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Early Tertiary Coralline Algae from Trinidad, British West Indies

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With 3 plates (VII-IX)

Abstract

A small collection of Early Tertiary limestone specimens from the Island of Trinidad contained 14 species of coralline algae. These were distributed among the genera *Archaeolithothamnium* (1), *Lithothamnium* (8), *Lithophyllum* (2), *Dermatolithon* (1), *Lithoporella* (1), and *Corallina* (1). Four new species are described: *Lithothamnium trinidadensum*, *Lithothamnium gaschei*, *Lithothamnium perplexum*, *Lithophyllum kugleri*, and *Dermatolithon eoceneum*.

Introduction

This study is based on a small collection of specimens sent to the writer by Dr. E. GASCHE of the Natural History Museum of Basle, Switzerland, and some material collected by Dr. H. G. KUGLER from the Morne Diablo Quarry, all from the Island of Trinidad, British West Indies.

The limestones are well consolidated and take a high polish. Specimens show an algal content ranging from 7 to 52 percent of the rock volume. The algae described consist largely of encrusting coralline algae which may occur either as coatings on large Foraminifera and other fossils, or as nodular masses or irregular crusts. Two branching types occur with them.

Thanks are due to Dr. GASCHE for supplying the specimens and for his courtesy and patience. The Colorado School of Mines supplied laboratory facilities and supplies. Dr. I. A. MACKAY assisted in some of the laboratory work.

The specimens described and illustrated are in the collections of the Natural History Museum of Basle, Switzerland.

Systematic Descriptions

All of the algae studied belong to the red algae and the family *Corallinaceae*. The basic classification of this group is shown in the table below.

Genus *Archaeolithothamnium* (ROTHPLETZ) FOSLIE

The thallus contains both hypothallic and perithallic tissue. The basal hypothallus consists of curved rows of cells. The perithallus usually consists of neatly

arranged rectangular cells. The sporangia are not collected in conceptacles but occur in lenses or layers in the perithallic tissue.

Family <i>Corallinaceae</i>	
Divisions	Genera
Crustose Corallines	<i>Archaeolithothamnium</i> <i>Lithothamnium</i> <i>Mesophyllum</i> <i>Lithophyllum</i> <i>Lithoporella</i> <i>Dermatolithon</i>
Articulated Corallines	<i>Amphiroa</i> <i>Corallina</i> <i>Jania</i>

This genus was widely distributed in the warmer Eocene seas where a large variety of species developed. It is abundantly represented in most of the Eocene floras studied by the writer. Hence, it is surprising to find only one specimen in the Trinidad collection.

Archaeolithothamnium cf. *lugeoni* PFENDER
(Pl. VII, fig. 2)

Archaeolithothamnium lugeoni PFENDER. – PFENDER, 1926, Bol. Real. Soc. Esp. Hist. Nat. 26, 321, pl. 9.

Archaeolithothamnium lugeoni PFENDER. – LEMOINE, 1939, Mat. Carte Géol. Algérie, 1^e sér., no. 9, 52.

Description:—Thallus forms a thin irregular crust 1 to 3 mm thick with warty protuberances issuing 2 to 3 mm above the general level. Several thalli may grow superimposed. Hypothallus thin, consisting of only 2 to 4 curved rows of cells not too clearly discernable. The cells measure approximately 15–22 μ long, 11–14 μ wide. Perithallic tissue has well defined vertical cell rows with poorly developed horizontal partitions. Cell rows 11–14 μ wide. Cells appear to be about 10–13 μ high. Sporangia oval to cylindrical with rounded ends, measuring 40–60 μ high and 27–40 μ in diameter.

Remarks:—The single Trinidad specimen observed closely fits the material described by Lemoine from Algeria which she referred to *A. lugeoni*. Our specimen agrees in cell dimensions with PFENDER's material from the Eocene of Spain but differs in having a poorly developed hypothallus (PFENDER's specimen had a thick, well developed basal hypothallus), and in having smaller sporangia.

Figured slide A 388c. Locality: Mejias Quarry.

