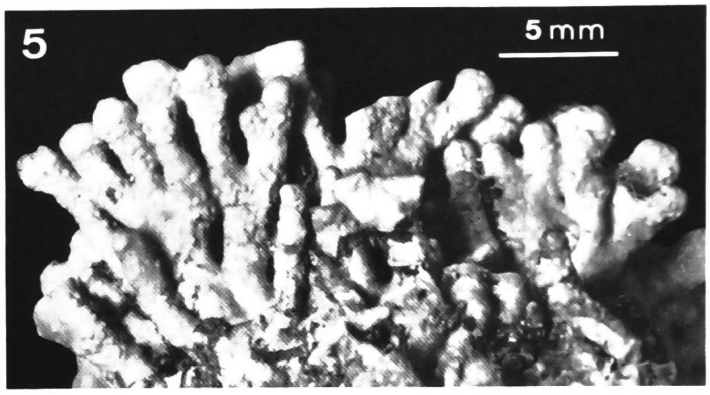
Figs 1-3. Holotype of *Lithothamnion canariense*. - 1: Holotype collection from TRH, showing box (A), specimens (B and C) and slides prepared by FOSLIE (D). - 2: Radial longitudinal section of the crust showing a coaxial region (M) and dorsal non-coaxial region (D). Note fusion (f) between cells of contiguous filaments. 3: Longitudinal section of protuberance showing cells of core stratified in irregular flabellate layers and several sporangial conceptacles.

▶

Figs 4-7. *Mesophyllum canariense*. - 4: Upper (A) and lower (B) views of TFC Phyc 5631. - 5: Group of branched protuberances. - 6: Surface view of a protuberance showing numerous sporangial conceptacles. - 7: Longitudinal fracture of protuberance showing a central core of filaments with cells stratified in flabellate layers of tissue. Note the different orientation of filaments.


