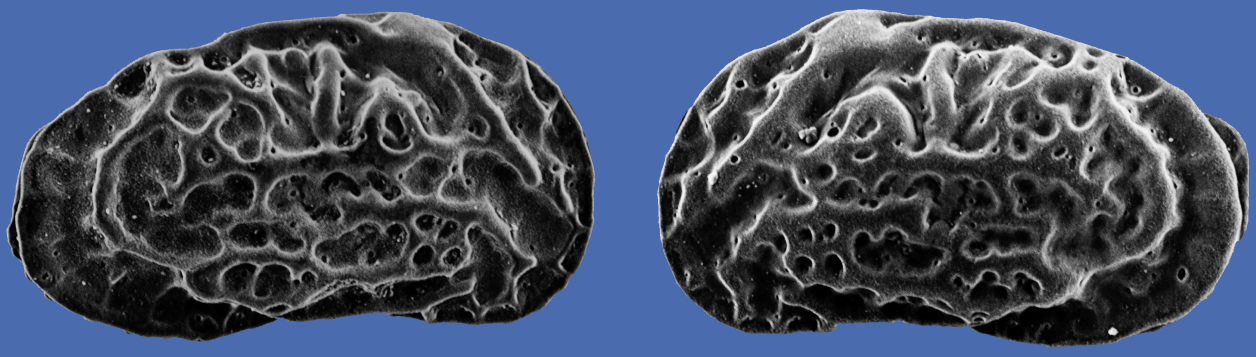
Zitteliana

An International Journal
of Palaeontology and Geobiology

Series A/Reihe A
Mitteilungen der Bayerischen Staatssammlung
für Paläontologie und Geologie

45



München 2005

Zitteliana

An International Journal of Palaeontology and Geobiology

Series A/Reihe A

Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Geologie

45

CONTENTS/INHALT

Zitteliana	A 45	218 Seiten	München, 30.12.2005	ISSN 1612-412X

Bayerische Staatssammlung für Paläontologie und Geologie
Richard-Wagner-Str. 10, D-80333 München, Deutschland
http://www.palaeo.de/zitteliana
email: zitteliana@lrz.uni-muenchen.de

ISSN 1612-412X
Druck: Gebr. Geiselberger GmbH, Altötting

Cover illustration: Ostracod *Callistocythere intricatoides* (Ruggieri, 1953) from the Thyrrenian of Altinova (Turkey). Left: Right valve, external view, BSPG 1980 X 1313 (length 0.640 mm). Right: Left valve, external view, BSPG 1980 X 1314 (length 0.646 mm). SEM Photograph: R. Matzke-Karasz (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Umschlagbild: Ostrakode *Callistocythere intricatoides* (Ruggieri, 1953) aus dem Thyrrenium von Altinova (Türkei). Links: Rechte Klappe, Außenansicht, BSPG 1980 X 1313 (Länge 0,640 mm). Rechts: Linke Klappe, Außenansicht, BSPG 1980 X 1314 (Länge 0,646 mm). REM-Foto: R. Matzke-Karasz (LMU München, Department für Geo- und Umweltwissenschaften, Sektion Paläontologie)

Zitteliana	A45	3-34	4 Textfigs, 9 Pls, 16 Tabs	München, 30.12.2005	ISSN 1612-412X

Jurassic corals from southern Tunisia

By
Dhirendra K. Pandey[1] & Franz T. Fürsich[2]*

[1]*Department of Geology, University of Rajasthan, Jaipur 302 004, Rajasthan, India*
[2]*Institut für Paläontologie der Universität Würzburg, Pleicherwall 1, D 97070 Würzburg, Germany;*

Manuscript received July 28, 2005; revision accepted September 10, 2005.

Abstract

The coral fauna from Middle Jurassic strata of southern Tunisia is described and figured, and complements previous records by Beauvais (1966a). Most of the corals are from the Lower Callovian Beni Oussid Member of the Tataouine Formation. The coral fauna comprises altogether 18 taxa belonging to 14 genera.

Key words: Scleractinia, Jurassic, taxonomy, Tunisia

Kurzfassung

Die Korallenfauna des südtunesischen Mitteljura wird beschrieben und abgebildet. Frühere Untersuchungen durch Beauvais (1966a) werden damit ergänzt. Die meisten Korallen stammen aus dem Beni Oussid-Member (Untercallov) der Tataouine-Formation. Die Korallenfauna besteht aus 18 Taxa, die zu 14 Gattungen gehören.

Schlüsselwörter: Scleractinia, Jura, Taxonomie, Tunesien

1. Introduction

The Jurassic sediments of southern Tunisia were deposited in an E-W trending, shallow marine basin (Ghadames Basin), situated on the northern margin of the Sahara Platform. Jurassic sediments are superbly exposed along the eastern margin of the Dahar Mountain Range, north and south of Foum Tataouine (Textfig. 1). The corals described in this paper have been collected from Middle to lower Upper Jurassic strata (Textfig. 2; see also Appendix), in the context of a quantitative palaeoecological analysis of the benthic fauna (Holzapfel 1998). Earlier on, corals from southern Tunisia have been described by Beauvais (1966a). The present account supplements and updates these earlier records. The comparatively low species diversity of the coral fauna is the result of the marginal marine nature of the Middle Jurassic sediments, which represent environments ranging from hypersaline and brackish lagoons to the nearshore, shallow shelf (Ben Ismail & M'Rabet 1990; Ben Ismail 1991; Holzapfel 1998). The corals do not form reefs, but generally occur as scattered individuals within a benthic fauna dominated by bivalves, less commonly by gastropods or brachiopods. Due to their scarcity, the corals only in a very limited way contribute to the characterization of the various palaeoenvironments present in southern Tunisia during the Jurassic by indicating fully marine environments.

In all, 18 species assigned to 14 genera and 11 families have been identified. Table 1 lists the coral taxa hitherto recorded from the Jurassic of southern Tunisia (Beauvais 1965, 1966a, and present work).

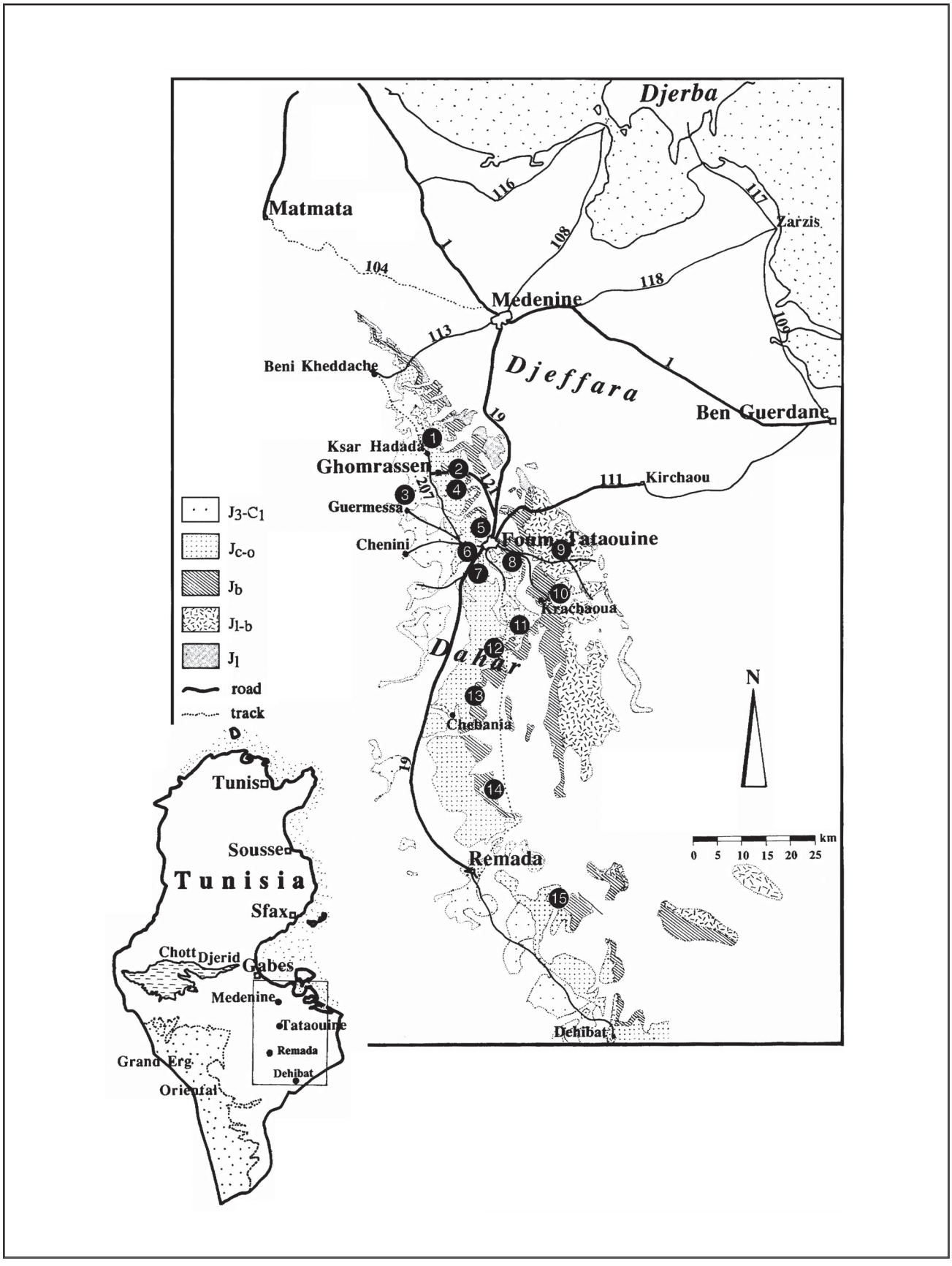
2. Material and Methods

Altogether some 72 specimens were available for study. They are housed in the collections of the Institut für Paläontologie, Würzburg University (prefix PIW).

Abbreviations of measurements

AB	angle of bifurcation
Ab	angle of budding
Att	diameter of attachment area
c'c'	distance between centers of corallites within a series
cc	minimum distance between centers of corallites
d	large diameter of corallites
d'	small diameter of corallites
D	large diameter of corallum
Dbr	diameter of the branches
Dd	density of dissepiments in longitudinal section
Ds	density of septa at the periphery (or where septa are almost parallel) per 1 mm (when not mentioned otherwise)
Dt	number of trabeculae at the distal margin of the septa per 1 mm (when not mentioned otherwise)
Dt.s	depth of series
H	height of corallum
Lc	length of collines (one measurement indicates maximum length)

**Author for correspondence and reprint requests; E-mail: franz.fuersich@mail.uni-wuerzburg.de*



Textfigure 1: Distribution of Jurassic rocks in southern Tunisia with positions of sections 1-15 studied by Holzapfel (1998). Corals were encountered at Ghomrassen (locality 2), Foum Tataouine North (4), Ksar Jelidat (8), Ksar Beni Soltane (11), Bir Remtha (12), Krechem el Miit (13), Faljet Jdari/Ed-Dghaghra (14), and Remada SE (15). J_l: Zmilet Haber Formation (Lower Lias); $J_{l\text{-}b}$: Mestaoua Gypsum Formation (Upper Lias); J_b: Krachoua and Techout formations (Bajocian-Bathonian); $J_{C\text{-}O}$: Tataouine Formation (Callovian-Lower Oxfordian); J_3-C_l: Asfer Formation (Upper Jurassic-lowermost Cretaceous). (From Holzapfel 1998).

Age	Formation	Member
Oxfordian-pre-Albian	Asfer	
Callovian	Tataouine	Hadada Ghoumrassen Krechem el Miit
Bathonian	Techout	Beni Oussid
Bajocian	Krachoua	

Textfigure 2: Stratigraphic framework of the Jurassic rocks of southern Tunisia (after Ben Ismail et al. 1989).

Lcf length of calicular fossa
Mls maximum length of series
Nc number of costae
Ns number of septa
Shape shape of corallum
Wc width of calicular series
Wp width of peritheca

In the present study, the assignment of families to suborders has been done following Chevalier & Beauvais (1987), Pandey & Fürsich (2003) and other recent studies (Roniewicz 1976; Eliášová 1976; Morycowa & Roniewicz 1995; Roniewicz & Stolarski 2001). Generally, the synonymy lists contain, apart from the earliest reference to the species, only those references, which refer to occurrences in Tunisia, recent references which contain exhaustive synonymy lists, and references, which are discussed in the text.

3 Taxonomy

Class Anthozoa Ehrenberg, 1834
Subclass Zoantharia Blainville, 1830
Order Scleractinia Bourne, 1900
Suborder Archaeocoeniina Alloiteau, 1952
(nom corr. ex Archeocaeniida Alloiteau, 1952)

Family Actinastraeidae Alloiteau, 1952

Genus *Enallocoenia* d 'Orbigny, 1849

Type species *Astrea crasso-ramosa* Michelin, 1840

Enallocoenia crassoramosa (Michelin, 1843)
Pl. 1, Figs 1-4

1843 *Astrea crasso-ramosa* sp. nov. - Michelin: 109, pl. 25, fig. 2.
1849 *Enallocoenia crasso-ramosa* (Michelin) - d' Orbigny: 7.
1850 *Enallocoenia crasso-ramosa* (Michelin) - d' Orbigny: 35.
2003 *Enallocoenia crassoramosa* (Michelin) - Pandey & Fürsich: 13, pl. 2, fig. 17 [cum syn.].

Material: 5 specimens from the Krechem el Miit Member, Tataouine Formation, Bir Remtha (PIW2004II 40), Ksar Beni Soltane (PIW2004II 41) and Foum Tataouine Nord (PIW2004II 66-67), and Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 63).

Dimensions (in mm): see Tab. 1

Description: Corallum encrusting, ramose-tubular, or digitate, cerioid. Calices small in diameter, subcircular, tetragonal to hexagonal in outline. Septa few, compact, non-confluent, thickest at the periphery and thinning towards corallite center, very rarely anastomosing, arranged in at least three cycles. About 6-10 septa reach the center or two-thirds of the radius, the remaining ones are either very short or rudimentary. Inner margin of septa occasionally swollen or with papillae-like extensions and joined to adjacent septa or to the columella. Distal margins of septa with fine and sharp denticles. Lateral surface of septa covered with very fine to fine granules or spinules. Dissepiments commonly ranging from vesicular to tabular, occasionally forming an incomplete ring around axial area. Wall thin, parathecal or septo-parathecal. Columella small, prominent, subcircular to elongated, styliform, seen only in few corallites.

Remarks: Of the five specimens one (PIW2004II 40) is internally recrystallised and a second (PIW2004II 41) is only

Table 1: Dimensions (in mm) of *Enallocoenia crassoramosa*

	D	H	D	Ns	Ds	Shape
PIW2004II 40	102	23	1.2-1.6	>8	5	crustose
PIW2004II 41	-	-	1.1	8-10+2 or 8+12	-	external mould
PIW2004II 63	-	1	0.6-2.1	28 (12+12+4) 34 (9+8+17)	7-8	crustose
PIW2004II 66	-	>27	1.2-1.5	18 (9+9) 20 (8+12)	>6	ramose, tubular
PIW2004II 67	-	29	1.5-2	22 (6+10+6)	6	ramose, digital
Enallocoenia sp.- (Beauvais 1966a)	-	-	1.5, 2.5	15-25	-	ramose

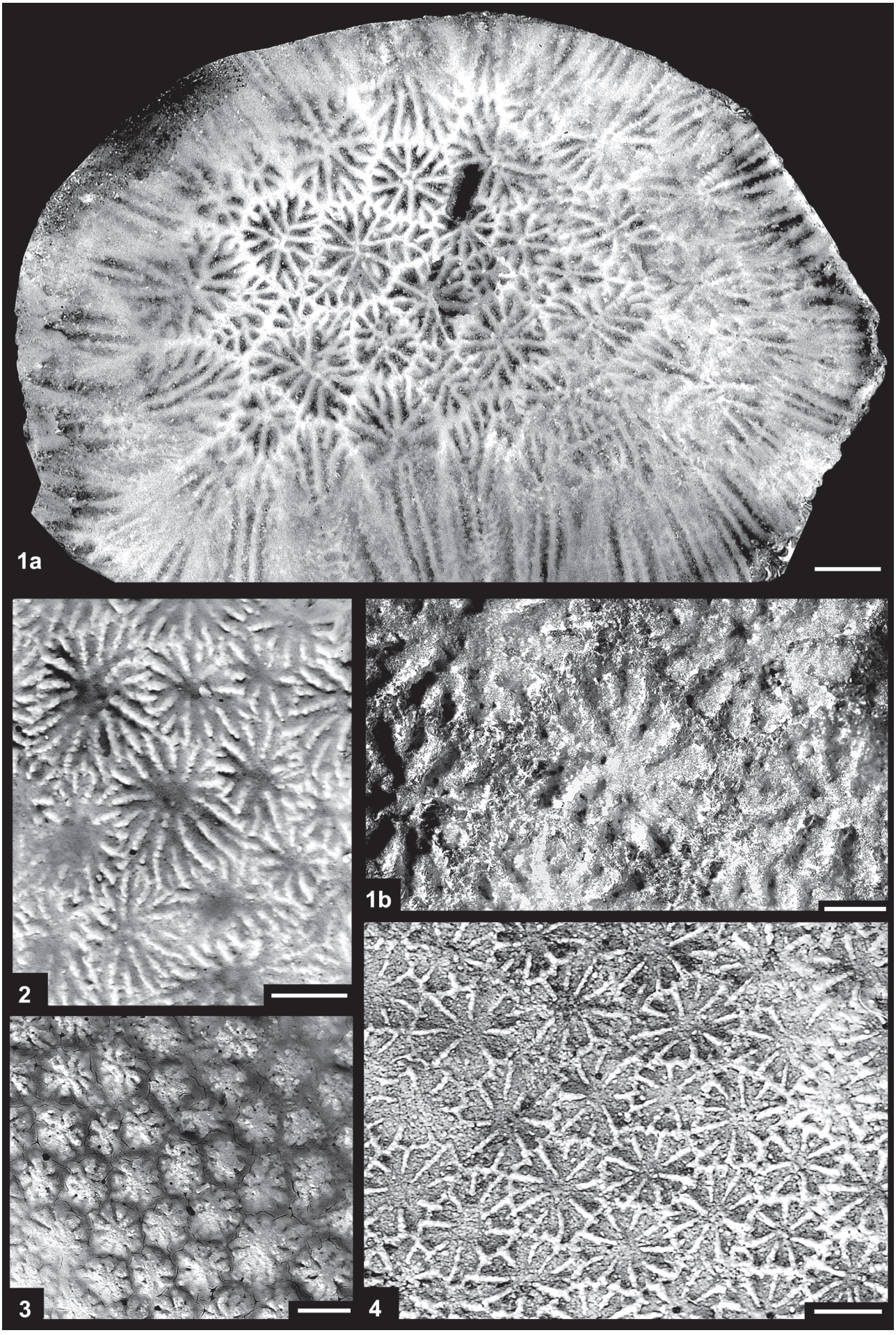

1a
1b
2
3
4

Table 2: Dimensions (in mm) of *Stylina micrommata*

	D	Cc	Ns	Nc	Wp
PIW2004II 43	0.6-1.0	1.6	13-16 (8+8)	13-16	0.5-1.0
Stylina micrommata of Pandey & Fürsich (2003) (PIW1999VIII 877)	0.3-1.0	0.7-1.6	12 (6+6) -		0.1-1.6
Stylina micrommata of Pandey & Fürsich (2003) (PIW1999VIII 602)	1.0-1.3	1.4-2.5	16-18 (8+8)	-	0.6-1.3
Stylina kachensis of Pandey & Fürsich (2003) (PIW1999VIII 600)	1-1.5	1.5	12 -		0.6
Stylina kachensis of Pandey & Fürsich (2003) (PIW1999VIII 593)	1.0-1.2	1.7	12 -	-	
S. subramosa (Koby, 1881: 79, pl. 15, fig. 3)	1.0-3.0	2.0-8.0	2 -	-	

an external mould. In these specimens the nature of the dissepiments and details of septa could not be observed. Except for the columella, which in most cases is not seen, the specimens match in morphological characters and dimensions the specimens from the Jurassic of Iran assigned to *Enallocoenia crassoramosa* (Michelin) by Pandey & Fürsich (2003). In the Iranian specimens the corallite diameter is smaller than in *E. crassoramosa* described by Beauvais (1964: 112), Roniewicz (1977: 617), and Prinz (1991: 181). The number of septa (8-34) varies widely. *Enallocoenia* sp. described by Beauvais (1966a: 116) from the Upper Jurassic of southern Tunisia has similar morphological features and dimensions. In all probability it also belongs to *E. crassoramosa*. However, in absence of any illustration of the specimen the assignment to the taxon is pending.