Genus *Lithothamnium* PHILIPPI

A common and widespread genus characterized by tissue containing both hypothallus and perithallus and by having conceptacles of sporangia with several, to many, pores in the roof. Normally, the hypothallus consists of curved rows of cells.

In the perithallus the cells tend to be arranged in more pronounced vertical rows than in horizontal layers. The majority of the algae in the Trinidad collection belonged to this genus, both in number of specimens and variety of species.

Lithothamnium cf. *aggregatum* LEMOINE

(Pl. VII, fig. 1)

Lithothamnium aggregatum LEMOINE. — LEMOINE, 1939, Mat. Carte Géol. Algérie, 1^e sér., no. 9, 66–67, pl. 1, fig. 12, pl. 3, figs. 3–4.

Description:—Thallus thin, crustose 3 to 6 mm thick. A number of superimposed thalli may develop an irregular crust or nodular mass. Hypothallus 80 to 125 μ thick, consists of curved rows of cells 10–14 \times 15–21 μ . Perithallus 265 to 500 μ thick, of regular rows of rectangular cells 15–29 \times 12–16 μ . Conceptacle chambers 25 to 400 μ in diameter and 90–100 μ high.

Remarks:—This is one of the most abundant forms present in the limestones studied. In growth habit, in appearance of the tissue and in cell dimensions, this form closely agrees with the species originally described by Lemoine from the Oligocene of Algeria, except that the conceptacles are slightly smaller. It resembles *L. laminosum* HOWE from the Eocene of California in general appearance and growth habit but has appreciably larger cells and a better developed hypothallus.

Figured slide A 387a, also on sl. A 388b. Locality: Mejias Quarry.

Lithothamnium cf. *bofilli* LEMOINE

(Pl. VII, fig. 3)

Lithothamnium bofilli LEM. — LEMOINE, 1928, Bull. Inst. Cat. Hist. Nat. Ser. 2, 8, no. 5–6, 96, fig. 5–6.

Lithothamnium bofilli LEM. — LEMOINE, 1939, Mat. Carte Géol. Algérie, 1^e sér., no. 9, 70.

Description:—Thallus crustose with small nodes or branches, irregular, ranging in thickness from 2–5 mm thick. Superimposed thalli form rounded nodules or balls several centimeters in diameter. Branches 2–3.5 mm high. Hypothallus 1 to 1.5 mm thick, of curved rows of rectangular cells which measure 14–17 \times 8–10 μ . Perithallus quite regular with well defined horizontal and vertical cell rows. Cells rectangular 8–9 \times 9–11 μ . The branchlets are of perithallic tissue; they show well developed vertical cell rows with cells becoming longer than in the perithallus of the crust. Conceptacles not present.

Remarks:—The specimens studied closely conform with the descriptions of the species given by Lemoine from the Eocene of Algeria and Spain except that the tissue is more regular and the noticeable growth zones mentioned by Lemoine are not present. The short, sharp branches seem to be a structure characteristic of the species. Observed on several specimens.

Figured slide A 389a. Locality: Vista Bella Quarry.

Lithothamnium perplexum n. sp.

(Pl. VIII, fig. 2)

Description:—Thallus forms a thin irregular crust 2–3 mm thick. A number may grow superimposed. Hypothallus thin, consisting of only a few layers of cells.

It was probably slightly calcified as it is poorly preserved. Perithallus composed of irregular horizontal layers of rectangular cells which vary considerably in size, even in the same layers. Commonly, the lower layers contain the largest cells, with progressively smaller ones in higher layers. Cells measure 18–48 μ high. No conceptacles observed.

Remarks:—This species is characterized by the poorly developed hypothallus, irregular perithallus and the large size attained by some of the perithallic cells. A number of specimens were observed in the collection.

Type slide A 388a. Locality: Mejias Quarry.

Lithothamnium cf. laminosum HOWE

(Pl. VII, fig. 4)

Lithothamnium laminosum HOWE. — HOWE, 1934, Geol. Soc. America, Bull. 45, 513, pl. 55.