4
10 mm
A
B


6
1 mm


5
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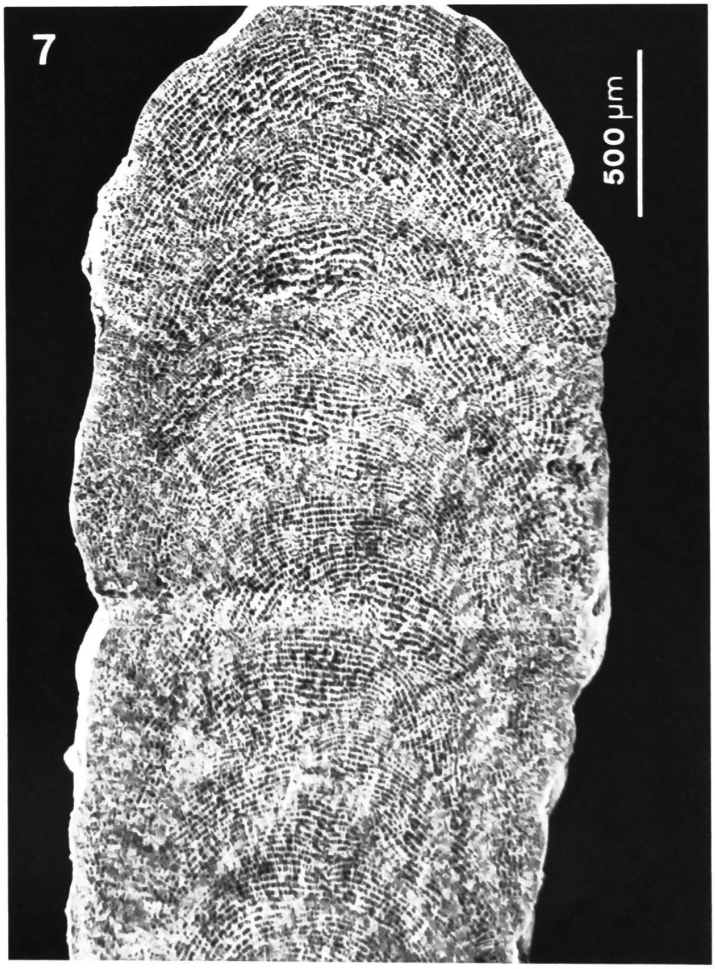
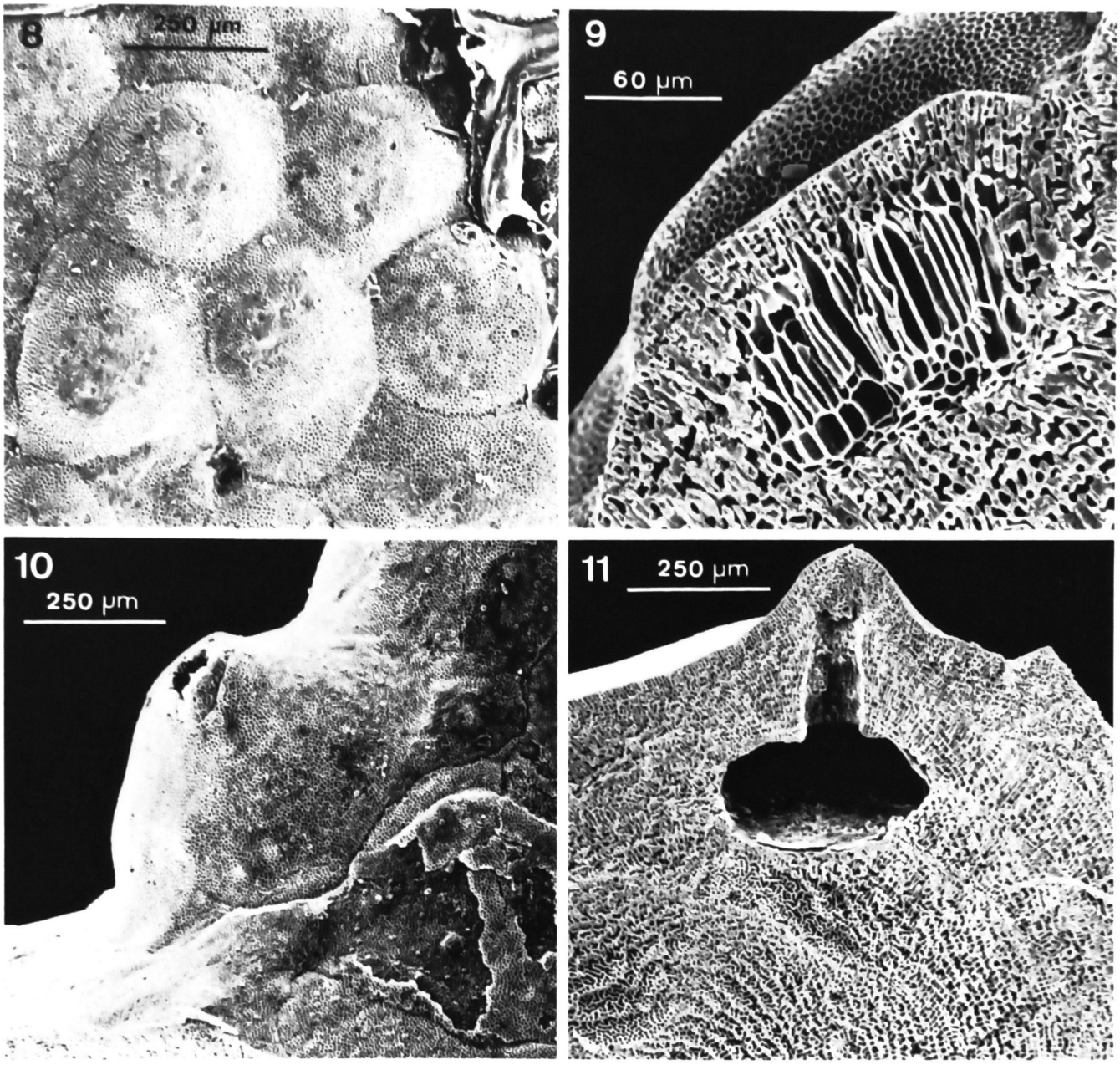

7
500 µm



Figs 8-11. Sporangial and carposporangial conceptacles of *Mesophyllum canariense*. - 8: Surface view of several multiporate sporangial conceptacles (TFC Phyc 5631). - 9: Longitudinal fracture of a sporangial conceptacle with chamber filled with sterile filaments (TFC Phyc 5631). - 10: Surface view of carposporangial conceptacle (TFC Phyc 5253). - 11: Longitudinal fracture of carposporangial conceptacle (TFC Phyc 5253).

Anatomical studies were carried out on selected fragments rehydrated over a long period in 4% formalin in sea-water, decalcified in PERENYI's solution and embedded in paraffin. Sections, 8 µm thick, were cut and stained in ERHLICH's haematoxylin - eosine (AFONSO-CARRILLO et al. 1984). Scanning electron microscopy procedures are outligned in AFONSO-CARRILLO et al. (1985). 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

Holotype:

The original collection of *Lithothamnion canariense* (Fig. 1) consists of two irregularly shaped cushion-like clumps of a crustose portion up to 0.5 mm in diameter and numerous erect protuberances 1.5-2 mm in diameter and up to 5 mm high. The plants are firmly attached to a conglomerate of tubes of worms and crustose corallines. Protuberances are simple or irregularly dichotomously divided, sometimes anastomosed, subcylindric or compressed. Groups of con-

vex multiporated sporangial conceptacles are common on the surface of protuberances. Carposporangial conceptacles are conical and less numerous.