The non-anastomosing nature of septa in *Enallocoenia crassoramosa* is one of the characteristic features of this Upper Jurassic species, by which it differs from *Actinastrea* (Pandey & Fürsich 2003). However, in a few cases anastomosing septa have been observed in the present material. Where the styliform columella has been seen, the inner edges of the septa occasionally join in the center. As in the specimens from Iran, the septa are occasionally joined with dissepiments or the columella. The degree of this character varies with ontogeny as evident in the present specimens and in members of the subfamily Stylininae described by Gill (1977). Under these circumstances, it is difficult to differentiate the species on one hand from *Actinastrea* (Wells 1956: F370; Alloiteau 1957: 68; Pandey & Fürsich 2003: 14) and on the other hand from the subfamily Stylininae. Beauvais´ (1964: 111) view that *Enallocoenia* differs from *Actinastrea* on the basis of its wall structure cannot be upheld as species of both genera exhibit a septo-parathecal wall.

Stratigraphic distribution in Tunisia: Upper Callovian.

Suborder Stylinina Alloiteau, 1952

(nom corr. ex Stylinida Alloiteau, 1952)

Family Stylinidae d' Orbigny, 1851

Subfamily Stylininae d' Orbigny, 1851, emended Roniewicz, 1976

Genus *Stylina* Lamarck, 1816

Type species *Stylina echinulata* Lamarck, 1816

Stylina micrommata (Quenstedt, 1857)

Pl. 2 , Fig. 2

1857 *Astraea micrommata* sp. nov. - Quenstedt: 701, pl. 85, fig. 2.

1875 *Stylina micrommata* (Quenstedt) - Becker: 141, pl. 36, fig. 11.

1954 *Stylina micrommata* (Quenstedt) - Geyer 1954: 130, pl. 9, fig. 3.

2003 *Stylina micrommata* (Quenstedt) - Pandey & Fürsich: 16. pl. 2, fig. 6.

Material: 1 specimen from the Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 43).

Plate 1: *Enallocoenia crassoramosa* (Michelin, 1843) from the Tataouine Formation.

Fig. 1: Krechem el Miit Member, Foum Tataouine Nord; PIW2004II 66, a: transverse polished section of a ramose colony showing few cases of anastomosing septa, scale bar 1.25 mm, b: close-up outer view of the ramose colony showing non-anastomosing septa, scale bar 0.5 mm.

Fig.2: Close-up view of upper surface, scale bar 1.25 mm, Beni Oussid Member, Tataouine Formation, Bir Remtha; PIW2004II 63.

Fig. 3: Close-up view of an external mould, scale bar 1.25 mm, Krechem el Miit Member, Ksar Beni Soltane; PIW2004II 41.

Fig. 4: Close-up view of upper surface of a moderately large colony showing non-anastomosing septa, scale bar 2.5 mm, Krechem el Miit Member, Bir Remtha; PIW2004II 40.

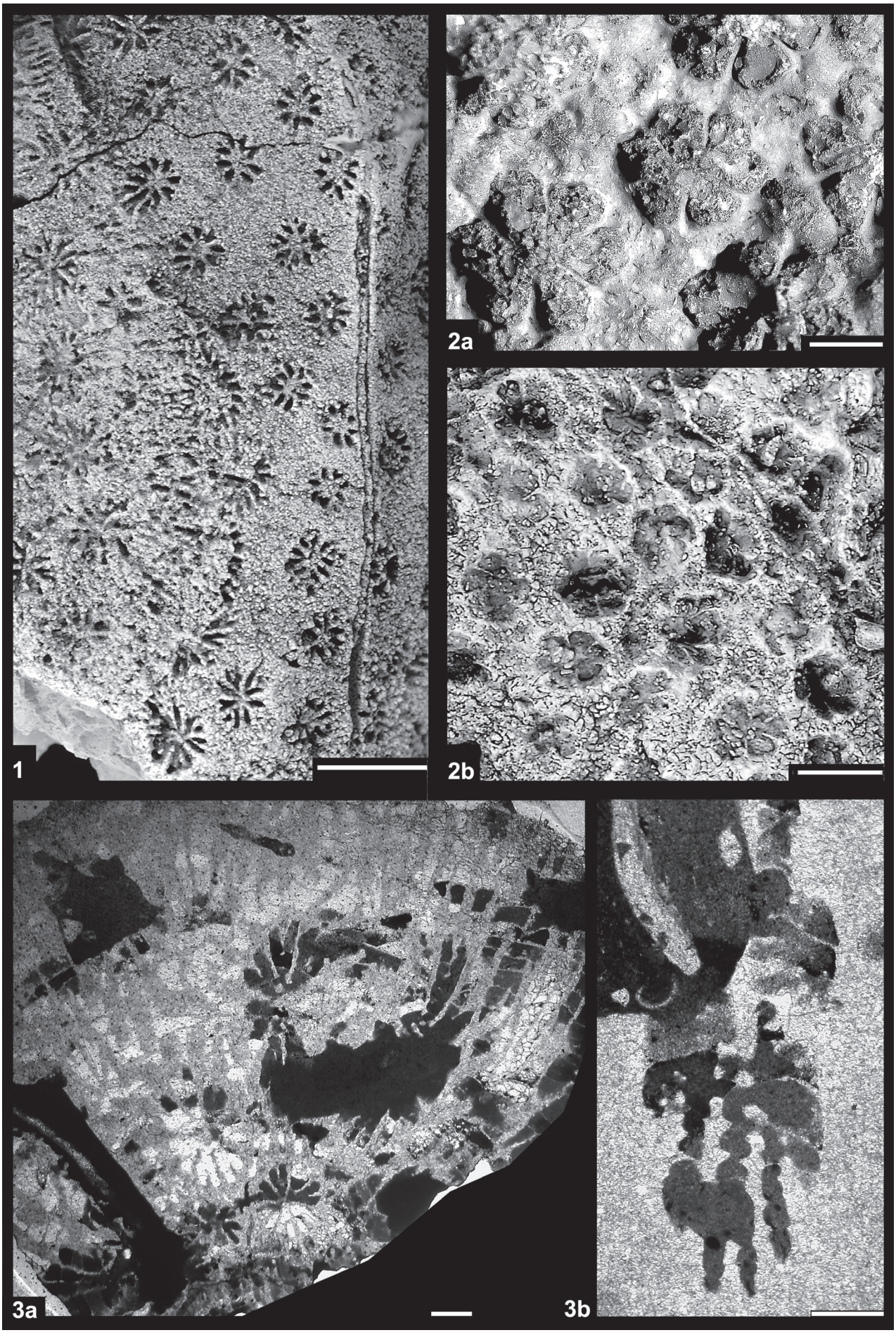

1
2a
2b
3a
3b

Table 3: Dimensions (in mm) of *Heliocoenia* sp. A

	D	H	Att.	D	cc	Ns	Ds	Wp
PIW2004II 16	35	17.5	28	1.7-2	2.3-3	12 (6+6)	-	0.5-1.3
PIW2004II 17	31	22	25	1.5-2	2.2	12 (6+6)	-	0.5-1
PIW2004II 18	28	31	23	2	2	9, 12-15	4	0-1.5

Dimensions (in mm): see Tab. 2

Description: Corallum ramose, plocoid. Calices small, circular in outline. Coenosteum thin, costate. Septa compact, octameral, arranged in three cycles, those of first cycle long and joining the columella. Septa of second and third cycles correspondingly shorter, those of third cycle anastomosing. Costae corresponding to septa. Auriculae present along the inner edge of septa. Endothecal dissepiments common. Wall septo-parathecal. Columella styliform.

Remarks: The nature of costae, whether confluent or non-confluent, according to Pandey & Fürsich (2003) one of the characters by which different species of *Stylina* can be distinguished, is not clear in the poorly preserved specimen. The nature of exothecal dissepiments is also not clear. When comparing a corallite diameter of up to 1.0 mm with the number of septa within the species of *Stylina* recorded from the Jurassic, then the present specimen can be easily referred to *Stylina micrommata*.

Stratigraphic distribution in Tunisia: Callovian.

Genus *Heliocoenia* Étallon, 1859

Type species *Heliocoenia variabilis* Étallon, 1859

Heliocoenia sp. A

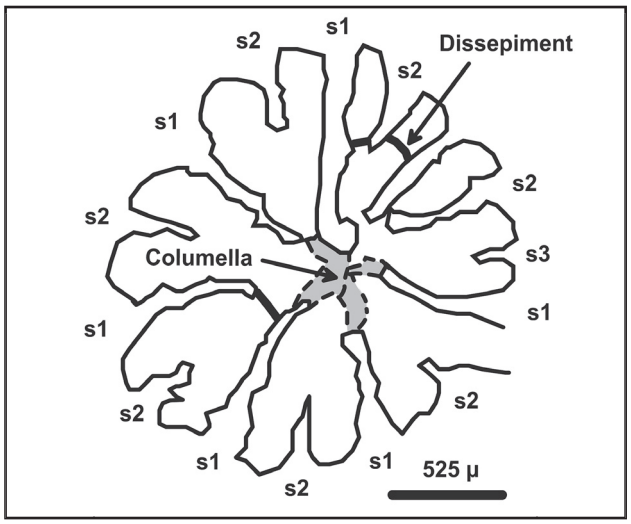
Pl. 2, Figs 2-3, Textfig. 3

Material: 3 specimens from the Beni Oussid Member, Tataouine Formation, Foum Tataouine North (PIW2004II 16-18).

Dimensions (in mm): see Tab. 3

Description: Corallum crustose, nodular, plocoid. Corallite subrounded, subpolygonal, hexagonal to pentagonal in outline. Calices, small, distinct, shallow. Costo-septa compact, thin, hexameral, numbering 12 or 15, arranged in three cycles (Textfig. 3) with distinct auricles or bulge along the inner edge. Septa of first cycle occasionally joined with the columella. Lateral surface covered with granules or spinules. Endothecal dissepiments dominantly tabular, occasionally vesicular. Wall during early ontogenic stage septothecal, on the upper surface parathecal. Coenosteum thin, occupied mainly by dissepiments. Columella styliform, irregular and elongated in outline.

Remarks: The specimens are poorly preserved and for the most part recrystallised. Thus, internal morphological features could only rarely be observed. However, the nature of septa, presence of a columella and of auricles at the inner edge of

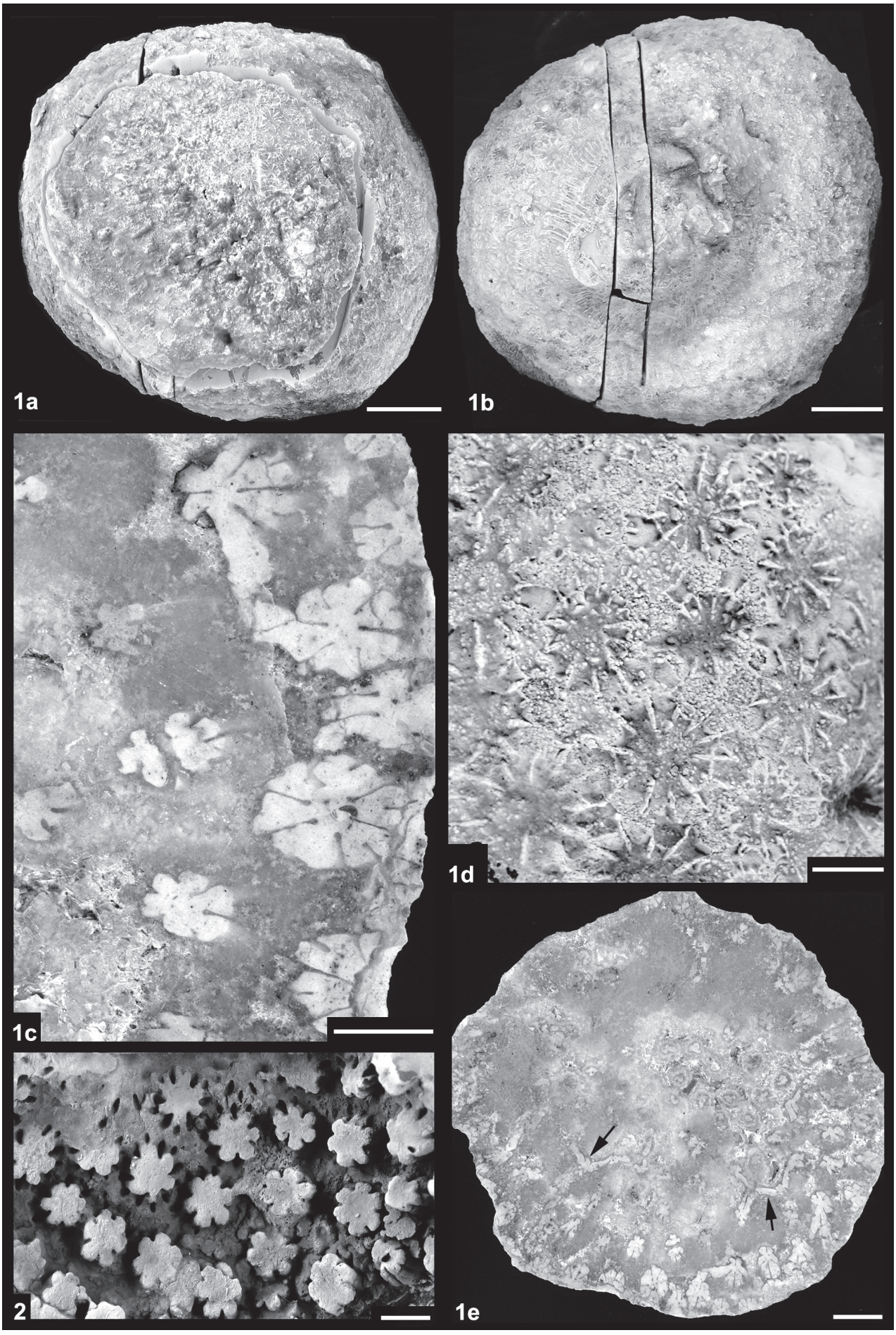


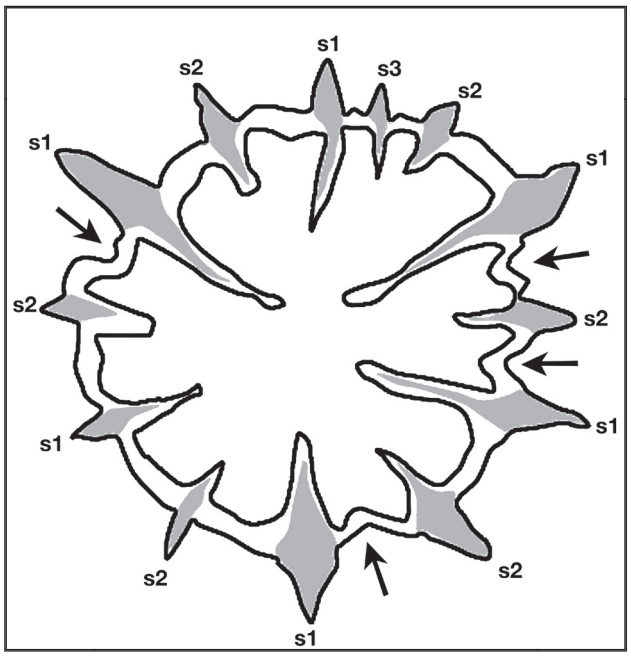
Textfigure 3: *Heliocoenia* sp. A from the Beni Oussid Member, Tataouine Formation, Foum Tataouine Nord; PIW2004II 18. Sketch of transverse section showing arrangement of septa, distribution of dissepiments and distinct auricles or bulges along the inner edges of septa producing the columella. Note interrupted outline of the corallite because of boring. s1, s2, and s3 are septa of first, second and third cycles, respectively.

Plate 2

Fig. 1: *Stylina micrommata* (Quenstedt, 1857) from the Beni Oussid Member, Tataouine Formation, Bir Remtha. Close-up view of a ramose colony, scale bar 2.5 mm; PIW2004II 43.

