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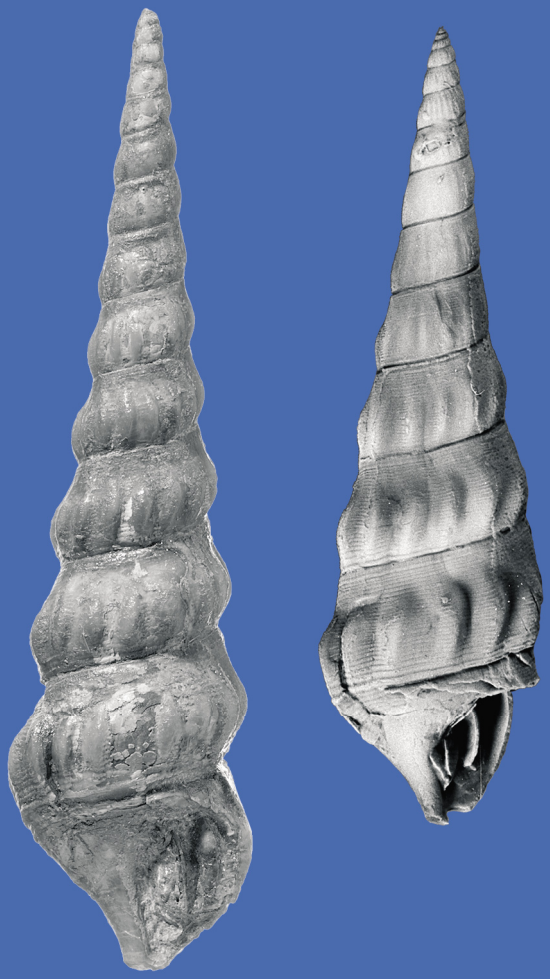
47



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Cover illustration: Snail *Pseudokatosira undulata* (BSPG 2007 XXII 1 and 2) from the Early Jurassic Amaltheenton of Franconia; this species is relatively rare and is the largest from the Amaltheenton (as large as 10 cm). For details see Nützel, A. & Gründel, J.: Two new gastropod genera from the Early Jurassic (Pliensbachian) of Franconia (South Germany), pp. 59 - 67 in this issue.

Umschlagbild: Schnecke *Pseudokatosira undulata* (BSPG 2007 XXII 1 und 2) aus dem unterjurassischen Amaltheenton Frankens; diese Art ist relativ selten und die größte aus dem Amaltheenton (bis zu 10 cm). Für weitere Informationen siehe Nützel, A. & Gründel, J.: Two new gastropod genera from the Early Jurassic (Pliensbachian) of Franconia (South Germany), S. 59 - 67 in diesem Heft.

Zitteliana	A47	3-52	4 Textfigs, 16 Pls, 43 Tabs	München, 31.12.2007	ISSN 1612-412X

Lower Cretaceous corals from the Koppeh Dagh, NE-Iran

By
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Abstract

A new section through parts of the Middle Aptian to Early Albian Sanganeh Formation at the southwestern margin of the Koppeh Dagh, NE-Iran, displays a succession of silty to fine-sandy marls between which limestone boulders and debris layers are intercalated at several levels. These boulders are olistoliths, derived from the edge of a nearby carbonate platform, long since eroded. Most of the olistoliths are reef limestones built of corals and calcareous sponges. At two levels, the reef fauna weathered out from the boulders and could be collected. Fourtyseven taxa of Scleractinia have been described and figured, which considerably extend our knowledge of the biodiversity of Cretaceous corals from the area. The corals show an interesting mixture of taxa known since the Middle Jurassic and those known only from the Cretaceous.