Portions of the holotype examined (Figs 2-3) are densely pseudoparenquimatous, but individual filaments are usually discernible. The crustose base is organized in a dorsiventrally manner (Fig. 2) and composed of a core of coaxial filaments, with cells 10-17 (25) µm long and 5-10 µm diameter, and a dorsal region with shorter cells (6-12 µm long and 3-8 µm diameter). Epithallial cells are up to 3 µm high and up to 7 µm diameter, but generally are no well preserved. Cell fusions are common. Longitudinal sections of protuberances (Fig. 3) show a central core of filaments whose distal portions curve towards the thallus surface. Cells of core are stratified in irregular flabellate layers of tissue (Fig. 3) and cells show similar dimensions to those described for the dorsal region of crustose base (8-12 µm long and 4-8 µm diameter). Several sporangial conceptacles (Fig. 3) with chambers up to 350 µm in diameter, 90-110 µm high, and containing tetrasporangia (60-90 µm long and 25-50 µm diameter) were found. Carposporangial conceptacles were not sectioned.

Fresh Material from Canary Islands:

The plants collected recently form cushion-like clumps (Figs 4-5) to about 15 cm in diameter and 1.5-3 cm high. They consist of an extensive branched system of protuberances arising from an inconspicuous crustose portion. Protuberances (Figs 5-6) are subterete or subcompressed, 1-2.5(3) mm diameter, sometimes simple or more often dichotomously divided, usually anastomosing at the middle portion forming palmate or irregular groups of protuberances, and with flat, inflated, rounded or obtuse apices.

The longitudinal fractures of protuberances examined (Fig. 7) show a central core of filaments with cells stratified in flabellate layers of tissue as result of a different orientation of filaments. This stratification of distinctly oriented filaments may be correlated with different growth phases. Tetrasporangial conceptacles are multiporate and occur singly or in scattered groups on the surface of protuberances (Figs 5 and 8). Conceptacle roof protrude conspicuously above the thallus surface, and are more or less domoid or somewhat flat-topped (Fig. 8). The fractures of tetrasporangial conceptacle examined (Fig. 9) were filled with sterile filaments. Carposporangial conceptacles are conical (Fig. 10) with a chamber up to 370 µm diameter and 160-200 µm high. Ostioles are 80-100 µm in diameter with a long canal (250-340 µm). Spermatangial conceptacles were not observed.

The holotype of *Mesophyllum canariense* and the new material studied almost certainly belong to the genus *Mesophyllum* as currently delineated by WOELKERLING & IRVINE (1986). Plants studied are non-geniculate; possess a core tissue distinctly coaxial when seen in radial longitudinal section of crusts; have fusions (not secondary pits) between cells of contiguous filaments; and have multiporate tetrasporangial conceptacles.

The relationships of *M. canariense* to other in the genus *Mesophyllum* remain uncertain. According to WOELKERLING & IRVINE (1986) at least 142 taxa have been referred to *Mesophyllum* since LEMOINE established the genus in 1928. *M. canariense* may be related to others species of *Mesophyllum* characterized also by the presence of erect protuberances. Moreover, the anatomical characters of protuberances previously described are not exclusives of *M. canariense*. A similar vegetative anatomy of protuberances have been reported by WEBER VAN BOSSE & FOSLIE (1904) in *M. erubescens* (FOSLIE) LEMOINE (as *Lithothamnion erubescens*) and by LEMOINE (1929: 34) in *M. incertum* (FOSLIE) LEMOINE. Further studies of these taxa, including relevant type collections are now in progress to determine more precisely these relationships.

Summary

Lithothamnion canariense was described by FOSLIE (1906) from plants collected by SAUVAGEAU at Tenerife (Canary Islands). LEMOINE (1928) transferred this species to the genus *Mesophyllum* LEMOINE.

In this work, the type collection of *L. canariense* and new material from the Canary Islands are examined in the light of recent taxonomic critera. The plants studied are non-geniculate; possess a core tissue distinctly coaxial; have fusions between cells of contiguous filaments; have multiporate tetrasporangial conceptacles; and certainly belong to the genus *Mesophyllum* as currently delineated by WOELKERLING & IRVINE (1986).

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