

Extant cheilostomatous bryozoans of the Middle Miocene from the north Western Desert, Egypt



Abdelmohsen Ziko ^{a,*}, Shehta Eweda ^a, Samar El-Khawaga ^b

^a Zagazig University, Zagazig, Egypt

^b Mansoura University, Mansoura, Egypt

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ABSTRACT

Twenty-nine extant Bryozoan species, belonging to the order Cheilostomata are described. They are from the Middle Miocene Marmarica Formation of the northern Western Desert in Egypt. The described bryozoans are collected from Matruh and Siwa areas.

Fourteen species belong to the suborder Anasca, and the other fifteen species belong to the suborder Ascophora. The identified bryozoan species exhibit many zoarial growth forms. The encrusting forms are membraniporiform and celoporiform, while the erect forms are adeoniforms, eschariforms, vinculariiforms, retoporiform, and cellariiforms.

They extend in the geologic record from the Eocene to the Recent, distributed mainly in the Tethyan realm, and recorded also from North America.

The extant species are mainly of Mediterranean affinity, some are of wider distribution in the Atlantic and Pacific oceans, and are rarely cosmopolitan.

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1. Introduction

This paper deals with the study of the extant cheilostomatous bryozoans of the Middle Miocene Marmarica Formation exposed in Cyrenaica, north Western Desert, Egypt.

Ziko et al. (2010) studied the Middle Miocene rocks exposed in the northern Western Desert in Egypt (Figure 1), in which the areas of study are located; belong to the Marmarica Formation (Said, 1962). The formation reaches a 78 m thickness in its type locality—to the north of Siwa Oasis. While in the study area in Siwa, it reaches 84 m. (Bahi El-Din section), and of less thicknesses in other measured sections in Siwa, and become 50 m in thickness in Matruh area at Wadi Umm El-Rakham (Figs. 2 and 3). The Marmarica Formation consists of limestones and marls with a number of oyster banks. It overlies the Moghra Formation of the Lower Miocene, and underlies unconformably the Pink Oolitic limestone of the Pliocene age. The Marmarica Formation is marked by fossils such as *Borelis melo*, *Ostrea virleti* and *O. frondosa*. The formation is characterized by their very rich bryozoan assemblages.

The studied bryozoans are deposited in the Department of

Geology, Faculty of Science, Zagazig University. The abbreviations for metres was used in the present study are: Lz = Zooecial length; lz = Zooecial width; ho = opesial length; lo = opesial width; Lov = ovicinal length; lav = avicularian length.

2. Systematic description

Class: Gymnolaemata Allman, 1856

Order: Cheilostomata Busk, 1852

Suborder: Anasca Levinsen, 1909

Family: Membraniporidae Busk, 1854

Genus: *Biflustra* Blainville, 1839

***Biflustra savartii* (Savigny-Audouin, 1826)**

(Pl. 1, Fig. 1)

1826 *Flustra savartii* Savigny-Audouin: 240, pl. 10, fig. 10.

1926 *Acanthodesia savartii* (Audouin): Harmer: 213, pl. 13, figs. 8, 13, 14, 16.

1929 *Acanthodesia savartii* (Savigny-Audouin): Canu and Bassler: 66, pl. 1, Figs. 1–5.

1953 *Acanthodesia savartii* (Audouin): Bassler: 155, figs. 118, 4.

1968 *Membranipora savartii* (Audouin): Cook: 129.

2006 *Membranipora savartii* (Savigny-Audouin): Ziko, El Safori, Zalat, El-Dera, Saber and El-Khawaga: 29, pl. 2, figs. 1, 2.

* Corresponding author.

E-mail address: abdelmohsenziko@yahoo.com (A. Ziko).

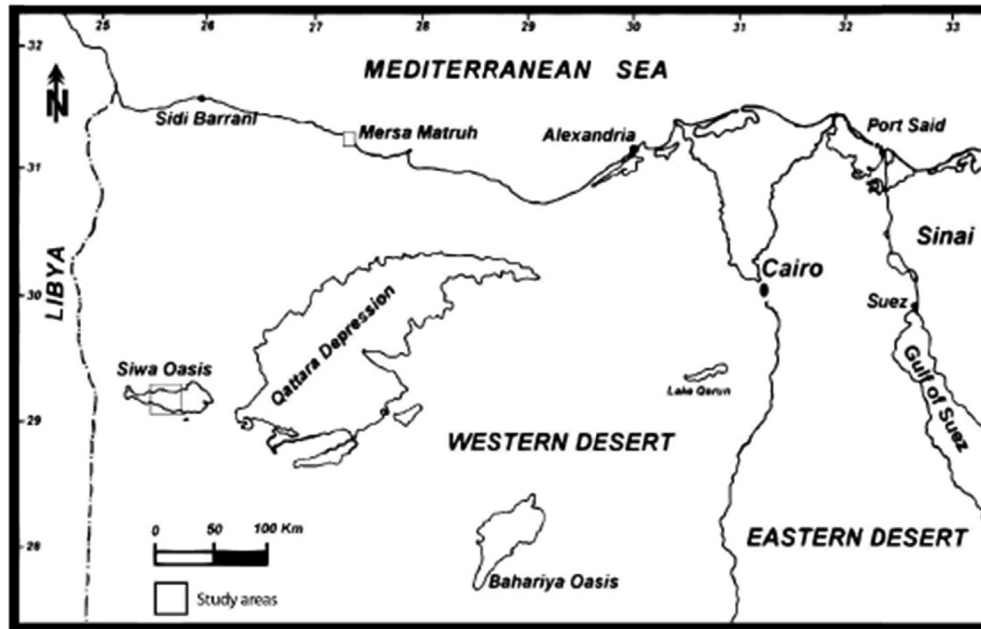


Fig. 1. Location map of the study areas.

Description: Zoaria encrusting membraniporiform, unilamellar. Zooecia distinct, rectangular shape, with convex distal margins and concave proximal one, separating by distinct grooves, arranged in alternating longitudinal rows, radiating from anastomosing region, the walls are heavily calcified, granulated. Cryptocyst reduced, granular. Opesia as large as the frontal of the zooecia, elliptical, rectangular, often with straight proximal margins and rounded distal one, margins are slightly denticulated. Mural rim thick, granulated.

Measurements:

Lz (1, 14): 0.33–0.52 mm.	lz (1, 14): 0.27–0.29 mm.
ho (1, 14): 0.27–0.35 mm.	lo (1, 14): 0.17–0.21 mm.

Occurrence: Middle Miocene, Marmarica Formation, Mersa Matruh, and Siwa.

Distribution: Eocene of Egypt, France, Spain, Italy, U.S.A., Belgium, and North America. Oligocene of Germany, Italy, U.S.A. Miocene of Egypt, France, Italy, England, Spain Tunisia, Algeria, Morocco, Austria, Italy, Poland, Portugal, U.S.A. and Central America. Pliocene of Egypt, Tunisia, Morocco, Spain, Portugal, England, Italy, Argentina, Venezuela, Australia, Japan. Pleistocene of Egypt, Italy, Algeria, U.S.A., Argentina, and China. (Ziko, 1996).

Habitat: It is a cosmopolitan species lives in warm, shallow waters at low depths (maximum depth 100 m). Equatorial and tropical zones of Atlantic, Pacific, Indian, and Red Sea. Near shore in depths 10–15 m (Moissette, 1988) and (Ziko, 1996).

Range: Eocene–Recent.

Genus: *Conopeum* Norman, 1903

Conopeum lacroixii (Audouin, 1826)

(Pl. 1, Figs. 2 and 3)

1826 *Flustra lacroixii* Audouin: 240, pl. 10, fig. 9.

1985 *Conopeum lacroixii* (Audouin): Ziko: 29, pl. 6, fig. 4.

2006 *Membranipora lacroixii* (Audouin): Ziko, El Safori, Zalat, El-Dera, Saber and El-Khawaga: 31, pl. 2, Figs. 3–4.

Description: Zoarium encrusting, membraniporiform, unilamellar. Zooecia distinct, circular to sometimes elongated, separated by distinct, deep grooves, arranged in alternating longitudinal rows. Cryptocyst reduced, granular. Opesia large occupied almost the entire of zooecia, terminal, elliptical, circular, with thin, elevated, granular mural rim. Two or more spines and tubercles at the proximal part of opesia. Small triangular space separating the zooecia.

Measurements:

Lz (1, 10): 0.41–0.68 mm.	lz (1, 10): 0.32–0.41 mm.
ho (1, 10): 0.30–0.53 mm.	lo (1, 10): 0.24–0.32 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh.

Distribution: Eocene and Miocene of Egypt. Eocene of France, Belgium and U.S.A. Oligocene of Europe. Miocene of North America, Tunisia, Italy, Australia and Hungary. Pliocene of England and Europe. Quaternary of England and Argentina (Canu and Bassler, 1920; Ziko, 1985 and El Safori, 2005).

Habitat: Atlantic, Pacific, and Indian Oceans, Mediterranean and Red Sea (El Safori, 2005 and Ziko et al., 2006). This species doesn't appear to inhabit the great depths, but it is common near shores (Canu and Bassler, 1920). Depth range between 70 and 180 m. (Canu, 1909).

Range: Eocene–Recent.

Family: Calloporidae Norman, 1903

Genus: *Callopora* Gray, 1848

Callopora lineata (Linnaeus, 1767)

(Pl. 1, Figs. 4 and 5)

1767 *Flustra lineata* Linnaeus: 1301.

1912 *Membranipora lineata* (Linnaeus): Canu: 193, pl. 10, fig. 3.

1953 *Callopora lineata* (Linnaeus): Bassler: 160, figs. 123, 2.

1985 *Callopora lineata* (Linnaeus): Ziko: 33, pl. 7, Figs. 1–5.

Description: Zoarium encrusting shell fragments, membraniporiform, unilamellar. Zooecia distinct, elongate, elliptical to hexagonal, separated by distinct, deep grooves, arranged in alternating longitudinal rows. Opesia large occupying almost the entire of zooecia, elliptical, elongate, with thick, granular

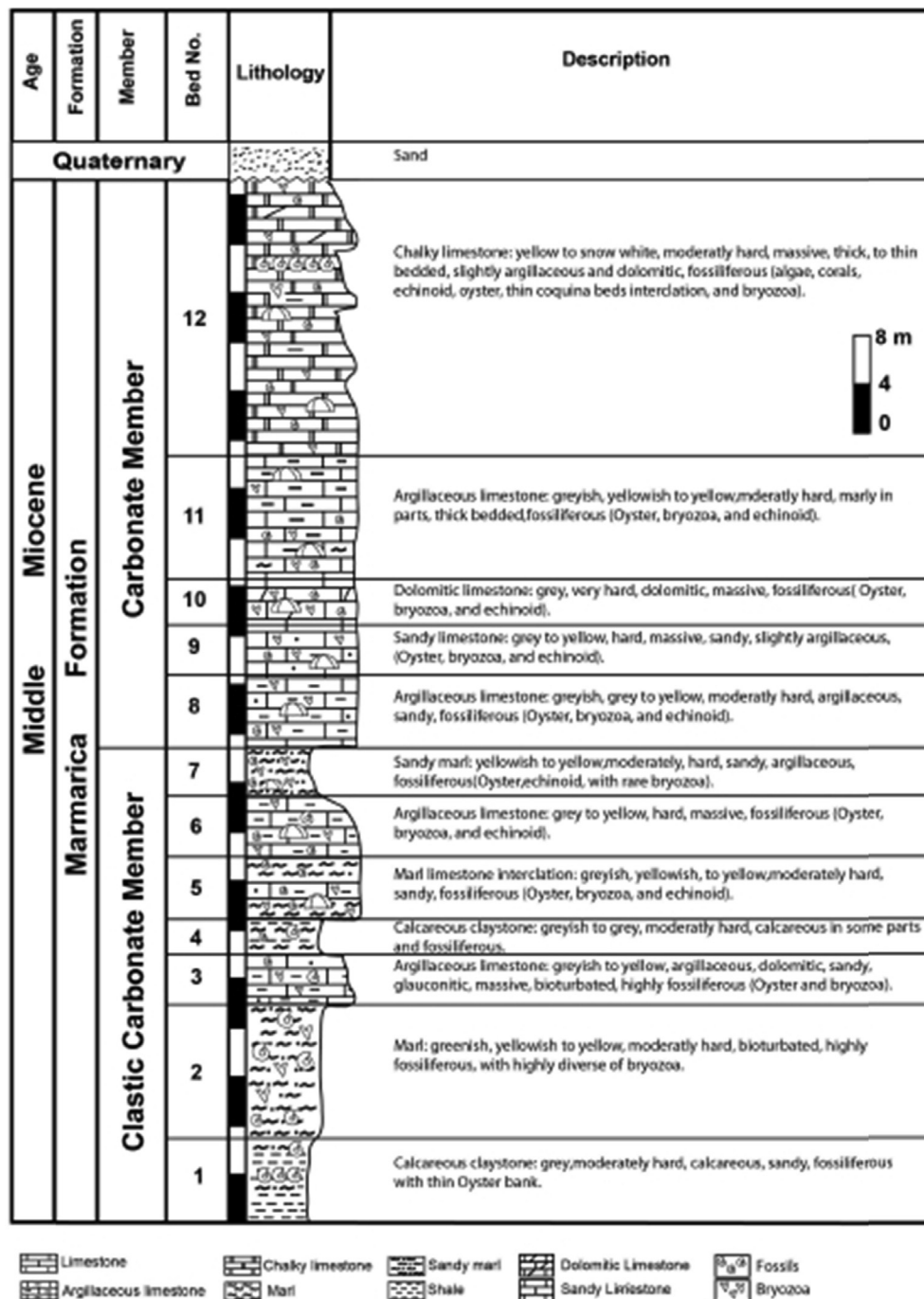


Fig. 2. Composite stratigraphic section at Siwa area.

mural rim, ornamented by spines. Gymnocyst flat, smooth, well developed. Interzooecial avicularia, of two sizes, the large with pivot, elongated, pointed distally, with long, straight, open channelled opesia. Ovicell hyperstomial, large, globular.

