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NOTES ON A COLLECTION OF BADENIAN (MIDDLE MIOCENE) CORALS FROM HUNGARY IN THE NATIONAL MUSEUM OF NATURAL HISTORY AT LEIDEN (THE NETHERLANDS)

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Oosterbaan, Arthur F.F. Notes on a collection of Badenian (Middle Miocene) corals from Hungary in the National Museum of Natural History at Leiden (The Netherlands). — Contr. Tert. Quatern. Geol., 27(1): 3-15, 3 figs, 2 pls. Leiden, June 1990.

Badenian corals from Hungary in the collection of the National Museum of Natural History at Leiden, The Netherlands, are systematically revised. Sixteen species belonging to 14 genera are recognised and briefly described herein. Palaeoecological notes are presented, together with data on the localities.

Key words — Coelenterata, Scleractinia, Badenian, Hungary, Paratethys, palaeoecology.

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CONTENTS

ÖSSZEFOGLALÁS

A szerző a Nationaal Natuurhistorisch Museum, Leiden, gyüjteményében lévő, a magyarországi bádeni emeletből származó korallok rendszertani revizióját adja. Összesen 16 fajt ir le, melyek 14 nemhez tartoznak. Az alsó badeni alakok (14 faj) együttese közel áll a franciaországi burdigalai emelet faunájához, mig a felső badeni fauna (4 faj) elszegényedett voltában a spanyol és olasz felsőmiocénre emlékeztet. A korallok kis, fejletlen foltzátonyokból származnak, a körülmények - különösen a felső badeni korszakban - nem voltak különösen kedvezőek a zátonyépitő korallok számára (vizszintváltozások, édesvizbeáramlás, viszonylag alacsony hőmérséklet, gyors üledékfelhalmozódás).

INTRODUCTION

Miocene reef coral faunas from various regions in Europe are characterised by a relatively restricted development of real reefs. Such faunas have recently been described by *e.g.* Esteban (1979), from the Late Miocene of southern Spain and Italy, and from the Early Miocene of SW France by Oosterbaan (1988).

This paper contains a description of similar Middle Miocene corals from Hungary. In this area the conditions must have been far from optimal for corals as well, because of sea level changes, freshwater influx, low temperature and high sedimentation rate (both clastic and volcanic).

The Miocene corals from the central Paratethys have been the subject of various publications. Those concerning Hungarian corals are interpreted in the present paper, as far as the species were present in the studied material. From other areas corals were described by *e.g.* Kojumdgieva & Strachimirov (1960), Kühn (1925) and Roskowska (1932). Without having seen the specimens described in these papers it seems hazardous to make decisions on synonymies. It is clear, however, that

several further species are described in these papers which are not present in the material studied here.

The Miocene European coral province is characterised by an assemblage with a mixture of endemic, Indo-Pacific and Caribbean genera. As an addition to the palaeogeographical data on the various genera given by Oosterbaan (1988: 249) it may be noted that *Plesiastrea* and *Acanthophyllia* are living now in the Indo-Pacific and are absent in the West Indian region, while *Mussismilia* and *Mycetophyllia* are present now in Brazil and the Caribbean, respectively, and have never been recorded from the Indo-Pacific.

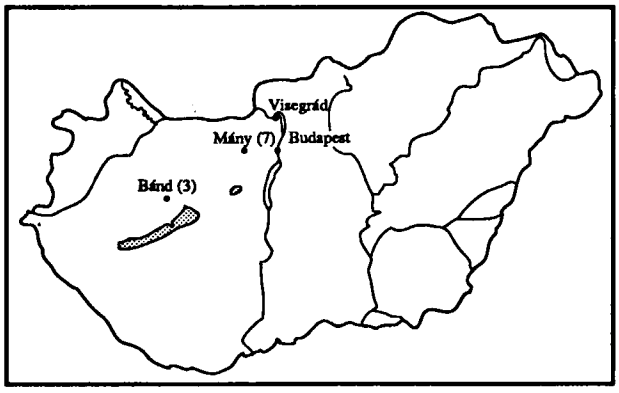


Fig. 1. Survey of Hungary, with indications mentioned in this paper (see Figs 2-3 for localities near Visegrád and around Budapest.

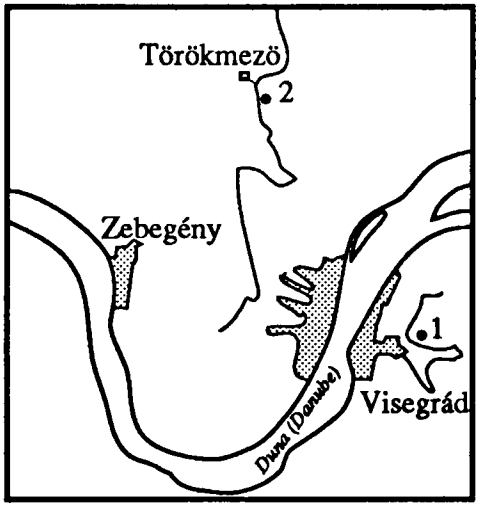


Fig. 2. Localities near Visegrád and Törökmezö.

In September of 1985 fossil corals were collected by the author at several, partly 'classic' Badenian localities in Hungary, together with Drs P. Müller (Budapest) and J. Kókay (Budapest). These specimens, as well as some material from other localities, partly no longer accessible and from boreholes donated by Dr Müller are now housed in the collections of the National Museum of Natural History (formerly the Rijksmuseum van Geologie en Mineralogie) at Leiden (RGM registration numbers).

Localities

1. Visegrád, Fekete hegy (text-figs 1, 2).
Age of deposit — Early Badenian.
Descriptions of locality — Scholz (1970: 193-194), Müller (1984: 43, fig. 6).
Remarks — Corals, some of which in the form of casts, were collected at the outer limits of former vineyards on the slope of Fekete hegy (= Black Hill) described by Müller (his code MV). They are often embedded in coarse grey limestone. This locality is assumed to have been referred to by Reuss (1871) as "Nagymaros" (Müller, 1984: 43).
Palaeoecology — Many gastropods, bivalves and rhodolytes were also found at this locality. Apparently, corals lived here in small scattered banks, reefs did not form. This could be the result of subtropical conditions in Hungary during the Early Badenian, similar to those prevailing in the Bermuda archipelago nowadays (Scholz, 1970: 201). The relatively high number of coral species (9) at this locality (and at the next two as well) indicates a euhaline, more or less clear water environment.

