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Coralline, Dasycladacean and Codiacean Algae from the Middle Eocene Rock Succession at Gabal El Mereir and G. El Teir, Nile Valley, Egypt

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ABSTRACT. Eighteen species of calcareous algae belonging to the families Corallinaceae, Dasycladaceae and Codiaceae are recorded, for the first time, from the Middle Eocene rock succession at Gabal El Mereir and Gabal Teir, Nile Valley, Egypt.

The corallines comprise two species of *Archaeolithothamnium*, two species of *Mesophyllum*, one species of *Lithophyllum*, one species of *Lithoporella* and one species of *Jania*. Ten species of Dasycladacean algae are represented by the following nine genera: *Diplopora*, *Actinoporella*, *Cymopolia*, *Neomeris*, *Larvaria*, *Trinocladus*, *Thyrsoporella*, *Belzungia*, *Furcoporella*, and one species of *Ovulites* belongs to the Family Codiaceae. One new Dasycladacean species, *Dipolopora aegyptiaca*, is described.

On the basis of these algal assemblages, the sections studies are referred to the Middle Eocene.

In the areas of Gabal El Mereir and Gabal El Teir, on the eastern side of the Nile Valley (Egypt), marine Middle Eocene rocks are exposed. Many stratigraphic and paleontologic studies have been carried out on the Eocene rocks of these sections (*e.g.* Said 1951, 1962; Bishay 1961, 1966; Krasheninnikov & Ponikarov 1964; Omara *et al.* 1977; and Cronin & Khalifa 1979). These studies, although comprehensive, were based mainly on the foraminiferal assemblages of this rock succession. No attempt, however, has been yet made to study the algal floras present in the Eocene rocks of these areas.

The aim of this paper is to record the presence of well preserved fossil algae in the Eocene succession of Gabal El Mereir and Gabal El Teir, and to demonstrate their great value for the age determination. Two stratigraphic sections of the Middle Eocene rocks were, therefore, measured and sampled at Gabal El Mereir (km 45 east of El Sheikh Fadl) and Gabal El Teir, in the vicinity of the town of Samalut (Fig. 1).

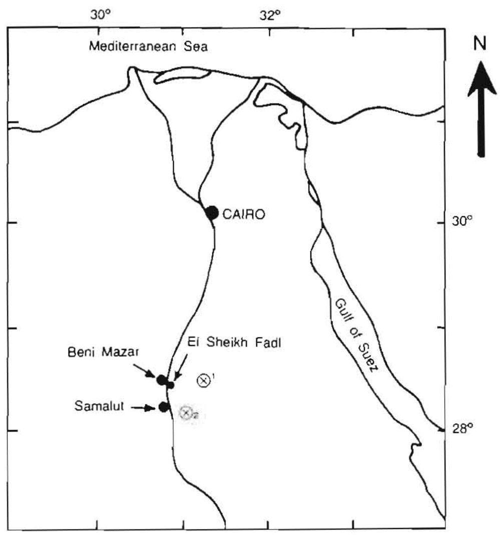


Fig. 1. Location map. ⊗[1] Gabal El Merier section (km 45 east of El Sheikh Fadl), ⊗[2] Gabal El Teir section (east of Samalut Town)

Stratigraphy and Age Assignment

The first section, located at Gabal El Mereir (km 45 east of El Sheikh Fadl), consists of 140 m of shales, calcareous sandstones, arenaceous marls and limestones (Fig. 2). In the second section (at Gabal El Teir, opposite Samalut) about 133 m of limestones, chalks, chalky limestones rich in *Nummulites* spp. and alveolinid limestones are exposed. These sections were previously studied by several workers, (*e.g.* Said 1962; Bishay, 1961, 1966; Omara *et al.* 1977 and Cronin & Khalifa 1979) whose subdivided them, from bottom to top, as follows: Minia, Samalut, Qarara and El Fashn formations. According to these authors, these rocks are dated as Middle Eocene.

Dasycladacean algae are abundant in the Middle Eocene rocks of the study areas. The Codiacean microflora, on the other hand, is only represented by a single genus, *Ovulites*. Moreover, these rocks are characterised by numerous species of Coralline algae. Among the reported species of fossil algae, *Dipolopora aegyptiaca* sp. nov. is here described as new.