Figs 2-3: *Heliocoenia* sp. A from the Beni Oussid Member, Tataouine Formation, Foum Tataouine North; PIW2004II 17. 2.a: Corallites on the lower surfcae of a nodular colony showing distribution of six primary septa, scale bar 1 mm, b: upper surface of the colony showing subpolygonal outline of corallites, scale bar 2.5 mm. 3a: Oblique thin - section showing organization of septa and auricles along the inner edge of the septa. Note the borings in the colony, scale bar 1.1 mm, b: longitudinal thin - section showing auricles at the inner edge of septa and vesicular dissepiments, scale bar 0.55 mm; PIW2004II 18.


1a
1b
1c
1d
1e
2



Textfigure 4: *Pseudocoenia slovenica* Turnšek, 1972, specimen from the Beni Oussid Member, Tataouine Formation, Remada SE, PIW2004II 1. Sketch of transverse section showing two complete cycles of septa and a single septum of the third cycle. Note other positions (arrowed) of septa of the third cycle. s1, s2, and s3 are septa of first, second and third cycle, respectively.

septa, and absence of distinct costae from the coenosteum refer these specimens to the genus *Heliocoenia*. Seen only in a few cases, the septa of different cycles do not essentially differ in length and their assignment to a particular cycle is difficult. The diameter of the corallites, septal arrangements and other morphological features are similar to those of *Heliocoenia variabilis* Étallon (1859: 475; Koby 1881: 66; Turnšek 1997: 101; Pandey & Fürsich 2003: 22), but the polygonal outline of the corallites in the present specimens and the lamellar outline of the columella in *H. variabilis* easily differentiate the two. *Heliocoenia pentagonalis* (Michelin) is another comparable species but has a larger corallite diameter and a higher number of septa and costae (Beauvais 1964: 145; Roniewicz 1966: 209). *Heliocoenia costulata* Koby (1881: 64, pl. 30, fig. 4; Turnšek 1997: 100) has comparable dimensions but exhibits distinct costae in the coenosteum.

The variability of the corallite diameter and number of septa led Beauvais (1964) to suggest that out of 35 species described by authors only 10 species may be valid. Based on the number of septa and the diameter of the corallites the specimens from Tunisia can be compared with *H. corallina* Koby (1881: 65; Roniewicz 1966: 209) but the polygonal outline of the corallites and the higher density of dissepiments do not match. In all probability, the present specimens belong to a new species.

Stratigraphic distribution in Tunisia: Callovian.

Subfamily Pseudocoeniinae Roniewicz, 1976

Genus *Pseudocoenia* d' Orbigny, 1850

Type species *Pseudocoenia suboctonis* d'Orbigny, 1850.

Pseudocoenia slovenica Turnšek, 1972

Pl. 3, Fig. 1, Pl. 4, Figs 1-5, Textfig. 4

1972 *Pseudocoenia slovenica* sp. nov. - Turnšek: 164, pl. 4, figs 1-2, pl. 5, figs 1-4.
1976 *Pseudocoenia slovenica* Turnšek - Roniewicz: 48, pl. 5, fig. 5.
1981 *Pseudocoenia slovenica* Turnšek - Eliášová: 125, pl. 8, figs 3-4.

Table 4: Dimensions (in mm) of *Pseudocoenia slovenica*

	D	H	Att.	d	cc	Ns	Nc	Wp
PIW2004II 1	60/58	40	10	1.6-3.1	3-42	12-16 (6+6+S3)	12-16	0.5-1.3
PIW2004II 2	-	-	-	2.0-2.4	2.2-3.2	12+ (6+6+S3)	12+	0.5-1
PIW2004II 3	-	-	11	1.4-2.1	2.5-3.6	12 (6+6)	12	0.4-1.5
PIW2004II 5	-	-	-	2.1-2.3	2.4-4	12 (6+6)	12	0.2-2
PIW2004II 14	-	-	-	1.2-1.6	1.2-2	13 (6+6+1)	-	0-0.6

Plate 3

Fig. 1: *Pseudocoenia slovenica* Turnšek, 1972 from the Beni Oussid Member, Tataouine Formation, Remada SE; PIW2004II 1. a: Upper view, scale bar 10 mm, b: lower view, scale bar 10 mm, c: part of transverse polished section showing organization of septa, swollen inner margin of septa and vesicular dissepiments, scale bar 2.5 mm, d: part of the upper surface showing vesicular dissepiments along the periphery which form continuous floor between adjacent corallites. Note three layers in each septum and predominantly parathecal walls, scale bar 2.5 mm, e: transverse polished section showing plocoid colony and borings (arrowed), scale bar 5 mm.

Fig. 2: *Solenocoenia*? cf. *sexradiata* (Goldfuss, 1826) from the Beni Oussid Member, Tataouine Formation, Bir Remtha; PIW2004II 47. Mould of a plocoid colony. Note negative impression of septa arranged in two distinct cycles and a tube joining two adjacent corallites, scale bar 2.5 mm.

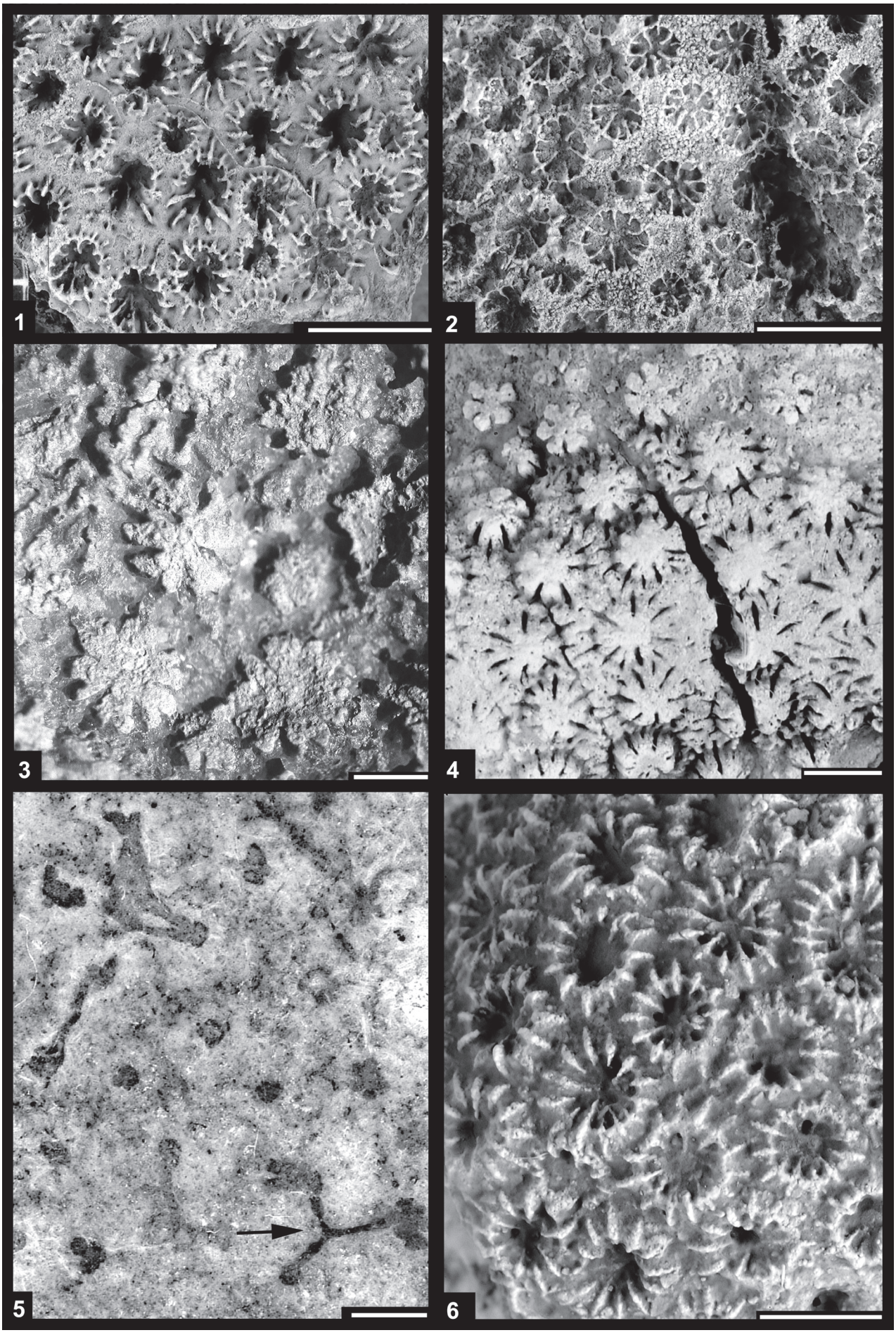

1
2
3
4
5
6

Table 5: Dimensions (in mm) of *Pseudocoemia* cf. *slovenica*

	d	cc	Ns	Nc	Wp
PIW2004II 15	1.2-2.3	1.3-2.6	12-22 (6+6+10)	12-22	0.3-1

1985 *Pseudocoenia slovenica* Turnšek - Rosendahl: 34, pl. 3, fig. 2.
1990 *Pseudocoenia slovenica* Turnšek -Errenst: 168, pl. 3, fig. 1 [cum syn.].
1997 *Pseudocoenia slovenica* - Turnšek: 171.
2003 *Pseudocoenia slovenica* Turnšek - Pandey & Fürsich: 27, pl. 5, fig. 5, pl. 5, figs 1-6.

Material: 14 specimens from the Beni Oussid Member, Tataouine Formation, Remada Southeast (PIW2004II 1, 13), Ghomrassen (PIW2004II 2 -12) and Bir Remtha (PIW2004II 14).

Dimensions (in mm): see Tab. 5

Description: Corallum pedunculate-fungiform, or nodular, crustose, or plocoid. Attachment area small, subcircular to large and irregular in outline. Corallite circular to oval in outline, in few cases slightly raised. Budding intracalicular. Calices small, shallow to deep, distinct. Costo-septa compact, moderately thick, occasionally exert, in some cases bicuneiform, hexameral, few in number, arranged in two complete, distinct cycles. Occasionally, a third cycle is developed (Textfig. 4). Inner edge of septa only in some cases bulging, rarely exhibiting auricles. Distal margin smooth to denticulate; denticles obtuse. Endothecal dissepiments predominantly tabular, occasionally vesicular. Vesicular dissepiments along the periphery form continuous floor between adjacent corallites, passing over the coenosteum with slight arch. Both endothecal and exothecal dissepiments continue over the adjacent costo-septa tangentially and cover its lateral surface partially or completely. This way each septum consists of three layers. A middle layer corresponding to the septum sensu stricto and a layer on each side corresponding to dissepiments. Walls predominantly parathecal, occasionally septo-parathecal. Coenosteum occupied by dissepiments and costae. Surface around peduncle costate (density 4 per 2 mm). Columella absent.

Remarks: The specimens are poorly to moderately well-preserved, heavily bored and internally recrystallised. Endothecal dissepiments, poorly defined auricles, the parathecal wall, nature of coenosteum and absence of a columella refer the specimens to *Pseudocoenia*. Of the various species of *Pseudocoenia*, *P. slovenica* is the only species with a comparable number of septa and costae. In both cases the septa are hexameral, bicuneiform and their number equals that of the costae (Turnšek 1972; Roniewicz 1976; Pandey & Fürsich 2003). The other species exhibit either an octomeral septal arrangement or at least twice the number of costae (Roniewicz 1966). The corallite diameters in the holotype from Slovenia (Turnšek 1972) range from 0.8-1.3 mm, which is less than even the smallest calice in the present specimens. However, this character is thought to be ecophenotypic (Wijsman-Best 1972: 17; Veron 2000: 101; Pandey & Fürsich 2001: 494). Due to intensive recrystallization some of the internal features, such as the density of dissepiments and details of tabulae along the axial part of the corallites could not be observed. In specimen PIW2004II 14 the septa form short tubercles at the wall.

Three of the specimens (PIW2004II 1, 3 and 12) exhibit borings joining adjacent corallites (Pl. 3, Fig. 1e, Pl. 4, Fig. 5). These were filled with micritic sediments before recrystallisation, thus not affected by it. In some cases they can be confused with the canal-like structures recorded by Roniewicz & Gill (in Roniewicz 1976: 111, fig. 9) in *Solenocoenia* Roniewicz & Gill. We regard these borings as signs of commensalism during lifetime of the coral, which reacted by producing additional skeletal material leading to distortion of the normal bauplan.

As the morphological features of the corals are exactly the same as in *P. slovenica*, the Tunisian material has been assigned to this species.

Stratigraphic distribution in Tunisia: Callovian.

Pseudocoenia cf. *slovenica* Turnšek, 1972
Pl. 4, Fig. 6

cf. 1972 *Pseudocoenia slovenica* sp. nov. - Turnšek: 83, pl. 4, figs 1-2, pl. 5, figs 1-4.
cf. 1976 *Pseudocoenia slovenica* Turnšek - Roniewicz: 48, pl. 5, fig. 5.
cf. 2003 *Pseudocoenia slovenica* Turnšek - Pandey & Fürsich: 27, pl. 5, fig. 5, pl. 5, figs 1-6.

Material: 1 specimen from the Beni Oussid Member, Tataouine Formation, Remada Southeast (PIW2004II 15).

Plate 4

Figs 1-5: *Pseudocoenia slovenica* Turnšek, 1972 from the Beni Oussid Member, Tataouine Formation. 1: Part of upper surface showing bicuneiform, hexameral arrangements of costo-septa in two complete cycles, scale bar 5 mm, Ghomrassen; PIW2004II 3. 2: Part of upper surface showing bulging of inner edge of septa, scale bar 5 mm, Ghomrassen; PIW2004II 2. 3: Upper surface showing two cycles of septa, scale bar 1 mm, Bir Remtha; PIW2004II 14. 4: External mould showing arrangement of septa similar to Fig. 1, scale bar 2.5 mm, Remada SE; PIW2004II 13. 5. Polished transverse section showing borings (arrowed) joining center of corallites. Note the contrast of colour of micritic sediment, scale bar 2.5 mm, Ghomrassen; PIW2004II 12.

Fig. 6: *Pseudocoenia cf. slovenica* Turnšek, 1972 from the Beni Oussid Member, Tataouine Formation, Remada SE. Part of upper surface. Note oval outline with larger diameter of a corallite, scale bar 2.5 mm; PIW2004II 15.


1a
1b
1c
3
2
1d
4

Table 6: Dimensions (in mm) of *Solenocoenia cf. sexradiata*

	d	Cc	Ns	Wp
PIW2004II 47	2-2.3	2.2-3.4	12 (6+6)	0.5-1.5
PIW1999VIII 880 (Pandey & Fürsich 2003)	2	2.5-3.5	12 (6+6)	
PIW2002V 97 (Pandey & Fürsich 2003)	2.2-2.5	3.2-4.2	12	

Dimensions (in mm): see Tab. 5

Description: Corallum crustose, plocoid. Corallite circular to oval in outline, slightly raised. Calices small, deep, distinct. Costo-septa compact, thick, exert, bicuneiform, few in number, hexameral, arranged mostly in two complete and distinct cycles. Primary septa occasionally joining in the center to form a pseudocolumella. In few corallites, septa of the first two cycles only slightly differ in length, those of the third cycle are short and incomplete. Inner margin of septa occasionally bulging. Distal margin smooth, forming acutely arched profile at the wall. Endothecal dissepiments predominantly tabular, occasionally vesicular along the periphery. Walls septo-parathecal. Coenosteum occupied by both tabular and vesicular dissepiments and costae. Columella absent.

Remarks: Externally the specimen is well preserved. Few bicuneiform costo-septa with distinct hexameral arrangement, endothecal dissepiments and absence of a columella refer this specimen to *Pseudocoenia slovenica* Turnšek, 1972. However, a few corallites with oval outline, a large diameter (1.9-2.3 mm) and 22 septa differ from the remaining ones of the colony. Even if one considers the corallite diameter to be an ecophenotypic character depending, for example, on the availability of space for growth of the corallites, the large number of septa in the few corallites and the thickness of septa differentiate the present specimen from *Pseudocoenia slovenica.* Until more material becomes available, the present specimen is assigned as *Pseudocoenia* cf. *slovenica*.

Stratigraphic distribution in Tunisia: Callovian.

Genus *Solenocoenia* Roniewicz & Gill (in Roniewicz, 1976)

Type species *Convexastrea semiradiata* Étallon, 1864

Remarks: Roniewicz & Gill (in Roniewicz 1976: 111) placed this genus as 'incertae sedis'. Beauvais & Noujoumat (1993: 311) assigned the taxon to the family Stylinidae d´Orbigny, 1851, although one characteristic feature of the family, the presence of auriculae, has so far not been recorded in *Solenocoenia* (pers. comm. E. Roniewicz 2001). Subsequently, Baron-Szabo (2002: 25) included *Solenocoenia* in the family Acroporidae Verrill, 1902 based on (1) the features of the peritheca, which closely correspond to those of *Astreopora* but also of *Acropora*, (2) absence of a columella, (3) an incomplete corallite wall typical of *Astreopora* and also of *Acropora*, and (4) corallites connected by a canal system, which closely corresponds to that seen in *Acropora* (pers. comm. R. C. Baron-Szabo 2004). However, as the peritheca is also similar to that of other genera of the Stylinidae, in the same family there are genera with and without columella, the corallite wall in *Solenocoenia* is parathecal, and as the "canals" in *Solenocoenia* are closed by dissepiments and are thus not continuous, we prefer to keep the genus at present within the Stylinidae. For a final judgment of its suprageneric placement the micro-architectural and microstructural features, so far unknown, need to be investigated.

Solenocoenia? cf. *sexradiata* (Goldfuss, 1826)
Pl. 3, Fig. 2

cf. 1826 *Astrea sexradiata* sp. nov. - Goldfuss: 71, pl. 24, fig. 5.
cf. 1976 *Solenocoenia sexradiata* (Goldfuss) - Roniewicz: 113, pl. 14, fig. 5, pl. 15, fig. 3 [cum syn.].
cf. 1990 *Solenocoenia sexradiata* (Goldfuss) - Errenst: 174, pl. 5, fig. 2 [cum syn.].
cf. 2003 *Solenocoenia sexradiata* (Goldfuss) - Pandey & Fürsich: 28, pl. 3, fig. 6.

Material: 1 specimen from the Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 47).