2. Törökmezö near Nagymaros, loc. 256 (text-figs 1, 2).
Age of deposit — Early Badenian.
Descriptions of locality — Müller (1984: 44, fig. 6).
Remarks — Corals, exclusively in the form of outer casts consisting of rather soft white limestone, were collected from a small former quarry at the top of a hill, described by Müller under code MTZ.
Palaeoecology — The ecological circumstances would have been similar at this locality and to those of Visegrád (Müller, 1984: 102).

3. Bánd near Herend, 200 m southeast from town church (text-fig. 1).
Age of deposit — Early Badenian.
Descriptions of locality — Kókay (1966: 100, erroneously described as Lower Tortonian), Hegedüs (1970: 185,190).

Remarks — Generally well-preserved corals were collected from a sandy hill slope on a potato field. Porous specimens (*Porites*) show traces of transportation.
Palaeoecology — Gastropods such as *Turritella* sp. and bivalves such as *Ostrea crassicostata* Sowerby, 1847 were also collected from this locality. The molluscan fauna comprises species of exposed as well as of more sheltered habitats (Kókay, 1966). It seems that a mixture of different reworked faunas is found here.

4. Rákos, railroad cutting, eastern part of Budapest (text-figs 1, 3).
Age of deposit — Early Late Badenian. The radiometric age of the overlying tuffite layer is taken to be 15.6 ± 0.8 MY (Kókay, 1966; Müller, 1984).
Description of locality — Kókay *et al.* (1984: 285,294), Müller (1984: 40).
Remarks — Poorly preserved corals were collected from a railroad cut exposing a layer of 100-200 cm thickness, which appears to be small patch reefs. It was described by Müller under code MRZ.

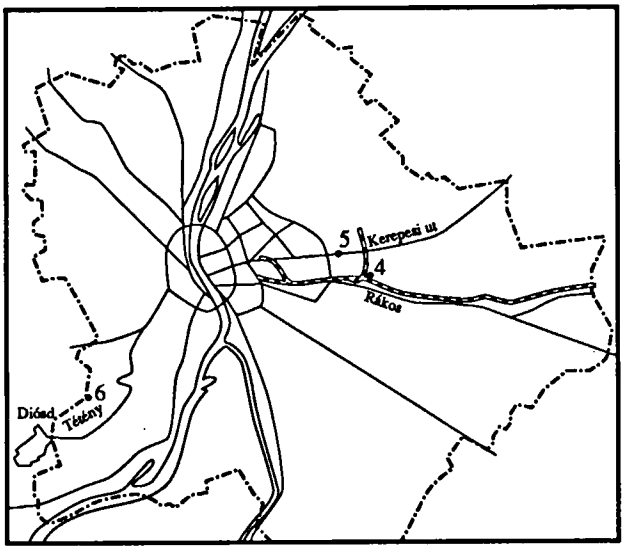


Fig. 3. Localities around Budapest.

Palaeoecology — Corals are assumed to have lived here in a 10-15 m deep trough, filled with water of oceanic salinity. The climate was probably semi-arid, with a poor terrestrial vegetation and much erosion. During the Late Badenian the climate suddenly became humid, which resulted in a dense forest-vegetation to arise on the surrounding slopes. The sea became brachyhaline, at least in the shallow parts, and the corals died off (Kókay *et al.*, 1984). The matrix, rich in fine particles, and the abundance of *Porites* species indicate a shallow, muddy environment (Müller, 1984; Oosterbaan, 1988: 251).

5. Kerepesi út, eastern part of Budapest (text-figs 1, 3).
Age of deposit — Early Late Badenian.
Description of locality — Kókay *et al.* (1984: 285, 294), Müller (1984: 42, fig. 4, 5).
Remarks — Outer casts of corals were found together with a rich molluscan, echinoid and decapod fauna (Kókay *et al.*, 1984). Müller did not give a code to this locality; it corresponds with the MRZ layer at Rákos.
Palaeoecology — The environment is thought to have been similar to that at Rákos, but with more agitated water (Müller, 1984).

6. Tétény, "MK", Kamaraerdei út (Katona út), southwestern part of Budapest (text-figs 1, 3).
Age of deposit — Early Late Badenian.
Description of locality — Müller (1984: 36, fig. 2, 3).
Remarks — Corals, eclusively outer casts, were found at the southern end of the exposure coded MK by Müller.
Palaeoecology — The environment is assumed to have been well aerated, with agitated water of a depth much less than 30 m, and of almost oceanic salinity (Müller, 1984).

7. Mány, borehole 192 (208,6-208,9 m), about 20 km west of Budapest (text-fig. 1).
Age of deposit — Early Late Badenian.
Description of locality — Kókay (1985: 28-29).
Remarks — The corals are pyritised, well preserved. They are found in argillaceous sediments.
Palaeoecology — Only this limited section in the borehole contains a euhaline fauna. It yields seven molluscan species, two of which are characteristic of brackish environments. According to Kókay (1985), the coral species would be the most enduring taxa of this fauna, capable of existing below the lower limit of normal salinity.

Notes on palaeoecology

It is highly probable that in the Badenian a firm euhaline connection between the Central Paratethys and the Mediterranean existed. The character of the coral faunas in these seas was essentially the same, which is also true for various other groups of organisms (Müller, 1984). The

coral faunas of the Early and Late Badenian are clearly different. The Early Badenian fauna is relatively rich (14 species), and is quite similar to the Burdigalian fauna of SW France.

The Late Badenian coral fauna is very poor at the localities studied (four species, two of which are not found at the Early Badenian localities). This fauna shows a closer resemblance to the monospecific Late Miocene coral reefs of southern Spain and Italy, described by Esteban (1979). On the basis of crab faunas of Badenian localities three biozones were differentiated by Müller (1985). His zones can partly be correlated with the coral faunas from Hungary. Müller gave a list of crab species characteristic of coral reef habitats in the Badenian. In the reef environments of the Early Badenian (Visegrád, Törökmezö) he found 24 species, whereas the Late Badenian localities in Budapest yielded 18 species (Müller, 1984: 111).

In the latest Badenian reef corals are absent. During this period the connection between the Mediterranean and the Central Paratethys was closed by tectonic movements. The latter became increasingly brachyhaline, first in the shallow parts. Consequently, corals could no longer live there (Kókay, 1985).