Key words: Scleractinia, Lower Cretaceous, taxonomy, NE-Iran

Kurzfassung

Ein neues Profil durch einen Teil der Sanganeh-Formation (Mittleres Apt bis Unter-Alb), gelegen am Südrand des Koppeh Dagh, NE-Iran, besteht aus einer siltig-feinsandigen Mergelfolge, in die mehrfach Kalkblöcke und Schuttlagen eingeschaltet sind. Bei den Blöcken handelt es sich um Olistolithe, die vom Rand einer benachbarten Karbonatplattform stammen, die seitdem völlig erodiert worden ist. Die meisten Olistolithe sind Riffkalke, deren Gerüst aus Korallen und Kalkschwämmen besteht. In zwei Horizonten ist diese Rifffauna herausgewittert und konnte aufgesammelt werden. Sie umfasst 47 Taxa der Scleractinia, die beschrieben und abgebildet werden. Unser Kenntnisstand der Biodiversität der Kreidekorallen dieser Region ist damit deutlich erweitert worden. Die Korallenfauna ist eine interessante Mischung aus Taxa, die bereits seit dem Mitteljura bekannt sind und solchen, die man nur aus der Kreide kennt.

Schlüsselwörter: Scleractinia, Unterkreide, Taxonomie, NE-Iran

1. Introduction

Despite the widespread occurrence of Cretaceous rocks in Iran, corals have never been described from these strata. The only exceptions are a paper by Kühn (1933), in which ten taxa are described from Niriz, in the southern part of the Esfahan Basin, and a recent paper by Baron Szabo et al. (2003), in which the authors describe 19 coral taxa from an Upper Aptian-Upper Albian reefal limestone north of Esfahan, central Iran (Table 1). Part of the explanation for the lack of information on Cretaceous Scleractinia from Iran may be the comparatively scarcity of suitable environments. More importantly, the documentation of Mesozoic macrofaunas, except for ammonites, is a largely neglected field of palaeontological research in Iran. The description of 47 taxa of Scleractinia in the present paper is a contribution to document the palaeobiodiversity of macro-organisms along the northern rim of the eastern Tethys, a necessary building block for future palaeobiogeographic studies.

2. Geological and stratigraphic framework

The Koppeh Dagh Mountains preserve a very thick succession of marine Cretaceous strata ranging from the Barremian-Aptian Tirgan Formation up to the Maastrichtian Kalat Formation (Textfigs 1, 2). This succession was deposited on the northern shelf of a deeper marine basin separating the Iran

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Table 1: List of scleractinian corals described by Kühn (1933) and Baron-Szabo et al. (2003) from the Lower Cretaceous of Iran.