Dimensions (in mm): see Tab. 6

Plate 5

Figs 1-2: *Enallhelia elegans* (Münster, 1829) from the Ghomrassen Member, Tataouine Formation, Krechem el Miit. 1: Side view of dendroid colony with a angle of branching less than 45° at more or less regular intervals in a single plane; PIW2004II 68, a: scale bar 2.5 mm, b: scale bar 5 mm, c: thick septa, arranged hexamerally and rows of granules occasionally bifurcating distally, scale bar 1.25 mm, d: longitudinal thin-section of a branching corallite showing position of auricles at intervals, scale bar 1.25 mm. 2: Side view of dendroid colony, scale bar 2.5 mm; PIW2004II 69.

Figs 3-4: *Cladophyllia minor* Beauvais, 1975. 3: Transverse broken surface of a branching colony showing outlines of two adjacent corallites, scale bar 1.25 mm, Krechem el Miit Member, Tataouine Formation, Faljet Jdari/Ed-Dghaghra; PIW2004II 72. 4: Longitudinal polished section showing arrangements of papillae and auriculae at the inner margin and granules along the lateral surface of septa, scale bar 1.25 mm, Ghomrassen Member, Tataouine Formation, Krechem el Miit; PIW2004II 71.

Table 7: Dimensions (in mm) of *Emallhelia elegans*

	H	Dbr	d	Ns	AB	Ab
PIW2004II 68	40	6	3	24	45	30
PIW2004II 69	20	4-5	2-2.5	24	45	30
Becker (1875)	-	5-7	2	6+6+?12	<45	30
Koby (1880)	100	5-7	2	12	45	30
Bendukidze (1982)	-	?	1.5-2.5	24	45	-
Rosendahl (1985)	-	5	1-1.5	-	-	-
Lauxmann (1991)	-	-	0.9-1.6	12-24	-	-

Description: Corallum colonial, plocoid. Corallites circular to subcircular in transverse section, occasionally connected to each other by canals. Septa arranged in two cycles. Septa of first cycle short, less than half of the radius, thickest along the periphery. Septa of second cycle rudimentary. Costae corresponding and equal to septa. Coenosteum consisting of thick and short costae.

Remarks: The specimen is an external mould broken into two pieces. Therefore, none of the endothecal and exothecal characters are known. The plocoid growth structure, shape and number of septa, absence of columella and presence of canals connecting few adjacent corallites match the characters of *Solenocoenia sexradiata* (Goldfuss). The present specimen closely resembles also a similar mould of *Solenocoenia sexradiata* housed in the Institute of Palaeobiology of the Polish Academy of Sciences, Warszawa (no. H.III/195 and 893) However, the costae in the specimen from Poland are much longer as they extend across the peritheca. The dimensions match those of specimens from the Jurassic of Iran (Pandey & Fürsich 2003). In view of the very poor preservation of the present specimen its assignment to *Solenocoenia*? *sexradiata* is only tentative. *Solenocoenia gracilis* Roniewicz (1976: 114, pl. 14, fig. 4, pl. 15, figs 1-2; Turnšek 1997: 187) has a smaller corallite diameter (1-1.5 mm).

Stratigraphic distribution in Tunisia: Callovian.

Subfamily Euheliinae de Fromentel, 1861

Remarks: Only three genera from the Jurassic have been included in this subfamily; *Euhelia* Milne-Edwards & Haime (1850: 90), *Tiaradendron* Quenstedt (1857: 714), and *Enallhelia* Milne-Edwards & Haime (1849: 69) (Vaughan & Wells 1943: 113; Wells 1956: F376). Of these, only *Enallhelia* has been recorded to have a well-developed styliform columella (Vaughan & Wells 1943: 113). The pattern of extracalicular budding in the dendroid colony, i.e whether it takes place along a single plane facing opposite sides or the same side of the main branch, alternately or simultaneously, are the main criteria by which these genera are differentiated.

Genus *Enallhelia* d' Orbigny, 1847 in d' Orbigny, 1849

Type species *Lithodendron compressum* Goldfuss, 1829; subsequently designated by Milne-Edwards & Haime (1850: 21)

Remarks: The genus is characterized by calices produced alternately on the sides with branches having a tendency to lie in a single plane (Lauxmann 1991: 130, pl. 3, fig. 1). Milne-Edwards & Haime (1857: 123) recorded '*Enallohelia*' (see also Becker 1875: 132; Koby 1880: 16; Geyer 1954: 141; Bendukidze 1982: 32), not *Enallhelia* (d' Orbigny 1849: 11, 1850: 385; Milne-Edwards & Haime 1850: 21) with a rudimentary columella, whereas Vaughan & Wells (1943: 113) mentioned a well-developed styliform columella. The only other comparable Jurassic genus, i.e. *Tiaradendron*, differs by pronounced bilateral symmetry of the calices. The anastomosing branches (Geyer 1954: pl. 9, fig. 15, pl. 10, fig. 2; Lauxmann 1991: 130, pl. 3, fig. 1), one of the generic characters of *Enallhelia* (Wells 1956: F376; Vaughan & Wells 1943: 113), have not been recorded often, possibly due to the mostly fragmentary nature of colonies. As in other dendroid colonies, in *Enallhelia* the angle of branching and budding is an important diagnostic character to differentiate species.

Enallhelia elegans (Münster, 1829)

Pl. 5, Figs 1-2

1829 *Lithodendron elegans* sp. nov - Münster 1829 in Goldfuss: 106, pl. 37, fig. 10.
1849 *Lithodendron elegans* Goldfuss – d´Orbigny: 11.
1850 *Enallhelia elegans* (Goldfuss) - Milne Edwards & Haime: 90.
1850 *Enallhelia elegans* - d´ Orbigny: 385.
1875 *Enallhelia elegans* (Goldfuss) - Becker: 134, pl. 36, figs 3-6.
1880 *Enallohelia elegans* (Goldfuss) - Koby: 16, pl. 1, fig. 1.
1954 *Enallohelia elegans* (Goldfuss) - Geyer: 141, pl. 9, fig. 15.
1982 *Enallohelia elegans* (Goldfuss) - Bendukidze: 32.
1985 *Enallhelia* cf. *elegans* (Goldfuss) - Rosendahl: 44.
1991 *Enallhelia elegans* (Münster) - Lauxmann: 130, pl. 3, fig. 1 [cum syn.].
1992 *Enallhelia elegans* (Münster) - Lauxmann: 20, fig. 1.

Material: 2 specimens from the Ghomrassen Member, Tataouine Formation, Krechem el Miit (PIW2004II 68-69).

Table 8: Dimensions (in mm) of *Cladophyllia minor*

	D	Ns
PIW2004II 71	3-3.3	26
PIW2004II 72	3-3.5	-
Cladophyllia minor Beauvais of Morycowa & Roniewicz (1990)	2.8-3.5	24+nS4
Cladophyllia tenuis (Koby 1889)	2	18-24
Cladophyllia tenuis Koby of Beauvais (1966a)	1.5-3	14-24

Dimensions (in mm): see Tab. 7

Description: Colony short, dendroid, angle of branching less than 45°, formed by alternate extracalicular budding of calices on opposite sides at more or less regular intervals in a single plane. Calices small, circular to oval in outline, moderately deep, forming an angle of about 30°-45° with the main branch. Septa thick, compact, arranged hexamerally in three perfect cycles. Septa of the first two cycles long, not of same size but not always easy to differentiate, those of third cycle short, confined near to the wall. Inner margin of septa with auricles which at intervals join in the center to form a well-developed styliform columella (Pl. 5, Fig. 1d). Costae thick and short, confined to the distal part, proximally continuing as granules. Wall septothecal, externally covered with rows of granules. Rows of granules occasionally bifurcating distally (Pl. 5, Fig. 1c).

Remarks: The specimens are fragmentary and it is difficult to ascertain whether the branches more or less lie in a single plane. However, the angle of branching and budding, diameters of the branches and of the calices, hexameral symmetry of septa, number of septa, and nature of costae match well the present species as described by earlier workers. It seems that the septa of the third cycle in the specimen described by Koby (1880: pl. 1, fig. 1c) are not developed. Specimens of the present species illustrated by Geyer (1954) and Lauxmann (1991) show anastomosing branching.

Other species of the genus differ either in a greater angle of branching, budding or octameral arrangements of septa (Becker 1875: 132-134). *Enallhelia striata* Quenstedt (Becker 1875: 135, pl. 36, fig. 7; Lauxmann 1991: 131, pl. 3, fig. 3, textfig. 3) exhibits budding of calices only on one side of the branches and hence should be assigned to *Stylangia* Fromentel (Wells 1956: F376).

Stratigraphic distribution in Tunisia: Upper Callovian-Oxfordian.

Family Cladophylliidae Morycowa & Roniewicz, 1990

Genus *Cladophyllia* Milne-Edwards & Haime, 1851

Type species *Lithodendron dichotomum* Goldfuss, 1826

Remarks: Morycowa & Roniewicz (1990) discussed in detail the characters of the family as well as of the type genus *Cladophyllia*. Although the specimens described here are poorly preserved they exhibit the morphological characters of *Cladophyllia*.

Cladophyllia minor Beauvais, 1975

Pl. 5, Figs 3-4

1975 *Cladophyllia babeana* var. *minor* new var. – Beauvais in Negus & Beauvais: 195, pl. 1, fig. 3a, b (without description).

1990 *Cladophyllia minor* Beauvais - Morycowa & Roniewicz: 171, pl. 15, figs 1-3, pl. 16, figs 1-2, textfig. 2.

Material: 2 fragmentary specimens from the Krechem el Miit Member, Tataouine Formation at Faljet Jdari/Ed-Dghaghra (PIW2004II 72) and the Ghomrassen Member, Tataouine Formation at Krechem el Miit (PIW2004II 71).

Dimensions (in mm): see Tab. 8

Description: Corallum colonial, branching, corallites small in diameter, subcircular to oval in outline. Septa thick to thin, thickest along the wall, compact, occasionally slightly curved, arranged in at least four cycles. Septa of the first cycle reaching the center and occasionally appearing to join the columella either independently or via papillae at the inner margin. Septa of second cycle slightly shorter, mostly difficult to differentiate from those of first cycle. Septa of third and fourth cycles correspondingly shorter and incomplete. Inner margin of septa ornamented with auriculae. Lateral surface ornamented with granules. Endothecal vesicular dissepiments common. Wall septothecal. Columella distinct, small and elongated in outline. Epitheca thin.

Remarks: Both specimens are poorly preserved. However, differentiation between dissepiments, septa and epitheca can be made. The epitheca is mostly eroded. The mode of budding is not clear since in the cases where budding could be recognized the wall is not preserved. Similarly the angle of bifurcation is not known. However, the possibility of biseptal budding resulting in formation of two corallites of equal diameter cannot be ruled out. On the basis of the available morphological features and dimensions, the specimens have been assigned to *Cladophyllia minor* Beauvais, a species

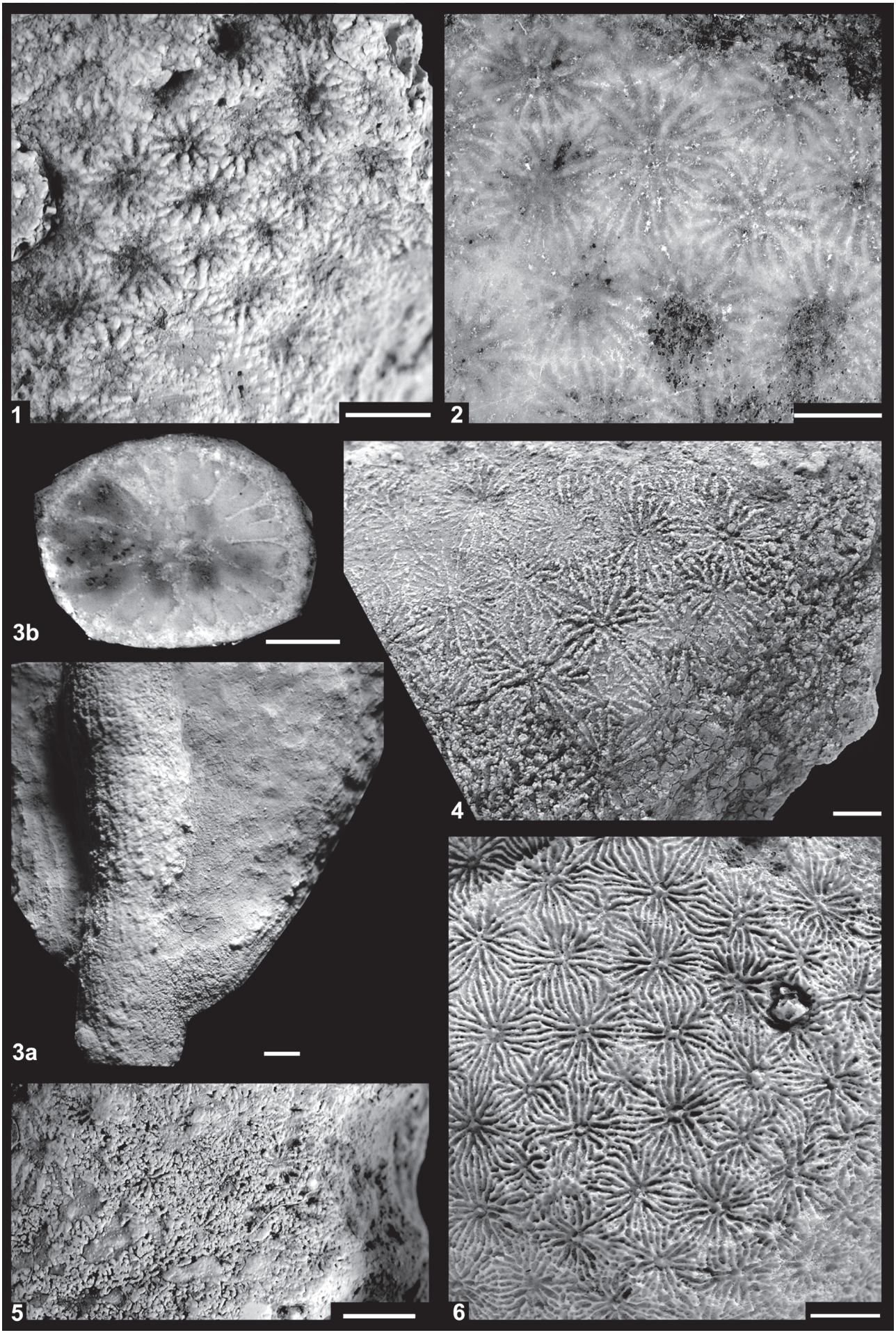

1
2
3b
4
3a
5
6

Table 9: Dimensions (in mm) of *Isastrea parvistella*

	d	Ns	Ds
PIW2004II 45	1.6-2.1	14, 18, 20-24	5/1
Isastrea parvistella Alloiteau (1958)	1.75-2.5	20-28	-

known from the Bathonian. *Cladophyllia tenuis* Koby (1889: 474, pl. 127, figs 6-7), the holotype of which comes from the Bajocian, is another comparable species, except for its slightly smaller corallite diameter, recorded by Beauvais (1966a: 118) from Tunisia. According to Beauvais, this colony is phaceloid and the corallites lack a columella. The present specimens have quite a distinct columella. Morycowa & Roniewicz (1990: 166-167) stated that a "columella is essential" for the family and the genus. Morycowa & Roniewicz (1990) mentioned the wall to be septothecate, but in the present specimens it is difficult to imagine that it is only septothecate as endothecal vesicular dissepiments are common along the wall.

The validity of *Cladophyllia tenuis* Koby 1889 was questioned by Morycowa & Roniewicz (1990: 168) on the basis of its poor state of preservation. Beauvais (1966a) did not give an illustration perhaps because of its poor preservation. When the dimensions of the various Jurassic species of *Cladophyllia* given by Morycowa & Roniewicz (1990: 168, table 1) are reviewed one finds that except for a few, such as *C. turolensis, C. morondavensis*, they do not differ much from each other, rather they are transitional. Due to the difficulty to clearly separate the various species Morycowa & Roniewicz (1990: 169) discussed them in stratigraphical order. Clearly, these forms need to be re-examined.

Stratigraphic distribution in Tunisia: Upper Callovian-Oxfordian.

Suborder Faviina Vaughan & Wells, 1943

(nom. corr. ex Faviida Vaughan & Wells, 1943 (Wells, 1956))

Family Isastraeidae Alloiteau, 1952

Genus *Isastrea* Milne-Edwards & Haime, 1851

Isastrea parvistella Alloiteau, 1958

Pl. 6, Fig. 1

1958 *Isastrea parvistella* sp. nov. - Alloiteau: 50, pl. 5, fig. 2, pl. 32, fig. 10.

Material: 1 specimen from the Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 45).

Dimensions (in mm): see Tab. 9

Description: Corallum colonial, ramose, cerioid. Calices

Table 10: Dimensions (in mm) of *Isastrea parva*

	d	cc	Ns	ds
PIW2004II 48	3.4		15-22	3
Isastrea parva (Gregory, 1900)	2.5-3	-	22-32	4 (measured from fig. 5d of pl. 15)
Melikerona(?) parva var. *madagascariensis* (Alloiteau, 1958)	3.5-5.22	3.7-4	23-33	-
Pseudisastraea parva of Alloiteau (1958)	3-4	2-3.5	16-24	-
Pseudisastraea parva of Beauvais (1978)	2-3	3	20-32	-

Plate 6

Fig. 1: *Isastrea parvistella* Alloiteau, 1958 from the Beni Oussid Member, Tataouine Formation, Bir Remtha. Part of upper surface, scale bar 2.5 mm; PIW2004II 45.

Fig. 2: *Isastrea parva* Gregory, 1900 from the Ghomrassen Member, Tataouine Formation, Faljet Jdari/Ed-Dghaghra. Part of polished transverse section showing septo-parathecal wall, scale bar 2.5 mm; PIW2004II 48.

Fig. 3: *Cladocora* sp. from the Beni Oussid Member, Tataouine Formation, Bir Remtha; PIW2004II 70. a: Side view showing a fragment of a dendroid colony with a 45° angle of branching and thin costae, scale bar 1.25 mm, b: polished transverse section of a corallite showing indistinct, papillose columella and septothecal wall, scale bar 1.25 mm.

Figs 4-6: *Craterastraea crateriformis* (Gregory, 1900) from the Beni Oussid Member, Tataouine Formation. 4: Part of upper surface apparently showing thamnasterioid colony, scale bar 1.25 mm, Ksar Beni Soltane; PIW2004II 60. 5: Part of upper surface, scale bar 2.5 mm, Bir Remtha; PIW2004II 42. 6: Part of upper surface showing synapticulae and a lower density of septa in the center than along the periphery of the calices, scale bar 2.5 mm, Remada SE; PIW2004II 44.