Description:—Thin, irregular crusts 1–2.1 mm thick. Grow superimposed, or on other algae. Hypothallus thin, poorly calcified, hence, poorly preserved. Formed of indistinct curved rows of rounded cells approximately 9–20 \times 6–11 μ . Perithallus has well defined layers of rectangular cells 13–22 \times 9–12 μ . Commonly, perithallus is only 4–8 layers thick. Conceptacles 200–335 μ in diameter and 90–110 μ high.

Remarks:—Observed on a number of slides. In general appearance and growth habit this form closely resembles *L. laminosum* HOWE described from the Eocene of California. It differs in having more pronounced horizontal cell rows in the perithallus. The conceptacles of the California species are unknown.

Figured slide A 385c. Locality: Mejias Quarry.

Lithothamnium trinidadensum n. sp.

(Pl. VII, fig. 5)

Description:—Thallus forms a thin undulating crust from 2–6 mm thick. The hypothallus is not strongly developed and probably was poorly calcified. It is formed of irregular curved rows of cells. Thickness of hypothallus 1–1.5 mm. Hypothallic cells ovoid to rectangular with rounded corners, size 8–17 \times 9–12 μ . The perithallus comprises most of the crust. It is formed of rectangular cells in well defined vertical rows and regular horizontal layers in much of the tissue. Cells measure 9–15 \times 9–11 μ . Conceptacle chambers 270–330 μ in diameter and 150–165 μ high, with evidence of numerous roof pores.

Remarks:—This species is closely related to *L. cantabricum* LEMOINE from the lower Eocene of Spain. It closely resembles it in growth habit and cell size, but differs in having a better developed hypothallus and shorter cells. The conceptacles of *L. cantabricum* are not known so it seems desirable to consider the Trinidad material as a new species.

Type slide A 383b. Locality: Rock Penal Road.

Lithothamnium cf. moreti LEMOINE

(Pl. VIII, fig. 1)

Lithothamnium moreti LEMOINE. — LEMOINE, 1928, Bull. Mus. Hist. Nat. 33, 547, fig. 2.

Lithothamnium moreti LEMOINE. — LEMOINE, 1939, Mat. Carte géol. Algérie, 1^e sér., no. 9, 71, pl. 2, figs. 1–3, 10–14.

Description:—Thalli develop crusts with warty protuberances or even short stubby branches. Hypothallus slightly to moderately developed – sometimes 75 to 125 μ thick; composed of curved rows of cells $9-20 \times 9-14 \mu$. Perithallus of fairly well defined vertical rows of rectangular cells. Perithallic cells $9-13 \times 9-13$ (19) μ . Conceptacle chambers relatively high compared to the width; 250–360 μ in diameter and 200–280 μ high.

Remarks:—In general appearance, growth habit, and size of conceptacles, this form agrees with material described by Lemoine from southern France and Algeria. It differs in having slightly larger cells as Lemoine specimens have perithallic cells of $5-12 \times 5-10 \mu$.

Figured slide A 387d and also on sl. A 384a. Localities: Mejias Quarry, Moruga and Herrera Rock Road.

Lithothamnium gaschei n. sp.

(Pl. VIII, figs. 3–4)

Description:—A strongly branching form. It is represented in the Trinidad collection by only a few pieces of branches, so it is uncertain whether the plant developed as a small crust with branches or as a loose branching mass. Diameter of branches 2.0–2.8 mm; length 3.0–4.7 mm. The tissue of the branches shows well developed irregular growth zones. The cells are in well defined vertical rows. Cells measure $17-21 \times 10-12 \mu$. Conceptacle chambers 223–310 μ in diameter; 100–110 μ high.

Remarks:—No lower Tertiary species of *Lithothamnium* have been described from the Americas which closely resemble this form. The nearest recorded species is *L. faurai* LEMOINE from the Eocene of Spain, southern France, and Algeria. However, *L. gaschei* differs from *L. faurai* considerably in cell dimensions and size of conceptacles. It also shows more strongly developed growth zones.

Type slide A 385b. Locality: Mejias Quarry.

Lithothamnium faurai LEMOINE

(Pl. IX, figs. 4–5)

Lithothamnium faurai LEMOINE. — LEMOINE, 1928, Bull. Mus. Hist. Nat. 33, 548.