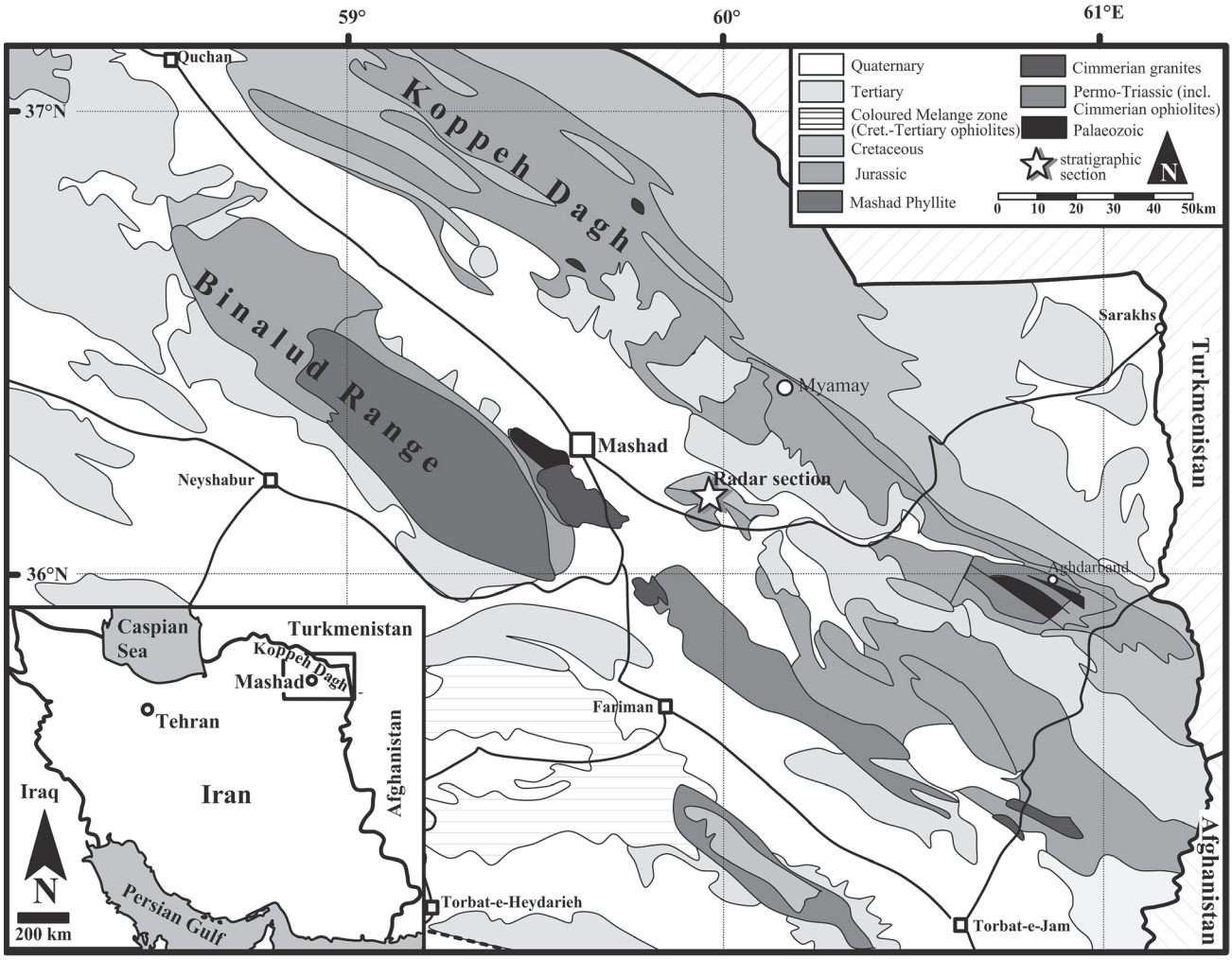
taxon	reference
Cyclolites robustus Quenstedt	Kühn 1933
Cyclolites numismalis Lamarck	Kühn 1933
Cyclolites medlicotti Noetling	Kühn 1933
Cyclolites scutellum Reuss	Kühn 1933
Cyclolites angiostoma Kühn	Kühn 1933
Aspidastraea orientalis Kühn	Kühn 1933
Palaeopsammia fastigiata Kühn	Kühn 1933
Cycloseris lamellata Kühn	Kühn 1933
Trochosmilia cf. *brevicula* Stoliczka	Kühn 1933
Placosmilia rudis Sowerby	Kühn 1933
Actinastrea aff.*pseudominima* (Koby)	Baron-Szabo et al. 2003
Columactinastraea sp.	Baron-Szabo et al. 2003
Eugyra cotteaui (d'Orbigny)	Baron-Szabo et al. 2003
Pseudomyriophyllia turnsekae Baron-Szabo	Baron-Szabo et al. 2003
Montlivaltia sp.	Baron-Szabo et al. 2003
Paraclausastrea pulchra Morycowa	Baron-Szabo et al. 2003
Placocoenia robusta Oppenheim	Baron-Szabo et al. 2003
Columnocoenia ksiazkiewiczi Morycowa	Baron-Szabo et al. 2003
Stylina micropora Koby	Baron-Szabo et al. 2003
Felixigyra deangelisi Prever	Baron-Szabo et al. 2003
Cyathophora haysensis Wells	Baron-Szabo et al. 2003
Diploastraea harrisi Wells	Baron-Szabo et al. 2003
Morphastrea cf. *ludovicina* (Michelin)	Baron-Szabo et al. 2003
Meandrophyllia meandroides (Koby)	Baron-Szabo et al. 2003
Eocomoseris raueni Löser	Baron-Szabo et al. 2003
Fungiastrea crespoi (Felix)	Baron-Szabo et al. 2003
Latiastraea cf. *kaufmanni* (Koby)	Baron-Szabo et al. 2003
Kobya aff. *crassolamellosa* Gregory	Baron-Szabo et al. 2003