Table 11: Dimensions (in mm) of *Cladocora* sp.

	H	d	Ns	AB
PIW2004II 70	20,5	4,4	24	45

small, subcircular to polygonal in outline. Septa compact, *Montlivaltia*-like, moderately thick along the periphery and thinner towards the free inner margin. Septa arranged in at least four cycles, those of the first cycle long, extending for two-thirds of the calice radius. Septa of second cycle occasionally equal to or slightly shorter than those of the first cycle. Septa of higher cycles short or rudimentary. Septa of adjacent corallites non-confluent. Wall septo-parathecal to parathecal. On the upper surface, calices occasionally lack a wall, occasionally they have a parathecal wall. Columella absent.

Remarks: The interior of the ramose colony is recrystallised and filled with coarse calcite crystals. The morphological features of the coral resemble those of *Isastrea*. Horizontal skeletal elements are absent except for vesicular dissepiments forming the wall. The transverse polished surface of the specimen closely resembles figure 5d of *Isastrea parva* from the Middle Bathonian of the Jumara Dome, Kachchh Basin (Gregory 1900). The cross-section of *Isastrea limitata* Lamouroux figured by Ljuljeva & Permjakov (1980: 112, pl. 35, fig. 2*)* is also similar. However, the corallite diameters are larger, the number of septa is greater, and the septal density is lower than in the present specimen.

The morphological features and dimensions of the present specimen closely match *Isastrea parvistella* Alloiteau (1958) recorded from the Lower Bathonian of Madagascar.

Stratigraphic distribution in Tunisia: Callovian.

Isastrea parva Gregory, 1900
Pl. 6, Fig. 2

1900 *Isastraea parva* sp. nov. - Gregory: 129, pl. 15, figs 4-5.

Material: 1 specimen from the Ghomrassen Member, Tataouine Formation, Faljet Jdari/Ed-Dghaghra (PIW2004II 48).

Dimensions (in mm): see Tab. 10

Description: Corallum flat, cerioid. Calices small, slightly depressed, polygonal in outline, demarcated by septo-parathecal wall. Septa thick, compact, arranged in at least three cycles, non-confluent with those of adjacent corallites. Septa of first two cycles, although not all of the same size, long and nearly reaching the center. Septa of third cycle either short or rudimentary. Inner margin of septa free.

Remarks: The septal ornamentation is completely obliterated due to recrystallization. The corallite diameter, number and density of septa, and nature of wall match *Isastrea parva* Gregory (1900: 129, pl. 15, fig. 5d). Unfortunately, the other figure of *Isastrea parva* Gregory (1900: pl. 15, fig. 4c) exhibits a columella, which is neither shown in his figure 5d nor seen in the present specimen. According to Gregory (1900: 129) the columella is parietal and occasionally present. However, in his figure 4c "the apparent styliform columella is incorrect" (Gregory 1900: 130 and explanation of fig. 4c of plate 15). On account of this figure there has been much confusion concerning the identification of *Isastrea parva* by the present workers (Pandey & Fürsich 1993: 18, pl. 2, figs 5, 6). Re-examination of the specimens RUC1993I 19, 326-334, and 346, recorded by Pandey & Fürsich (1993) as *Melikerona parva* (Gregory), suggests their assignment to *Amphiastrea piriformis*. The characteristic features of *Amphiastrea*, such as anastomosing septa, primary septa joining in the center, one of the septa being long, the incomplete ring of dissepiments and `taschenknospung' are clearly seen and have been overlooked by the present authors due to the identification of *Isastrea parva* partly as *Pseudisastraea parva* (Alloiteau 1958: 57, pl. 1, fig. 10, pl. 6, fig. 11, pl. 7, fig. 4, pl. 24, fig. 2, pl. 29, figs 7-9) and partly as *Melikerona*(?) *parva* Gregory sp. 1900 p.p., var. *madagascariensis* by Alloiteau (1958: 65, pl. 1, fig. 8, pl. 7, fig. 4). According to Alloiteau, both taxa possess a columella or pseudocolumella, which he correlated with Gregory´s (1900) fig. 4c of plate 15. (It seems to be a typographical mistake that Alloiteau (1958) referred for both forms to his pl. 7, fig. 4). Beauvais (1978: 49, pl. 1 fig. 2) defined a topotype of *Melikerona parva* (Gregory) housed in the Natural History Museum, London (BMNH R5303). It is clear that the specimens from Madagascar of *Pseudisastraea parva* and *Melikerona*(?) *parva* need to be re-examined in order to clarify the present taxonomic confusion.

Stratigraphic distribution in Tunisia: Upper Callovian-Oxfordian.

Family Faviidae Gregory, 1900, emend. Alloiteau, 1952

Genus *Cladocora* Ehrenberg, 1834

Type species *Caryophyllia caespitosa* Lamarck, 1816 (= *Madrepora caespitosa* Linné, 1767)

Remarks: The genus is well-known from the Late Cretaceous (Vaughan & Wells 1943: 172; Wells 1956: F404) but very poorly known from Jurassic (Pandey & Fürsich 1993: 13, pl. 2, fig. 8). The diagnostic characters such as a colonial dendroid to phaceloid corallum, extracalicular budding, small calice diameter (<5 mm) (Chevalier & Beauvais 1987: 718, fig. 410/8), well-developed ornamentation on the lateral surface of septa, denticles along the distal margin of the septa (Alloiteau 1952: 621, pl. 2, fig. 8, textfigs 70-72; 1957: 187, textfigs 138-139), paliform lobes along the inner margin of all septa except those of the last cycle, papillose columella (Vaughan & Wells 1943: 172, pl. 29. fig. 4; Wells 1956: F404, fig. 302.1), and a septothecal wall and septal microstructure (Alloiteau 1957: 187, text fig, 140) have all been recorded (Milne-Edwards & Haime 1850: 38).

Table 12: Dimensions (in mm) of *Craterastraea crateriformis*

	D	H	Dbr	d	cc	Ns	Ds	Dt
PIW2004II 42	-	4.8	18	2.3	2-3	14+14	7-8	-
PIW2004II 44	40	-	-	2.7-3.2	2.7-3.2	25-38 (11+12+12)	6	-
PIW2004II 60	33.5	9	-	1.6-2	1.6-2.2	32 (9+9+14)	7-8	1

Cladocora sp.

Pl. 6, Fig. 3

Material: 1 fragmentary specimen from the Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 70).

Dimensions (in mm): see Tab. 11

Decription: Colony dendroid, angle of branching 45°, budding extracalicular. Corallites tubular, small in diameter, circular to suboval in outline. Septa thin, slightly curved, compact, arranged hexamerally in at least three cycles. Septa of first two cycles long, extending for more than half of the radius, not easy to differentiate, those of third cycle short, one-fourth of the radius. Inner margin of septa of first two cycles with paliform lobes that join in the center to form an indistinct, papillose columella (Pl. 6, Fig. 3b). Costae thin, continuous. Wall septothecal.

Remarks: The dendroid growth structure, nature of septa, paliform lobes at the inner margin of septa, papillose columella and septothecal wall match well *Cladocora* Ehrenberg described by earlier workers. Since the specimen is not well preserved the septal ornamentation cannot be seen. In the transverse polished section angular granules can be observed.

Stratigraphic distribution in Tunisia: Callovian.

Suborder Fungiina Verrill, 1865 (nom. correct Wells 1956: F376)

Family Agariciidae Gray, 1847

Genus *Craterastraea* Beauvais, 1978

Type species *Thamnastraea crateriformis* Gregory, 1900

Remarks: Pandey & Fürsich (2003: 79) redefined the genus and assigned it to the family Agariciidae Gray. This genus has hitherto been recorded from the Middle Jurassic of the Kachchh Basin, from north-western Jordan, and from east-central Iran, ranging from the Middle Bathonian to the Early Kimmeridgian. This is the fourth record of the genus.

Craterastraea crateriformis (Gregory, 1900)

Pl. 6, Figs 4-6

1900 *Thamnasteria crateriformis* sp. nov. - Gregory: 135, pl. 17, figs 4-5, 7.
1978 *Craterastraea crateriformis* (Gregory) - Beauvais: 56, pl. 4, fig. 1.
1993 *Craterastraea crateriformis* (Gregory) - Pandey & Fürsich: 27, pl. 6, fig. 12, pl. 7, figs 10, 12, 15, textfig. 18.
2000 *Craterastraea* cf. *crateriformis* (Gregory) - Pandey, Ahmad & Fürsich: 10, pl. 2, fig. 1.
2003 *Craterastraea crateriformis* (Gregory) - Pandey & Fürsich: 79, pl. 23, figs 1, 3-5.

Material: 3 specimens from the Beni Oussid Member, Tataouine Formation, of Bir Remtha (PIW2004II 42), Remada Southeast (PIW2004II 44) and of Ksar Beni Soltane (PIW2004II 60).

Dimensions (in mm): see Tab. 12

Description: Corallum colonial, ramose, branching, or encrusting, thamnasterioid to ploco-thamnasterioid. Calices subcircular in outline and superficial to slightly depressed in

Table 13: Dimensions (in mm) of *Chomatoseris iranensis*

	D	H	H/D	Ns	Ds	Dt	Lcf
PIW1999II 53	17	10	0.59	180	4-5	5	4
PIW1999II 54	13.2	9	0.65	158	4	4	6.5
PIW1999II 55	15	13	0.87	-	5	4-6	-
PIW1999II 56	13	9	0.69	158	4-5	4	4
PIW1999II 58	17.5-18.5	8	0.44	193	4	4	5
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 5	33-35	14	0.40	267	3.5-4.5	6-7	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 6	17.5-18.5	9	0.48	181	4.5	5-5.5	-

Tab. 13 cont.

	D	H	H/D	Ns	Ds	Dt	Lcf
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 7	21-22	9	0.4	167	4	5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 8	18	8.5	0.47	165	4	5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 9	19	10	0.52	-	3.5-4	5.5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 10	18-18.5	10	0.54	165	4.5	4.5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 11	18.5	7.5	0.40	-	-	-	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 12	28.5	11.5	0.40	194	4.5	5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW1999VIII 579	30-27	12.9	0.43	305	4	4.5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW200 II 1	22.5	10.6	0.47	217	3.5-4	3.5-4	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW2001II 2	22.2	10.8	0.48	218	3.5		-
C. iranensis of Pandey & Fürsich (2003: 111) PIW2001II 3	25.5	~16.5	0.64	-	3	~3.5	-
C. iranensis of Pandey & Fürsich (2003: 111) PIW2001II 4	21.0	10.5	0.5	194	3.5	4-4.5	-
C. iranensis of Pandey et al. (2000: 20) PIW1996VII 132	14	4	0.28	156	5	6	-
C. iranensis of Pandey et al. (2000: 20) PIW1996VII 192	18	7	0.39	150	5	5	-
C. iranensis of Pandey et al. (2000: 20) PIW1996VII 318	28	12.5	0.42	>300	4	5	-
C. iranensis (Flügel, 1966: 65) SMF20209 Holotype	36	10	0.28	170	3.4-3.7	-	7
C. iranensis (Flügel, 1966: 65) GSI 18	30	6	0.2	170	3.4-3.8	-	3
C. iranensis (Flügel 1966: 65) GSI 20	25	5	0.2	130	4	-	6
C. iranensis (Flügel 1966: 65) SMF 20208	27	7	0.26	240	3.8	-	3
C. iranensis (Flügel 1966: 65) GSI 19	31	12	0.39	200	3.8-4.2	-	7
C. iranensis (Flügel, 1966: 65) GSI 43	40	16	0.4	340	3.5	-	5
C. bouchardi (Milne-Edwards & Haime) of Beauvais (1966a: 142)	18	8	0.44	-	5-5.5	5-6	5.5
C. jacobi Alloiteau of Beauvais (1966a: 142, pl. 4, fig. 4)	18	5	0.27	-	4	5-6	-
Chomatoseris sp. 1 of Gill & Lafuste (1971: 6)	11.2	4.4	0.39	-	4-4.5	-	1.8
C. orbulites of Beauvais (1966b: 1015) and Koby (1887: pl. 101, fig. 3)	12	6.1	0.5	-	4-5	4-5.5	1.8
C. orbulites of Beauvais (1966b: 1015) and Koby (1887 : pl. 101, fig. 4)	13.3	5.1	0.5	-	4. 5-5	5	1.7
C. orbulites of Beauvais (1966b: 1015) and Koby (1887 : pl. 101, fig. 5)	14.4	5.5	0.38	-	4.5-5	4-5	1.8
C. orbulites of Beauvais (1966b: 1015) and Koby (1887 : pl. 101, fig. 6)	11.2	4.6	0.41	-	4.5	4-5.5	1.6
C. orbulites of Beauvais (1966b: 1015) and Koby (1887: pl. 101, fig. 7)	9.7	4.1	0.42	-	4.5-5	5	1.2
C. orbulites of Beauvais (1966b: 1015) and Koby (1887 : pl. 101, fig. 8)	8.8	4.4	0.5	-	5	5-5.5	1
C. orbulites of Beauvais (1966b: 1015) and Koby (1887 : pl. 101, fig. 9)	7.7	2.6	0.34	-	4.5	5-5.5	1.5

Tab. 13 cont.

	D	H	H/D	Ns	Ds	Dt	Lcf
C. orbulites of Beauvais (1966b: 1015) and Koby (1887: pl. 101, fig. 10)	6.3	2.3	0.36	-	4.5-5	5-5.5	0.7
C. orbulites of Beauvais (1966b: 1015) and Koby (1887: pl. 101, fig. 11)	17.6	7.5	0.43	-	3-4	4	2
C. orbulites of Beauvais (1966b: 1015) and Koby (1887: pl. 101, fig. 12)	18.8	5.2	0.26	-	3.5	3-4	1
C. orbulites of Beauvais (1966b: 1015) and Koby (1887 : pl. 101, fig. 13)	16	6.1	0.37	-	4	3-5	2
C. orbulites of Beauvais (1966b: 1015) and Koby (1887: pl. 101, fig. 15)	15.8	5.2	0.31	-	3.5-4	4	1.7
C. hemispherica Milne Edwards & Haime, 1851 of Beauvais (1970: 66)	13.7	10	0.73	-	4	4- .5	3.3
C. orbulites Lamouroux, 1821, holotype (Beauvais 1967: 41)	17.2	7.5	0.43	-	5	4.5-6	2
C. orbulites, syntype (coll. Portes) (Beauvais 1967: 41)	19.6	6.9	0.35	-	4.6	4.5	2.5
C. orbulites, coll. d´Orbigny (Beauvais 1967: 41)	19	7,8	0,41	-	4.5-5	4.5-6	2.7
C. orbulites, coll. Michelin (Beauvais 1967: 41)	20	10	0.50	-	5	4.5-6	2
C. bajociana d´Orbigny, 1849, coll. d´Orbigny, nr. 3468 (Beauvais 1967: 43)	13.4	6.3	0,47	-	4.6-5	6-7	1.8
C. bouchardi (Milne-Edwards & Haime, 1851), holotype, coll. Michelin (Beauvais 1967: 43)	27.6	13	0.47	-	4.5-5	6	5.8

the center, bordered by sparse to dense synapticulae. Costosepta subcompact, confluent, anastomosing, arranged in at least four cycles, of which about 9-14 reach the center while the others remain correspondingly shorter, showing a lower density in the center than along the periphery of the calices. Trabeculae of septa more spaced near the axial part of the corallite, distal margin with small distinct denticles (seen in specimen PIW2004II 60). Endotheca consisting of vesicular dissepiments. Synapticulae common along the periphery. Columella small, distinct, papillose to spongy.

Remarks: The interior of the specimens is recrystallised. Specimen PIW2004II 42 has been bored and its external surface is poorly preserved. The upper surface of specimen PIW2004II 44 is well preserved (Pl. 6, Fig. 6). Morphological features such as low density of the septa in the depressed part of the calices, circular outline of the calices, common synapticulae along the periphery, and the dimensions match well *Craterastraea crateriformis* (Gregory).

The septal arrangement and the columella in specimen PIW2004II 44 compare well with *Thamnasteria dumonti* Chapuis & Dewalque (Beauvais 1966a: 138, pl. 3, fig. 3) from the Bajocian of southern Tunisia. However, the density of septa in the present specimens is high compared to *Thamnasteria dumonti* (7-8 per 2 mm). Details of the septal structure of the present specimens are not known.

Stratigraphic distribution in Tunisia: Callovian.

Suborder Microsolenina Morycowa & Roniewicz, 1995

Family Microsolenidae Koby, 1890

Genus *Chomatoseris* Thomas, 1935

Type species *Madrepora porpites* Smith, 1819

Chomatoseris iranensis Flügel, 1966

Pl. 7, Figs 1-6

1966 *Chomatoseris iranensis* sp. nov. -Flügel: 63, pl. 16, fig. 7, pl. 17, figs 1-2, 6.

2000 *Chomatoseris iranensis* Flügel - Pandey, Ahmad & Fürsich: 18, pl. 5, figs 1, 3.

2003 *Chomatoseris iranensis* Flügel - Pandey & Fürsich: 111, pl. 35, figs 1-6.

Material: 7 specimens from the Techout Formation, Ksar Jelidat (PIW2004II 53-56), the Krechem el Miit Member, Tataouine Formation, Ghomrassen (PIW2004II 57), and the Ghomrassen Member, Tataouine Formation, Bir Remtha (PIW2004II 58-59).