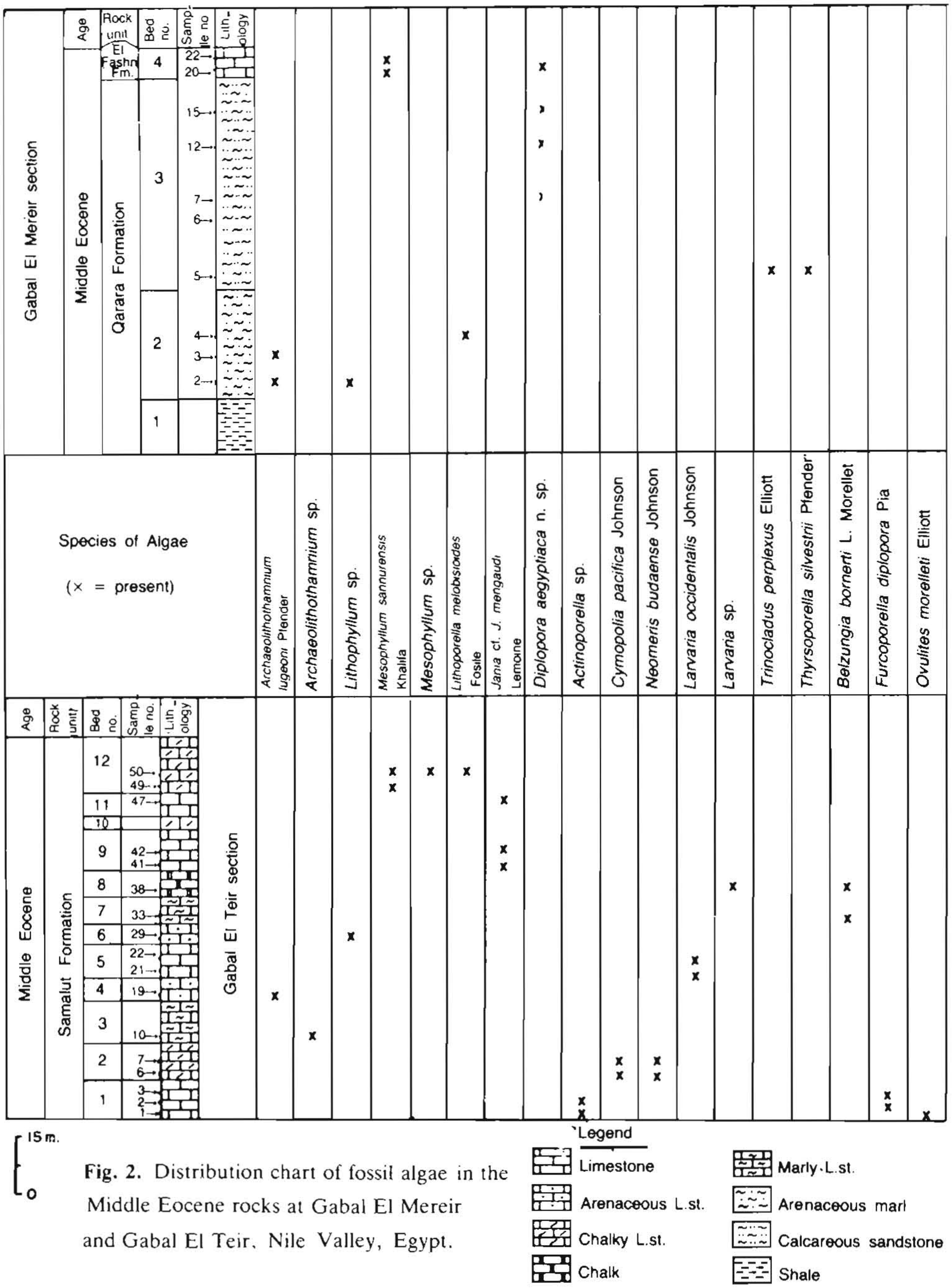


Fig. 2. Distribution chart of fossil algae in the Middle Eocene rocks at Gabal El Mereir and Gabal El Teir, Nile Valley, Egypt.

The following eighteen taxa of Coralline, Dasycladacean and Codiacean algae from these Middle Eocene sections recorded and systematically described for the first time: *Archaeolithothamnium lugeoni* Pfender, *A.* sp., *Lithophyllum* sp., *Mesophyllum sannurensis* Khalifa, *M.* sp., *Lithoporella melobesioides* Foslie, *Jania* cf. *J. mengaudi* Lemoine, *Belzungia bornerti* Morellet, *Thyrsoporella silvestrii* Pfender, *Trinocladus perplexus* Elliott, *Neomeris budaense* Johnson, *Larvaria occidentalis* Johnson, *L.* sp., *Actinoporella* sp., *Furcoporella diplopora* Pia, *Cymopolia pacifica* Johnson, *Diplopora aegyptiaca* n. sp. and *Ovulites morelleti* Elliott.

Most of the algal species present in the samples studied were previously reported from other Middle Eocene rocks in the Tethys belt, Pacific Ocean and Indian Ocean (Elliott 1955, 1956). Among the Dasycladacean algae, the species *Thyrsoporella silvestrii* Pfender and *Furocoporella diplopora* Pia were based on material from the Lutetian of Austria (Pia 1920), Egypt, Syria (Pfender 1940) and Iraq (Elliott 1955, 1956). Moreover, *Belzungia bornerti* L. Morellet, *Cymopolia pacifica* Johnson, *Ovulites morelleti* Elliott and *Larvaria* sp. were described from the Middle Eocene of the Paris Basin (France) and Saipan (Elliott 1960, 1968 and Johnson 1961).