Systematic part

In the following descriptions of the various species only a selected list of synonyms is given, including the first valid introduction of the species. For the synonymy of species already described in Oosterbaan (1988) the reader is referred to that paper.

Phylum Coelenterata
Classis Anthozoa
Ordo Scleractinia Bourne, 1900
Subordo Astrocoeniidae Vaughan & Wells, 1943
Familia Pocilloporidae Gray, 1842
Genus *Stylophora* Schweiger, 1819

Stylophora reussiana Montanaro-Gallitelli & Tacoli, 1951
Pl. 1, Fig. 1

1871 *Stylophora* spec. — Reuss, p. 251, pl. 19, fig. 15.
1951 *Stylophora reussiana* Montanaro-Gallitelli & Tacoli, p. 161, pl. 1, fig. 1.
1954 *Stylophora reussiana* Montanaro-Gallitelli & Tacoli — Kopek, p. 28, pl. 10, figs 1-6, 8.
1961 *Stylophora reussiana* Montanaro-Gallitelli & Tacoli — Chevalier, p. 115, pl. 1, fig. 2.
1970 *Stylophora reussiana* Montanaro-Gallitelli & Tacoli — Hegedüs, p. 186, pl. 1, fig. 1.

Type material — Specimens from Forchtenau (Burgenland, Austria), mentioned by Reuss, were not found in the collections of the Natural History Museum of Vienna. Specimens from Zabcice (near Brno, Moravia), mentioned by Montanaro-Gallitelli & Tacoli, were not studied, there whereabouts are unknown.

Material studied — Early Badenian of Visegrád, RGM 211 386 (1 specimen), RGM 211 360 (4 specimens); Early Badenian of Törökmezö, RGM 211 374 (7 specimens). The species has also been recorded from the Early Badenian of Bánd (Hegedüs, 1970).

Description — Colony plocoid, branching, with a branch diameter of 0.4-1.8 cm, in some specimens foliaceous. The corallites show extratentacular budding and shallow calices, slightly exsert with a diameter of 0.7-1.0 mm, at a distance of 0.5-2.0 mm from each other. There are six septa, all of which reaching the well developed styliform columella. Costae or septa of a second cycle are not visible in studied specimens. The coenosteum surface is coarsely granulate. Description of the inner structures is not possible for these specimens, since they are all casts.

Remarks — The only established difference between this species and *Stylophora raristella* (Defrance, 1826) is the absence of costae in the former, while in the latter the costae are short, but generally well developed (Oosterbaan, 1988).

Plate 1

Fig. 1. *Stylophora reussiana* Mantanaro-Gallitelli & Tacoli, 1951.
Early Badenian, Visegrád. Leg. A.F.F. Oosterbaan. Coll. RGM 211 386.

Fig. 2. *Siderastrea crenulata* (Goldfuss, 1826)
Late Badenian, Mány. Leg. P. Müller. Coll. RGM 211 387.

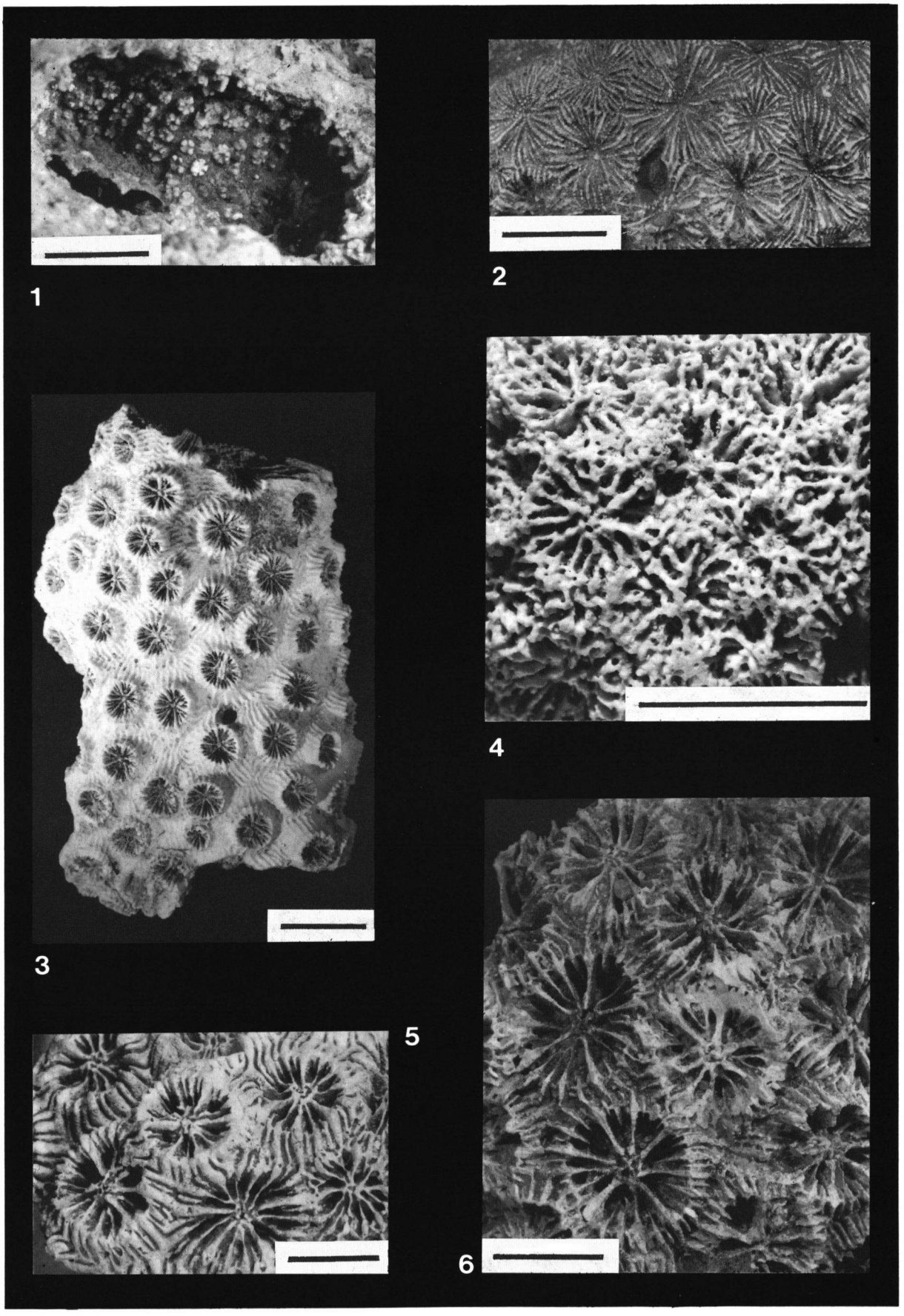
Fig. 3. *Tarbellastraea reussiana* (Milne-Edwards & Haime, 1850)
Early Badenian, Bánd. Leg. A.F.F. Oosterbaan Coll. RGM 211 388.