Measurements:

Lz (1, 10): 0.30–0.58 mm.
ho (1, 10): 0.30–0.53 mm.
Lov: 0.13–0.17 mm.
Lav: 0.30 mm.

lz (1, 10): 0.21–0.47 mm.
lo (1, 10): 0.24–0.32 mm.
lov: 0.23–0.26 mm.
lav: 0.10 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh.

Distribution: Eocene and Miocene of Egypt. Eocene of Argentina. Miocene of France, Italy, Austria, Poland, Pliocene of Italy and Spain. Quaternary of Italy. (Ziko, 1985 and El Safori, 2002).

Habitat: North Atlantic between latitudes 65°N and 25°N, Australia, Alaska. Mediterranean and Arctic, Pacific and Indian Oceans (Australia and New-Zealand). Universally abundant in the temperate zones in the north hemisphere in the littoral zone. During summer the species may be found at depths of 150 m but more commonly in shallower depths (El Safori, 2002).

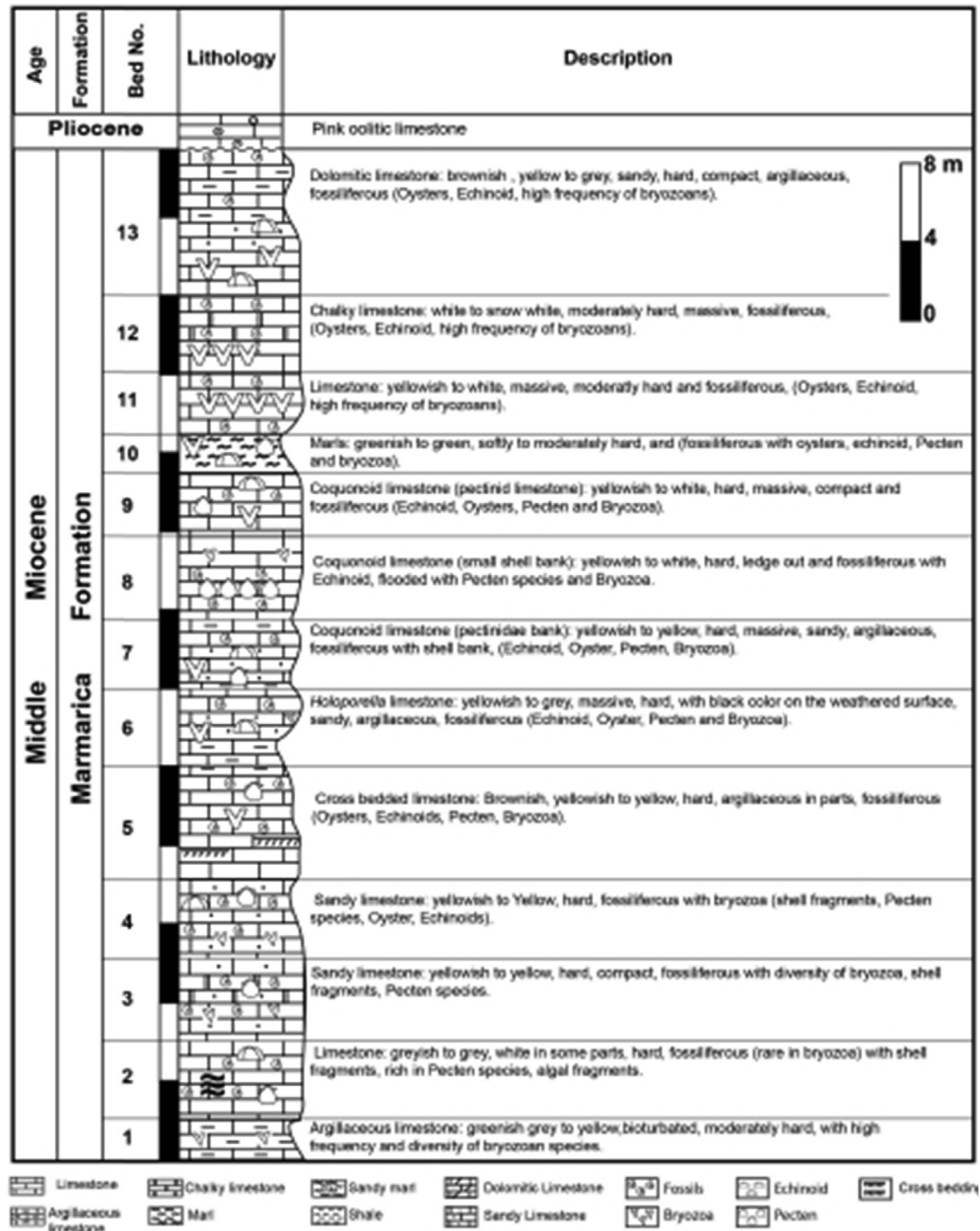


Fig. 3. Composite stratigraphic section at Matruh area.

Range: Eocene–Recent.

Genus: *Alderina* Norman, 1903
Alderina imbellis (Hincks, 1860)
 (Pl. 1, Fig. 6)

1929 *Alderina imbellis* (Hincks): Canu and Bassler: 108, pl. 8, fig. 2.
 1953 *Alderina imbellis* (Hincks): Bassler: G 161, fig. 123, 1.

Description: Zoarium encrusting shell fragments, membraniporiform, unilamellar. Zooecia distinct, elongate, elliptical, separated by distinct, deep grooves, arranged in alternating longitudinal rows. Opesia large occupied almost the entire of zooecia, elliptical, elongate, with thick, granular mural rim. Ovicell endozoocial, of semicircular outline.

Measurements:

Lz (1, 5): 0.34–0.41 mm.
 ho (1, 5): 0.23–0.30 mm.

lz (1, 5): 0.26–0.29 mm.
 lo (1, 5): 0.20–0.21 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh.

Distribution: Miocene of France and Recent of Phillippine (Canu and Bassler, 1929).

Habitat: It was found in warm waters and equatorial waters. Atlantic: Norway, North Sea and Gulf of Gascony (550 m). (Canu and Bassler, 1929).

Range: Miocene–Recent.

Family: Microporidae Hincks, 1880

Genus: *Micropora* Gray, 1848

Micropora coriacea (Johnston, 1847)
 (Pl. 2, Fig. 1)

1847 *Flustra coriacea* Johnston: 349, pl. 56, fig. 8.

1940 *Micropora coriacea* (Esper): Osburn: 373.

1953 *Micropora coriacea* (Esper): Bassler: 170, fig. 129, 1.

Description: Zoarium encrusting, membraniporiform, uniserial, flat. Zooecia distinct, elongate, flask shape, originating from ancestrular zone, separated by shallow, thin furrows.

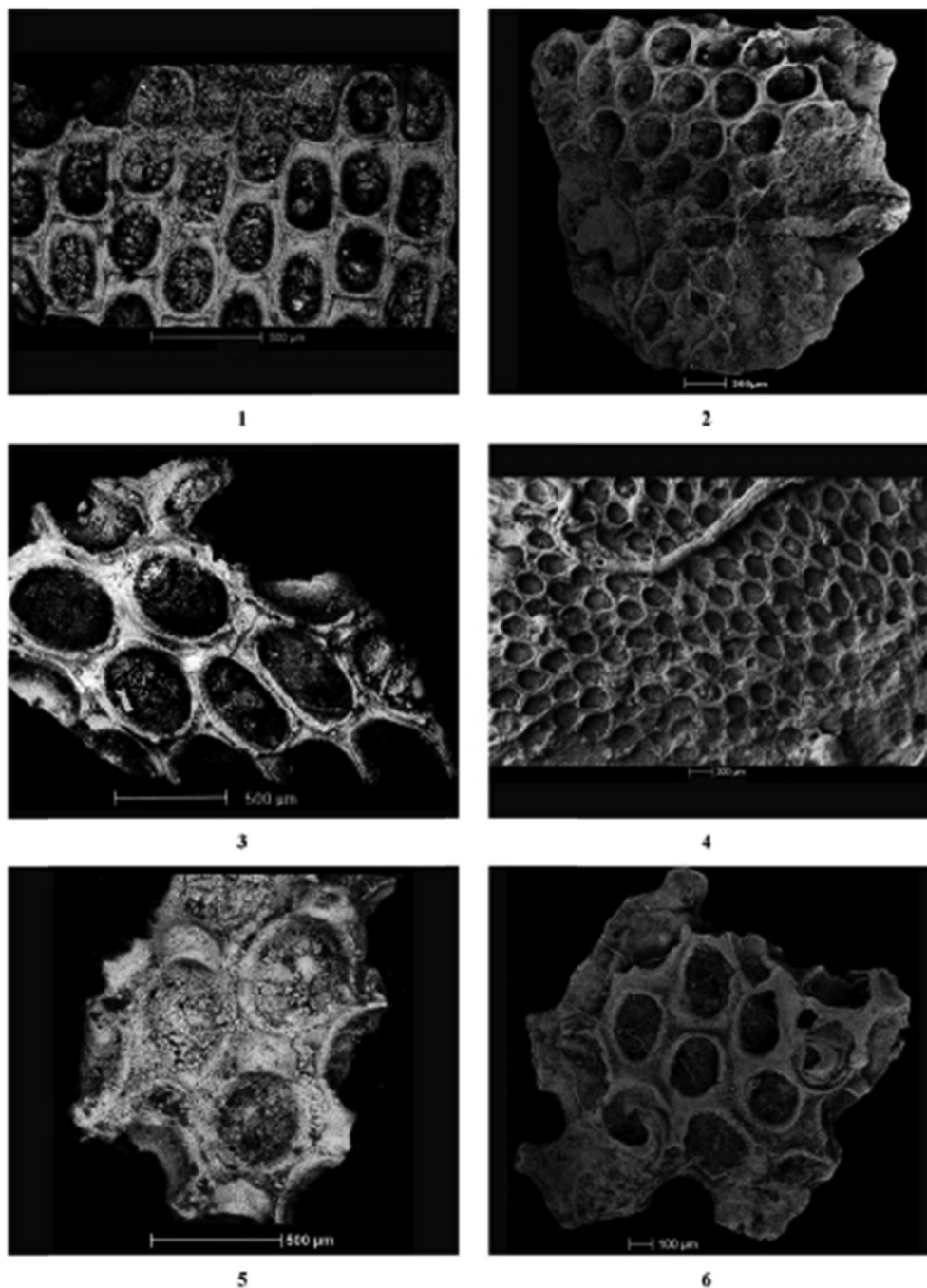


Plate 1. Fig. 1: *Membranipora savartii* (Savigny-Audouin, 1826). 1. Frontal view of zoarium. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Figs. 2, 3: *Conopeum lacroixii* (Audouin, 1826). 2. General view of zoarium. 3. General view of another zoarium. (Matruh area, Marmarica Formation, Middle Miocene). Figs. 4–5: *Callopora lineata* (Linnaeus, 1767). 4. General view of zoarium. 5. General view of another zoarium with distinct hyperstomial ovicells. (Matruh area, Marmarica Formation, Middle Miocene). Fig. 6: *Alderina imbellis* (Hincks, 1860). 6. General view of zoarium. (Matruh area, Marmarica Formation, Middle Miocene).

Frontal flat to gently convex, thick, finely perforated and granulated. Zooecial outlines thicker proximally than distally. Cryptocyst plane to slightly convex, granular with two large opesiules at the distolateral corners of the frontal cryptocyst just below opesia. Opesia terminal, transverse, semicircular, straight proximally, curved distally, with two rounded cardelles, with distinct, thin mural rim. No ovicells or avicularia are observed.

Measurements:

Lz (1, 5): 0.48–0.58 mm.	lz (1, 5): 0.25–0.35 mm.
ho (1, 5): 0.08–0.10 mm.	lo (1, 5): 0.10–0.13 mm.

Occurrence: Middle Miocene, Marmarica Formation, Siwa.

Distribution: Eocene of France, Italy, Poland, U.S.A., Oligocene of France, Hungary, U.S.A., Australia, Miocene of Egypt (Middle Miocene of Siwa), Iran, France, Italy, Morocco, U.S.A., Argentine and Australia. Pliocene of Italy. Pleistocene of Italy and U.S.A. Recent of Mediterranean Sea (Moissette, 1988).