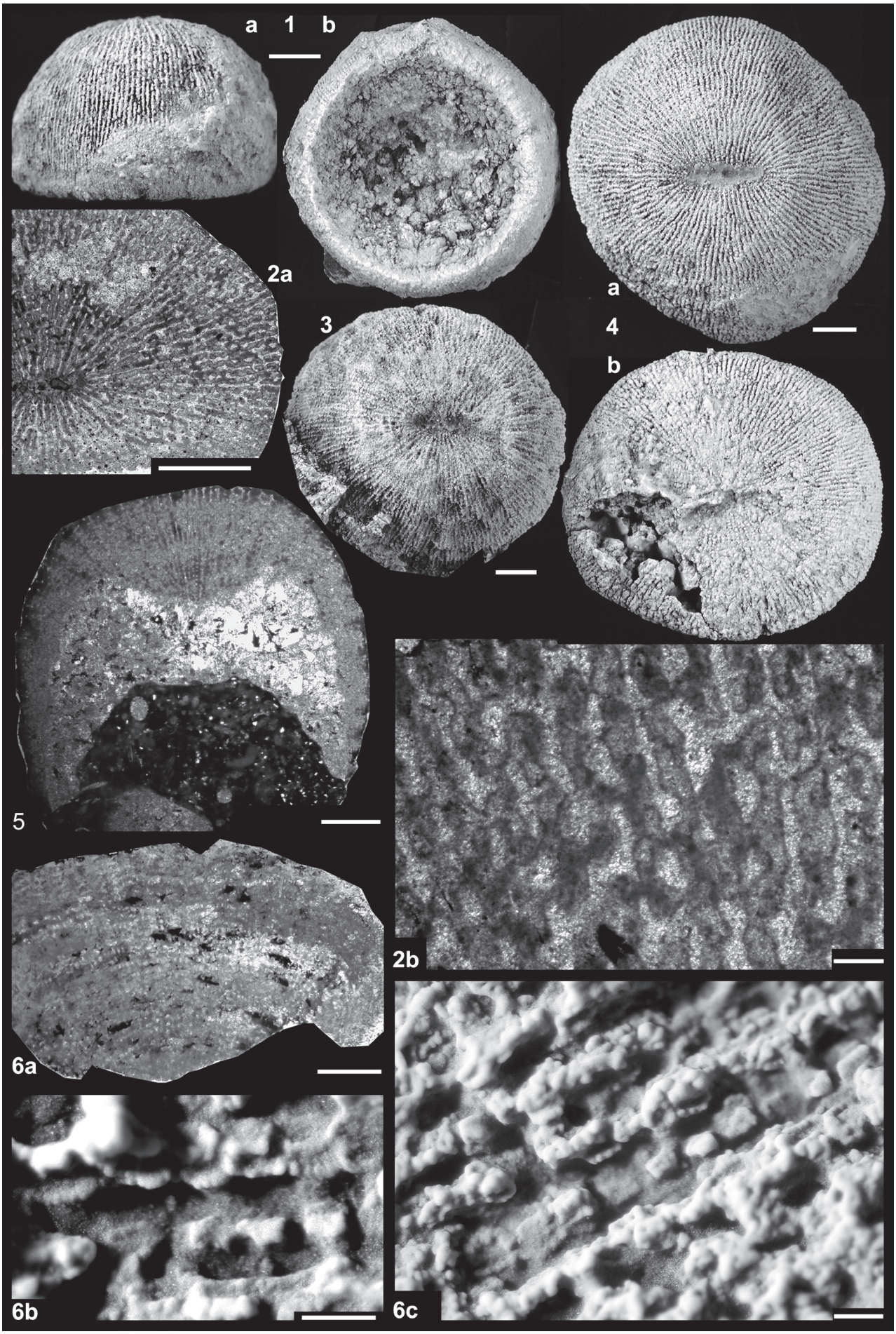

a 1 b
2a
3
a
4
b
5
2b
6a
6b
6c

Table 14: Dimensions (in mm) of *Microphylliopsis* aff. *scolioides*

Specimen	D	H	Lc	Mls	Wc	Dt.s	d	c'c	Ns	Ds	Dt
PIW2004II 49	42	25	>16.5	15	4	1	-	1.5	~17	5	4
PIW2004II 50	52	39	>11	-	3.0	0.1	2-2.5	2.1	~24	4	5
PIW2004II 51	36	22	>23	11.5	2-2.3	0.2	2-3.5	2.-3.5	~28	5	5
M. scolioides Beauvais (1966a)	-	-	-	3-6	-	-		4-5	-	6-7/2	7-8/2

Dimensions (in mm): see Tab. 13 (for measurements of specimens from the Jurassic of Iran see Pandey & Fürsich (2003: 111).

Description: Corallum solitary, cyclolitoid in shape, small in size. Upper surface obtusely to acutely convex, lower surface slightly to acutely concave (specimen PIW2004II 53-57) to almost flat (specimen PIW2004II 58). Septa thin to moderately thick, numerous, fenestrate, anastomosing, slightly flexuous. Septa composed of pennular trabeculae, which remain restricted to the upper and lateral sides or grew concentrically. Pennulae poorly to well visible, rectangular in outline, longer axis either parallel or at right angle to the septal plane. Distal margin of septa with denticles, occasionally beaded. Pennulae symmetrical to asymmetrical, curved upward. Maeniana denticulate, denticles subangular (Pl. 7, Fig. 6b-c) occasionally continuous for more than two trabeculae. Synapticulae common. Columellar cavity oval in outline, occasionally deep, steep-sided. Epitheca absent.

Remarks: The moderately preserved specimens display beautifully the three ontogenic stages figured by Gill & Lafuste (1971: 8, textfig. 2) for *Chomatoseris* from the Middle Jurassic of Afghanistan. Apparently, five of the specimens (PIW2004II 53-57) exhibit a cyclolitoid shape (Alloiteau 1952: 549) with a concave lower surface, and seem to have overgrown small pebbles, but the growth remained restricted to the upper and lateral sides. A longitudinal section of specimen PIW2004II 55 exhibits outward-directed pennulae at the periphery of the upper and lateral sides of the corallum. The lower concave surface is filled with matrix (Pl. 7, Figs 1b, 5). The center is completely recrystallised. In specimens PIW2004II 58-59, additional downward growth resulted in a concentric arrangement ("centrifugal growth") of septa.

The maximum diameter of the corallum in one of the specimens (PIW1999II 58) does not run parallel to the length of the calicular fossa. The solitary, cyclolitoid shape, pennular trabeculae, fenestrate nature and concentric orientation of septa, and absence of epitheca are diagnostic morphological features of *Chomatoseris*. In previous studies, some of the species of *Chomatoseris* have been either distinguished on the basis of the height-diameter ratio of the corallum or on the basis of shape (Milne Edwards & Haime 1851: 121, 142; Beauvais 1966a: 143, 1970: 66, pl. B, fig. 5, pl. D, fig. 5; Flügel 1966: 63). Shapes of the coralla vary from flat or discoidal (*C. normaniana* d' Orbigny, 1850: 241; Milne-Edwards & Haime 1851: 121 & 142), to plano-convex (*C. orbulites* Lamouroux, 1821: 86, pl. 83; Milne-Edwards & Haime 1851, 142: pl. 25, fig. 3), to almost hemispherical (*C. hemispherica* Milne-Edwards & Haime, 1851: 142, pl. 25, fig. 2; Beauvais 1970: 66, pl. B, fig. 5, pl. D fig. 5 (poor illustrations)), sub-conical or almost conical (*C. bouchardi* Milne-Edwards & Haime, 1851: 121, 142; Koby 1886: 331, pl. 101, figs 11-15; Beauvais 1967: 43, pl. 4, fig. 5). When viewing the dimensions of the various species of *Chomatoseris* there is a considerable range in the H/D ratio, which has no relationship as far as the number of septa, density of septa, and density of trabeculae are concerned. However, there is a consistency in the septal and trabecular densities.

The specimens of *C. orbulites* (Koby, 1887) described by Beauvais (1966b: 1015), are of similar dimensions but exhibit a small, circular calicular fossa. In this respect *Chomatoseris* sp. 1 of Gill & Lafuste (1971: pl. 1 figs 13-15) resembles *C. orbulites*. A circular calicular fossa might be one of the distinctive features of this species of *Chomatoseris*. However, the specimens of *C. orbulites* described by Koby (1887: 329, pl. 101, figs 3-10) and Beauvais (1967: 41, pl. 4, figs 1, 3) show a circular to elongated calicular fossa. This throws doubts on the usefulness of the outline of the calicular fossa as a diagnostic feature to distinguish species.

C. orbulites of Beauvais (1967: 41, pl. 4, figs 1, 3, textfig.

Plate 7: *Chomatoseris iranensis* Flügel, 1966.

Figs 1, 3, 5: Techout Formation, Ksar Jelidat. 1. Scale bar 2.5 mm; PIW2004II 56, a: side view showing cyclolitoid corallum with convex upper surface, b: lower view showing concave surface.- 3: Upper view, scale bar 2.5 mm; PIW2004II 53.- 5: Longitudinal thin-section showing growth restricted to the upper and lateral sides, scale bar 2.5 mm; PIW2004II 55.

Figs 2, 4: Ghomrassen Member, Tataouine Formation, Bir Remtha. 2: PIW2004II 59, a: Part of transverse thin-section showing pennular trabeculae growing upward near center and outward near periphery, scale bar 2.5 mm, b: magnified view of Fig. 2a showing shape of the pennulae, scale bar 0.25 mm.- 4: Scale bar 2.5 mm; PIW2004II 58, a: upper view showing slightly flexuous septa, b: lower view showing flat surface.

Fig. 6: Krechem el Miit Member, Tataouine Formation, Ghomrassen; PIW2004II 57. a: Part of the longitudinal thin - section, scale bar 2.5 mm, b-c: magnified part of upper surface showing pennulae and subangular denticles along maenianae. Note subrounded to rectangular outline of pennulae, scale bars 0.25 mm.

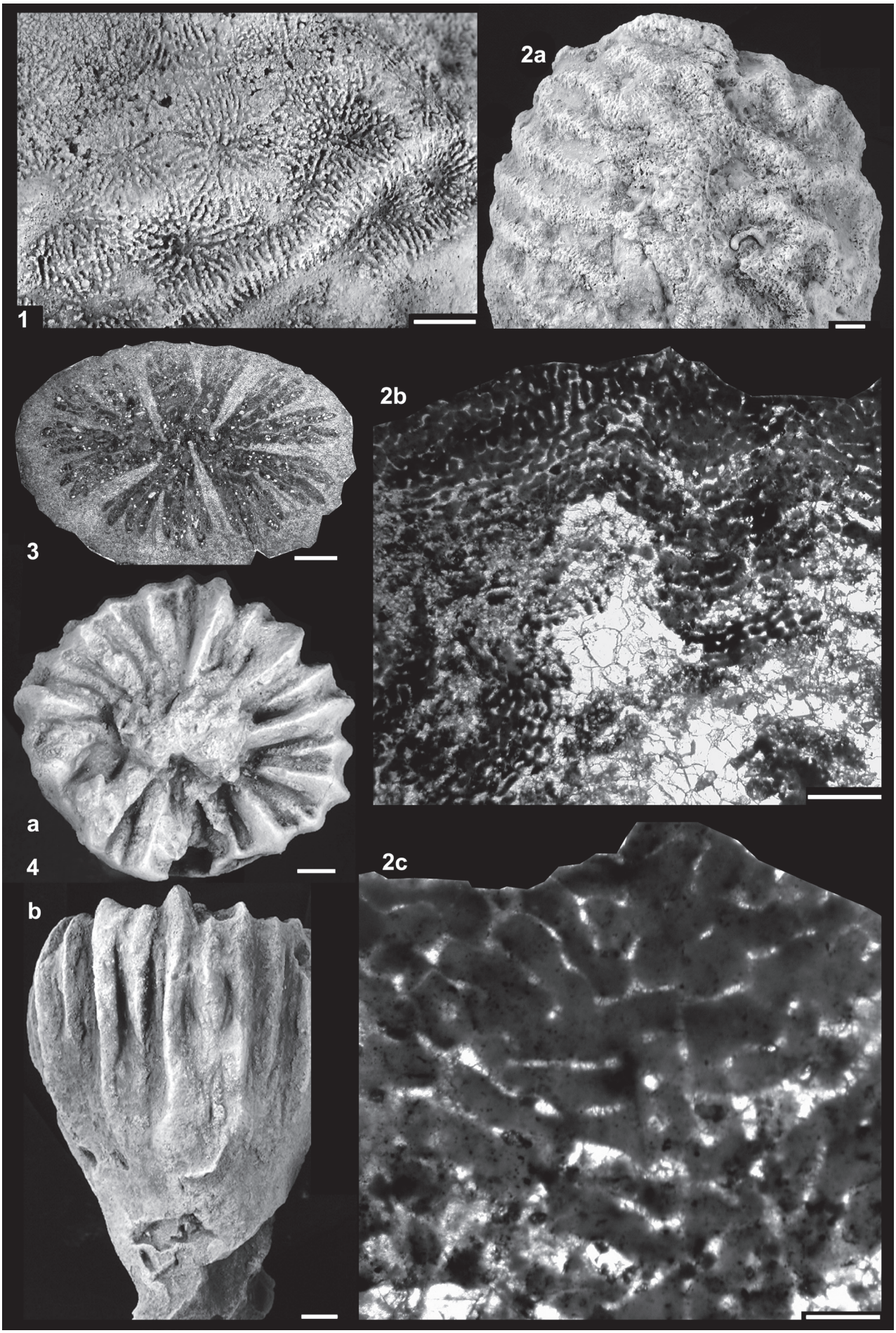

1
2a
2b
2c
3
4
a
b

Table 15: Dimensions (in mm) of *Codonosmilia elegans*

	d	d‘	H	Att	Ns
PIW2004II 61	22.4	20	30	12.5	24
PIW2004II 62	17.5	13.5	17.5	8	24

6) differs from *C. bouchardi* (Milne Edwards & Haime) of Beauvais (1967: 43, pl. 4, fig. 5, textfig. 7) by the ornamentation of pennular structures.

The dimensions of the present specimens are also quite close to *C. bouchardi* (Milne-Edwards & Haime) recorded by Beauvais (1966a: 142) from southern Tunisia except that the latter has a subconical to almost conical shape. Furthermore, Beauvais (1967: 43, textfig. 7) showed that the distal trabecular part, but probably also the margins of the pennular structure, are ornamented with equal, small, and regularly spaced denticles. The poor state of preservation does not allow to observe this character.

C. jacobi Alloiteau (Beauvais 1966a: 142, pl. 4, fig. 4), also recorded from southern Tunisia, exhibits similar dimensions.

Chomatoseris iranensis of Flügel is characterised by its concentric or centrifugal growth around the supporting substrate. In some of the present specimens the growth remained restricted to the upper and lateral sides, which is considered as reflecting an ontogenic growth stage (Gill & Laufuste 1971: 8).

Stratigraphic distribution in Tunisia: Bathonian, Upper Callovian-Oxfordian.

Family Latomeandridae Alloiteau, 1952

Remarks: The family has been redefined by Morycowa & Roniewicz (1995: 378) and included in the suborder Microsolenina Morycowa & Roniewicz, 1995.

Genus *Microphylliopsis* Beauvais, 1966a

Type species *Microphylliopsis scolioides* Beauvais, 1966a

Remarks: Beauvais (1966a: 144) included *Microphylliopsis* in the Latomaeandridae and considered it to be close to *Microphyllia*, from which it can be easily differentiated on the basis of longer and sinuous series, an incomplete wall, absence of a network of synapticulae and more strongly perforated radial elements.

The corals of the family Latomaeandridae possess pennulae (Morycowa & Roniewicz 1995: 378). Beauvais (1966a) did not mention pennular structures in *Microphylliopsis*. However, a longitudinal thin-section of a specimen (described below), which matches *Microphylliopsis* in all essential characters, exhibits a well-developed pennular structure.

Microphylliopsis aff. *scolioides* Beauvais, 1966a

Pl. 8, Figs 1-2

aff. 1966a *Microphylliopsis scolioides* sp. nov. - Beauvais: 145, pl. 4, fig. 5.

Material: 3 specimens from the Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 49-51).

Dimensions (in mm): see Tab. 14

Description: Corallum massive, globose, pendunculate to crustose, meandroid. Calices arranged in short to long, sinuous valleys, separated by low, tectiform or tholiform collines. Calice centers moderately distinct, united occasionally by septum of valley. Septa irregularly perforated, commonly anastomosing, arranged at right angles to the collines. Septa non-confluent to confluent with those of adjacent series. Synapticulae common. Distal margin partially monoliform, rest with delicate, conspicuous projecting trabeculae above the distal margin of septa. Trabeculae pennular in addition to being ornamented with irregular granules and horizontal projections such as balconies, which mostly join the adjacent trabeculae of the same septum or those of the adjacent septum. Longitudinal section parallel to the septa exhibits transverse, discontinuous or continuous, oscillation ripple-like menianae. Menianae with fine denticles. Wall incomplete, synapticulo-septothecal. Columella parietal or papillose.

Remarks: The incomplete wall structure, lower number of septa in corallites of comparable diameter and the more perforated nature of septa differentiate the present specimens from *Microphyllia* but match *Microphylliopsis*. The septal ornamentation in the present specimens is quite confusing.

As has been mentioned previously the height, course, pattern and form of collines may vary within the same specimen and depend upon the shape of the corallum and on microen-

Plate 8

Figs 1-2: *Microphylliopsis* aff. *scolioides* Beauvais, 1966a from the Beni Oussid Member, Tataouine Formation, Bir Remtha. 1: View of upper surface showing partially monoliform distal margins of septa, arranged at right angles to the collines, scale bar 2.5 mm; PIW2004II 51. 2: PIW2004II 49, a: upper view showing sinuous valleys, separated by collines, scale bar 2.5 mm, b: longitudinal thin-section parallel to septa exhibiting transverse, discontinuous oscillation ripple-like menianae, scale bar 2 mm, c: enlargement of Fig. 2b exhibiting transverse, discontinuous or continuous menianae with fine denticles, scale bar 1 mm.

Figs 3-4: *Codonosmilia elegans* Koby, 1888 from the Beni Oussid Member, Tataouine Formation. 3: Transverse thin-section showing arrangement of septa in three cycles, scale bar 2 mm, Bir Remtha; PIW2004II 62. 4: PIW2004II 61, a: side view showing arrangements of costae, scale bar 2.5 mm, b: upper view, scale bar 2.5 mm, Ksar Beni Soltane.