Fig. 4. *Porites* cf. *leptoclada* Reuss, 1871
Early Badenian, Bánd. Leg. P. Müller. Coll. RGM 211 325.

Fig. 5. *Thegioastraea incerta* (Osasco, 1897)
Early Badenian, Bánd. Leg. A.F.F. Oosterbaan Coll. RGM 211 390.

Fig. 6. *Montastrea mellahica* (Gregory, 1906)
Early Badenian, Bánd. Leg. A.F.F. Oosterbaan Coll. RGM 211 389.

Bar length represents 5 mm approximately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Stylophora subreticulata Reuss, 1871 has much larger calices (1.5 mm as opposed to 0.7-1.0 mm), and also shows a polygonal pattern on the coenosteum surface.
Distribution — The species is found in the Badenian of Hungary and Moravia, and the Middle Miocene of Algeria (Chevalier, 1961).

Subordo Fungiina Verrill, 1865
Familia Agariciidae Gray, 1847
Genus *Pavona* Lamarck, 1801

Pavona minor (Zuffardi-Comerci, 1932)

See Oosterbaan, 1988, p. 257, pl. 1, fig. 3, with synonymy.

Material studied — Early Badenian of Visegrád, RGM 211 354 (1 specimen); Early Badenian of Törökmezö, RGM 211 349 (1 specimen), RGM 211 338 (12 specimens).
Distribution — This species is also known from the Early Miocene of Aquitaine and the Middle Miocene of Turin (Chevalier, 1961; Oosterbaan, 1988).

Familia Siderastreidae Vaughan & Wells, 1943
Genus *Siderastrea* de Blainville, 1830

Siderastrea froehlichiana (Reuss, 1847)

See Oosterbaan, 1988, p. 258, pl. 1, fig. 4, with synonymy.

Material studied — Early Badenian of Bánd, RGM 211 324 (8 specimens). The species is also known from the Early Badenian of Visegrád (Scholz, 1970, p. 197).
Distribution — This species has also been reported from various localities in the western Mediterranean, from Aquitaine, and from Austria (Oosterbaan, 1988).

Siderastrea crenulata (Goldfuss, 1826)
Pl. 1, Fig. 2

1826 *Astraea crenulata* Goldfuss, p. 71, pl. 24, fig. 6.
1871 *Astraea crenulata* Goldfuss — Reuss, p. 245, pl. 12, figs 1, 2.
1954 *Siderastraea crenulata* (Goldfuss) — Kopek, p. 15, pl. 4, fig. 6; pl. 6, fig. 1.
1961 *Siderastrea crenulata* (Goldfuss) — Chevalier, p. 421, pl. 25, fig. 6, text-fig. 147.

Type material — Goldfuss' type specimen from Piacenza is lost (Chevalier, 1961).
Material studied — Late Badenian of Mány, Budapest, RGM 211 387 (1 specimen), RGM 211 369 (1 specimen), Late Badenian of Tétény, RGM 211 374 (2 specimens).
Description — Colony massive, cerioid, with extratentacular budding. The corallites are slightly exsert and polygonal, with a diameter of 2.5-7.0 mm. There are 28-48 septa, in four cycles. Septa of the first and second cycle reach the small styliform columella. The other cycles reach half the distance between wall and columella. The septa bear regular granulations on their margins. Synapticulae are present. The wall is synapticulothecate, no thicker than 0.5 mm, and not visible at the surface. Endothecal dissepiments are not visible in our specimens.
Remarks — This well-known species differs clearly from *Siderastrea froehlichiana* in having regular granulations, and a wall not visible at the colony surface.
Distribution — This species is known from the Middle and Late Miocene of Italy, North Africa, Greece and the Pannonian Basin (Chevalier, 1961).

Familia Poritidae Gray, 1842
Genus *Porites* Link, 1807

Porites cf. **leptoclada** Reuss, 1871
Pl. 1, Fig. 4

1871 *Porites leptoclada* Reuss, p. 261, pl. 17, figs 3, 4.
1954 *Goniopora leptoclada* (Reuss) — Kopek, p. 29, figs 3, 6, 8.
1970 *Porites leptoclada* Reuss — Hegedüs, p. 189, pl. 1, fig. 11.

Type material — Specimens from Niederleis and Nodendorf (Austria), mentioned by Reuss, were not found in the collections of the Natural History Museum in Vienna.
Material studied — Early Badenian of Bánd, RGM 211 325 (1 specimen).
Description — Colony massive (?, the only specimen is 15 mm in diameter), cerioid, and with extratentacular budding. The corallites have a diameter of 1.4-2.8 mm, and a depth of 0.0-1.2 mm. The synapticulothecate wall is better developed than in *Porites collegniana*. There are 12-24 strongly granulate septa in three cycles. Those of the first cycle reach the poorly developed, trabecular or styliform columella, often forming an irregular paliform crown. Pores and synapticulae are present, but rare. A third cycle of septa is generally present, the septa reaching half the distance between the wall and the columella, like the septa of the second cycle. Thin endodissepiments are present, but rare.

Remarks — Reuss mentioned only two cycles of septa and a styliform columella, which makes the present identification dubious. The only available small fragment in the studied collection is not sufficient for further identification.
Distribution — This species is not found outside the Austrian-Hungarian basin.

Porites collegniana Michelin, 1842

See Oosterbaan, 1988, p. 259, pl. 1, fig. 6, with synonymy.

Material studied — Early Badenian of Visegrád, RGM 211 355 (4 specimens); Early Badenian of Bánd, RGM 211 328 (33 specimens); Early Badenian of Törökmezö, RGM 211 344 (3 specimens); Late Badenian of Rákos, RGM 211 373 (5 specimens); Late Badenian of Tétény, RGM 211 375 (12 specimens); Late Badenian of Kerepesi út, RGM 211 371 (1 specimen).
Distribution — This species is known from the Early and Middle Miocene of the whole Mediterranean area.