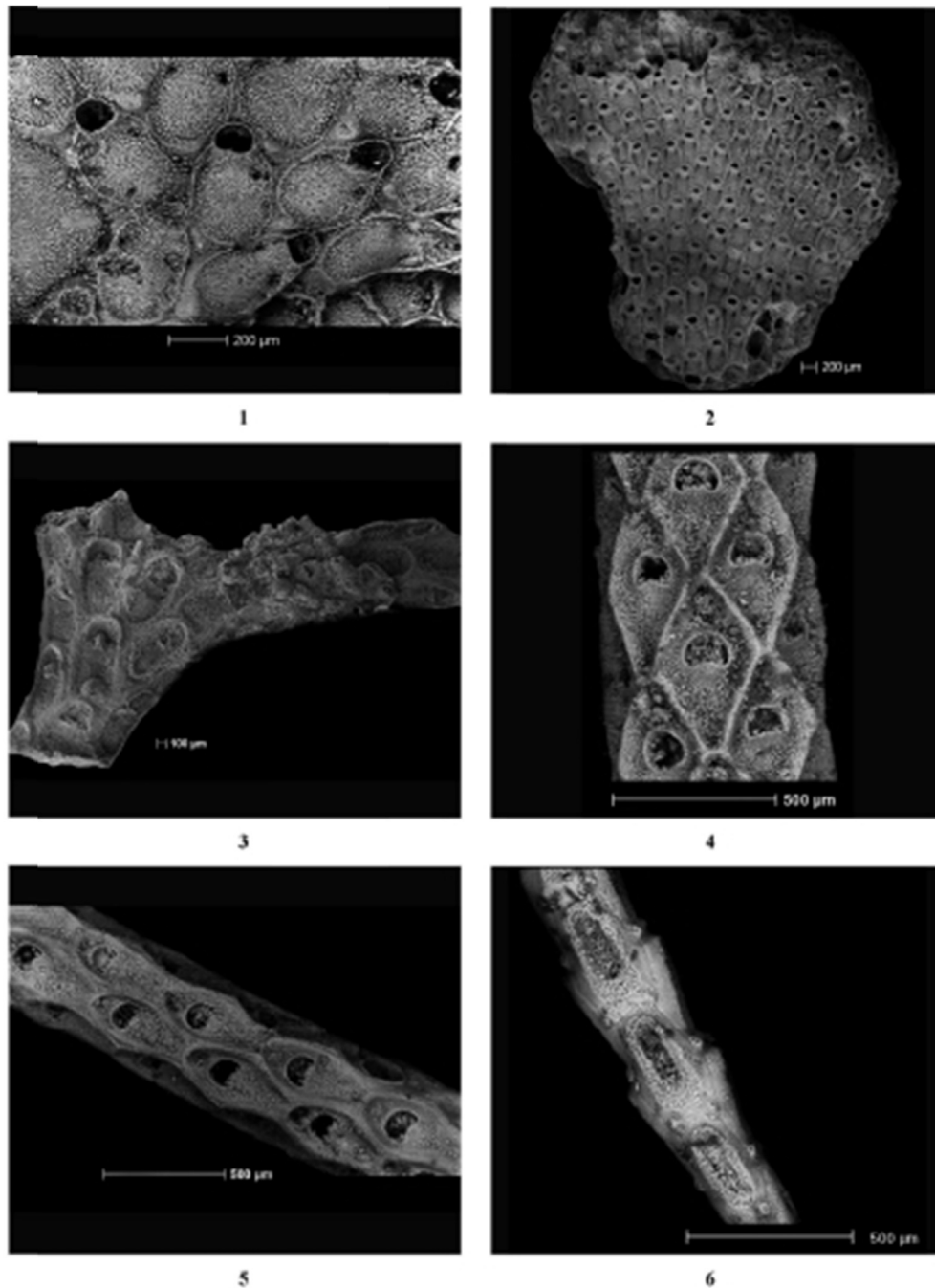


Plate 2. Fig. 1: *Micropora coriacea* (Esper, 1791). 1. General view of the zoarium, notice large, frontal opesiules. (Siwa area, Marmarica Formation, Middle Miocene). Fig. 2: *Calpensia calpensis* (Busk, 1854). 2. General view of zoarium, showing frontal opesiules. (Matruh area, Marmarica Formation, Middle Miocene). Fig. 3: *Steginoporella magnilabris* (Busk, 1854). 3. General view of zoarium large, proximal denticle. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Fig. 4: *Cellaria fistulosa* (Linnaeus, 1758). 4. General view of zoarium showing two, large denticles at the proximal border of opesia. (Matruh area, Marmarica Formation, Middle Miocene). Fig. 5: *Cellaria sinuosa* (Hassall, 1841). 5. General view of zoarium. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Fig. 6: *Nellia tenella* (Lamarck, 1816). 6. General view of erect zoarium. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene).

Habitat: It is a cosmopolitan species lives in all seas in cool and relatively deep water from the Antarctic to Australia, in the Indian Ocean, in the Mediterranean Sea, and in the Pacific Ocean from California to Japan. It lives at depths 0–800 m and in the Mediterranean at 30–100 m depth (Moissette, 1988).

Range: Eocene–Recent.

Family: Calpensiidae Canu and Bassler, 1923

Genus: *Calpensia* Jullien, 1888

Calpensia calpensis (Busk, 1854)

(Pl. 2, Fig. 2)

1854 *Membranipora calpensis* Busk: 60, pl. 104, figs. 5, 6.

Description: Zoaria encrusting, membraniporiform, unilamellar. Zooecia distinct, elongated, rectangular, arranged in alternating, longitudinal rows, connected by their mural rims, with thick outlines. Cryptocyst large, slightly convex, finely granulated. Opesia terminal, transverse, semicircular, straight proximally and arched distally. Mural rim thick, crenulated. Two small opesiules, disto-lateral to zooecia, elliptical.

Measurements:

Lz (1, 4): 0.40–0.47 mm.	lz (1, 4): 0.27–0.33 mm.
ho (1, 4): 0.13–0.17 mm.	lo (1, 4): 0.10–0.20 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh.
Distribution: Miocene of Egypt (Siwa area, Western desert) (El Safori, 2002).

Miocene of France and Portugal. Pliocene of Italy and Tunisia.
 Pleistocene of Italy and Quaternary of Italy.

Habitat: Recent, Mediterranean Sea (David et al., 1972).

Range: Miocene–Recent.

Family: Steginoporellidae Bassler, 1953

Genus: *Steginoporella* Smitt, 1873

Steginoporella magnilabris (Busk, 1854)

(Pl. 2, Fig. 3)

1854 *Membranipora magnilabris* Busk: 62, pl. 65, fig. 4.

1926 *Steginoporella magnilabris* (Busk): Harmer: 277, pl. 17, figs. 1, 2, 3, 7, 9, 12, text fig. 10.

1929 *Steginoporella magnilabris* (Busk): Canu and Bassler: 144, pl. 15, figs. 1, 2.

1940 *Steginoporella magnilabris* (Busk): Osburn: 375.

1953 *Steginoporella magnilabris* (Busk): Bassler: 172, figs. 132 a, b.

2006 *Steginoporella magnilabris* (Busk): Ziko, El Safori, Zalat, El-Dera, Saber and El-Khawaga: 38, pl. 5, Figs. 2–3.

Description: Zoarium erect, Vinculariiform or adeoniform, large, bifoliate cylindrical, branched, with 3–5 zooecial rows, arranged in alternating longitudinal manner. Zooecia distinct, elongate, rectangular to hexagonal. Zooecial outlines thick, well developed. Frontal cryptocyst, flat, depressed, concave, thick, finely perforated with rounded and small pores arranged in regular manner. Opesia terminal, transverse, semicircular, with straight proximal and convex, highly arched distal margins, with distinct, thick, elevated mural rim. Large denticle (lyrule) at the middle of the proximal border of the opesia. Two small, rounded opesiules just below the opesia.

Measurements:

Lz (1, 6): 0.89–1.0 mm.	lz (1, 6): 0.46–0.54 mm.
ho (1, 6): 0.26–0.31 mm.	lo (1, 6): 0.29–0.37 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh and Siwa.

Distribution: Miocene and Pliocene of North America (Canu and Bassler, 1923). Recent of Gulf of Mexico (Bassler, 1953). Recent of the Mediterranean Sea (Ziko et al., 2006).

Habitat: It is the most cosmopolitan species, principally found in tropical and subtropical seas, sometimes in temperate zones, from shallow waters. Depth is very variable; from 0 to 600 m. At Western Atlantic, Florida (24–59 m), Jamaica (16–19 m), Brazil (32 m). Western Pacific, Japan (324 m), China Sea (43 m), Philippines (29 m), Singapore to Honolulu (32–64 m). Indian Ocean and East Africa (3–16 m) (Canu and Bassler, 1923) and (Harmer, 1926).

Range: Miocene–Recent.

Family: Cellariidae Hincks, 1880

Genus: *Cellaria* Ellis and Solander, 1786

Cellaria fistulosa (Linnaeus, 1758)

(Pl. 2, Fig. 4)

1758 *Eschara fistulosa* Linnaeus: 804.

1953 *Cellaria fistulosa* (Linnaeus): Bassler: 176, fig. 135, 1.

2002 *Cellaria fistulosa* (Linnaeus): Hayward and McKinney: 34, fig. 15 A–E.

Description: Zoaria free, erect, cellariiform, cylindrical, composed of articulated segments. Zooecia distinct, hexagonal, arranged in alternating longitudinal rows, ranged about eight rows per each segment, separating by shallow grooves. Cryptocyst deep, concave, finely granulated. Opesia subterminal, horse shoe shape, semilunar, transverse with slightly straight to curved proximal border and rounded distal one, proximal edge with two triangular teeth projecting upward. Mural rim thin, smooth. Zooecial outlines thick, granulated. Ovicell endotoical, globular, depressed.

Measurements:

Lz (1, 5): 0.44–0.60 mm.	lz (1, 5): 0.24–0.32 mm.
ho (1, 5): 0.08–0.11 mm.	lo (1, 5): 0.08–0.13 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh.

Distribution: Oligocene of Germany and Spain. Miocene of Egypt, France, Austria, Portugal, Romania, CSSR, Morocco and Algeria. Pliocene of Portugal, Italy, Tunisia and Spain. Pleistocene of Italy. Recent of North Atlantic (Moissette, 1988).

Habitat: It is a cosmopolitan species except Arctic and Antarctic regions. Common in shallow coastal waters throughout the Mediterranean with optimum depth range of 30–80 m. It lives in hot, temperate to slightly cold waters (Moissette, 1988) and (El Safori, 2002).

Range: Oligocene–Recent.

Cellaria sinuosa (Hassall, 1841)

(Pl. 2, Fig. 5)

1841 *Farcimia sinuosa* Hassall: 172, pl. 6, Figs. 1–6.

2000 *Cellaria sinuosa* (Hassall): Ziko, El-Sorogy, Zalat, Eweda and Saber: 1478, pl. 3, fig. 8.

Description: Zoaria free, erect, cellariiform, cylindrical. Zooecia distinct, Rhomboidal, arranged in alternating longitudinal rows, ranged about ten rows per each segment. Cryptocyst deep, concave, finely granulated. Opesia subterminal, close to the distal of zooecia, horse shoe shape, semi lunar, transverse with slightly straight proximal border and rounded distal one, proximal edge with two triangular teeth. Mural rim thin, smooth. Zooecial outlines thin, elevated, smooth.

Measurements:

Lz (1, 8): 0.44–0.48 mm.	lz (1, 8): 0.27–0.33 mm.
ho (1, 8): 0.08–0.10 mm.	lo (1, 8): 0.09–0.13 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh and Siwa.

Distribution: Miocene of Egypt (Middle Miocene of Matruh, Siwa and Cairo-Suez district). Pliocene of England, France, Portugal and Italy. Pleistocene of Italy. (Moissette, 1988).

Habitat: It lives in East Atlantic and in temperate waters of the Mediterranean Sea. With optimum range depths 80–100 m reaches to 160 m in Mediterranean Sea (Moissette, 1988).

Range: Miocene–Recent.

Division: Cellularina Smitt, 1867

Family: Farciminariidae Busk, 1852

Genus: *Nellia* Busk, 1852

Nellia tenella (Lamarck, 1816)

(Pl. 2, Fig. 6)

1816 *Cellaria tenella* Lamarck: 135.

1929 *Nellia oculata* (Busk): Canu and Bassler: 185, pl. 5, fig. 12.

1940 *Nellia oculata* (Busk): Osburn: 400.

1953 *Nellia oculata* (Busk): Bassler: 179, figs. 137, 2.

1985 *Nellia oculata* (Lamarck): Ziko: 58, pl. 13, Figs. 4–6.

2004 *Nellia tenella* (Lamarck): El-Sorogy, Abdelwahab, Ziko, El-Dera, Saber and Abu El-Khir: 203, pl. 1, Fig. 9.

Description: Zoarium erect, cellariiform, straight, delicate, slightly long with articulated internodes, composed of four identical zooecial faces, arranged alternatively. Zooecia distinct, elongate, rectangular, separating by distinct, thin, deep grooves, arranged in alternating longitudinal rows. Gymnocyst large, smooth, slightly convex. Opesia terminal, elliptical, with thin, elevated, smooth mural rim. A pair of small avicularia at the distal part of zooecia, on basal gymnocyst, with pivot, short, triangular rostrum, with pivot. Ovicell not observed.

Measurements:

Lz (1, 2): 0.38–0.44 mm.	lz (1, 2): 0.23–0.25 mm.
ho (1, 2): 0.23–0.27 mm.	lo (1, 2): 0.10 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh and Siwa.

Distribution: Eocene and Miocene of Egypt (Ziko, 1985) and (El-Dera, 1996).

Eocene of Europe, Africa, America and France. Oligocene of Europe, Africa and America. Miocene of Africa, Asia, Europe, America, Hungary and Australia. Pliocene-Pleistocene of Asia and America.

Habitat: Cosmopolitan in tropical and warm-temperate zones of all oceans, from depth ranging between 17 and 450 m but much frequent on sponges from 20 to 28 m. (Ziko et al., 2000). Recent of Egyptian Red Sea. (El-Sorogy et al., 2004).

Range: Eocene–Recent.

Family: Bugulidae Gray, 1848

Genus: *Dendrobeania* Levinsen, 1909

Dendrobeania lamellosa (Canu and Bassler, 1928).

(Pl. 3, Fig. 1)

1928 *Dendrobeania lamellosa* Canu and Bassler: 41, pl. 5, Figs. 9–14.

1940 *Dendrobeania lamellosa* Canu and Bassler: Osburn: 392.

Description: Zoarium membraniporiform, unilamellar, large, broad ramified fronds. Zooecia distinct, elongate, somewhat fusiform. Frontal, gymnocyst, very small, often absent. Opesia large occupied almost the entire front. Mural rim thick, elevated, with two to three distal spines. Avicularia large, interopesia, with the shape of a kidney bean, with small mandible. Ovicell hyperstomial, large, globular, smooth. Non celluliferous face of zoarium, with hydrostatic tuberosities.

Measurements:

Lz: 0.57–0.63 mm	lz: 0.25–0.40 mm.
ho: 0.48–0.54 mm.	lo: 0.15–0.29 mm.
Lov: 0.20–0.28 mm.	lov: 0.40–0.48 mm.
Lav: 0.22–0.26 mm.	lav: 0.09–0.15 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh.

Distribution: In Egypt: Middle Miocene of western desert (Matruh area) (El-Dera, 1996).

Habitat: Pacific in the Gulf of Mexico region (Canu and Bassler, 1928).

Range: Miocene–Recent.

Family: Scrupocellariidae Levinsen, 1909

Genus: *Scrupocellaria* Van beneden, 1845

Scrupocellaria elliptica (Reuss, 1848).

(Pl. 3, Figs. 2–5)

1847 *Bactridium ellipticum* Reuss: 56, pl. 9, Figs. 7–8.

1995 *Scrupocellaria elliptica* (Reuss): Ziko and El-Sorogy: 308.

2004 *Scrupocellaria elliptica* (Reuss): El-Sorogy, Abdelwahab, Ziko, El-Dera, Saber and Abu El-Khir: 205, pl. 2, fig. 1.