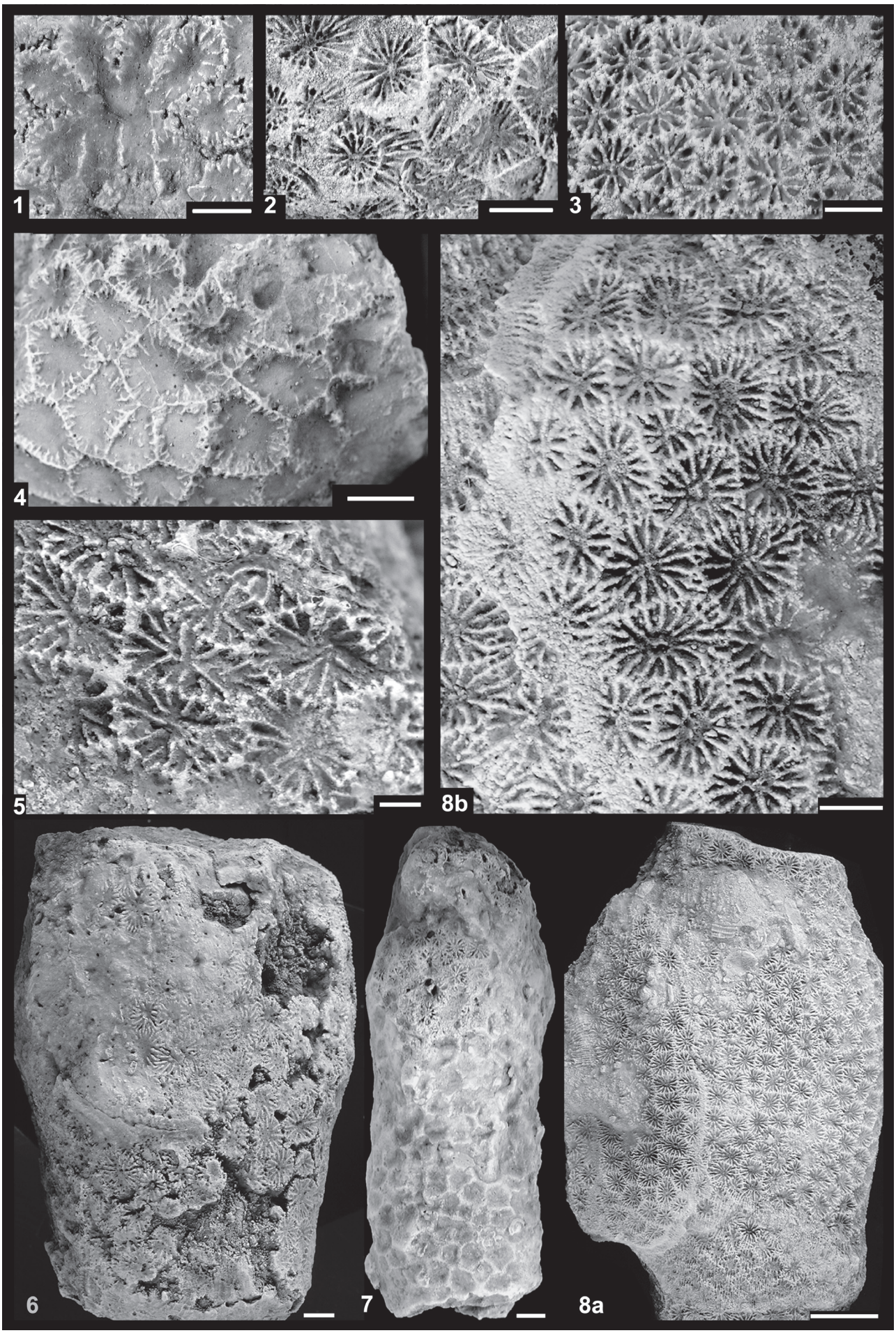

1
2
3
4
5
8b
6
7
8a

Table 16: Dimensions (in mm) of *Amphiastraea piriformis*

	D	Att.	d	Ns	Ds	Shape	Remarks
PIW2004II 19	83	83	2-4	19	3	crustose	1*
PIW2004II 20	-	-	2-3.5	18	4	flat	2
PIW2004II 21	-	-	2.5-3.5	18-24	4	columnar	3
PIW2004II 22	-	-	2.6	18	4	fragmentary	4
PIW2004II 23	18	15	2.2-2.6	23	5	crustose	5
PIW2004II 24	13	10.2	2-3.2	-	-	globose	-
PIW2004II 25	22	-	1.5-3	22	7	globose	6
PIW2004II 26	-	-	4.4-5.2	22	4	massive	6
PIW2004II 27	-	-	2.2-3.2	10-17	4	columnar	7
PIW2004II 29	72	72	3-3.7	22-28	4-5	crustose	8
PIW2004II 30	45	45	2.6-3.4	25	6	crustose	9
PIW2004II 31	42	-	2.5	19	5	columnar	10
PIW2004II 32	21	-	2	18	5	flat, nodular	10
PIW2004II 33	37	-	1.5	17	5	digital	10
PIW2004II 35	69	-	2.4-2.5	18	4	crustose	11
PIW2004II 38			3.1-3.5	24	4	columnar	12
PIW2004II 39			3.1-3.6	23	5	globose	13
PIW2004II 46	29	15	2.3-3.6	29-33	7	globose	14
PIW2004II 64	-	-	1.5-2.5	14-22	5	crustose	15

Remarks: 1. Septa anastomosing, primary septa joined in the center, one of the septa long, incomplete ring of dissepiments, pocket budding. 2. Pseudocolumella, incomplete ring of dissepiments. 3. Septa anastomosing. 4. Primary septa joined in the center, biseptal budding. 5. Pocket budding, primary septa joined in the center. 6. Septa anastomosing, primary septa joined in the center, dissepiments peripheral, pocket budding. 7. Septa anastomosing, primary septa joined in the center, pocket and biseptal budding. 8. Septa of adjacent corallites confluent, anastomosing, incomplete ring of dissepiments, pocket budding. 9. Septa of adjacent corallites confluent, anastomosing, occasionally joined in the center to form pseudocolumella, distal margin with sharp denticles, incomplete ring of dissepiments, pocket budding. 10. Septa anastomosing, joined in the center, incomplete ring of dissepiments. 11. Septa anastomosing, incomplete ring of dissepiments. 12. Pocket budding, one of the septa long. 13. Pocket budding, pseudocolumella, incomplete ring of dissepiments. 14. Septa anastomosing, one of the septa long, biseptal budding, pocket budding. 15. Septa occasionally anastomosing, occasionally joined in the center and thickening the columella.

Plate 9: *Amphiastraea piriformis* GREGORY, 1900. 1, 4: Krechem el Miit Member, Tataouine Formation. 2-3, 6-8: Beni Oussid Member, Tataouine Formation.

Figs 1-8: 1: Part of upper surface showing calices arranged in a ring, scale bar 2.5 mm; Bir Remtha; PIW2004II 19.

4: Part of upper surface showing polygonal calices, pocket budding and primary septa joining in the center. Note the arrangement of calices along each side of a polygonal calice, scale bar 2.5 mm, Faljet Jdari/Ed-Dghaghra; PIW2004II 25.

2: Part of upper surface showing polygonal shape of calices and endothecal vesicular dissepiments forming a ring, scale bar 2.5 mm, Remada SE; PIW2004II 39.

3: Part of upper surface showing more or less equal diameter of calices, anastomosing septa and biseptal budding, scale bar 2.5 mm, Bir Remtha; PIW2004II 27.

6: Columnar shape of colony, scale bar 2.5 mm, Remada SE; PIW2004II 38.

7: Digitate shape of colony, scale bar 2.5 mm, Bir Remtha; PIW2004II 34.

8: Bir Remtha; PIW2004II 29, a: general view of upper surface of a crustose colony, scale bar 10 mm, b: close-up view showing anastomosing septa, confluent with those of adjacent calices, and pocket budding, scale bar 2.5 mm. 5: Part of upper surface showing polygonal outline of calices and anastomosing septa, scale bar 1 mm, Ghomrassen Member, Tataouine Formation, Faljet Jdari/Ed-Dghaghra; PIW2004II 21.

vironmental factors (Pandey & Fürsich 2003: 84). The degree of perforation and the abundance of synapticulae may also have been governed by certain environmental parameters. For example, a lower intensity of light enhances porosity (Pandey et al. 1999), whereas higher water energy increases the abundance of synapticulae, an anchoring mechanism of the polyps (Wells 1956: F343) (see also Budd Foster 1979; Lathuilière & Budd 1994).

The dimensions of *Microphylliopsis scolioides* Beauvais (1966a: 145, pl. 4, fig. 5), particularly the distance between two adjacent calice centers (c'c') do not match those of the present specimens. In addition, the density of septa in *M. scolioides* is low. In all probability, our specimens represent a new species. However, until more specimens become available that provide more information regarding the morphological variability, they have been designated in open nomenclature.

Stratigraphic distribution in Tunisia: Callovian.

Suborder Rhipidogyrina Roniewicz, 1976

Family Rhipidogyridae Koby, 1905

Subfamily Rhipidogyrinae Koby, 1905

Genus *Codonosmilia* Koby, 1888

Type species *Codonosmilia elegans* Koby, 1888

Codonosmilia elegans Koby, 1888

Pl. 8, Figs 3-4

1888 *Codonosmilia elegans* sp. nov. - Koby: 455, pl. 120, figs 1-7.
2003 *Codonosmilia elegans* Koby - Pandey & Fürsich: 119, pl. 36, figs 1-6, pl. 38, fig. 7.

Material: 2 specimens from the Beni Oussid Member, Tataouine Formation, Ksar Beni Soltane (PIW2004II 61) and Bir Remtha (PIW2004II 62).

Dimensions (in mm): see Tab. 15

Description: Corallum solitary, trochoid, low, with small attachment area. Proximal part slightly expanded. Calice superficial, subcircular to oval in outline. Septa compact, proximally thin, distally thick, arranged in three cycles, those of the first cycle thick, slightly bent before reaching the center and occasionally touching adjacent septa. Near the distal part, septa of the second and third cycles equally thick but correspondingly shorter. External surface and lateral surface of costo-septa ornamented with granules. Endothecal vesicular dissepiments common along the periphery. Costae corresponding to septa, those of primaries starting close to the base, other costae shorter, terminating sharply.

Remarks: Morphological features such as thickness and number of costo-septa, microstructure and absence of a columella closely resemble *Codonosmilia elegans* Koby. Internal recrystallization has led to mixing endothecal (vesicular dissepiments) and radial (septa) components; consequently the nature of the wall, whether parathecal or septo-parathecal, is difficult to decipher. *Lophosmilia tenuicaulata* Gregory (1900: 37, pl. 3, figs 4-6, pl. 4, fig. 2; Pandey & Fürsich 1993: 21, pl. 6, figs 1-5) is very similar as far as the external profile of the costo-septa is concerned but can be easily distinguished based on the higher number of costo-septa (32-43), and the presence of a distinct columella.

Stratigraphic distribution in Tunesia: Callovian.

Suborder Pachythecaliina Eliášová, 1976

Family Amphiastraeidae Ogilvie, 1897

Remarks: The family Amphiastraeidae is known by variable growth structures (Eliášová 1975: 4, table 1), bilateral symmetry of calices, and pocket budding (Pandey & Fürsich 2003).

Genus *Amphiastraea* Étallon, 1859

Type species *Amphiastraea basaltiformis* Koby, 1888

Amphiastraea piriformis Gregory, 1900

Pl. 9, Figs 1-8

1900 *Amphiastraea piriformis* sp. nov. - Gregory: 71, pl. 14, fig. 14, pl. 15, figs 1-2.
1900 *Amphiastraea piriformis* sp. - Gregory: 72, pl. 15, fig. 3.
1904 *Connectastrea piriformis* (Gregory) - Koby: 69, pl. 29, figs 6-6a (after Geyer 1955: 326).
1904 *Connectastrea gregoryi* sp. nov. - Koby: 67, pl. 29, figs 1-4 (after Geyer 1955: 326).
1955 *Amphiastraea piriformis* Gregory - Geyer: 326.
1966a *Connectastrea piriformis* (Gregory) - Beauvais: 132, pl. 2, fig. 2.
1972 *Amphiastraea piriformis* Gregory - Turnšek: 187, 243, pl. 25, figs 1-2.
1980 *Amphiastraea piriformis* Gregory - Ljuljeva & Permjakov: 123, pl. 44, figs 5-6.
1981 *Amphiastraea piriformis* Gregory - Turnšek, Buser & Ogorelec: 364, fig. 4D.
1985 *Amphiastraea piriformis* Gregory - Rosendahl: 54.
1990 *Amphiastraea piriformis* Gregory - Errenst: 163, pl. 1, fig. 4.
1993 *Amphiastraea piriformis* Gregory - Pandey & Fürsich: 19, pl. 5, figs 10-11, textfig. 13.
2003 *Amphiastraea piriformis* Gregory - Pandey & Fürsich: 126, pl. 21, fig. 2, pl. 40, figs 1-4.

Material: 25 specimens from (a) the Beni Oussid Member, Tataouine Formation, Bir Remtha (PIW2004II 27-34, 64), Foum Tataouine Nord (PIW2004II 26), Ghomrassen (PIW2004II 20, 46), Ksar Beni Soltane (PIW2004II 22-24) and Remada Southeast (PIW2004II 38-39, 65), (b) the Krechem el Miit Member, Tataouine Formation, Faljet Jdari/Ed-Dghaghra (PIW2004II 25, 35-37) and Bir Remtha(PIW2004II

19), and (c) the Ghomrassen Member, Tataouine Formation, Bir Remtha (PIW2004II 52) and Faljett Jdari/Ed-Dghaghra (PIW2004II 21).

Dimensions (in mm): see Tab. 16

Description: Corallum cerioid, crustose, globose, columnar, digital to nodular in shape, mostly fragmentary. Calices distinct, shallow to moderately deep, diameter ranging from 1.5-5.2 mm, circular, oval to polygonal, trigonal, pentagonal, or hexagonal in outline, occasionally arranged in rings. Septa few, compact, anastomosing, numbering 10-28. Septa thickest at the wall, thinning towards the center, and occasionally very thin near the axis of the corallite. Distal margin of septa with fine and sharp denticles. Septa of adjacent corallites mostly non-confluent, alternating, occasionally continuous and bicuneiform. All septa of the first and a few of the second cycle joined in the center to form a pseudocolumella, those of higher cycles often short or rudimentary. Lateral surfaces of septa ornamented with very small spinules. Endothecal vesicular dissepiments occasionally continuous between a few adjacent septa forming part of a ring near the periphery. Budding intracalicular pocket to biseptal budding. Axis of corallites slightly eccentric. Wall septothecal to septo-parathecal.

Remarks: The specimens are poorly to moderately preserved as is generally the case with specimens of *Amphiastraea,* which occurs predominantly in siliciclastic sediments. The interior is completely recrystallised. However, due to the contrasting colour of the sediment the skeletal features could be observed. The morphology of the specimens agrees well with that of *Amphiastraea piriformis* Gregory described by earlier workers (e.g., Pandey & Fürsich 1993: 19; 2003: 126). Intracalicular pocket budding is a conspicuous feature of the present specimens. As it was difficult to observe all the characteristic morphological features in each specimen, the features of each specimen are listed. The septal density measured along the periphery depends upon the state of preservation. In most cases, diagenetic processes caused rudimentary septa to merge with the wall and consequently can no longer be recognized.

Pseudodiplocoenia soltanensis Beauvais (1966a: 131, pl. 1, fig. 7) shows comparable corallites and a similar number of septa. The apparent plocoid growth structure in *Pseudodiplocoenia* Alloiteau (1958: 74) is, in our opinion, the result of the arrangement of endothecal dissepiments in a ring and should be re-examined. Similar ring-forming dissepiments have been observed in specimens assigned to *A. piriformis* and *A. basalitiformis* (Pandey & Fürsich 1993: 19).

Koby (1904: 67) created the new genus *Connectastrea* based on *A. piriformis* from the Jurassic of Kachchh. Beauvais (1976: 22, textfig. 13) illustrated the microarchitecture and the ornamentation on the lateral surfaces and denticles along the distal margin of the septa in *Connectastrea* and grouped the genus with the family Actinastraeidae Alloiteau, 1952. Wells (1956: F397) and Eliášová (1975: 6) considered the genus a junior synonym of *Amphiastraea*.

The ornamentation of the lateral septal surfaces of *Amphiastraea basaltiformis* Koby (Beauvais 1964: fig. 43) is similar to that of *Connectastrea* (Beauvais 1976: 22, textfig. 13). The growth structures, pattern of septa and budding in the present specimens and in the specimens from the Middle Jurassic of the Kachchh Basin (Pandey & Fürsich 1993) and east-central Iran (Pandey & Fürsich 2003) assigned to *Amphiastraea piriformis* are similar to *Amphiastraea basaltiformis*. Thus, we agree with Wells (1956) and Eliášová (1975) that *Connectastrea* is a junior synonym of *Amphiastraea*.

Amphiastrea grandiflora (Beauvais 1966a: 133, pl. 2, figs 1, 3) from southern Tunisia has a larger corallite diameter (4-7 mm) and a higher number of septa (32-42).

Bussonastrea tricalix Beauvais (1965: 247, fig. 1; 1966a: 133, pl. 3, fig. 1) from the Upper Jurassic of southern Tunisia has been distinguished from *Amphiastraea* on the basis of its mode of budding. In *Amphiastraea,* apart from pocket budding, biseptal budding has been recorded (Pandey & Fürsich 2003), which results in formation of calice pairs. In addition, a few specimens in the present collection (PIW2004II 19, 25, 29, and 35) show corallites arranged in groups of three, four or several calices. However, it is difficult to recognize whether these formed by pocket budding or by repeated biseptal budding or by a combination of the two. Figure 1 of Beauvais (1965) is a good example of the "tricalyx" pattern, but another figure (Beauvais 1966a: pl. 3, fig. 1b) does not differ much from the calyx patterns exhibited by the present specimens. It is worth mentioning that Bendukidze (1982: 61) illustrated biseptal and triseptal budding in *Isastrea favosiformis*, which resulted in the arrangement of corallites in groups of two or three.

Stratigraphic distribution in Tunesia: Callovian-Oxfordian.

Acknowledgements

The coral material described in this paper was collected by S. Holzapfel (Scheinfeld, Germany). We would like to thank B. Lathuilière (Nancy, France) for his comments concerning the taxonomy of some of the taxa. M. Nose (Munich, Germany) and an anonymous reviewer are thanked for their constructive remarks. Part of the work was carried out while DKP visited the Institut für Paläontologie, Würzburg University, in June 2004, a visit that was sponsored by the Alexander von Humboldt Foundation. S. Kuldeep (Jaipur, India) and R. Wassermann (Würzburg, Germany) prepared the thin-sections and polished sections, and H. Schönig (Würzburg, Germany) carried out the photographic work. We would also like to thank M. Strifler (Würzburg, Germany) for editing the plates.

4. References

Alloiteau, J. (1952): Madréporaires post-paléozoiques. – In: Piveteau, J. (ed.) Traité de Paléontologie, vol. 1; Paris (Masson et Cie), 539 – 684.