Familia Faviidae Gregory, 1900
Genus *Tarbellastraea* Alloiteau, 1952

Tarbellastraea reussiana
(Milne Edwards & Haime, 1850)
Pl. 1, Fig. 3

1847 *Explanaria astroites* Goldfuss — Reuss, p. 17, pl. 2, figs 7-8 (non figs 9-14).
1850 *Heliastraea reussiana* Milne Edwards & Haime, p. 110.
1871 *Heliastraea reussiana* Milne-Edwards & Haime — Reuss, p. 240, pl. 9, fig. 2; pl. 18, fig. 4.
1871 *Heliastraea conoidea* Reuss, 1871, p. 240, pl. 10, fig. 3.
1954 *Orbicella reussiana* (Milne-Edwards & Haime) — Kopek, p. 9, pl. 1, figs 9-12.
1954 *Orbicella conoidea* (Reuss) — Kopek, p. 11, pl. 2, figs 3, 7-9; pl. 3, figs 1, 2.
1961 *Tarbellastraea reussiana* (Milne Edwards & Haime) — Chevalier, p. 205, pl. 10, fig. 1; pl. 24, fig. 4.
1961 *Tarbellastraea conoidea* (Reuss) — Chevalier, p. 199, pl. 24, fig. 3.
1970 *Tarbellastraea reussiana* (Milne Edwards & Haime) — Scholz, p. 195.
1970 *Tarbellastraea conoidea* (Reuss) — Scholz, p. 195, pl. 1, fig. 2.
1970 *Tarbellastraea reussiana* (Milne Edwards & Haime) — Hegedüs, p. 186, pl. 1, fig. 3.
1970 *Tarbellastraea conoidea* (Reuss) — Hegedüs, p. 187, pl. 1, fig. 4.

Type material — Specimens from the Vienna basin, described by Reuss (1847) as *Explanaria astroites* Goldfuss, were designated as types by Milne Edwards & Haime (1850). I was unable to trace them in the Natural History Museum in Vienna.

Material studied — Early Badenian of Visegrád, RGM 211 365 (4 specimens), RGM 211 366 (9 specimens), RGM 211 367 (3 specimens), RGM 211 368 (16 specimens); Early Badenian of Bánd, RGM 211 332 (71 specimens); RGM 211 333 (13 specimens); RGM 211 388 (1 specimen); RGM 211 329 (3 specimens); Early Badenian of Törökmezö, RGM 211 350 (10 specimens), RGM 211 351 (9 specimens); Late Badenian of Rákos, RGM 211 372 (5 specimens); Late Badenian of Tétény, RGM 211376 (7 specimens); Late Badenian of Kerepesi út, RGM 211 370 (11 specimens).
Description — Colony form massive or branching with branches of 15-30 mm in diameter. The corallites show extratentacular budding and are plocoid and often rather exsert. They are 1.0-3.2 mm in diameter, often oval, and lie at a distance of 0.5-3.0 mm from each other. There are generally 24 septa in three cycles. In some (often branching) specimens a reduced fourth cycle of septa is present in some calices. The septa of the first two cycles reach the styliform columella. In some calices the columella is absent. The costae are well-developed, opposite all septa and covering the whole coenosteum surface. The wall is septothecal, not thickened. The coenosteum is vesicular, with many exodissepiments, irregularly thickened. Endodissepiments are present, but thinner and less numerous.
Remarks — The characters distinguishing this species from *Tarbellastraea ellisiana* (Defrance, 1826) are the (general) absence of a fourth cycle of septa, the styliform or absent columella, and the absence of laminae (Oosterbaan, 1988: 266). *Tarbellastraea conoidea* is here considered a growth form of *Tarbellastraea reussiana*, since specimens from Bánd show transitions between the characters of both taxa: *Tarbellastraea conoidea* would have a reduced fourth cycle, and a branching growth form.
Distribution — The species is known from the Middle Miocene of the entire Mediterranean area (Chevalier, 1961).

Genus *Montastrea* de Blainville, 1830

Montastrea mellahica (Gregory, 1906)
Pl. 1, Fig. 6

1906 *Orbicella mellahica* Gregory, p. 52, pl. 6, figs 3, 4.
1954 *Orbicella defrancei* (Milne Edwards & Haime) — Kopek, p. 10, pl. 2, figs 4-6.
1961 *Heliastraea oligophylla* (Reuss, 1871) var. *major* Chevalier, p. 171, pl. 5, fig. 22; pl. 7, fig. 6.

1961 *Heliastraea mellahica* (Gregory) — Chevalier, p. 172.
1970 *Heliastraea oligophylla major* Chevalier — Hegedüs, p. 186, pl. 1, fig. 2.
1970 *Heliastraea* aff. *mellahica* (Gregory) — Scholz, p. 196, pl. 3, fig. 3; pl. 4, fig. 2.
? 1988 *Montastrea pelouaensis* (Chevalier) — Oosterbaan, p. 267, pl. 2, fig. 6.

Type material — The holotype from Djebel Mellaha (Egypt) is lost (Chevalier, 1961).
Material studied — Early Badenian of Visegrád, RGM 211 358 (5 specimens), RGM 211 363 (6 specimens), RGM 211364 (7 specimens); Early Badenian of Bánd, RGM 211 322 (12 specimens), RGM 211 389 (1 specimen); Early Badenian of Törökmezö, RGM 211 348 (6 specimens), RGM 211 339 (1 specimen). The species probably also occurs in the Late Badenian of Tétény and Rákos (Müller, 1984).
Description — Colony form massive, with slightly exsert, plocoid corallites that show extratentacular budding. They have a diameter of 1.8-7.0 mm and are at a distance of (0.5-) 1.0-2.0 (4.0) mm from each other. There are 28-40 septa, finely dentate. Those of the first three cycles (generally 20-24) reach the well developed spongy columella. There are often some slightly developed septa of the fourth cycle. The coenosteum surface is covered with finely denticulate costae, at least opposite the first three cycles of septa. The wall is septo- to parathecal, thickened to a maximum of 1.0 mm. The coenosteum is vesicular. Exodissepiments are denticulate, horizontal, but not thickened. Endodissepiments are thin, smooth and oblique.
Remarks — Differences between our specimens from Hungary and *Montastrea pelouaensis* are small: the distance of the corallites is generally 1.0-2.0 mm instead of 3.0-5.0 mm, the fourth cycle of septa is more reduced, and neither the wall nor the coenosteum are thickened. *Heliastraea defrancei* Milne Edwards & Haime (see Reuss, 1871) has much larger corallites (8-10 mm, at a distance of 4-6 mm from each other). *Heliastraea oligophylla* Reuss (1871) has no septa of the fourth cycle. *Heliastraea mellahica* and *Heliastraea oligophylla* var. *major* are distinguished by Chevalier by the presence of 24 septa of the first three cycles in the former and fewer than 24 septa of the first three cycles in the latter. These two characters occur in one and the same specimen from Bánd.
Distribution — Seeing that there are serious taxonomic problems in this genus, the distribution of the present species is unclear. It is recorded from the Early and Middle Miocene of southern France, Spain, North Africa, Cyprus and Syria (Chevalier, 1961).