Description: Zoarium erect, cellariiform, free, biserial, articulated segments, straight to slightly curved. Zooecia distinct, elliptical, alternating, separated by thick furrows. Frontal cryptocyst, small, reduced, smooth. Opesia large, oval. Lateral avicularia present giving the branch a serrate shape. Frontal avicularia, with pivot, open channelled, present at the side of the proximal end of the opesia, at a bifurcation. Two or three spines are present at the distal part of opesia. Ovicell large, globular, hyperstomial, finely perforated. Dorsal smooth, dorsal vibracula transverse. Radicular pore circular, just beneath the vibraculum. Joints separated the zooecia are normally developed at the dorsal side.

Measurements:

Lz: 0.19–0.29 mm.	Lz (ovicelled): 0.41–0.53 mm	
lz: 0.12–0.22 mm.	lz (ovicelled):	0.16–0.25 mm.
ho: 0.13–0.21 mm.	lo: 0.08–0.12 mm.	
Lov: 0.17–0.19 mm.	lov: 0.15–0.17 mm.	

Occurrence: Marmarica limestone, Middle Miocene, Matruh.

Distribution: In Egypt: Middle Miocene of western desert (Matruh and Siwa areas), Cairo-Suez district (Ziko et al., 1992) and Pleistocene of Red Sea coast (Ziko and El-Sorogy, 1995). Recent of Egyptian Red Sea (El-Sorogy et al., 2004). Eocene: Spain, France, Italy and U.S.A. (Canu and Bassler, 1920). Oligocene: France and Italy. Miocene: Libya, France, Iran, Portugal, Belgium, CSSR, Italy, Austria, Poland and Algeria. Pliocene: Portugal, Spain, Italy and Tunisia. Pleistocene: Italy and Tunisia. (Vávra, 1977; Moissette, 1988 and Schmid, 1989).

Habitat: Recent of North Atlantic. (Vávra, 1977).

Range: Eocene–Recent.

Division: Cribrimorpha

Family: Cribrilinidae Hincks, 1880

Genus: *Cribrilaria* Canu and Bassler, 1929

Cribrilaria radiata (Moll, 1803).

(Pl. 3, Fig. 6)

1803 *Eschara radiata* Moll: 63, pl. 4, fig. 7.

1929 *Puellina radiata* (Moll): Canu and Bassler: 238, pl. 22, fig. 1.

1930 *Cribrilaria radiata* (Moll): Canu and Bassler: 29, pl. 2, fig. 8.

1940 *Puellina radiata* (Moll): Osburn: 406.

1953 *Cribrilaria radiata* (Moll): Bassler: 186, fig. 141, 2.

1992 *Cribrilaria radiata* (Moll): Ziko, Hamza and El-Dera: 308, pl. 4, fig. 4.

1996 *Cribrilaria radiata* (Moll): Ziko: 132.

2000 *Cribrilaria radiata* (Moll): Ziko, El-Sorogy, Zalut, Eweda and Saber: 1480, pl. 4, figs. 2, 4.

Description: Zoarium encrusting molluscan shells and other debris or hard substratum, making rounded patches, multiserial. Zooecia distinct, medium size, oval to slightly circular, hexagonal, convex, separated by deep grooves. Frontal convex, with costules, include about 15–17 long costae radiated medially reaching lateral zone with slit-like intercostal pores, about 5–6 pores between each costae. Orifice terminal, lunate, semicircular, straight proximally, rounded distally, wider than long, distal part bearing about 5 spines. Peristome thick, smooth, circles the orifice. Avicularia large, drop-like, interzooecial, with tapered, elongate, triangular rostrum, with pivot. Ovicells hyperstomial, smooth, domed, globular, with thick median longitudinal ridge.

Measurements:

Lz: 0.36–0.49 mm.	lz: 0.26–0.38 mm.
ho: 0.04–0.06 mm.	lo: 0.09–0.11 mm.
Lov: 0.15–0.17 mm.	lov: 0.17–0.19 mm.
Lav: 0.24–0.26 mm.	lav: 0.13–0.20 mm.

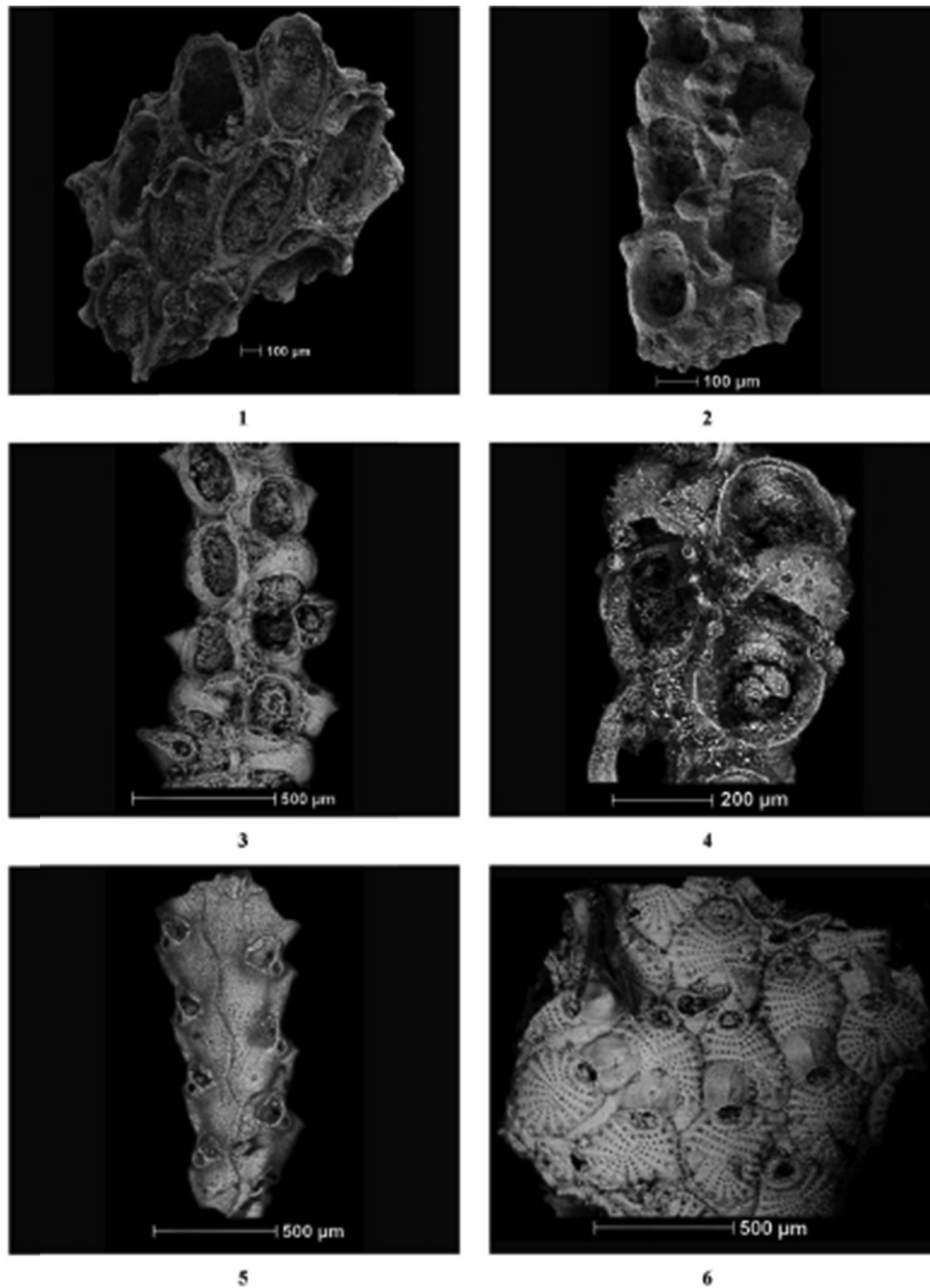


Plate 3. Fig. 1: *Dendrobeatia lamellosa* (Canu and Bassler, 1928). 1. General view of zoarium of another zoarium showing avicularia and large denticles at the distal border of opesia. (Matruh area, Marmarica Formation, Middle Miocene). **Figs. 2–5:** *Scrupocellaria elliptica* (Reuss, 1848). 2. General view of zoarium showing lateral avicularia and hyperstomial ovicells. 3. General view of zoarium showing lateral avicularia and hyperstomial ovicells. 4. Enlarged view of zoarium showing hyperstomial ovicells and distal, proximal spines around opesia. 5. Dorsal view of zoarium showing transverse, dorsal vibracula and circular radicular pore. (Matruh area, Marmarica Formation, Middle Miocene). **Fig. 6:** *Cribrilaria radiata* (Moll, 1803). 6. General view of zoarium showing smooth, hyperstomial ovicells, interzoecial avicularia and highly costulated frontal. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene).

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Distribution: In Egypt: Middle Miocene of western desert (Matruh and Siwa areas), Cairo-Suez district, western side of the Gulf of Suez and west central Sinai. Pliocene of Kom El Shellul, south of the Giza Pyramids Plateau. Post-Pliocene, north of the Giza Pyramids Plateau (Ziko, 1996). Eocene: U.S.A., Oligocene: Italy and U.S.A. Miocene: France (basins of Rhône and Loire),

Portugal, Italy, Austria, Poland, Algeria, CSSR and Africa. Pliocene: England, Pays-Bas, Italy, Austria and Tunisia. Pleistocene: Europe, U.S.A. (Canu and Bassler, 1920), (Canu, 1912), (David et al., 1972) and (Ziko et al., 2000).

Habitat: It is a cosmopolitan species. Recent of Mediterranean (0–400 m.) with optimum depth 50–80 m. Atlantic, Pacific and Indian (David et al., 1972) and (Ziko, 1996).

Range: Eocene–Recent.

Genus: *Figularia* Jullien, 1886*Figularia figularis* (Johnston, 1847).

(Pl. 4, Figs. 1 and 2)

1847 *Lepralia figularis* Johnston: 314, pl. 56, fig. 2.1979 *Figularia figularis* (Johnston): Hayward and Ryland: 70, figs. 10 C, 20.2002 *Figularia figularis* (Johnston): Hayward and McKinney: 38, fig. 16 D, E.

Description: Zoarium membraniporiform, encrusting molluscan shells and other bryozoans, unilaminar. Zooecia distinct, large, hexagonal, convex, separated by distinct, deep grooves, radiating from ancestrular area. Frontal convex, with costules, include about 12–14 short costae fused medially, at intervals laterally, with slit-like intercostal pores, about 4 pores between each costae, becomes larger in the central area, clear, rounded to slightly elongate. Orifice terminal, lunate, semicircular, like transverse D-shape, straight proximally, arched distally, wider than long. Peristome thick, smooth, circles the orifice. Avicularia large, vicarious, interzoecial, with spoon shaped mandible. Ovicells hyperstomial, smooth, domed, globular.

Measurements:

Lz: 0.50–0.61 mm.	lz: 0.33–0.53 mm.
ho: 0.08–0.11 mm.	lo: 0.11–0.14 mm.
Lav: 0.42 mm.	lav: 0.22 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh.**Distribution:** Miocene: Italy, Melilla, Morocco and New Zealand. Pliocene: England, Italy. Pleistocene: Italy (Moissette, 1988).**Habitat:** Recent of east Atlantic (England, Iran, Croatia), this species is abundant in shallow coastal habitats throughout the Mediterranean at depth range from 30 to 90 m. (Moissette, 1988) and (Hayward and McKinney, 2002). It lives in temperate waters (Pouyet and Moissette, 1992)**Range:** Miocene–Recent.**Suborder:** Ascophora Levinsen, 1909**Family:** Schizoporellidae Jullien, 1903**Genus:** *Schizoporella* Hincks, 1877*Schizoporella errata* (Waters, 1878)

(Pl. 4, Fig. 3)

1878 *Lepralia errata* Waters: 11, pl. 1, fig. 9.1979 *Schizoporella errata* (Waters): Hayward and Ryland: 170, fig. 68.1992 *Schizoporella errata* (Waters): Gordon and Mawatari: 31, pl. 9, B.2002 *Schizoporella errata* (Waters): Hayward and McKinney: 67, fig. 30, F–I.2006 *Schizoporella errata* (Waters): Ziko, Zalat, El Safori, El-Dera, Saber and El-Khawaga: 46, pl. 7, Figs. 5–6.

Description: Zoarium encrusting, membraniporiform, unilaminar. Zooecia distinct, inflated, rectangular to hexagonal, arranged in longitudinal alternating rows, separated by salient, thin and deep grooves. Frontal convex, coarse tremocyst, with rounded, numerous, closely arranged tremopores, with large areolar pores, arranged in one row. Orifice terminal, semicircular, as wide as long, with thin peristome, with deep U-shaped sinus and two large, triangular condyles. Avicularia single, situated at the right side of orifice. No ovicells are observed in our specimens.

Measurements:

Lz (1, 4): 0.52–0.74 mm.	lz (1, 4): 0.37–0.46 mm.
ho (1, 4): 0.13–0.15 mm.	lo (1, 4): 0.15–0.16 mm.

Occurrence: Marmarica limestone, Middle Miocene, Siwa.**Distribution:** In Egypt: Recent of the Egyptian Mediterranean. It is found through the Mediterranean, has been reported also from Atlantic in: Senegal, Gabon and Angola; the eastern coasts of the Americas from north Carolina to Brazil. It has been reported also from Red Sea, the Persian Gulf and the Pacific coast of North America (Hayward and Ryland, 1979).**Habitat:** It is widespread warm temperate-subtropical species, typical of shallow sublittoral (Hayward and Ryland, 1979).**Age:** Miocene–Recent.*Schizoporella dunkeri* (Reuss, 1848)

(Pl. 4, Figs. 4 and 5)

1848 *Cellepora dunkeri* Reuss: 90, pl. 10, fig. 27.1979 *Schizoporella dunkeri* (Reuss): Hayward and Ryland: 172, fig. 69.1989 *Schizoporella dunkeri* (Reuss): Bishop and Hayward: 18, Figs. 67–69.2002 *Schizoporella dunkeri* (Reuss): Hayward and McKinney: 69, fig. 31, A–E.2006 *Schizoporella dunkeri* (Reuss): Ziko, Zalat, El Safori, El-Dera, Saber and El-Khawaga: 44, pl. 7, fig. 4.