Alloiteau, J. (1957): Contribution à la systématique des madréporaires fossiles, 2 vols.; Paris (Centre National de Recherche Scientifique), 462 pp.

Alloiteau, J. (1958): Monographie des madréporaires fossiles de Madagascar. – Annales géologiques de Madagascar, **25:** 1-218.

Baron-Szabo, R. C. (2002): Scleractinian corals of the Cretaceous; Knoxville TN (Baron-Szabo), 539 pp.

Beauvais, L. (1964): Étude stratigraphique et paléontologique des formations à madréporaires du Jurassique supérieur du Jura et de l'Est du Bassin de Paris. – Mémoires de la Société géologique de France, No. 100, **43:** 1-288.

Beauvais, L. (1965): Un nouveau mode de bourgeonnement chez les madréporaires post-paléozoiques. – Comptes Rendues de l'Académie des Sciences, **260:** 247-249.

Beauvais, L. (1966a): Étude des madréporaires jurassiques du Sahara Tunisien. – Annales de Paléontologie (Invertébrés), **52:** 115-152.

Beauvais, L. (1966b): Révision des madréporaires du Dogger de la collection Koby. – Eclogae geologicae Helvetiae, **59:** 989-1024.

Beauvais, L. (1967): Révision des madréporaires du Dogger collection A. d' Orbigny et H. Michelin conservées au Muséum National d'Histoire Naturelles de Paris. – Mémoires de la Société géologique de France, No. 106, **46:** 1-54.

Beauvais, L. (1970): Madréporaires du Dogger: Étude des types de H. Milne-Edwards et J. Haime. – Annales de Paléontologie (Invertébrés), **56:** 39-74.

Beauvais, L. (1976): Madréporaires du Jurassique, I - Étude morphologique, taxonomique et phylogénétique du sous-order Amphiastraeida Alloiteau. – Mémoires de la Société géologique de France, No. 126, **55:** 1-42.

Beauvais, L. (1978): Révision des topotypes de madréporaires Bathoniens de Cutch (Inde), collection Gregory, British Museum de Londres. – Annales de Paléontologie (Invertébrés), **64:** 47-68.

Beauvais, L. & Nouiouat, S. (1993): Une nouvelle faune de coralliaires jurassiques dans l´Atlas saharien d´Algérie. – Géobios, **26:** 291-318.

Becker, E. & Milaschewitsch, C. (1875-1876): Die Korallen der Nattheimer Schichten. – Palaeontographica, **21:** 121-164 (Becker 1875), 165-204, pls. 40-45 (Becker & Milaschewitsch 1875), 205-244, pls. 46-51 (Milaschewitsch 1876).

Bendukidze, N. S. (1982): Pozdnejurskie korally rifogennykh otlozhenij kavkaza i krima. – Trudy Geologicheskij Institut Akademija Nauk Gruzinskoj SSR, **74:** 1-166.

Ben Ismail, M. (1991): Les bassins mésozoiques (Trias à Aptien) du sud de la Tunisie : Stratigraphie integrée, characteristiques géophysiques et évolution géodynamique. – Thèse pour obténir le grade de Docteur es-sciences géologiques; Tunis, 429 pp.

Ben Ismail, M. & M´Rabet, A. (1990): Evaporite, carbonate and siliciclastic transitions in the Jurassic sequences of Southern Tunisia. – Sedimentary Geology, **66:** 65-82.

Ben Ismail, M., Bouaziz, S., Almeras, Y., Clavel, B., Donze, P., Enay, R., Ghenmi, M. & Tintant, H. (1989): Nouvelles données biostratigraphiques sur le Callovien et les faciès „purbecko-wealdiens" (Oxfordien à Vraconien) dans la région de Tataouine (Sud-tunisien). – Bulletin de la Société géologique de France, **5:** 353-360.

Blainville, H. M. de (1830): Zoophytes. – In: Defrance, J. L. M. (Ed.), Dictionnaire des Sciences Naturelles, **60:** 274-364.

Bourne, G. C. (1900): The Anthozoa. – In: Lankester, E. R. (Ed.), A Treatise on Zoology. Part 2. The Porifera and Coelenterata; London (Adam & Charles Black), 80 pp.

Budd Foster, A. (1979): Phenotypic plasticity in the reef corals *Montastraea annularis* (Ellis & Solander) and *Siderastrea siderea* (Ellis & Solander). – Journal of Experimental Marine Biology and Ecology, **39:** 25-54.

Chevalier, J. P. & Beauvais, L. (1987): Systématique ordre des Scléractiniaires. – In: Grassé, P. P. (Ed.), Cnidaires, Anthozoaires. Cnidaires. – Traité de Zoologie, 3, fasc. 3; Paris (Masson), 679-764.

Ehrenberg, C. G. (1834): Beiträge zur physiologischen Kenntniss der Corallenthiere im Allgemeinen und besonders des Rothen Meeres. – Abhandlungen der Königlichen Academie der Wissenschaften zu Berlin, **1832:** 225-380.

Eliášová, H. (1975): Sous-ordre Amphiastraeina Alloiteau, 1952 (Hexacorallia) des calcaires de Stramberk (Tithonien, Tchécoslovaquie). – Časopis pro Mineralogii a Geologii, **20:** 1-23.

Eliášová, H. (1976): Les coraux de l´ordre Hexanthiniaria Montanaro-Gallitelli, 1975, Zoantharia de Blainville, 1830, dans les calcaires de Štramberk (Tithonien, Tchécoslovaquie). – Věstník Ústředního ústavu geologického, **51:** 357-366.

Eliášová, H. (1981): Sous-order Stylinina Alloiteau, 1952 (Hexacorallia) des calcaires de Štramberk (Tithonien, Tchécoslovaquie). – Sborník geologických ved. Paleontologie, **24:** 117-133.

Errenst, C. (1990): Das korallenführende Kimmeridgium der nordwestlichen Iberischen Ketten und angrenzender Gebiete (Fazies, Paläogeographie und Beschreibung der Korallenfauna). Teil 1. – Palaeontographica, **A214:** 121-207.

Étallon, A. (1859-1862): Études paléontologiques sur le Haut-Jura. Rayonnés du Corallien. – Mémoires de la Société d'émulation du Doubs, 3e sér., **3:** 401-553 (1859), **6:** 217-243 (1862).

Étallon, A. (1864): Classe des Polypes. – In: Thurmann, J. & Étallon, A. (Eds), Lethea Bruntrutana ou études paléontologiques et stratigraphiques sur les terrains jurassiques supérieurs du Jura bernois et en particulier des environs de Porrentruy. – Denkschriften der Allgemeinen Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften, **20:** 357-412.

Flügel, E. (1966): Mitteljurassische Korallen vom Ostrand der Großen Salzwüste (Shotori-Kette, Iran). – Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen, **126:** 46-91.

Fromentel, E. de (1858-1861): Introduction à l'étude des polypiers fossiles. – Mémoires de la Société d'émulation du Doubs, 3e sér., **5:** 1-357.

Geyer, O.F. (1954): Die oberjurassische Korallenfauna von Württemberg. – Palaeontographica, **A104:** 121-224.

Geyer, O.F. (1955): Korallen-Faunen aus dem Oberen Jura von Portugal. – Senckenbergiana Lethaea, **34:** 317-356.

Gill, G.A. & Lafuste, G.J. (1971): Madréporaires simples du Dogger d'Afghanistan: Etude sur les structures de type «*Montlivaltia*». – Mémoires de la Société géologique de France, N.S., No. 115, **50:** 1-40.

Gill, G.A. (1977): Essai de regroupement des stylinides (hexacoralliaires) d'après la morphologie des bords internes de leurs septes. – In: Second International Symposium on Corals and Coral Reefs 1975. - Mémoires du Bureau de Recherches géologiques et Minières, **89:** 283-295.

Goldfuss, G.A. (1826-33) : Petrefacta Germaniae. Pars 1; Düsseldorf (Arnz), 253 pp.

Gray, J.E. (1847): An outline of an arrangement of stony corals. – The Annals and Magazine of Natural History, **19:** 120-128.

Gregory, J.W. (1900): Jurassic fauna of Cutch. The Corals. – Memoirs of the Geological Survey of India. Palaeontologia Indica, series 9, **2:** 1-195.

Holzapfel, S. (1998): Palökologie benthischer Faunengemeinschaften und Taxonomie der Bivalven im Jura von Südtunesien. – Beringeria, **22:** 3-199.

Koby, F. (1880-1890): Monographie des polypiers jurassiques de la Suisse. – Mémoires de la Société paléontologique Suisse, **7-16:** 1-582.

Koby, F. (1904): Description de la faune Jurassique du Portugal, polypiers du Jurassique supérieur. – Comunicaçoes dos serviços geologicos de Portugal, 1-167.

Koby, F. (1905): Sur les polypiers jurassiques des environs de St.Vallier de Thiey. – Bulletin de la Société géologique de France, séries 4, **2:** 847-863.

Lamarck, J.B.P. de. (1816): Histoire naturelle des animaux sans vertébrés; Paris (Verdière), 568 pp.

Lamouroux, J. (1821): Exposition méthodique des genres de l'ordre des polypiers; Paris (Agasse), 115 pp.

Lathuilière, B. & Budd, A. (1994): Analyse d'image et analyse morphofonctionnelle des coraux. – Comptes Rendus de l'Académie des Sciences (II), **318:** 1273-1276.

Lauxmann, U. (1991): Revision der oberjurassischen Korallen von Württemberg (SW-Deutschland). – Palaeontographica, **A219:** 107-175.

Lauxmann, U. (1992): Die Riffkorallen aus dem höheren Oberjura der Schwäbischen Alb. – Jahreshefte der Gesellschaft für Naturkunde Württemberg, **147:** 11-28.

Linnaeus, C. (1767): Madrepora. – Systema naturae, Editio Duodecima, Reformata, **1:** 1272-1282.

Ljuljeva, S. A. & Permjakov, V. V. (1980): Kokkolitoforidy i korally mezozoya Ukrainy. Paleontologicheskiy spravochnik; Kiev (Naukova Dumka), 170 pp.

Michelin, H. (1840-1847): Iconographie zoophytologique. Déscrip-

tion par localités et terrains des polypiers fossiles de France et pays environnants; Paris (P. Bertrand), 348 pp.

Milne-Edwards, H. & Haime, J. (1849): Mémoire sur les polypiers appartenant à la famille des oculinides, au groupe intermédiaire des Pseudoastréides et à la famille des Fungides. – Comptes rendus de l'Académie des Sciences, **29:** 67-73.

Milne-Edwards, H. & Haime, J. (1850): Recherches sur les polypiers. Mémoire 5, Monographie des Oculinides. – Annales de sciences naturelles, 3ème série, **13:** 63-110.

Milne-Edwards, H. & Haime, J. (1850-54): A monograph of the British fossil corals. – Palaeontographical Society Monographs, Part 1: i-lxxxv, 1-71, pls. 1-11 (1850); Part 2: 73-145, pls. 12-30 (1851); Part 3: 147-210, pls. 31-46 (1852); Part 4: i-iv, 211-244, pls. 47-56 (1853); Part 5: 245-322, pls. 57-72 (1854).

Milne-Edwards, H. & Haime, J. (1851): Monographie des polypiers fossils des terrains paléozoiques. – Archives du Muséum d'Histoire Naturelle, **5:** 1-502.

Milne-Edwards, H. (1857-1860): Histoire naturelle des coralliaires ou polypes proprement dits; Paris (Roret), 1: 1-326 (1857); 2: 1-633 (1857); 3: 1-560 (1860); atlas: 31 pls.

Morycowa, E. & Roniewicz, E. (1990): Revision of the genus *Cladophyllia* and description of *Apocladophyllia* gen. n. (Cladophylliidae fam. n., Scleractinia). – Acta Palaeontologica Polonica, **35:** 165-190.

Morycowa, E. & Roniewicz, E. (1995): Microstructural disparity between Recent fungiine and Mesozoic microsolenine scleractinians. – Acta Palaeontologica Polonica, **40:** 361-385.

Negus, P. & Beauvais, L. (1975): The Fairford coral bed (English Bathonian), Gloucestershire. – Proceedings of the Geologists´ Association, **86:** 183-204.

Ogilvie, M. M. (1897): Die Korallen der Stramberger Schichten. – Palaeontographica, Supplement, **2:** 73-282.

Orbigny, A. de (1849): Note sur les polypiers fossiles; Paris (Masson), 12 pp.

Orbigny, A. de (1850): Prodrome de paléontologie stratigraphique universelle des animaux mollusques et rayonnés; Paris (Masson et Cie.), 1: 1-394; 2: 1-428.

Orbigny, A. de (1851): Cours élémentaire de paléontologie (3:) Polypiers ou Zoophytes; Paris (Masson), 2: 151-189;

Pandey, D. K., Ahmad, F. & Fürsich, F. T. (2000). Middle Jurassic scleractinian corals from northwestern Jordan. – Beringeria **27:** 3-29.

Pandey, D. K. & Fürsich, F. T. (1993): Contribution to the Jurassic of Kachchh, Western India. I. The coral fauna. – Beringeria, **8:** 3-69.

Pandey, D. K & Fürsich, F. T. (2001): Environmental distribution of scleractinian corals in the Jurassic of Kachchh, Western India. – Journal of the Geological Society of India, **57:** 479-495.

Pandey, D. K. & Fürsich, F. T. (2003): Jurassic corals of east-central Iran. – Beringeria, **32:** 3-138.

Pandey, D. K., McRoberts, C. A. & Pandit, M. K. (1999): *Dimorpharaea* (Scleractinia, Anthozoa) from the Middle Jurassic of Kachchh, India. – Journal of Paleontology, **73:** 1015-1028.

Prinz, P. (1991): Mesozoische Korallen aus Nordchile. – Palaeontographica, **A216**: 147-209.

Quenstedt, F. A. (1856-1858): Der Jura; Tübingen (Laup & Sieber), 842 pp., 100 pls. [1-208, pls. 1-24 (June 1856); 209-368, pls. 25-48 (Dec. 1856); 369-576, pls. 49-72 (May 1857); 577-842, pls. 73-100 (Nov. 1857)

Roniewicz, E. (1966): Les madréporaires du Jurassique supérieur de la bordure des Monts de Sainte-Croix, Pologne. – Acta Palaeontologica Polonica **11:** 157-264.

Roniewicz, E. (1976): Les scléractiniaires du Jurassique supérieur de la Dobrogea centrale, Roumanie. – Palaeontologia Polonica, **34:** 1-121.

Roniewicz, E. (1977): Upper Kimmeridgian Scleractinia of the west Pomerania (Poland). – Rocznik Polskiego Towarzystwa Geologicznego, **47:** 613-622.

Roniewicz, E. & Stolarski, J. (2001): Triassic roots of the amphiastraeid scleractinian corals. – Journal of Paleontology, **75:** 34-45.

Rosendahl, S. (1985): Die oberjurassische Korallenfazies von Algarve (Südportugal). – Arbeiten aus dem Institut für Geologie und Paläontologie der Universität Stuttgart, Neue Folge, **82:** 1-125.

Smith, W. (1819): Strata identified by organized fossils; London, 32 pp.

Thomas, H. D. (1935): On *Tricycloseris*, *Anabacia*, and some new genera of Hexacoralla. – Geological Magazine, **72:** 424-430.

Turnšek, D. (1972): Upper Jurassic corals of southern Slovenia. – Razprave Slovenska Akademija Znanosti in Umetnosti, **15:** 147-265.

Turnšek, D. (1997): Mesozoic scleractinian corals from Slovenia. – ZRC Series, **16:** 1-512.

Turnšek, D., Buser, S. & Ogorelec, B. (1981): An Upper Jurassic reef complex from Slovenia, Yugoslavia. – In: Toomey, D. F. (Ed.), European Fossil Reef Models. – Society of Economic Paleontologists and Mineralogists, Special Publications, **30:** 361-369.

Vaughan, T. W. & Wells, J. W. (1943): Revision of the suborders, families and genera of the Scleractinia. – Geological Society of America, Special Papers, **44:** xv + 1-363.

Veron, J. E. N. (2000): Corals of the world; Townsville (UNSW Press), 1: 463 pp.; 2: 429 pp; 3: 490 pp.

Verrill, A. E. (1865): List of polyps and corals sent by the Museum of Comparative Zoology to other institutions in exchange, with annotations. – Bulletin of the Museum of Comparative Zoology, **1:** 29-60.

Verrill, A. E. (1902): Notes on corals of the genus *Acropora* (Madrepora Lam.), with descriptions and figures of types and of several new species. – Transactions of the Connecticut Academy of Arts and Sciences, **11:** 207-266.

Wells, J. W. (1956): Scleractinia. – In: Moore, R. C. (Ed.), Treatise on Invertebrate Paleontology, Part F, Coelenterata; Lawrence and New York (University of Kansas Press and Geological Society of America), F328-F444.

Wijsman-Best, M. (1972): Systematics and ecology of New Caledonian Faviinae (Coelenterata - Scleractinia). – Bijdragen tot de Dierkunde, **42:** 1-90.

Appendix

Stratigraphic distribution of corals in Jurassic rocks of southern Tunisia.

Techout Formation (Bathonian)

Chomatoseris iranensis Flügel, 1966

Tataouine Formation (Callovian-Oxfordian)
Beni Oussid Member (Callovian)

Enallocoenia crassoramosa (Michelin, 1843)
Stylina micrommata (Quenstedt, 1857)
Heliocoenia sp. A
Pseudocoenia slovenica Turnšek, 1972
Pseudocoenia cf. *slovenica* Turnšek, 1972
Solenocoenia? cf. *sexradiata* (Goldfuss, 1826)
Isastrea parvistella Alloiteau, 1958
Cladocora sp.
Craterastraea crateriformis (Gregory, 1900)
Microphylliopsis aff. *scolioides* Beauvais, 1966a
Codonosmilia elegans Koby, 1888
Amphiastraea piriformis Gregory, 1900

Krechem el Miit Member (Callovian)

Enallocoenia crassoramosa (Michelin, 1843)
Cladophyllia minor Beauvais, 1975
Chomatoseris iranensis Flügel, 1966
Amphiastraea piriformis Gregory, 1900

Ghoumrassen Member (Oxfordian)

Enallhelia elegans (Münster, 1829)
Cladophyllia minor Beauvais, 1975
Isastrea parva Gregory, 1900
Chomatoseris iranensis Flügel, 1966
Amphiastraea piriformis Gregory, 1900