Species of Coralline algae (*Archaeolithothamnium sannurensis* Khalifa, *A. lugeoni* Pfender and *Jania* cf. *J. mengaudi* Lemoine were previously recorded from the Lutetian rocks of Egypt, Spain and Algeria (Johnson & Tafur 1952; Johnson 1964; and Mansour *et al.* 1982).

The Coralline, Dasycaladacean and Codiacean algal species recognised indicate a Middle Eocene (Lutetian) age for the sections studied. This age assignment is in accordance with previous age determinations based on other groups (Cronin & Khalifa 1979).

Systematic Paleontology of the Algae

The generic and the specific classification of the Codiacean and Dasycladacean algae used in this work is based on the system proposed by Pia (1920) and later modified by Rezak (1959). Pia based his classification of fossil Dasycladaceae upon the following characteristic features:

1. Type of thallus or skeleton (segmented, unsegmented, branches, etc.).
2. Form of the whorled branches (simple or branches, broadened at extremities or tapered, open or closed pores, etc.).
3. Arrangment of the whorled branches (irregular, in whorls, or in clusters).
4. Shape of the central stem or axial cell (cylindrical or other).
5. Sporangia (position and shape).

6. Dimensions (measurements, percentage relation of internal to external diameter 'd/D').

Among the Dasycladacean algae, genera are arranged in tribes as shown in Table 1. Species are differentiated on other criteria, including the size and shape of first-order branches and location of reproductive organs.

The species reported are shown in Table 2. The described and figured specimens are deposited in the Museum of the Geology Department, Assiut University, Assiut, Egypt.

Table 1. Comparison of measurement of species of *Diplopora* (c.f. different sources) and the new species of *Diplopora aegyptiaca*.

Species of Diplopora	Diameter			Shape	Locality	Age
	Outer (in mm)	Stem	Branches			
Diplopora? latissima Endo. 1956.	4.0-6.6	1.2-3.8	72-92 μ	Cylindrical	Japan	Permian
Diplopora orientalis Endo. 1957.	2.7-3.0	1.7-1.9	81-135 μ	Cylindrical	Japan	Permian
Diplopora phanerospora Pia; Endo, 1952.	1.98	0.62-0.94	156 μ	Spherical	Japan	Permian
Diplopora americana Johnson, 1951.	3.08	—	125-138 μ	Club-shaped	West-Texas	Permian
Diplopora alta Endo, 1961.	1.34 4.00	0.945- 0.513	81-135 μ	Cylindrical slightly undulating	Japan	Triassic
Diplopora johnsoni Praturlon, 1964.	—	—	—	Cylindrical	Italy	Cretaceous
Diplopora aegyptiaca n. sp.	5.0-7.5	1.5-4.5	100-125 μ	Cylindrical to oval	Egypt	Eocene

Phylum **RHODOPHYTA**
Family **Corallinaceae**
Subfamily **Melobesioideae**
Genus ***Archaeolithothamnium*** Rothpletz, 1891
Archaeolithothamnium lugeoni Pfender
(Pl. 1, Fig. 7)

Archaeolithothamnium lugeoni Pfender, 1926. Espanola Histor. Nat. V. 26, p. 321.

Archaeolithothamnium lugeoni Pfender. Lemoine, 1939, Mat. Carte géol. de L'Algérie, Paléontol., No. 9, p. 52.

Archaeolithothamnium lugeoni Pfender. Johnson & Tafur, 1952, V. 26, No. 4, p. 537-538, pl. 62, Figs. 1,4.

Description. Thallial tissue with thin hypothallium, formed of curved loosely packed rows of irregularly sized cells 0.02-0.03 mm length, and 5-10 μ in width. Perithallial tissue consists of regular rows of rectangular cells 10-20 μ in length and 5-8 μ in width. Sporangia are not connected into conceptacles, but form layer embedded in the perithallial tissue.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene bed no. 4, sample no. 19; Gabal El Mereir, Qarara Formation, Middle Eocene, bed no. 2, samples no. 2,3.

Archaeolithothamnium sp.
(Pl. 1, Fig. 1)

Description. This alga develops as a thick crust with thalli overgrowing each other repeatedly to form an appreciable composite thickness. Hypothallium is absent. Perithallium consists of thick, regular, arched layers with rectangular cells 20-30 μ by 5-10 μ in size. Sporangia are spherical to ovoid, measuring 40-50 μ in diameter and 50-60 μ in hight. They are not regularly arranged but occur isolated or in irregular clusters in the perithallial tissue.

Remarks. Unfortunately, only a single specimen is available which is inadequate for determination to species level.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 3, sample no. 10.

Genus ***Lithophyllum*** Philippi, 1837
Lithophyllum sp.
(Pl. 1, Fig. 10)

Description. A strongly branching form 1.5 mm in length and 0.8 mm in width. Thallus has a thick hypothallium, strongly coaxial, with arc-like rows of cells almost vertical. Cells measure 40-40 μ in length and 15-20 μ in width. Perithallium and conceptacles absent.