Lithothamnium faurai LEMOINE. — LEMOINE, 1939, Mat. Carte géol. Algérie, 1^e sér., no. 9, 74, figs. 36–37.

Description:—Fragments of branches 1–1.5 mm in diameter. Most of the branch consists of curved rows of rectangular cells ranging in length from 12–34 μ with widths from 10–17 μ . The tissue shows slight suggestions of growth zones. A conceptacle present has a diameter of 280 μ and a height of 99 μ . It contains traces of enclosed sporangia.

Remarks:—The fragments studied closely fit LEMOINE's species described from the Upper Eocene of Spain and Algeria. It differs from *L. gaschei* in having larger and more variable sized cells, and in having much less conspicuous growth zones.

Figured slide A 381a. Locality: Point Bontour, San Fernando.

Genus *Lithophyllum* Philippi

Thallus has a hypothallus and perithallus. Hypothallus is commonly formed of concentric layers of cells. In the perithallus, normally, the cells show a more distinct

arrangement into layers, rather than vertical rows. Sporangia collected into conceptacles having only a single roof pore.

Lithophyllum ovatum (CAPEDER) LEMOINE

(Pl. IX, fig. 2)

Lithothamnium ovatum CAP. – CAPEDER, 1900, *Malpighia* 14, 177, pl. 6, figs. 5 ab.

Lithophyllum ovatum (CAPEDER) LEMOINE. – LEMOINE, 1926, C. R. Congr. Soc. Sav. Sciences 1925.

Description:—Thallus crustose with well developed hypothallus and Perithallus. Hypothallus coaxial, attains a thickness of from 120–185 μ , with cells measuring 17–21 \times 9–11 μ . Perithallus formed of well defined layers of cells, 10–12 \times 8–10 μ . Conceptacle chambers 260–275 μ in diameter and 120–128 μ high.

Remarks:—This form fits LEMOINE's descriptions of specimens from Spain and Italy although the average length of the cells is slightly less.

Figured slide A 385a. Locality: Mejias Quarry.

Lithophyllum kugleri n. sp.

(Pl. VIII, fig. 6)

Description:—Thallus forms a very thin crust, 2–8 mm thick. Hypothallus absent or reduced to one or two rows of irregular cells. Thalli may grow superimposed or sandwiched between other algae. The crust consists of perithallic tissue formed of irregular horizontal layers of rather irregular, rectangular cells, measuring 26–36 \times 17–29 μ . Conceptacle chambers relatively wide and flat with a large pore. They measure 330–395 μ in diameter and 122–135 μ high.

Remarks:—The distinctive features of this species are the lack of hypothallic tissue, the irregular cells and their irregular arrangement. The writer is not acquainted with any lower Tertiary species having similar characteristics.

Type slide A 385c. Locality: Mejias Quarry.

Genus *Dermatolithon* FOSLIE

Thallus thin, consisting of only a few layers of cells. Hypothallus normally consists of a single row of large, obliquely elongated cells. Perithallus of cubic or nearly cubic cells. Conceptacles strongly arched and perforated by a single pore.

Dermatolithon eoceneium n. sp.

(Pl. IX, fig. 1)

Description:—Thallus forms a tiny crust or plate formed of one or at most, a few layers of rectangular, vertically elongated and, commonly, slightly inclined cells, 30–47 μ high and 12–19 μ wide. Smaller, nearly cubic cells, surround the conceptacles and form the upper layers if thallus is several layers thick. The conceptacle measures 360 μ in diameter and 240 μ high, with a strongly arched roof.

Remarks:—This form is believed to be the first Eocene *Dermatolithon* to be described from the western hemisphere. It closely resembles an undescribed species recently studied by the author, from the Eocene of Saipan, Mariannas Islands.

Type slide A 385d. Locality: Mejias Quarry.

Genus *Lithoporella* (FOSLIE)

This genus, as now interpreted by JOHNSON, is similar to *Dermatolithon* except that the hypothallic cells are vertically, rather than obliquely, elongated and, commonly, the plant consists only of a single layer of hypothallic cells, except around conceptacles.