Genus *Thegioastraea* Sismonda, 1871

Thegioastraea incerta (Osasco, 1897)
Pl. 1, Fig. 5

1897 *Heliastraea incerta* Osasco, p. 441, fig. 5.
1961 *Thegioastraea incerta* (Osasco) — Chevalier, p. 218, pl. 5, fig. 20; pl. 10, fig. 12.

Type material — The holotype from Colline de Turin is lost; a neotype from Baldissero near Turin should be in the collections of the Laboratoire paléontologique in Paris (Chevalier, 1961), but I could not find it there.
Material studied — Early Badenian of Visegrád, RGM 211 357 (1 specimen); Early Badenian of Bánd, RGM 211 326 (7 specimens), RGM 211 390 (1 specimen); Early Badenian of Törökmezö, RGM 211 340 (3 specimens).
Description — Colony massive, plocoid, with extratentacular budding and in some specimens exsert calices. The corallites have a diameter of 4.5-9.0 mm, and are at a distance of 0-5.5 mm from each other. There are 24-40 denticulate septa. Those of the first and second cycle reach the well-developed trabecular columella, often forming a paliform crown. The septa of the third cycle generally reach half the distance between the wall and the columella. Septa of the fourth cycle are reduced or even absent. Costae are variable in thickness, in some calices alternately thickened, and cover the whole coenosteum surface. The coenosteum is vesicular to subcompact. The wall is septothecate, in some calices with pores. Vesicular exo- and endodissepiments are present. The exodissepiments are often thickened.
Remarks — *Thegioastraea taurinensis* (d'Achiardi, 1868) has much largercalices (6.5-15 mm), which are also further apart (4.0-10 mm) and which have no septothecal wall (Oosterbaan, 1988: 272).
Distribution — The species is mentioned from northern Italy and Languedoc (Chevalier, 1961).

Genus *Plesiastrea* Milne Edwards & Haime, 1848

Plesiastrea conferta (Reuss, 1847)
Pl. 2, Fig.1

1847 *Cladocora conferta* Reuss, p. 19, pl. 3, figs 4, 5.
1871 *Cladangia conferta* (Reuss) — Reuss, p. 247, pl. 16, figs 1-7; pl. 18, fig. 3.

1961 *Cladocora conferta* Reuss — Chevalier, p. 224.
1985 *Cladangia conferta* Reuss — Kókay, p. 29 (no description).

Type material — The holotype from Rudelsdorf (Bohemia) was not found in the Reuss collection in the Natural History Museum of Vienna.
Material studied — Late Badenian of Mány, RGM 211 369 (3 specimens).
Description — Colony plocoid, with irregular exsert corallites and extratentacular budding. Intratentacular budding is present in one specimen, with trabecular linkage. The corallites are 2.1-6.0 mm in diameter, at a distance of 0.0-2.5 mm. There are 26-42 fine granulate septa in four cycles. The septa of the first three cycles are somewhat thickened, show some pores near the centre, and reach the well-developed trabecular columella, forming a crown of pali (or very loose paliform lobes). These are not thickened opposite the second cycle of septa. The septa of the fourth cycle are thin and short, often fusing with other septa in the inner parts of the coral. Low granulate costae, often curved, cover the whole coenosteum surface. The wall is septothecal, not thickened. Exodissepiments are absent, endodissepiments are smooth, thin and not numerous.
Remarks — Recent *Plesiastrea versipora* (Lamarck, 1816), the type species of this genus, shows a strong resemblance to the fossils from Mány. The genus *Cladocora* Ehrenberg, 1834 has a characteristic phaceloid or dendroid colony form, the genus *Cladangia* Milne Edwards & Haime, 1851 has a characteristic incrusting colony form, both being dissimilar to our plocoid fossils.
Distribution — This species is mentioned from the Early and Middle Miocene at various localities in Central Europe, Algeria, and Italy (Chevalier, 1961).

Genus *Solenastrea* Milne Edwards & Haime, 1848

Solenastrea desmoulinsi (Milne Edwards & Haime, 1851)

1851 *Plesiastraea desmoulinsi* Milne Edwards & Haime, p. 100.
1871 *Plesiastraea desmoulinsi* Milne Edwards & Haime — Reuss, p. 243, pl. 9, fig. 1.
? 1871 *Solenastraea distans* Reuss, p. 241, pl. 7, fig. 4.
1954 *Plesiastraea desmoulinsi* Milne Edwards & Haime — Kopek, p. 13, pl. 4, fig. 2; pl. 5, figs 1-3.
? 1954 *Cyphastraea distans* (Reuss) — Kopek, p. 12, pl. 3, figs 3, 6-9; pl. 4, figs 1, 3.
1961 *Palaeoplesiastraea desmoulinsi* (Milne Edwards & Haime) — Chevalier, p. 264, pl. 13, fig. 4; pl. 24, fig. 5; text-figs 96, 97.
? 1970 *Cyphastraea distans* (Reuss) — Hegedüs, p. 187, pl. 1, fig. 6.
1970 *Palaeoplesiastraea desmoulinsi* (Milne Edwards & Haime) — Scholz, p. 196, pl. 1, fig. 3.
? 1970 *Cyphastraea distans* (Reuss) — Scholz, p. 197.
1988 *Solenastrea desmoulinsi* (Milne Edwards & Haime) — Oosterbaan, p. 274, pl. 3, fig. 3. (see here for type material and description).