Occurrence. Gabal El Teir section, Samalut Formation, bed no. 6, sample no. 29; Gabal El Mereir, Qarara Formation, Middle Eocene, bed no. 2, sample no. 2.

Genus ***Mesophyllum*** Lemoine, 1928
Mesophyllum sannurensis Khalifa
(Pl. 1, Figs. 4,5)

Mesophyllum sannurensis Khalifa, 1982, Qatar Univ. Sci. Bull. (QUSB); (in press).

Description. A strongly branching form, with a well developed medullary hypothallium surrounded by a thick marginal perithallium. Hypothallium is composed of irregular layers of large cells. Each layer consists of a number of rows of cells with thick, dark lines between the layers which gives a zoned appearance to the tissue. Conceptacles are absent.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene bed no. 12, samples no. 49, 50; Gabal El Mereir, El-Fashn Formation, Middle Eocene, bed no. 4, samples no. 20, 22.

Mesophyllum sp.
(Pl. 1, Figs. 2, 3)

Description. Branching forms consist of numerous layers of cells, differentiated into a well-developed co-axial hypothallium, surrounded by a thick marginal perithallium. Characteristically, the medullary hypothallium is formed of regularly curved or arched layers of cells and it has multi-apertured conceptacles.

Remarks. No described species of Tertiary *Mesophyllum* matches, especially with regard to the length of hypothallic and perithallic layers. It may represent an undescribed species, but being poorly preserved, it is difficult to give it a specific name.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 12, sample no. 50.

Genus ***Lithoporella*** Foslie, 1909
Lithoporella melobesioides Foslie
(Pl. 1, Fig. 8)

Melobesia (Lithoporella) melobesioides Fosile. Lemoine, 1939, Mat. Carte géol. de l'Algérie, sér. 1, Paléontol., No. 9, p. 108-109, Figs. 78, 79.

Lithoporella (Melobesia) melobesioides Fosile. Johnson & Ferris, 1949, Paleontology, V. 23, p. 196, pl. 37, Figs. 4, 5; pl. 39, Fig. 9.

Lithoporella melobesioides Foslie. Elliott, 1956, Micropaleontol., V. 2, p. 333, pl. 2. Figs. 7, 10, 11.

Lithoporella melobesioides Foslie. Johnson & Kaska, 1965, Colorado School Mines Prof. Contrib., No. 1, p. 50-51, pl. 44, Fig. 3.

Description. A thin crust 1.8 mm in length and 0.55 mm in width. Hypothallium formed of a single layers of large (up to 70 μ), vertically elongated cells. Conceptacles absent.

Remarks. Commonly *Lithoporella* spp. occur abundantly in all Tertiary rocks where other coralline algae occur (Johnson & Kaska 1965). The Egyptian Eocene *Lithoporella melobesioides* Foslie compares well to *L. melobesioides* described by Elliott (1956) from the Middle Eocene of Iraq. However, the Eocene species differs from the Late Neogene, Miocene and Pliocene *Lithoporella melobesioides* Foslie by having larger, especially wider cells and large single-apertures to the conceptacles.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 12, sample no. 50; Gabal El Mereir, Qarara Formation, Middle Eocene, bed no. 2, sample no. 4.

Genus ***Jania*** Lamouroux, 1812
Jania cf. *J. mengaudi* Lemoine
(Pl. 1, Fig. 9)

Jania mengaudi Lemoine. Lemoine and Mengaud 1939, Soc. Hist. Nat. Toulouse, Bull., V. 66, p. 178, Figs. 5-6.

Jania, cf. *J. mengaudi* Lemoine. Johnson, 1964, Micropaleontol., V. 10, No. 2, p. 207-216, pls. 1-3.

Description. Thallus consists of slender segments with about 1.2 mm long with diameters of nearly 0.20 mm. Segments contain 15-20 tiers of cells; the tiers exhibit 12 to 22 cells. Cells have maximum length in the center of tier ranging from 25-50 μ and widths of 10-20 μ. Marginal cells are not present.

Remarks. The figured specimen differs in cells dimensions from previously described Late Cretaceous (Maestrichtian) and Early Eocene forms. It shows close affinities to *Jania mengaudi* Lemoine, from the Late Eocene of Spain.

Occurence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 11, sample no. 47; bed no. 9, samples no. 41, 42.

Phylum **CHLOROPHYTA**
Family **Dasycladaceae**
Tribe **Diploporeae**
Genus ***Diplopora*** Schafhautl, 1863
Diplopora aegyptiaca n. sp.
(Pl. 1, Figs. 12-16)

Etymology. It is here named after its first occurrence in the Egyptian Eocene rocks.

Holotype. Plate 1, Fig. 13.

Paratype. Plate 1, Figs. 12, 14, 15, 16.