Description: Zoarium encrusting, membraniporiform, unilaminar. Zooecia distinct, inflated, highly convex, flask shaped with rectangular outlines, arranged in longitudinal alternating rows, separated by salient, deep grooves. Frontal convex, coarse tremocyst, with polygonal, numerous, closely arranged tremopores, with large areolar pores, arranged in one row. Orifice terminal, semicircular, wider than long, with thin peristome, with deep U-shaped sinus and two large, triangular condyles. Avicularia single, leveled with the sinus. No ovicells are observed in our specimens.

Measurements:

Lz (1, 3): 0.39–0.63 mm.	lz (1, 3): 0.33–0.47 mm.
ho (1, 3): 0.10–0.11 mm.	lo (1, 3): 0.08–0.13 mm.

Occurrence: Marmarica limestone, Middle Miocene, Siwa.**Distribution:** In Egypt: Recent of the Egyptian Mediterranean (Ziko et al., 2006). Miocene of Austria and Morocco, Pliocene of Italy (Pouyet and Moissette, 1992). This is the first record of this species in the Miocene of Egypt.**Habitat:** It is distributed from western Norway south to Gibraltar and the Mediterranean; it occurs in the English Channel but has not been reported from the North Sea (Hayward and Ryland, 1979). It is also abundant throughout the Adriatic, in shallow detritic environments (Hayward and McKinney, 2002). It is known to be a common sublittoral species around the western coasts of the British Isles. It encrusts hard substrata, particularly stones and coarse grounds (Hayward and Ryland, 1979).**Range:** Miocene–Recent.*Schizoporella longirostris* (Hincks, 1886)

(Pl. 4, Fig. 6, Pl. 5, Figs. 1 and 2)

1886 *Schizoporella unicornis* forma *longirostris* Hincks: 266, pl. 10, fig. 2.1930 *Schizoporella longirostris* (Hincks): Canu and Bassler: 43, pl. 4, Figs. 15–20; pl. 5, Figs. 1–19.1979 *Schizoporella longirostris* (Hincks): Hayward and Ryland: 173, fig. 70.1995 *Schizomavella longirostrata* (Hincks): Soule and Soule: 288, fig. 32.

Description: Zoarium encrusting. Zooecia distinct, inflated, elongated, arranged in longitudinal alternating rows, separated by salient, thin and deep grooves. Frontal convex, coarse

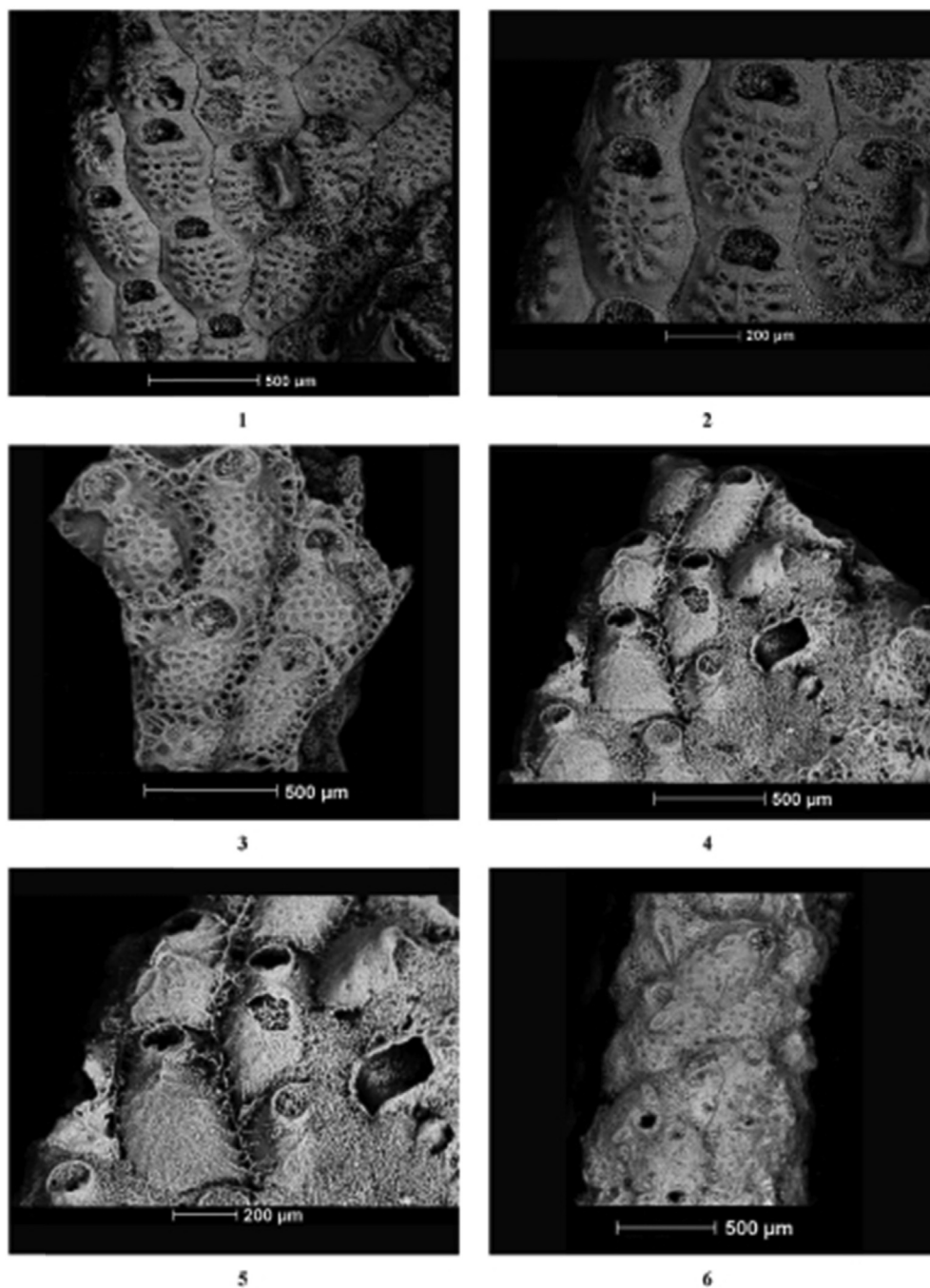


Plate 4. Figs. 1–2: *Figularia figularis* (Johnston, 1847). 1. General view of zoarium showing spatulate avicularia. 2. Enlarged view of the same zoarium showing costulated frontal with spines. (Matruh area, Marmarica Formation, Middle Miocene). **Fig. 3:** *Schizoporella errata* (Waters, 1878). 3. General view of zoarium showing deep U-shaped sinus. (Siwa area, Marmarica Formation, Middle Miocene). **Figs. 4, 5:** *Schizoporella dunkeri* (Reuss, 1848). 4. General view of zoarium showing deep U-shaped sinus and large areolar pores. 5. Enlarged view of zoarium. (Siwa area, Marmarica Formation, Middle Miocene). **Fig. 6:** *Schizoporella longirostris* (Hincks, 1886). 6. General view of zoarium showing avicularia with long, open channelled rostrum. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene).

tremocyst, with rounded, numerous, closely arranged tremopores, with areolar pores. Orifice terminal, semicircular, as wide as long, with thin peristome, with deep U-shaped sinus and two large triangular condyles. Avicularia paired, on both sides, lateral to orifice, situated level with the sinus. Large frontally budded avicularium characterizes this species, oriented proximolaterally, with very long, open channelled rostrum. Ovicells hyperstomial, inflated, spherical, as wide as length, globular, prominent, with numerous, large and rounded tremopores.

Measurements:

Lz (2, 5): 0.40–0.59 mm.	lz (2, 5): 0.24–0.38 mm.
ho (2, 5): 0.06–0.13 mm.	lo (2, 5): 0.06–0.12 mm.
Lav: 0.18–0.33 mm.	lav: 0.07–0.15 mm.
L (frontal av): 0.20–0.37 mm	l (frontal av): 0.07–0.18 mm.
Lov: 0.21–0.24 mm.	lov: 0.21–0.24 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Distribution: In Egypt: Middle Miocene of the Gulf of Suez and Cairo-Suez District and western desert (Siwa area). Miocene of Austria, France, Algeria and Italy. Pliocene of Italy. Pleistocene of Italy and U.S.A.

Habitat: This species essentially known from the Mediterranean Sea. It lives at depths range from 0 to 150 m. Sublittoral on stones and shells collected from 20 to 60 m in the Mediterranean. It has been reported from the Adriatic and the Aegean (Soule and Soule, 1995).

Range: Miocene-Recent.

Genus: *Herentia* Gray, 1848

Herentia (*Herentia*) *hyndmanni* (Johnston, 1847)

(Pl. 6, Figs. 5 and 6)

1847 *Lepralia hyndmanni* Johnston: 306, pl. 54, fig. 6.

1979 *Escharina hyndmanni* (Johnston): Hayward and Ryland: 196, fig. 82.

Description: Zoarium encrusting, membraniporiform. Zooecia distinct, flask shape, of oval to hexagonal outlines, wide, arranged in alternating longitudinal rows, separated by salient, thin and deep grooves. Frontal slightly convex, fine tremocyst, with small, rounded, numerous, closely arranged tremopores, with large areolar pores, arranged in single row. Orifice terminal, circular, as wide as long, with thin and distinct peristome, with rimule, with deep V-shaped sinus, short, with two large, triangular condyles. Distal border of the orifice rapidly thickened by additional calcification, forming a raised and curved rim above that of the primary orifice. Avicularium interzooidal, on the right or left, proximal to the orifice, with orbicular rostrum and pivot. Ovicells immersed, hyperstomial, globular.

Measurements:

Lz (1, 5): 0.52–0.59 mm.	lz (1, 5): 0.43–0.56 mm.
ho (1, 5): 0.20–0.24 mm.	lo (1, 5): 0.20–0.24 mm.
Lov: 0.15 mm.	lov: 0.35–0.38 mm.
Lav: 0.11 mm.	lav: 0.15 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh.

Distribution: Miocene of Austria, Pliocene of Italy. Pleistocene of Italy (Pouyet and Moissette, 1992). This is the first record of this species in the Miocene of Egypt and in Egypt at all.

Habitat: Recent: Atlantic (Gulf of Gascony 125–250 m), Spain (150 m) and Mediterranean from 10 to 20 m depth. This species lives at relatively high depths from 200–600 m. (Pouyet and Moissette, 1992).

Range: Miocene-Recent.

Family: Exochellidae Bassler, 1935

Genus: *Escharoides* Milne-Edwards, 1836.

Escharoides coccinea (Abildgaard, 1806).

(Pl. 5, Fig. 3)

1806 *Cellepora coccinea* Abildgaard: 30, pl. 116, Figs. 1–2.

1979 *Escharoides coccinea* (Abildgaard): Hayward and Ryland: 78, fig. 24.

Description: Zoarium ecrusting. Zooecia distinct, inflated, flask shaped, arranged in longitudinal alternative rows, separated by deep grooves, radiating from ancestrular area. Frontal convex, finely granular, with small, distinct, rounded areolar pores. Aperture terminal, semi-orbicular, with straight proximal border, with median short mucro, distal part with 4–5 rounded spines. Peristome thin and elevated. Pair of avicularia, transverse, perpendicular to the zoecial axis, large, lateral to the aperture, close to its proximal, directed inside, with pivot. No Ovicells are observed in our specimens.

Measurements:

Lz (2, 5): 0.38–0.48 mm.	lz (2, 5): 0.33–0.52 mm.
ho (2, 5): 0.10–0.16 mm.	lo (2, 5): 0.12–0.14 mm.
Lav: 0.08–0.12 mm.	lav: 0.07–0.08 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Distribution: Eocene of Germany, France, Italy, Romania. Oligocene of Germany, France, Italy, U.A.E and U.S.A. Miocene of France, Italy, Austria and Algeria. Pliocene of Italy, Tunisia, Algeria, Spain and Portugal. Pleistocene of Italy. This the first record of this species in the Miocene of Egypt and in Egypt at all.

Habitat: This species founds at depths ranging from 0 to 350 m. With optimum depth of 30–80 m in the Mediterranean. It is common and characteristic intertidal species of rocky shores all around the British Isles in the Atlantic. (Hayward and Ryland, 1979) and (Pouyet and Moissette, 1992).

Range: Miocene-Recent.

Family: Microporellidae Hincks, 1880

Genus: *Microporella* Hincks, 1877

Microporella ciliata (Pallas, 1766).

(Pl. 5, Figs. 4 and 5)

1766 *Eschara ciliata* Pallas: 38.

1940 *Microporella ciliata* (Pallas): Osburn: 432.

1952 *Microporella ciliata* (Pallas): Osburn: 377, pl. 44, fig. 1.

1953 *Microporella ciliata* (Pallas): Bassler: 207, fig. 155/9.

1979 *Microporella ciliata* (Pallas): Hayward and Ryland: 222, fig. 95, A–E.

2002 *Microporella ciliata* (Pallas): Hayward and McKinney: 83, fig. 37, E–J.

2006 *Microporella ciliata* (Pallas): Ziko, Zalut, El Safori, El-Dera, Saber and El-Khawaga: 49, pl. 8, fig. 6.

Description: Zoarium encrusting, membraniporiform, multi-serial. Zooecia distinct, inflated, flask shaped, arranged in longitudinal alternative rows, separated by deep grooves. Frontal convex, tremocyst with small rounded, numerous, closely arranged tremopores, Ascopore rounded, large, just below the aperture. Aperture terminal, semilunar, with thin, elevated peristome, with two or more spines at the distal part of it. Two small avicularia oriented distally. Ovicell hyperstomial, inflated, large, globular, with the same tremopores as the front.

Measurements:

Lz (2, 5): 0.45–0.50 mm.	lz (2, 5): 0.32–0.45 mm.
ho (2, 5): 0.07–0.09 mm.	lo (2, 5): 0.11–0.14 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh.

Distribution: In Egypt: Miocene of the western side of the Gulf of Suez and Western desert (Siwa area). Pleistocene of the Red Sea coast and Recent of the Egyptian coast of the Mediterranean. Miocene of Austria, Germany, Portugal, Italy, France, Morocco, New Zealand, Algeria and U.S.A. Pliocene of England, Netherlands, Spain, Italy, Tunisia. Pleistocene of Italy and U.S.A. Recent of Tripoli (Libya). It is distributed in the north east Atlantic from Norway to the Mediterranean, where it is widespread (Ziko et al., 2006).