Material studied — Early Badenian of Visegrád, RGM 211 331 (5 specimens); Early Badenian of Törökmezö, RGM 211 342 (4 specimens); Early Badenian of Bánd, RGM 211 331 (5 specimens), RGM 211 330 (26 specimens).
Remarks — The differences, mentioned by Reuss, 1871, between the genera *Solenastraea* and *Plesiastraea* are the absence of paliform lobes and costae not covering the whole coenosteum surface. However, in his figure of *Solenastraea distans* low granulate costae are visible, as are smal paliform lobes. The figures in Kopek (1954) and Hegedüs (1970) also show a strong resemblance.
Distribution — The species is known from the Early and Middle Miocene of the western Mediterranean and central Europe (Oosterbaan, 1988).

Familia Mussidae Ortmann, 1890
Genus *Mussismilia* Ortmann, 1890

Mussismilia vindoboniensis Chevalier, 1961
Pl. 2, Figs 3, 4

? 1900 *Mussismilia provincialis* Matheron in Repelin, p. 94 (no description, according to Chevalier, 1961).
1961 *Mussismilia vindoboniensis* Chevalier, p. 285, pl. 14, figs 4, 12; pl. 15, fig. 1.
1961 *Mussismilia provincialis* (Matheron) in litt. Repelin — Chevalier, p. 284, pl. 14, figs 2, 3; pl. 15, fig. 7.
1970 *Mussismilia vindoboniensis* Chevalier — Scholz, p. 198, pl. 5, figs 1-5.

Type material — The holotype from San Pau d'Ordal (Spain) (Coll. Chevalier) should be in the Laboratoire Paléontologique in Paris, but I could not find it there.
Material studied — Early Badenian of Visegrád, RGM 211 391 (2 specimens), RGM 211 361 (7 specimens), RGM 211 355 (1 specimen), RGM 211 362 (7 specimens); Early Badenian of Törökmezö, RGM 211 346 (5 specimens), RGM 211 343 (16 specimens).

Description — Colony phaceloid, with branches up to 15 cm long, generally consisting of one corallite. Corallites mono- to tristomodeal, with intratentacular budding and trabecular linkage. The calices are flat, often oval, and 12-30 mm in diameter. There are 44-80 septa in 5 cycles. The septa of the first three cycles reach the large, trabecular columella. Septa of the fourth cycle are thinner, and reach half of the distance between wall and columella. Septa of the fifth cycle are reduced to small ridges. Costae are present, opposite all septa, those of the fifth cycle are thin. The septa are granulate, strongly serrate at their margins, and contain pores and synapticulae near the columella. The wall is septo- to parathecal, thickened to a maximum of 1.5 mm and shows small horizontal ridges crossing the costae. Thin vesicular endodissepiments are present.
Remarks — This species shows a strong resemblance to the Indopacific genus *Lobophyllia* de Blainville, 1830, which, however, shows lamellar linkage, has no porous septa, and slender rather than triangular teeth on the septal margins. The differences mentioned by Chevalier (1961) between *Mussismilia provincialis* and *M. vindobonensis* are: the latter species has more serrate and compact corallites, which are more often fused, 36-60 instead of 58-86 septa, a smaller columella, and no costae of the fifth order. In our Hungarian specimens costae of the fifth order are present, and the number of septa varies from 44 to 80, which leads me to conclude that they are synonyms. However, according to Chevalier (1961), neither Matheron nor Repelin published a valid description of *Mussismilia provincialis*, which makes him the author of this species. Unfortunately, I was unable to obtain Matheron's and Repelin's papers.
Distribution — This species is also known from the Early and Middle Miocene of southern France and Spain.

Genus *Acanthophyllia* Wells, 1937

cf. **Acanthophyllia ampla** (Reuss, 1871)
Pl. 2, Fig. 5

1871 *Lithophyllia ampla* Reuss, p. 231, pl. 6, fig. 2.
1916 *Lithophyllia ampla* Reuss — Krumpholz, p. 31.
1956 *Acanthophyllia ampla* (Reuss) — Wells, p. F417.
1957 *Lithophyllia ampla* Reuss — Kopek, p. 14, pl. 3, figs 4, 5; pl. 4, figs 4, 5.
1961 *Acanthophyllia ampla* (Reuss) — Chevalier, p. 276.

Type material — I was unable to trace in the Natural History Museum in Vienna the specimen from Lapugy (Transylvania), mentioned by Reuss.
Material studied — Early Badenian of Visegrád, RGM 211 359 (2 specimens), RGM 211 393 (1 specimen).
Description — Solitary coral, discoid, with a diameter of 38-74 mm. There are 80-120 septa in 6 or 7 cycles. Septa of the first and second cycle reach the large (up to 12 mm) spongy columella, and are thickened to a maximum of 1.5 mm. Septa of the third and fourth cycle are often also somewhat thickened. Granulation or dentation is not visible, neither is any wall structure.
Remarks — The poor preservation of our specimens does not allow a definite identification.
Distribution — This species has only been described from Hungary, Bohemia and Bosnia (Kopek, 1954).