Description. Thallus develops into a cylindrical plant as seem in the transverse sections and has an oval form in longitudinal sections. The general form of the central stem, in transverse section, is also cylindrical and oval in axial section. Calcification is only present around the central stem. The thickness of the central stem varies from slender (about 20% the diameter of the thallus) to thick (about 50% the diameter of the thallus). The thallus consists of secondary and primary branches. The primary branches commonly occur in clusters which reach up to eight bundles in number. Moreover, widely-spaced whorls of primary branches developed along the central stem are also present. The branches are thick at the base and relatively thin toward the end, sometimes appearing as a long hair-like growth.

The sporangia are well-developed into two main types. In the first, sporangia are embedded in the central stem as seen in transverse section. In the second type, the sporangia are present along the primary branches as seen in longitudinal section. In both cases, the sporangia appear as spherical or ovoid cavities with outside openings.

Remarks. The figured specimens of the new species *Diplopora aegyptiaca* are completely different, especially in shape of central stem, number of bundles, position of sporangia and shape, from those described in the previous literature by Johnson (1951, 1961), Endo (1952, 1956, 1957) and Praturlon (1964).

Type locality. Gabal El Mereir section, at km 45 east of El Sheikh Fadl, on the eastern side of the Nile Valley, Egypt (Fig. 1).

Type level. Gabal El Mereir section, Qarara Formation bed no. 3, samples no. 7, 12, 15: El Fashn Formation bed no. 4, sample no. 20; Middle Eocene (Late Lutetian) age.

Table 2. Genera and species reported in the studied sections

Phylum	Family	Subfamily	Genera & Species
Rhodophyta (Red Algae)	Corallinaceae (Coralline Algae)		*Archaeolithothamnium lugeoni* Pfender *Archaeolithothamnium* sp. *Lithophyllum* sp. *Mesophyllum sannurensis* Khalifa *Mesophyllum* sp. *Lithoporella melobesioides* Fosile
		Corallinoideae (Articulated)	*Jania* cf. *J. mengaudi* Lemoine
Chlorophyta (Green Algae)	Dasycladaceae	Diploporeae	*Diplopora aegyptiaca* n. sp. *Actinoporella* sp.
		Neomereae	*Cymopolia pacifica* Johnson *Neomeris budaense* Johnson *Larvaria occidentalis* Johnson *Larvaria* sp.
		Thyrsoporelleae	*Trinocladus perplexus* Elliott *Thyrsoporella silvestrii* Pfender *Belzungia bornerti* L. Morellet
		Macroporellineae	*Furcoporella diplopora* Pia
	Codiaceae		*Ovulites morelleti* Elliott

Genus ***Actinoporella*** Gümbel, 1882
Actinoporella sp.
(Pl. 2, Fig. 19)

Description. Thallus cylindrical with thick, slightly curved primary branches regularly arranged in whorls. Commonly a prominent calcareous tube develops around each branch with no secondary branches. Sporangia are present in the lower primary branches.

Remarks. Only a single specimen is available which is not sufficient for determination to species level.

Occurrence. Gabal El Teir section, Minia Formation, Middle Eocene, bed no. 1, samples no. 1, 2.

Tribe **Neomereae**
Genus *Cymopolia* Lamouroux, 1816
Cymopolia pacifica Johnson
(Pl. 1, Fig. 11)

Cymopolia pacifica Johnson, 1961, Colorado School Mines, (clothbound book), p. 169, pl. 68, Figs. 1-3.

Description. Thallus develops as branching segmented stems. The segments are cylindrical with rounded ends. Each segment has a cylindrical central stem from which develop regular whorls of short, primary branches. Each primary branch has usually four secondary branches surrounding an egg-shaped sporangium.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 2, samples no. 6, 7; Gabal El Mereir section, Qarara Formation, bed no. 3, samples no. 6, 7.

Genus ***Neomeris*** Lamouroux, 1816
Neomeris budaense Johnson
(Pl. 2, Figs. 11, 15, 16)

Neomeris budaense Johnson, 1969, Colorado School, Mines, pp. 154-155, pl. 42, Figs. 1-4; pl. 43, Figs. 3, 4.

Description. It consists of a central stem from which arise regular whorls of primary branches. Each primary branch ends in a tuft of secondary branches which, in turn, end in a terminal hair. Sporangia spherical to ovoid. Calcification is light around the central stem.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 2, samples no. 6, 7.

Genus ***Larvaria*** Defrance, 1822
Larvaria occidentalis Johnson & Kaska
(Pl. 2, Fig. 20)

Larvaria occidentalis Johnson & Kaska, 1965, Colorado School Mines, p. 88, pl. 8, Figs. 1-7.

Description. Thallus of cylindrical tubes, attaining length of approximately 2 mm and diameter of 0.60 mm. Central stem is also cylindrical and thick. Primary branches are short with regular whorls. Each primary branch ends in a cluster in one or two secondary branches. Sporangia spherical to ovoid. Calcification is present around the central stem and primary branches.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 5, samples no. 21, 22; Gabal El Mereir section, Qarara Formation, Middle Eocene, bed no. 3, samples no. 12, 15.