Habitat: It has a cosmopolitan distribution. (Hayward and McKinney, 2002). It lives in the Mediterranean Sea at optimum depth <100 m and in low rate of sedimentation. (Ziko, 1996). It is also common in shallow coastal waters and temperate zone, with depth range 0–660 m. It does not seem to be widespread in arctic waters, it lives in Atlantic and Pacific (Hayward and Ryland, 1979).

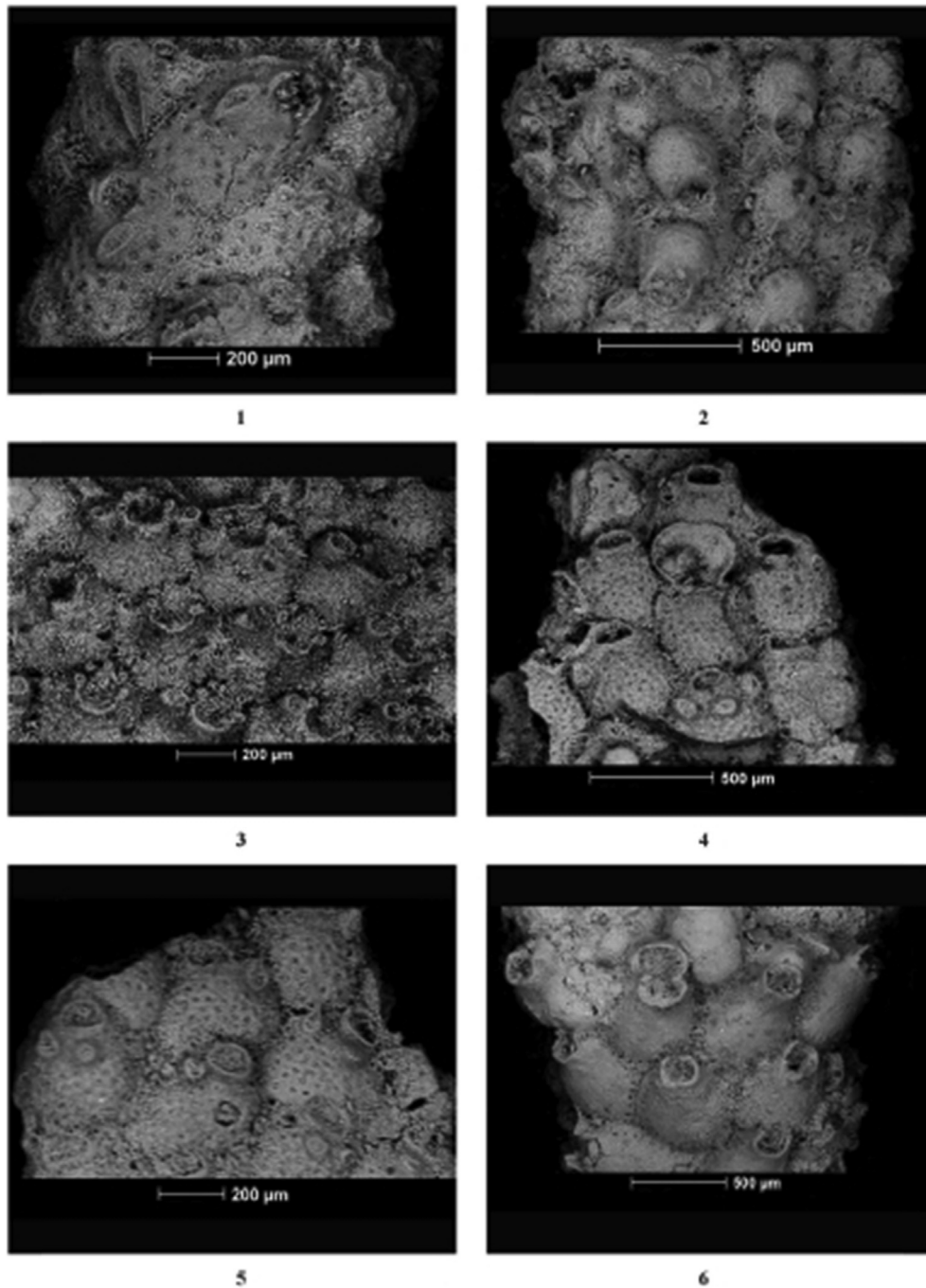


Plate 5. Figs. 1, 2: *Schizoporella longirostris* (Hincks, 1886). 1. Enlarged view of zoarium. 2. General view of another zoarium showing hyperstomial ovicells. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). **Fig. 3:** *Escharoides coccinea* (Abildgaard, 1806). 3. General view of zoarium showing conical zooecia, pair of avicularia and five spines around opesia. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). **Figs. 4, 5:** *Microporella ciliata* (Pallas, 1766). 4. General view of zoarium showing hyperstomial ovicell, avicularia and ascopore. 5. General view of another zoarium. (Matruh area, Marmarica Formation, Middle Miocene). **Fig. 6:** *Escharella ventricosa* (Hassall, 1842). 6. General view of zoarium showing hyperstomial ovicell. (Matruh area, Marmarica Formation, Middle Miocene).

Range: Miocene–Recent.

Family: Escharellidae [Levinson, 1909](#)

Genus: *Escharella* [Gray, 1848](#).

Escharella ventricosa ([Hassall, 1842](#)).

(Pl. 5, [Fig. 6](#))

1842 *Lepralia ventricosa* Hassall: 412.

1952 *Mucronella ventricosa* (Hassall): [Osburn](#): 436, pl. 52, fig. 3.

1979 *Escharella ventricosa* (Hassall): [Hayward and Ryland](#): 144, fig.

56.

Description: Zoarium ecrusting, membraniporiform. Zooecia distinct, inflated, flask shaped, arranged in longitudinal alternating rows, separated by deep grooves. Frontal convex, finely granular, with small, distinct, rounded areolar pores. Aperture terminal, orbicular, with thin peristome, with lyrula and two triangular, lateral condyles. Four spines located distally on orifice. Ovicell globular, hyperstomial and smooth.

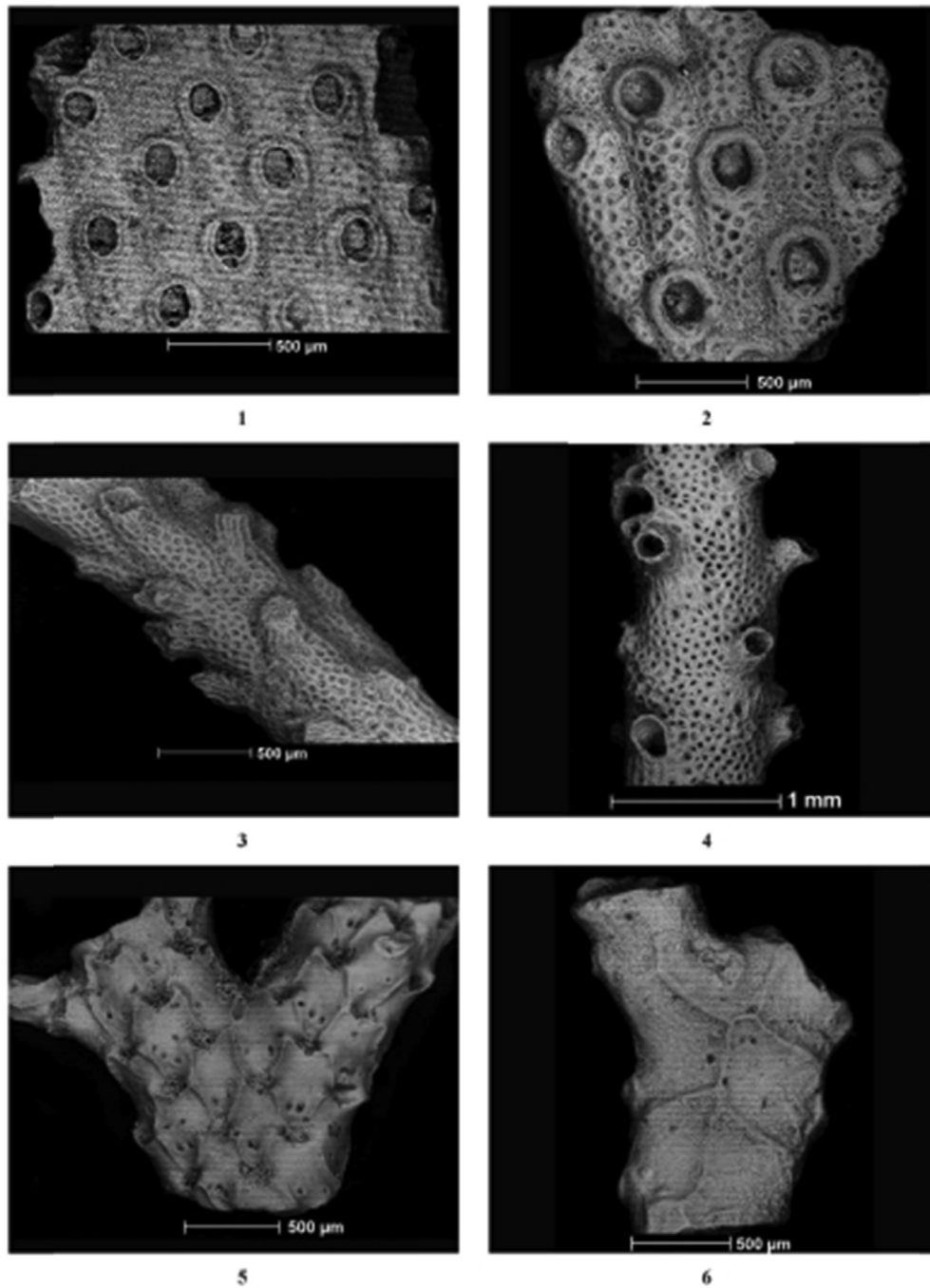


Plate 6. Figs. 1, 2: *Smittina cervicornis* (Pallas, 1766). 1. General view of zoarium showing oral avicularia. 2. General view of another zoarium. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Figs. 3, 4: *Margaretta cereoides* (Ellis and Solander, 1786). 3. General view of zoarium showing reticulate frontal. 4. General view of zoarium showing ascopore below orifice and tapered out peristome. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Figs. 5, 6: *Iodictyum rubeschi* (Reuss, 1848). 5. General view of zoarium showing olocyst with few pores. 6. Dorsal view of zoarium showing transverse veins and few tiny, rounded pores. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene).

Measurements:

Lz (1, 7): 0.58–0.75 mm.	lz (1, 7): 0.45–0.50 mm.
ho (1, 7): 0.13–0.18 mm.	lo (1, 7): 0.15–0.20 mm.
L ov: 0.25–0.30 mm.	l ov: 0.28–0.33 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh.

Distribution: Miocene of Portugal, France, Algeria and Libya. Pliocene of England, Italy, Spain, Tunisia. Pleistocene of Italy (Moissette, 1988).

Habitat: Recent in Arctic Ocean (Canada), Pacific, Atlantic and Mediterranean. This species lives in temperate and cold waters at depths from 40 to 420 m. (Li, 1990).

Range: Miocene–Recent.

Family: Mucronellidae Levinsen, 1902

Genus: *Smittina* Norman, 1903

Smittina cervicornis (Pallas, 1766).

(Pl. 6, Figs. 1 and 2)

1766 *Millepora cervicornis* Pallas: 252.

1930 *Porella cervicornis* (Pallas): Canu and Bassler: 54, pl. 7, figs. 4, 5.

1989 *Smittina cervicornis* (Pallas): Bishop and Hayward: 30, pl. 117–118.

Description: Zorium erect, adeoniform, bilamellar, elongate. Zooecia distinct, elongate, elliptical, separated by deep, thin furrows, arranged in alternating longitudinal rows with 5–7 rows on each side of zoarium. Frontal tremocyst, flat to slightly convex, with numerous, large, rounded, polygonal tremopores. Orifice circular, deeply placed in peristome, rounded distally, with broad v-shape sinus proximally. Peristome thick, distinct, finely granulated, raised. Oral Avicularia present, large, median, proximal to orifice, tranverse, within the peristome, with large, sub-rounded opesia. Ovicell hyperstomial, globular, perforated by small, rounded pores as those of the zooecia.

Measurements:

Lz (4, 12): 0.97–1.1 mm.	lz (4, 12): 0.28–0.36 mm.
ho (4, 12): 0.22–0.25 mm.	lo (4, 12): 0.17–0.19 mm.
Low: 0.26 mm.	lov: 0.33 mm.
L (oral av.): 0.10 mm.	l (oral av.): 0.07 mm.

Occurrence: Middle Miocene, Marmarica Formation, Matruh and Siwa.

Distribution: In Egypt: Middle Miocene of Western Desert (Siwa and Matruh), Cairo-Suez District, western side of the Gulf of Suez and west-central Sinai. Eocene: Hungary and Romania. Oligocene: Italy. Miocene: France, Portugal, Austria, Poland, Romania, Belgium, Italy, Morocco, and Algeria. Pliocene: Portugal, Spain, Italy, Tunisia, and Algeria; Pleistocene: Italy. Recent: Atlantic, Mediterranean and Adriatic (Pouyet and Moissette, 1992 and Ziko et al., 2000).

Habitat: This species lives in tropical, warm waters. It lives in Atlantic Ocean at depths 30–400 m. In the Mediterranean, it lives at less depth from 30 to 120 m with optimum depth from 40 to 60 m. Adriatic from 36 to 100 m and Red Sea. (Pouyet and Moissette, 1992), (Canu and Bassler, 1930) and (Ziko et al., 2000).

Range: Oligocene–Recent.

Family: Magarettidae Harmer, 1957

Genus: *Margaretta* Gray, 1848.

Margaretta cereoides (Ellis & Solander, 1786).

(Pl. 6, Figs. 3 and 4)

1786 *Cellaria cereoides* Ellis & Solander: 26, pl.5, figs. B–E.

1940 *Tubucellaria cereoides* (Ellis & Solander): Osburn: 440.

1953 *Tubucellaria cereoides* (Ellis & Solander): Bassler: 210, fig. 158, 12.