Lithoporella melobesioides (FOSLIE)

(Pl. IX, fig. 3)

Mastophora melobesioides FOSLIE. – FOSLIE and WEBER VAN BOSSE, 1904, Siboga Exped. 61, 73–77, figs. 30–32.

Melobesia (Lithoporella) melobesioides (FOSLIE). – LEMOINE, 1939, Carte Géol. Algérie, 1^e sér., no. 9, 108–110, figs. 78, 79.

Lithoporella (melobesioides) (FOSLIE) FOSLIE. – LIGNAC-GRUTTERINK, 1943, Verh. Geol. Mijnb. 13, 292–293, pl. 2, fig. 8.

Lithoporella (Melobesia) melobesioides FOSLIE. – JOHNSON and FERRIS, 1949, Jour. Pal. 23, 196 to 197, pl. 37, figs. 4–5; pl. 39, fig. 2.

Lithoporella melobesioides (FOSLIE). – JOHNSON and FERRIS, 1950, Bishop Mus. Bull. 201, 18, pl. 8, fig. A.

Lithoporella (Melobesia) melobesioides FOSLIE. – JOHNSON and TAFUR, 1952, Jour. Pal. 26, 541 to 542, pl. 62, fig. 2, pl. 64, fig. 7.

Description:—Thallus small, composed of a single layer of large cells except immediately around conceptacles. Several thalli may grow superimposed. Cells rectangular, vertically elongated and much larger than in most genera of the crustose coralline algae. They show a great range of size even in the same row. Size 18–46 μ high and 11–24 μ wide. No conceptacles present.

Remarks:—Algae of this type have been observed in practically every collection of coralline algae studied by the writer, ranging in age from Eocene to Recent. The great range of cell size does not permit separation into species unless conceptacles are present. In appearance, growth habit and cell size, it is identical to the Recent species so that name is applied. A number of specimens were observed in the Trinidad collection.

Figured slide A 387d. Locality: Mejias Quarry.

Genus *Corallina* LINNAEUS

Plants form clusters or tufts of segmented stems which branch at close intervals, ordinarily in a plane. In sections, the segments consist largely of a medullary hypothallus composed of arched layers of long cells. The perithallus is reduced to a single, or at most, a few layers of small cells; conceptacles lateral or terminal, commonly, not calcified; hence, seldom preserved in fossil material.

Corallina sp. ?

(Pl. VIII, fig. 5)

Description:—Several badly worn segments of articulated corallina algae were observed in the slides studied. Most of them can reasonably be assigned to the genus *Corallina*, but the material is too poor and scanty to merit specific description and naming.

Figured slide A 385d. Locality: Mejias Quarry.

EARLY TERTIARY ALGAE, TRINIDAD, B. W. I. ¹⁾

Species	Hypothallus		Perithallus		Conceptacles		Slide Spec.	Growth Form
	L	W	L	W	Diam.	Ht.		
<i>Archaeolithothamnium</i> cf. <i>lugeoni</i>								
PFENDER	15-22	9-12	11-14	9-13	40-60 ²⁾	27-40	1493	Warty crust
<i>Lithothamnium</i> cf. <i>aggregatum</i>								
LEMOINE	15-21	10-14	15-29	12-16	225-400	90-100	1432a	Thin crust
<i>Im. bofilli</i> LEMOINE	14-17	8-10	8-9	9-11			1436	Crust with nodes
<i>Im. perplexum</i> n. sp.			18-48	20-45			1469	Thin crust
<i>Im. cf. laminosum</i> HOWE	9-20?	6-11	13-22	9-12	200-335	90-110	1467	Thin crust
<i>Im. trinidadensum</i> n. sp.	8-17	9-12	9-15	9-11	270-330	160-168	1438	Thin crust
<i>Im. cf. moreti</i> LEMOINE	9-20	9-13	9-13	9-13 (19)	250-360	200-280	{ 1494 1496	Crust with short branches
<i>Im. gaschei</i> n. sp.			17-21	10-12	223-310	100-110	1466	Branches
<i>Im. faurai</i> LEMOINE			12-34	10-17	280	99	1492	Branches
<i>Lithophyllum</i>								
<i>Lpm. ovatum</i> (CAP.) LEMOINE	17-21	9-11	10-12	8-10	260-275	122-128	1437	Crust
<i>Lpm. kugleri</i> n. sp.			26-36	17-29	337-395	122-135	1467	Crust
<i>Dermatolithon</i>								
<i>Dm. eoceneum</i> n. sp.	30-47	12-19			360	245	1468	Thin crust
<i>Lithoporella</i>								
<i>Lpa. melobesoides</i> (FOSLIE)	18-46	12-24					1494	Thin crust