Larvaria sp.
(Pl. 2, Fig. 15a)

Larvaria sp., Johnson, 1961, Colorado School Mines, p. 170, pl. 69, Figs. 2-9.

Description. Thallus forms a short cylinder, which consists of a cylindrical central stem surrounded by closely spaced, regularly arranged, whorls of branches. The diameter of the central stem is about 33% that of the thallus.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 8, sample no. 38.

Tribe **Thyrsoporelleae**
Genus *Trinocladus* Raineri, 1922
Trinocladus perplexus Elliott
(Pl. 2, Figs. 21, 22)

Trinocladus perplexus Elliott, 1955, Micropaleontol., V. 1, No. 2, pp. 128-129, pl. 1, Figs. 16-18.

Description. Specimens are characterised by character of branching. Thallial tissue is cylindrical to club-shaped with external diameter (D) up to 0.45 mm; axial stem diameter up to 0.15 mm (d/D = 33%). Central stem is cylindrical and large.

Primary, secondary and tertiary branches are present. Primary branches are thick and occur in regular whorls. The secondary branches contain sporangia.

Remarks. The genera *Trinocladus, Thyrsoporella* and *Belzungia* are closely related and structurally very similar (Johnson 1969).

They are readily distinguished by the character of their branching. *Thyrsoporella* have primary, secondary and tertiary branches. *Trinocladus* has only primary branches at the base, primary and secondary branches a little higher, while in the upper half of the alga, tertiary branches also develop.

Occurrence. Gabal El Teir, Samalut Formation, Middle Eocene, bed no. 8, sample no. 38; Gabal El Mereir section, bed no. 3, sample no. 5.

Genus ***Thyrsoporella*** Gümbel, 1882
Thyrsoporella silvestrii Plender
(Pl. 2, Figs. 17, 18)

Thyrsoporella silvestrii Pfender, 1940, Inst. Egypte Bull., V. 22, pp. 227-228.

Description. Thallial tissue appears as cylindrical tubes. Central stem is cylindrical, large and slightly calcified. Three orders of ramifications (primary, secondary and tertiary branches) are present. Primary branches are thick and occur in regular whorls. The dimensions of this species are as follows:

1. External diameter (D) = 64 - 95 μ.
2. Internal diameter (central cavity or stem) d = 32-45 μ.
3. Relation of internal to external diameter (d/D)=50%.

Remarks. *Thyrsoporella* may be distinguished from *Trinocladus* by the percentage relation of internal to external diameter (d/D), details of branching and general characters of thallial tissue.

Occurrence. Gabal El Mereir section, Qarara Formation, Middle Eocene, bed no. 3, sample no. 5.

Genus ***Belzungia*** L. Morellet, 1908
Belzungia bornerti L. Morellet
(Pl. 2, Figs. 3-8, 10, 12)

Belzungia bornerti L. Morellet, 1908, Soc. géol. France Bull., 4*th* sér., tome 8, pp. 40-43, pl. 1, Figs. 1-5.

Description. Ovaliform, tubular to cylindrical fragments up to 1.50 mm long Tubular to ovaliform central stem with slightly larger cavity. Three orders of primary, secondary and tertiary branches are present. Pores representing primary branches are arranged into semiparallel rows especially at the lower and upper edges.

Dimensions are:

1. External diameter (D) 0.50-0.80 mm.
2. Internal diameter (d) 0.20-0.45 mm.
3. Ratio (d/D) = 40%.

Occurrence. Gabal El Teir section, Samalut Formation, Middle Eocene, bed no. 7, sample no. 33, bed no. 8, sample no. 38.

Tribe **Macroporellineae**
Genus *Furcoporella* Pia, 1918
Furcoporella diplopora Pia
(Pl. 2, Figs. 9, 13, 14)

Furcoporella diplopora Pia, 1918, P.K. Akad, Wiss. Wien, Denkschr., V. 95, p. 211.

Furcoporella diplopora Pia. Pfender, 1940, Inst. Egypte Bull., V. 22, pp. 242-243.

Furcoporella diplopora Pia. Elliott, 1956, Micropaleontol., V. 2, No. 4, pp. 332-333.

Description. Thallial tissue appears as cylindrical tubes, apparently incomplete and up to 4.00 mm long, strongly calcified around the central cavity; diameter up to 0.50 mm. Tubes have whorls of six or seven pore-pairs, each pair bifurcating in a straight sided V-formation on the horizontal plane from a single inner opening to two outer openings. In vertical section the pores occur at right angles to the main axis, with expanded ends.

Dimensions are:

1. External diameter (D) 0.35-0.45 mm.
2. Internal diameter (diameter of central cavity) 0.15-0.22 mm.
3. Ratio (d/D) = 40-50%.