2002 *Margaretta cereoides* (Ellis & Solander): Hayward and McKinney: 74, fig. 33 D–G.

2006 *Margaretta cereoides* (Ellis & Solander): El-Sorogy, Abdelwahab, Nour, Ziko and Shehata: 202, pl. 4, figs. 3, 4.

Description: Zoarium erect, cellariiform, articulated, elongated, cylindrical segments. Zooecia distinct, elongate, large, fusiform, closely attached, separated by fine threads. Frontal convex, tremocyst with small rounded, polygonal, numerous, closely arranged tremopores, give reticulate appearance to the frontal. Ascopore rounded, slightly large, median, below the proximal part of peristome, sometimes hidden by tremocyst. Orifice terminal, rounded, with slightly thick peristome. Peristome thick, large, occupies about one third of zooecia, tapered out as a neck shape, covered by the same tremocyst, with straight distinct threads. No avicularia or ovicells are observed.

Measurements:

Lz (3, 8): 0.94–1.29 mm.	lz (3, 8): 0.47–0.59 mm.
ho (3, 8): 0.15–0.24 mm.	lo (3, 8): 0.12–0.15 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Distribution: In Egypt: Middle Miocene of the Western Desert (Siwa and Matruh areas); Cairo-Suez District; West central Sinai (Ziko, 1996); Post-Pliocene of north Giza Pyramids Plateau; Recent of Dahab Bay, Gulf of Aqaba, Southern Safaga Bay, Red Sea. (El-Sorogy et al., 2001) and (El-Sorogy et al., 2004). Eocene: basin of Paris, Spain, Italy. Oligocene: Germany, Italy, U.S.A., Poland, Rumania, CSSR. Miocene: Burbigalien (basin of Rhone, France), Helvetian (Basin of Loire, France), Poland, Rumania, CSSR. Pliocene: Italy, north Africa, Central America. Pleistocene: Italy. Recent: Atlantic (Gulf of Mexico), Mediterranean Sea, Red Sea, Indian Ocean, Pacific Ocean (Australia). (Moissette, 1988).

Habitat: It is a cosmopolitan species. Atlantic, Adriatic, Mediterranean, Pacific, Red Sea and Indian Ocean. In Atlantic only in tropical and subtropical provinces. It is mostly distributed in shallow sublittoral from 10 to 45 m. (Schmid, 1991). It is found in hot waters and hot temperatures at depths from (10–45 m) up to 90 m with optimum depth 10–60 m (Moissette et al., 2007) and (Ziko, 1996).

Range: Eocene–Recent.

Family: Reteporidae Smitt, 1867

Genus: *Iodictyum* Harmer, 1933

Iodictyum rubeschi (Reuss, 1848).

(Pl. 6, Figs. 5 and 6)

1848 *Retepora rubeschii* Reuss: 48, pl. 6, Figs. 35–37.

2004 *Iodictyum rubeschi* (Reuss): El-Sorogy, Abdelwahab, Ziko, El-Dera, Saber and Abu El Khir: 217, pl. 6, figs. 3, 4.

Description: Zoarium erect, reteporiform, white, branching, composed of five alternating longitudinal series of zooids. Zoarial back, smooth to finely granulated, ornamented by transverse veins and few tiny, rounded pores. Zooecia distinct, elongate, flask shaped, separated by distinct thin deep furrows. Frontal olocyst, slightly convex, smooth except for a few rounded marginal pores. Orifice terminal, semicircular, deeply placed in raised peristomie, proximal edge slightly concave with large, triangular lateral condyles and U-shape median sinus. Peristomie thick, erect, appears as a neck or collar of orifice, broadly flared, bend out. Avicularia observed at right lateral side of the peristomie, small, elongated, with triangular rostrum, with pivot. No ovicells are observed.

Measurements:

Lz (2, 10): 0.45–0.48 mm.	lz (2, 10): 0.18–0.25 mm.
ho (2, 10): 0.09–0.11 mm.	lo (2, 10): 0.09–0.16 mm.

Occurrence: Marmarica Limestone, Middle Miocene, Matruh and Siwa.

Distribution: In Egypt: Middle Miocene of west-central Sinai, North of western desert, Miocene of the Cairo-Suez district, western side of the Gulf of Suez, east central Sinai and Recent of Southern Safaga Bay, Red Sea (Ziko, 1996) and (El-Sorogy et al., 2004). Miocene of Austria and France (Vávra, 1977) and (Schmid, 1989).

Habitat: Gulf of Aqaba (Red Sea), depth range 0–15 m. (El-Sorogy et al., 2004).

Range: Miocene–Recent.

Genus: *Sertella* Jullien, 1903

Sertella beaniana (King, 1846)

(Pl. 7, Fig. 1)

1846 *Retepora beaniana* King: 237.

1979 *Sertella beaniana* (King): Hayward and Ryland: 262, fig. 113.

Description: Zoarium erect, reteporiform, branched, reticulated, slender, anastomosing, leaving a series of open spaces

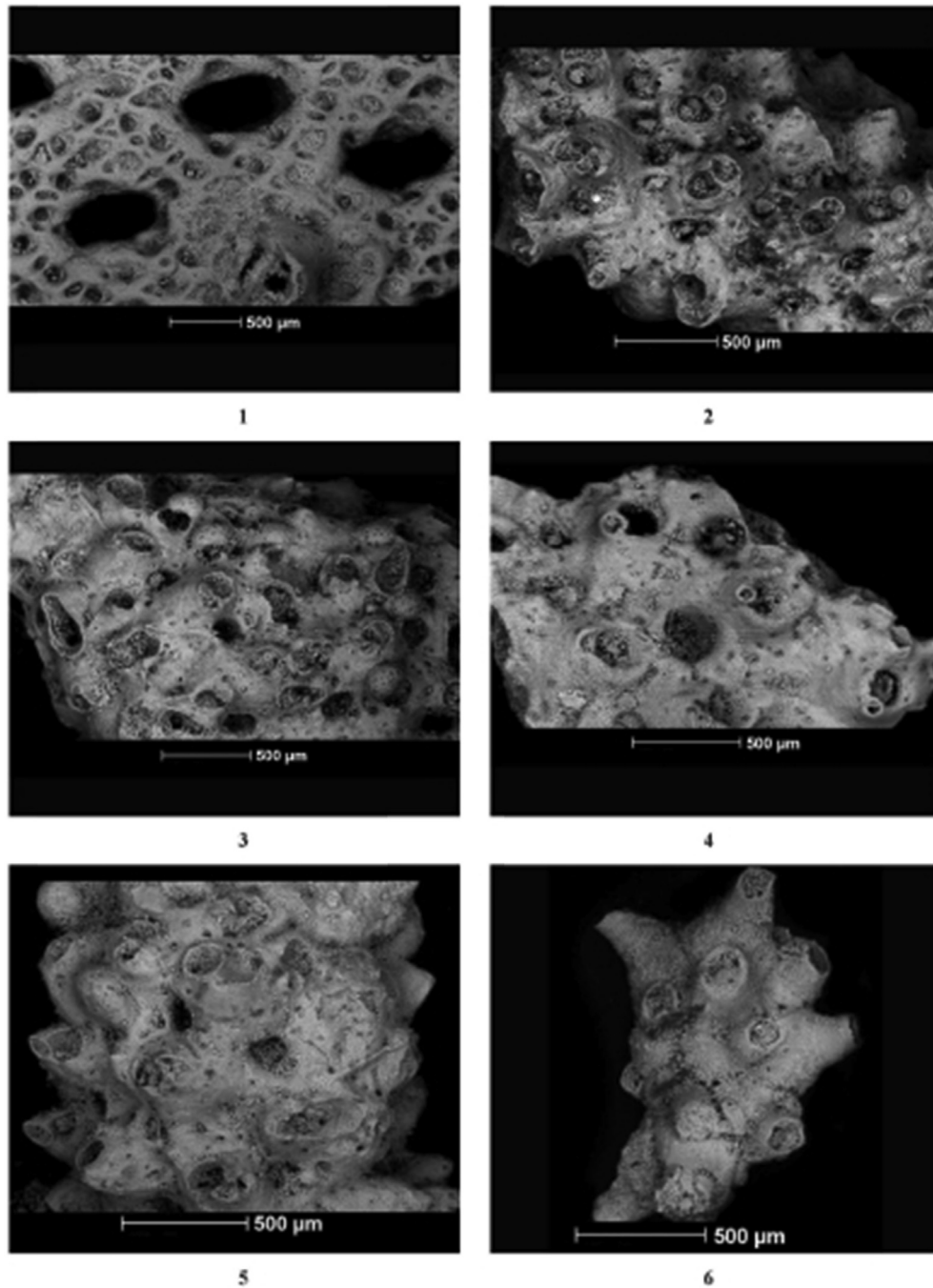


Plate 7. Fig. 1: *Sertella beaniana* (King, 1846). 1. General view of zoarium showing fenesterulae of variable sizes. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Fig. 2: *Celleporaria palmata* (Michelin, 1847). 2. General view of zoarium showing oral avicularia. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Fig. 3: *Cellepora polythele* (Reuss, 1848). 3. General view of zoarium showing oral, interzoecial avicularia and hyperstomial ovicells. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Figs. 4–5: *Turbicellepora avicularis* (Hincks, 1860). 4. General view of zoarium showing oral avicularia with pivot. 5. General view of another zoarium showing spatulate avicularia. (Matruh and Siwa areas, Marmarica Formation, Middle Miocene). Fig. 6: *Lagenipora pinnacula* (Hayward, 1980). 6. General view of zoarium showing hyperstomial, inflated ovicell with a narrow crescentic frontal tabula. (Matruh area, Marmarica Formation, Middle Miocene).

(fenesterulae) between them, of variable sizes. Fenestrulae elliptical, less wide than the branches. Zooecia indistinct, elongated, arranged in alternating longitudinal rows, opening on one face of the colony. Opesia semi-circular, deeply placed in peristome. Peristome thick, elevated. Frontal convex, smooth, with scattered marginal pores. Oral avicularia numerous, small, with pivot, just below the proximal part of the opesia, within the peristome, oriented proximally. Frontal avicularia large, with random orientation. Ovicell hyperstomial, globular, often

broken, hard to be distinguished. Basal surface crossed by thickened sutures. Tiny avicularia numerous, and located on the basal surface.

Measurements:

Lz (1, 5): 0.33–0.47 mm.	lz (1, 5): 0.23–0.33 mm.
ho (1, 5): 0.10–0.13 mm.	lo (1, 5): 0.13–0.17 mm.
L (oral av.): 0.07 mm.	l (oral av.): 0.07 mm.
L (Fenestrulae): 0.67–0.80 mm	l (Fenestrulae): 0.37–0.43 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Distribution: In Egypt: Miocene of Western desert (Siwa, and Matruh areas). Miocene of France, Hungary and Spain. Pliocene of Netherland, France, England and Italy. Pleistocene of Italy. (Moissette et al., 2007).

Habitat: Recent of East Atlantic and Mediterranean Sea. It lives in relatively cold waters, at depths ranging from 20 to 300 m. (Moissette, 1988).

Range: Miocene–Recent.

Family: Celleporidae Busk, 1852

Genus: *Celleporaria* Lamouroux, 1821

Celleporaria palmata (Michelin, 1847)

(Pl. 7, Fig. 2)

1847 *Cellepora palmata* Michelin: 325, pl. 78, fig. 1a–b.

1989 *Celleporaria palmata* (Michelin): Bishop and Hayward: 50, Figs. 209–211.

2006 *Celleporaria palmata* (Michelin): Ziko, El Safori, Zalat, El-Dera, Saber and El-Khawaga: 53, pl. 9, figs. 5, 6.

Description: Zoarium encrusting, celleporiform, many polymorphs, massive, lamellar or branches. Zooecia distinct, crowded, inflated, flask shaped, without definite arrangement, separated by thin, deep grooves. Frontal convex, smooth, olocyst, with large areolar pores. Orifice terminal, subcircular, with thin peristome. Oral avicularia (umbo avicularia), large subrounded, transverse, with pivot. Vicarious (interzooecial) avicularia small, elongated, elliptical. Ovicell hyperstomial, inflated, smooth olocyst as frontal.

Measurements:

Lz (2, 6): 0.40–0.68 mm.	lz (2, 6): 0.29–0.37 mm.
ho (2, 6): 0.17 mm.	lo (2, 6): 0.12 mm.
L (oral avicularia): 0.11 mm.	l (oral avicularia): 0.07 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Distribution: In Egypt: Recent of Mediterranean Sea (Ziko et al., 2006). Miocene of Portugal, France, Morocco, Austria, Vienna and Spain. Pliocene of England, France, Spain, Italy, and Algeria (Moissette, 1988).

Habitat: It is found incrusting on dead shells along the shore of northern Mediterranean (Ziko et al. 2006).

Range: Miocene–Recent.

Genus *Cellepora* Linné, 1767

Cellepora polythele (Reuss, 1848).

(Pl. 7, Fig. 3)

1847 *Cellepora polythele* Reuss: 77, pl. 9, fig. 18.

2004 *Holoporella polythele* (Reuss): El-Sorogy, Abdelwahab, Ziko, El-Dera, Saber and Abu El-Khir: 219, pl. 6, fig. 7.

Description: Zoarium encrusting, celleporiform, massive, globular, ramose, dichotomously branched, sometimes perforated, large, cylindrical branches reach diameter up to 1.5 mm. Zooecia distinct, crowded, inflated, flask shaped, arranged in irregular manner, separated by thin, deep grooves. Frontal convex, smooth, olocyst, with large areolar pores. Orifice terminal, semicircular, with thin, elevated peristome, with broad sinus. Oral avicularia small subrounded, transverse, with pivot. Vicarious (interzooecial) avicularia large, elongated, elliptical, with rounded proximal and distal margins, without definite orientation, avicularian opesia elliptical, large, deep, with short rostrum, with pivot. Ovicell globular, hyperstomial, large, perforated by large rounded pores.