¹⁾ Measurements in microns (1 μ = 0.001 mm)²⁾ These are sporangia

LOCALITY LIST

Slide Number	Specimen Data	Locality	Age
A 381 a	<i>Lithothamnium</i> and <i>Lepidocyclina</i> limestone	Point Bontour, San Fernando, Trinidad	Eocene
A 382 a	Yellow-brown Limestone with many nummulites		
A 383 a-b	Marl with <i>Lepidocyclina</i>	Rock Penal Road	Oligocene
A 384 a	Orbitoid limestone with <i>Lithothamnium</i>	Herrera Rock Road	? Oligocene
A 385 a-e	Foraminiferal- <i>Lithothamnium</i> limestone	Mejias Quarry	Oligocene and/or Eocene
A 386 a	Orbitoid limestone	Penal Rock Road, Moruga	-----
A 387 a-d	Calcareous sandstone with large foraminifera, coral, etc.	Mejias Quarry, Moruga	Oligocene and/or Eocene
A 388 a-c	Conglomeratic sandstone with <i>Foraminifera</i>	Mejias Quarry	Oligocene and/or Eocene
A 389 a	Algal nodules	Vista Bella Quarry	Eocene

The Museum Catalogue numbers of the specimens correspond to those of the slides. However, the latter are marked with small letters.

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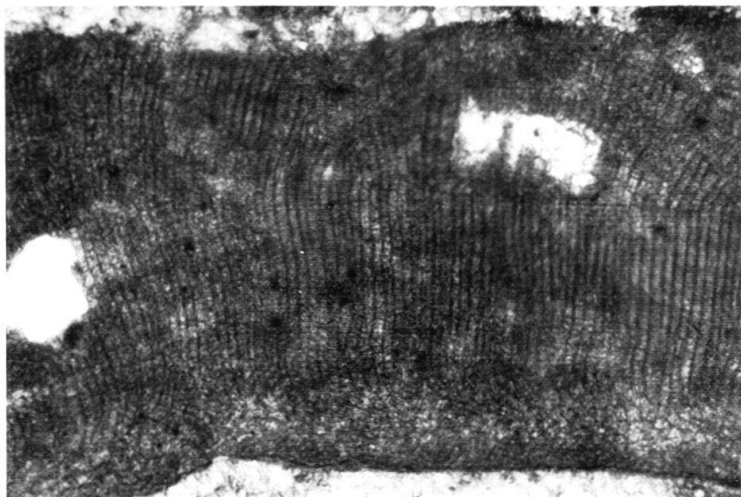
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Plate VII

Early Tertiary Algae from Trinidad, B. W. I.