Occurrence. Gabal El Teir section, Minia Formation, Middle Eocene, bed no. 1, samples no. 2,3.

Family **Codiaceae**

Genus *Ovulites* Lamarck, 1816

Ovulites morelleti Elliott

(Pl. 2, Figs. 1, 2)

Ovulites morelleti Elliott, 1955, Micropaleontol., V. 1, No. 2, pp. 126-127, pl. 1, Figs. 4-6.

Description. Hollow elongate-tubular bodies, with slight terminal clubbing. Length ranges up to 1.5 mm whereas diameter is normally up to 0.3 mm. Wall finely perforated; pores are straight and radial.

Occurrence. Gabal El Teir section, Minia Formation, Middle Eocene, bed no. 1, sample no. 1.

Plate 1

Explanation of Plate 1
(For all Figures × 50)

Fig. 1. *Archaeolithothamnium* sp. Thick perithallium with sporangia. Gabal El Teir, Samalut Formation, bed no. 3, sample no. 10.

Figs. 2,3. *Mesophyllum* sp. Branching forms of well-developed hypothallium, perithallium and conceptacle cavities. Gabal El Teir, Samalut Formation, bed no. 12, sample no. 50.

Figs. 4,5. *Mesophyllum sannurensis* Khalifa. 4, thick hypothallium surrounded by marginal perithallium. 5, thick fragment of hypothallium. Gabal El Teir, Samalut Formation, bed no. 12, sample no. 49.

Fig. 6. Crustose coralline alga. Gabal El Merier, bed no. 2, sample no. 2.

Fig. 7. *Archaeolithothamnium lugeoni* Pfender. Oblique section showing thick perithallium and conceptacles. Gabal El Mereir, Qarara Formation, bed no. 2, sample no. 2.

Fig. 8. *Lithoporella melobesioides* Fosile. Hypothallium with single layers of large, vertically elongated cells. Gabal El Teir, Samalut Formation, bed no. 12, sample no. 50.

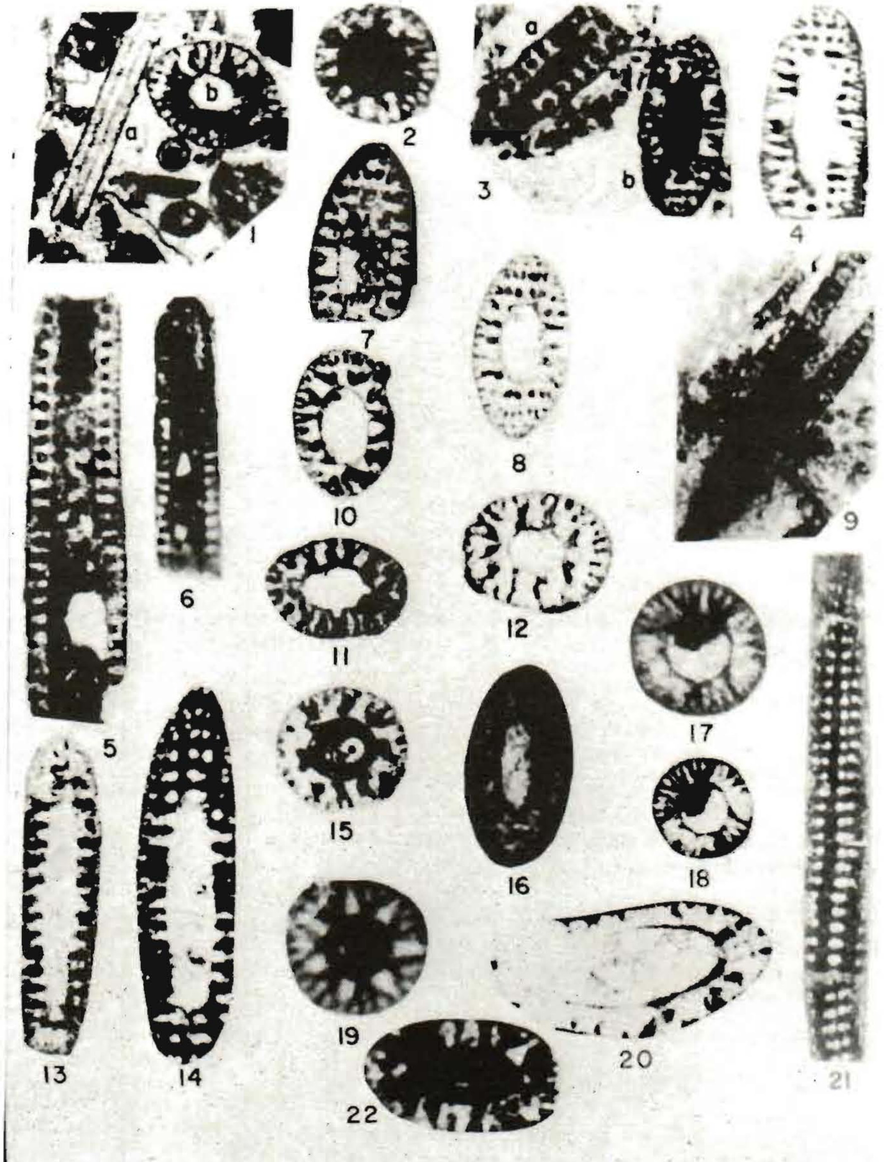
Fig. 9. *Jania* cf. *J. mengaudi* Lemoine. Branching form with tiers of cells. Gabal El Teir, Samalut Formation, bed no. 11, sample no. 47.