Measurements:

Lz (2, 6): 0.40–0.68 mm.	lz (2, 6): 0.29–0.37 mm.
ho (2, 6): 0.13–0.16 mm.	lo (2, 6): 0.16–0.18 mm.
L ov.: 0.16–0.18 mm.	l ov.: 0.24–0.26 mm.
L (interzooecial avicularia): 0.29–0.45 mm.	
l (interzooecial avicularia): 0.16–0.18 mm.	
L (oral avicularia): 0.11 mm.	l (oral avicularia): 0.07 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Remark: *Holoporella polythele* played an important role in the Marmarica Formation in the area where it acts as an essential reef-builder.

Distribution: In Egypt: Middle Miocene of the Gulf of Suez and Cairo-Suez District, west-central Sinai and north western desert (Matruh and Siwa areas) (Ziko, 1996) and (Ziko et al., 2000). Miocene of Italy, Austria, Hungary, Netherlands, France and CSSR (Vávra, 1977).

Habitat: Mediterranean, optimum depth 10–20 m. (Ziko, 1996).

Range: Miocene–Recent.

Genus: *Turbicellepora* Ryland, 1963

Turbicellepora avicularis (Hincks, 1860).

(Pl. 7, Figs. 4 and 5)

1860 *Cellepora avicularis* Hincks: 278.

1979 *Turbicellepora avicularis* (Hincks): Hayward and Ryland: 284, fig. 124.

1989 *Turbicellepora avicularis* (Hincks): Bishop and Hayward: 50, Figs. 204–205.

2002 *Turbicellepora avicularis* (Hincks): Hayward and McKinney: 90, fig. 41 A–D.

Description: Zoarium encrusting or free, celleporiform, many polymorphs, massive, lamellar or branches. Zooecia distinct, crowded, inflated, flask shaped, without definite arrangement, separated by thin, deep grooves. Frontal convex, smooth, olocyst, with areolar pores, without costules. Orifice terminal, subcircular, with thick peristome raised laterally to enclose lateral oral avicularium. Oral avicularia (avicularia situated on umbos), large subrounded, transverse, with pivot, situated to left or right of the sinus, with rostrum directed distolaterally or proximolaterally. Vicarious (interzooecial) avicularia large, elongated, elliptical, with spatulate mandible. Ovicell hyperstomial, inflated, perforated by rounded, large pores.

Measurements:

Lz (2, 6): 0.50–0.63 mm.	lz (2, 6): 0.30–0.37 mm.
ho (2, 6): 0.11–0.15 mm.	lo: 0.13–0.21 mm.
L (oral av): 0.09–0.15 mm.	l (oral av): 0.09–0.13 mm.
L (spatulate av): 0.43 mm.	l (spatulate av): 0.21 mm.
L (ov): 0.28 mm.	l (ov): 0.25 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh and Siwa.

Habitat: It occurs off all British coasts from the lower shore to at least 130 m and western Mediterranean. It is probably absent from arctic waters (Hayward and Ryland, 1979). It is the most commonly occurring species of *Turbicellepora* in the northeast Atlantic region, where it is widespread in shallow coastal waters (Hayward and McKinney, 2002).

Range: Miocene–Recent.

Genus: *Lagenipora* Hincks, 1877

Lagenipora pinnacula (Hayward, 1980).

(Pl. 7, Fig. 6)

1980 *Celleporina pinnacula* Hayward: 278.

1989 *Lagenipora pinnacula* (Hayward): Gordon: 69, pl. 38, F–H.

2001 *Lagenipora pinnacula* (Hayward): El-Sorogy, Abdelwahab, Ziko, and El-Dera: 73, pl. 6, fig. 1.

Description: Zoarium encrusting, celleporiform, massive, irregularly lobed, with groups of zooides growing rapidly in opposing directions., radiating from ancestrular area. Zooecia distinct, large, inflated, flask shaped, without definite arrangement, separated by deep grooves. Kenozooides frequent, little smaller than autozooides. Frontal convex, smooth, olocyst, with areolar pores. Orifice terminal, orbicular, sometimes hidden by tall, cylindrical peristome. Ovicell small, hyperstomial, inflated, a narrow crescentic frontal tabula present, with fine radiating ridges, without any marked pores.

Measurements:

Lz (1, 5): 0.45–0.53 mm.	lz (1, 5): 0.25–0.38 mm.
ho (1, 5): 0.08–0.13 mm.	lo (1, 5): 0.10–0.13 mm.

Occurrence: Marmarica limestone, Middle Miocene, Matruh.
Habitat: Recent of New Zealand (62–220 m) and South Atlantic (Hayward, 1980) and (Gordon, 1989). Recent of Dahab Bay, Gulf of Aqaba (El-Sorogy et al., 2001).

3. Paleobathymetry as induced from the extant species: (Fig. 4)

From the study of the extant species, the bathymetric distribution of the studied cheilostomatous fauna can be deduced. Twenty-nine extant species are recorded in this study, they are: *Membranipora savartii* (10–100 m), *Conopeum lacroixii* (70–180 m), *Callopora lineata* (150 m), *Alderina imbellis* (550 m), *Micropora coriacea* (0–800 m); optimum depth (30–100), *Steginoporella elegans* (16–324 m), *Steginoporella magnilabris* (0–600 m), *Cellaria fistulosa* (30–80 m), *Cellaria sinuosa* (80–100 m), *Nellia tenella* (17–450 m); optimum depth (20–28), *Cribrilaria radiata*

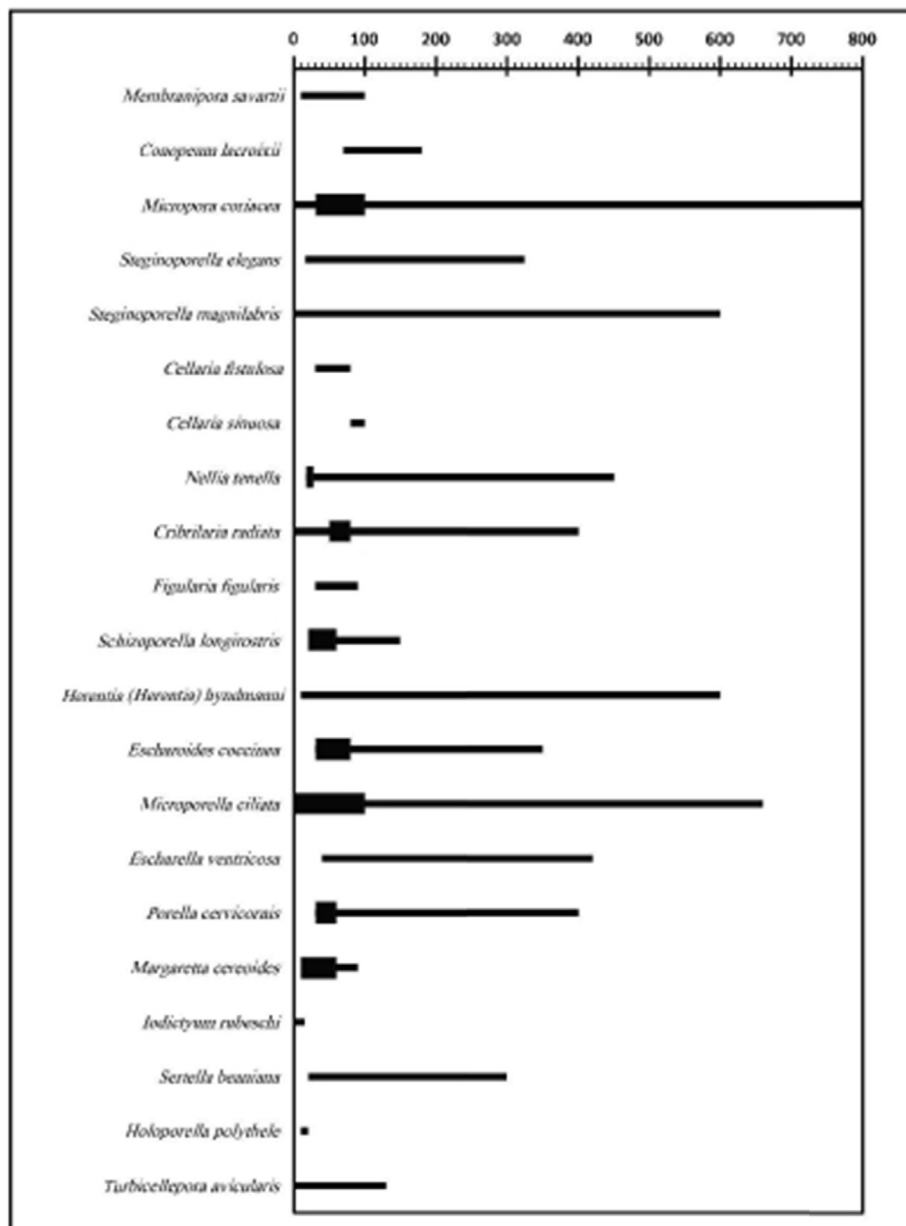


Fig. 4. Bathymetry of the studied cheilostome species, thick lines indicate optimum depths.

Table 1

Biogeography, paleoecology, and stratigraphy of the studied Cheilostomata Bryozoans. Rare: R <3, Common: C=3–10, Abundant: A>10.

Species	Occurrences								Zoarial Form	Stratigraphy	Biogeography	Distribution in Egypt																				
	Siwa				Matruh																											
	Bah. Al-Din	El-Rokham	Huys	Takrut	Bir. 1	W. Umm El-Rokham	W. Umm El-Ashbar	W. Habia					W. Magad																			
									Membranoporeiform	Celleporiform	Acanthoporeiform	Vinculariform	Eschariform	Reteoporeiform	Celleporiform	Eocene	Oligocene	Miocene	Pliocene	Pleistocene	Recent	Red Sea	Mediterranean	Atlantic	Pacific	Indian	Arctic	Western Desert	Cairo-Suez	Gulf of Suez	W. Central Sinai	Recent Egyptian Mediterranean
<i>Biflustra savarmi</i>	A	A	-	-	-	A	-	-	A																							
<i>Conopeum lacroixi</i>	-	-	-	-	-	C	-	-	C																							
<i>Callopora lineata</i>	-	-	-	-	-	A	-	-	-																							
<i>Alderina umbellus</i>	-	-	-	-	-	R	-	-	-																							
<i>Micropora coriacea</i>	C	-	-	-	-	-	-	-	-																							
<i>Calpensia calpensis</i>	-	-	-	-	-	C	-	-	-																							
<i>Steginoporella magnalabris</i>	-	-	-	-	C	C	-	-	C																							
<i>Cellana fistulosa</i>	-	-	-	-	-	A	C	C	C																							
<i>Cellana sinuosa</i>	C	-	-	C	-	A	C	C	C																							
<i>Netlia tenella</i>	-	-	-	C	-	A	A	-	A																							
<i>Dendroboeana lamellosa</i>	-	-	-	-	-	C	-	-	-																							
<i>Scrupocellana ellipaca</i>	-	-	-	-	-	A	A	-	A																							
<i>Cribrilaria radicata</i>	A	-	-	A	-	A	-	-	-																							
<i>Figularia figularis</i>	-	-	-	-	-	C	-	-	-																							
<i>Schizoporella errata</i>	C	-	-	C	-	-	-	-	-																							
<i>Schizoporella dunkeri</i>	-	R	-	-	-	-	-	-	-																							
<i>Schizoporella longirostris</i>	C	C	-	-	-	C	-	-	-																							
<i>Herentia (Herentia) hvdmani</i>	-	-	-	-	-	R	-	-	-																							
<i>Escharoides coccinea</i>	-	-	-	C	-	C	-	-	-																							
<i>Microporella ciliata</i>	-	-	-	-	-	C	-	-	-																							
<i>Escharella ventricosa</i>	-	-	-	-	-	R	-	-	-																							
<i>Smittina cervicornis</i>	A	A	-	A	-	A	A	-	A																							
<i>Margaretta cereoides</i>	C	-	-	-	C	C	-	-	-																							
<i>Iodictyum rubeschi</i>	C	-	-	C	-	C	-	-	-																							
<i>Sertella beaniana</i>	A	-	-	A	A	A	A	-	A																							
<i>Celleporaria palmam</i>	A	A	-	A	-	A	A	A	-																							
<i>Cellepora polythele</i>	A	A	-	A	-	A	A	A	A																							
<i>Turbicellepora avicularis</i>	A	-	-	-	-	A	-	-	-																							
<i>Lagenipora pinnacula</i>	-	-	-	-	-	R	-	-	-																							

(0–400 m); optimum depth (50–80 m), *Figularia figularis* (30–90 m), *Schizoporella longirostris* (0–150 m); optimum depth (20–60 m), *Escharoides coccinea* (0–350 m); optimum depth (30–80 m), *Microporella ciliata* (0–660 m); optimum depth (less than 100 m), *Escharella ventricosa* (40–420 m), *Porella cervicornis* (30–400 m); optimum depth (40–60 m), *Margaretta cereoides* (10–90 m); optimum depth (10–60 m), *Iodictyum rubeschi* (0–15 m), *Sertella beaniana* (20–300 m), *Holoporella polythele* (10–20 m), *Turbicellepora avicularis* (0–130 m).

As it is obvious from (Fig. 4), most species tend to exist with optimum occurrences less than 100 m in depth.

4. Conclusions

The vertical and geographic distribution of the 29 extant bryozoan species in the study area, as well as their zoarial growth forms, its stratigraphic ranges, their biogeographic distribution, and their distribution in the different Egyptian Miocene provinces (Table 1).

16 extant species are represented in Matruh area, and 23 ones from Siwa area. Such areal distribution confirms the uniformity of paleoenvironmental and paleoecological conditions of Northern Western Desert basin during the formation of the Marmarica Formation of the Middle Miocene age.

The encrusting growth-forms (membraniform and celleporiform) attain 20 species, while the erect ones (adeoniform, escharirom, vinculariiform, reteporiform and cellariiform) attains species. The encrusting groups exceed the erect ones, which confirm the shallowness of sea. On the other hand, the cellariiform (erect flexible) is the most abundant group among the erect forms, which confirm that the environment was agitated with high energy.

7 species are extending from Eocene to Recent, 4 species from Oligocene to Recent, and 27 species from the Miocene to Recent. Such observation indicates that Mediterranean-conditions prevail from the Miocene till now.

The Mediterranean-Atlantic biogeographic provinces are the most abundant, where 27 species are occurred there, such distribution insure the Mediterranean-Atlantic affinity of the Egyptian Middle Miocene Bryozoans.

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