Genus *Mycetophyllia* Milne-Edwards & Haime, 1848

Mycetophyllia horrida Reuss, 1860
Pl. 2 , Fig. 2

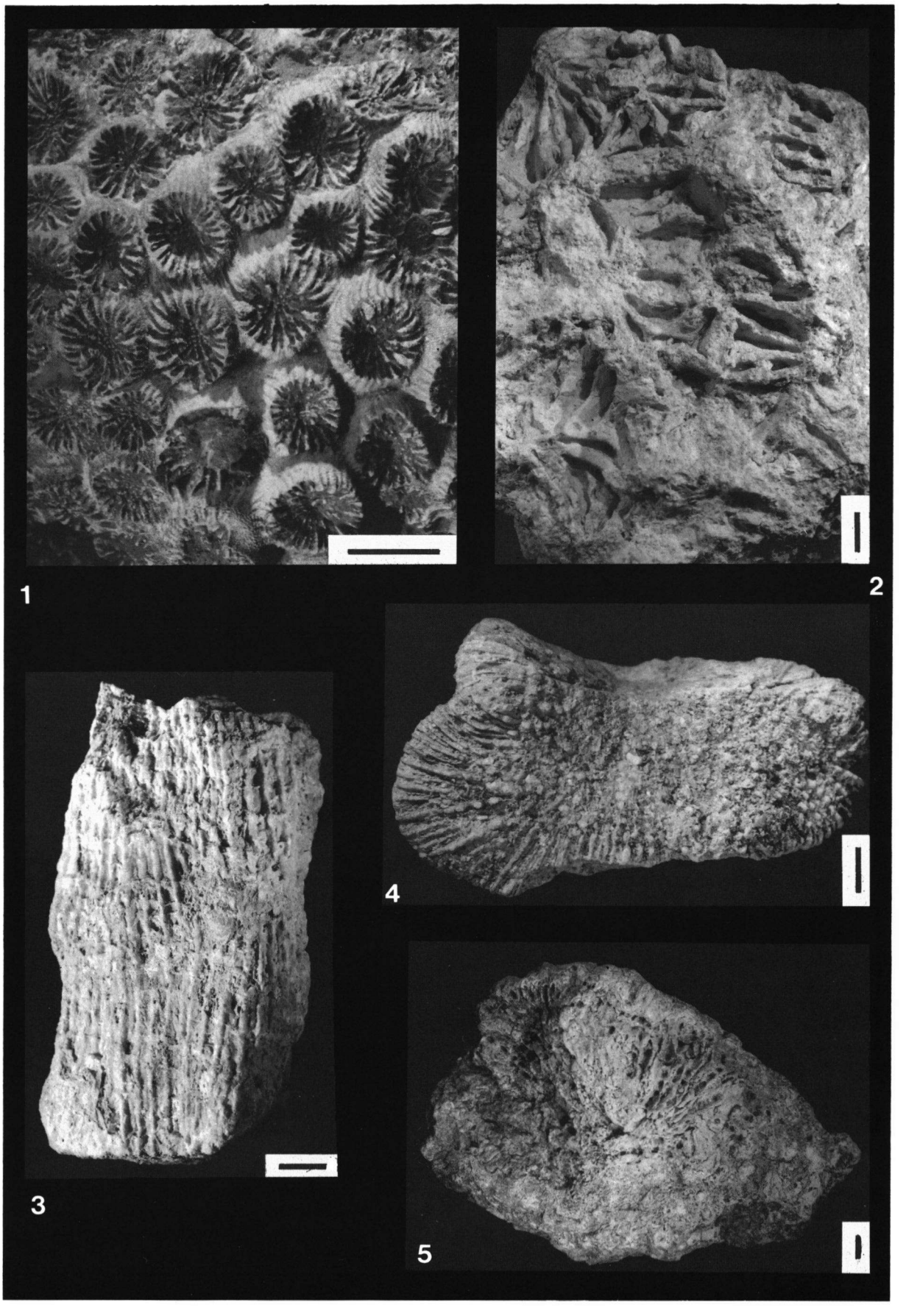
1860 *Mycetophyllia horrida* Reuss, p. 220, pl. 2, figs 1, 2.
1871 *Mycetophyllia horrida* Reuss — Reuss, p. 235, pl. 6, fig. 5.
1961 *Mycetophyllia horrida* Reuss — Chevalier, p. 293.

Type material — The specimen from Rudelsdorf in Bohemia, mentioned by Reuss (1860) was not found in the Natural History Museum in Vienna.
Material studied — Early Badenian of Törökmezö, RGM 211 341 (4 specimens), RGM 211 392 (1 specimen).

Plate 2

Fig. 1. *Plesiastrea conferta* (Reuss, 1847)
Late Badenian, Mány. Leg. P. Müller. Coll RGM 211 369.
Fig. 2. *Mycetophyllia horrida* Reuss, 1860
Early Badenian, Törökmezö. Leg. A.F.F. Oosterbaan. Coll. RGM 211 392.
Figs 3-4. *Mussismilia vindoboniensis* Chevalier, 1961
Early Badenian, Visegrád. Leg. A.F.F. Oosterbaan. Coll. RGM 211 391.
Fig. 5. cf. *Acanthophyllia ampla* (Reuss, 1871)
Early Badenian, Visegrád. Leg. A.F.F. Oosterbaan. Coll. RGM 211 393.

Bar length represents 5 mm approximately


1
2
3
4
5

Description — Colony flat, meandroid, consisting of polystomodeal corallites with lamellar and trabecular linkage. The calice centres are at a distance of 10-25 mm from each other. There are at least three cycles of septa, showing mussid dentation at their ridges, and being granulate at their margins. Septa of the first two cycles are thickened to a maximum of 1.0 mm, often fusing with each other near the small, spongious columella. There are 5-7 of these septa in 1 cm. Septa of the third cycle, if present, are thin and do not reach the columella. A real wall is absent. At the colony margin a partial exotheca, not unlike that seen in *Syzygophyllia* Reuss, 1860 (see Oosterbaan, 1988), is visible in one specimen. As all specimens are casts, inner structures are not preserved.
Distribution — The species is known only from Bohemia and Hungary.

Subordo Dendrophylliina Vaughan & Wells, 1943
Familia Dendrophylliidae Gray, 1847
Genus *Astroides* Quoy & Gaimard, 1827

cf. **Astroides subirregularis** (Osasco, 1897)

See Oosterbaan, 1988, p. 279, pl. 3, fig. 2, with synonymy.

Material studied — Early Badenian of Bánd, RGM 211 327 (1 specimen).
Remarks — The description and figures of *Rhizangia procurrens* Reuss (1871, p. 246, pl. 5, fig. 11; pl. 6, fig. 1) (also in Hegedüs, 1970, p. 188, pl. 1, figs 9, 10) show a strong resemblance to this species, which has, however, a characteristic encrusting growth form, quite unlike the only, rather poorly preserved specimen from Bánd.
Distribution — The species is also known from the Early Miocene of Aquitaine and the Turin region (Oosterbaan, 1988).

Genus *Turbinaria* Oken, 1815

Turbinaria cyathiformis (de Blainville, 1830)

See Oosterbaan, 1988, p. 279, pl. 4, fig. 1, with synonymy.

Material studied — Early Badenian of Törökmezö, RGM 211 352 (3 specimens), RGM 211 345 (10 specimens); Early Badenian of Bánd, RGM 211 323 (1 specimen).
Distribution — This species is known from the Early and Middle Miocene of the western Mediterranean and central Europe (Chevalier, 1961).

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