Fig. 10. *Lithophyllum* sp. Branching form, showing coaxial medullary hypothallium. Gabal El Teir, Samalut Formation, bed no. 6, sample no. 29.

Fig. 11. *Cymopolia pacifica* Johnson. Branching segment stem with short primary branches, secondary branches and egg-shaped sporangium. Gabal El Mereir, Qarara Formation, bed no. 3, sample no. 7.

Figs. 12-16. *Diplopora aegyptiaca* (n. sp.). 12,13, transverse sections show spherical central stem; sporangia are embedded in the central stem. 14,15; 16 longitudinal sections with primary branches; sporangia are present along the primary branches. Gabal El Merier. Qarara Formation, bed no. 3, samples no. 7, 12, 15.

Plate 2



Explanation of Plate 2

(Except Fig. 18(×23); for all other Fig. × 75)

Figs. 1,2. *Ovulites morelleti* Elliott. la, longitudinal section, lb, 2, transverse sections of segments. Gabal El Teir, Minia Formation, bed no. 1, sample no. 1.

Figs. 3-8 & 10,12. *Belzungia bornerti* Morellet. 3b,4,7,8,10,12, transverse sections showing primary, secondary and tertiary branches with sporangia, 3a,5,6, longitudinal sections with only primary branches. Gabal El Teir, Samalut Formation, bed no. 7, sample no. 33, bed no. 8, sample no. 38.

Figs. 9,13,14. *Furcoporella diplopora* Pia. Vertical-oblique sections; note progressive divergence of pores above and below. Gabal El Teir, Minia Formation, bed no. 1, samples no. 2,3.

Figs. 11,15,16. *Neomeris budaense* Johnson, Transverse sections. Gabal El Teir, Samalut Formation, bed no. 2, sample no. 6.

Fig. 15a. *Larvaria* sp. Transverse section. Gabal El Teir, Samalut Formation, bed no. 8, sample no. 38.

Figs. 17,18. *Thyrsoporella silvestrii* Pfender. Transverse section with cylindrical tubes, primary, secondary and tertiary branches. Gabal El Merier, Qarara Formation, bed no. 3, sample no. 5.

Fig. 19. *Actinoporella* sp. Transverse section with only primary branches. Gabal El Teir, Samalut Formation, bed no. 1, samples no. 1,2.

Fig. 20. *Larvaria occidcntalis* Johnson. Transverse sections showing large central stem. Gabal El Teir, Samalut Formation, bed no. 5, sample no. 21.

Figs. 21,22. *Trinocladus perplexus* Elliott. 21, longitudinal section showing only primary branches. 22, transverse section showing primary and secondary branches. Gabal El Mereir, Qarara Formation, bed no. 3, sample no. 5.

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الأشنات المرجانية، الداسيكلاديسية والكودياسية من تتابع صخور الأيوسين الأوسط بجبل المرير وجبل الطير (وادي النيل - مصر)

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من خلال الدراسة الميكروباليتولوجية ودراسة الشرائح الرقيقة من تتابع صخور الأيوسين الأوسط بجبل المرير وجبل الطير (وادي النيل، مصر) أمكن التعرف، لأول مرة، على ثمانية عشر نوعاً من الطحالب المرجانية والداسيكلاديسية والكودياسية، والتي تنتمي إلى قبيلة الطحالب الحمراء والخضراء.

تشتمل الأشنات المرجانية على نوعين من الارشيوليثوثامنيم، نوعين من الميثوفيللم، نوع من الليثوفيللم، نوع من الليثوبوريلا، ونوع من الجانيا. وهناك عشرة أنواع أخرى تنتمى إلى تسعة أجناس (ديبلوبورا، اكتينوبوريلا، كيموبوليا، نيوميرس، لارفاريا، ترابنوكلادس، ترسوبوريلا، بلذونجيا، فركوبوريلا) تتبع عائلة الداسيكلاديسيا بالإضافة للنوع الأخير (أوفيوليتس) الذي يتبع عائلة الكودياسيا.

وبمقارنة هذه الأنواع السالفة الذكر والممثلة في قطاعات البحث مع مثيلاتها في مناطق أخرى من العالم، وجد أن غالبيتها لها أهمية كبرى في تحديد عمر هذه الصخور وأنها تتبع الأيوسين الأوسط، وهذا يتفق تماماً مع الدراسات السابقة بالفونة.