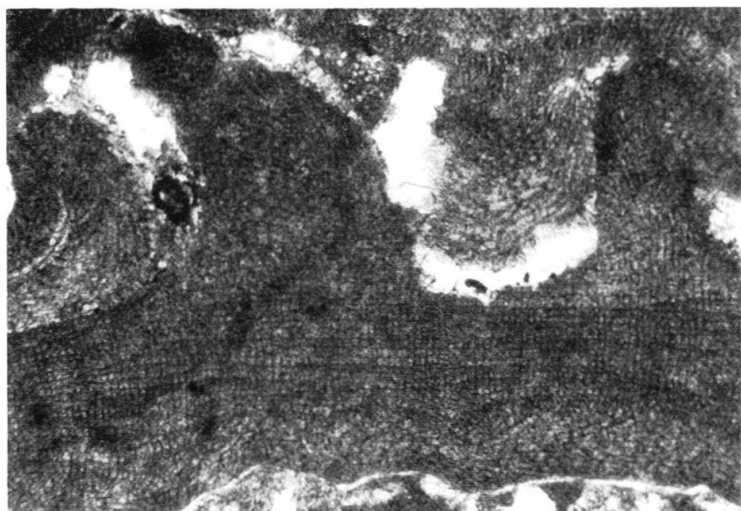
- Figure 1. *Lithothamnium* cf. *aggregatum* LEMOINE. $\times 100$.
Section showing a well-developed hypothallus, the perithallus and a conceptacle chamber 71
- Figure 2. *Archaeolithothamnium* cf. *lugeoni* PFENDER. $\times 50$.
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Holotype 72



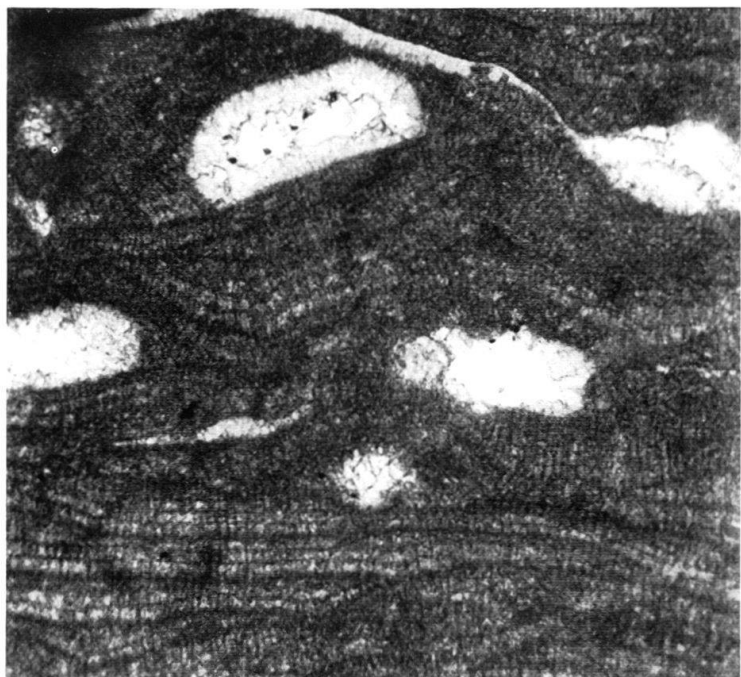
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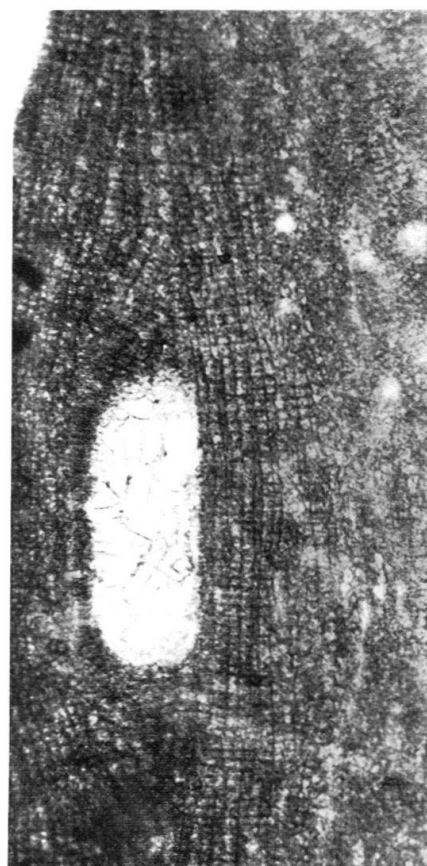
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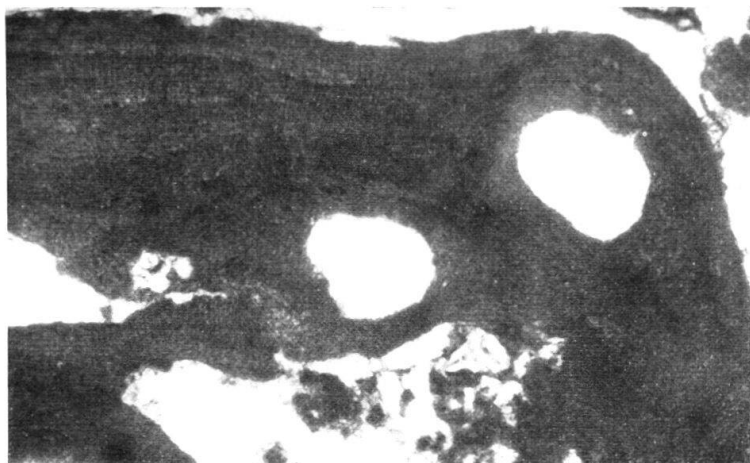
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Plate VIII

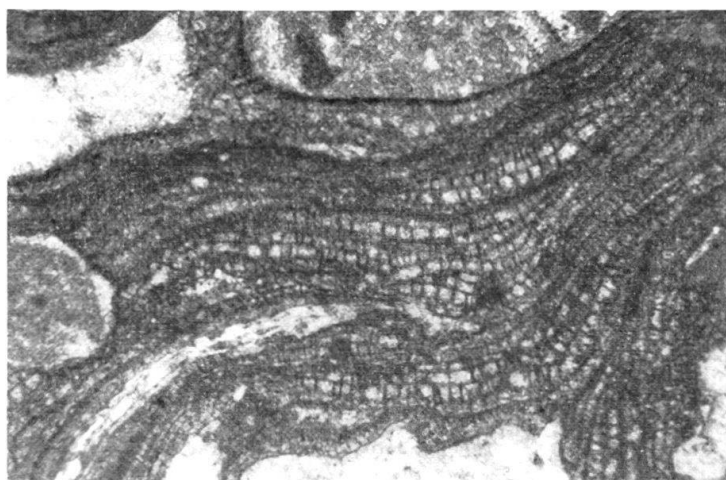
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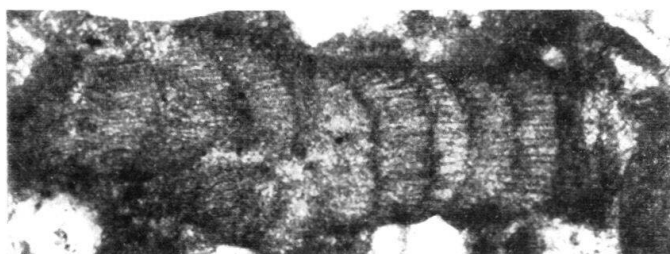
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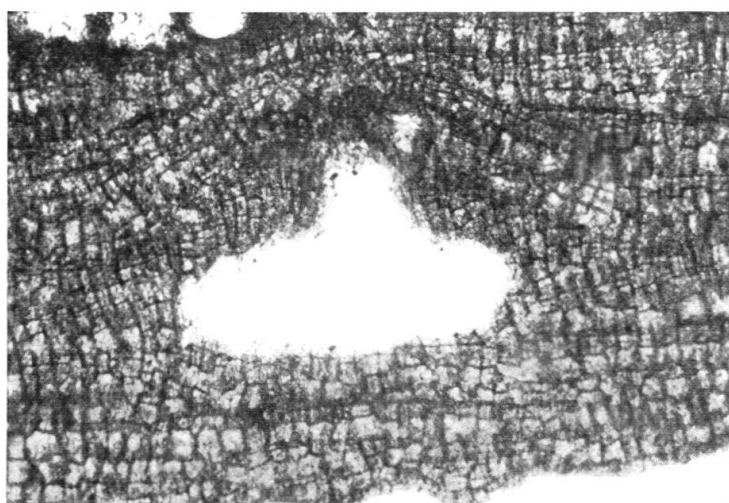
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Plate IX

- Figure 1. *Dermatolithon ecceneium* n. sp. $\times 50$.
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