Plate from Eurasia (Turan Plate) during the Cretaceous. Fault-controlled subsidence resulted in the deposition of several kilometres of Cretaceous sediments (e.g., Berberian & King 1981). The boundaries of the Lower Cretaceous formations (which are briefly described below) are highly diachronous, generally being older in the western and younger in the eastern part of the Koppeh Dagh (Immel et al. 1997; Textfig. 2).

The first marine Cretaceous strata overlying the non-marine uppermost Jurassic to Neocomian Shurijeh Formation are grouped in the Tirgan Formation (Barremian-lowermost Aptian). It consists of grey to brown, thick-bedded shallow-water limestones with bio- and intraclasts, ooids, and orbitolinids, intercalated with thin marl beds. The thickness of the Tirgan Formation is highly variable, ranging from a few tens to over 500 m (Immel et al. 1997).

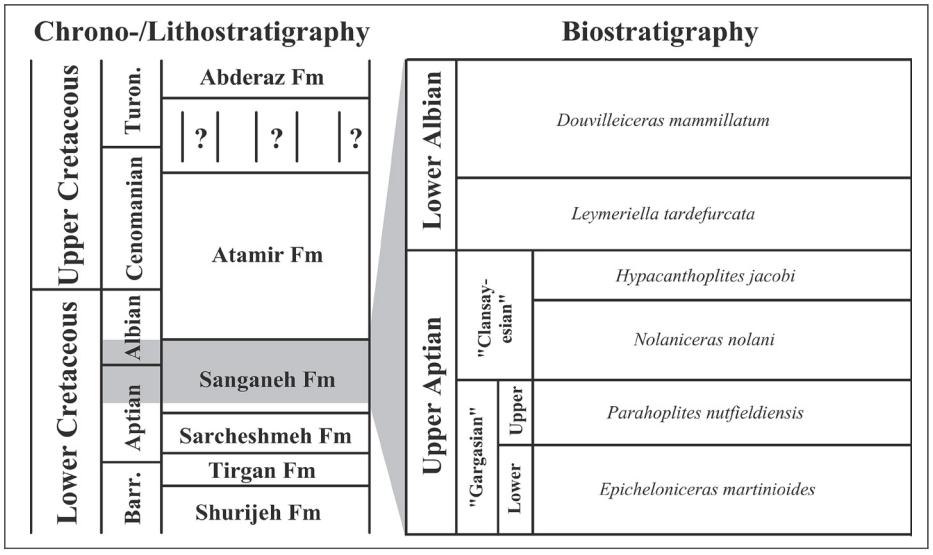
The Tirgan Formation is overlain by the Sarcheshmeh Formation (uppermost Barremian-Lower Aptian), an up to 1000 m thick, soft-weathering unit of light-grey marls and argillaceous shales. The unit is rich in ammonites (Immel et al. 1997) and was deposited in an open and somewhat deeper marine environment (Raisossadat & Moussavi-Harami 2000).

The Sanganeh Formation consists of soft, dark-grey to greenish, monotonous shales and often contains concretions. Occasionally siltstone beds may be intercalated. Its age is mid-Aptian to Early Albian based on a fairly rich ammonoid fauna (Immel et al. 1997; Raisossadat 2006). The Sanganeh Formation represents a deeper marine (basinal) environment. At its type section (NNE of Mashad), the formation is 770 m thick but it is reduced to 70 m in the western Koppeh Dagh.

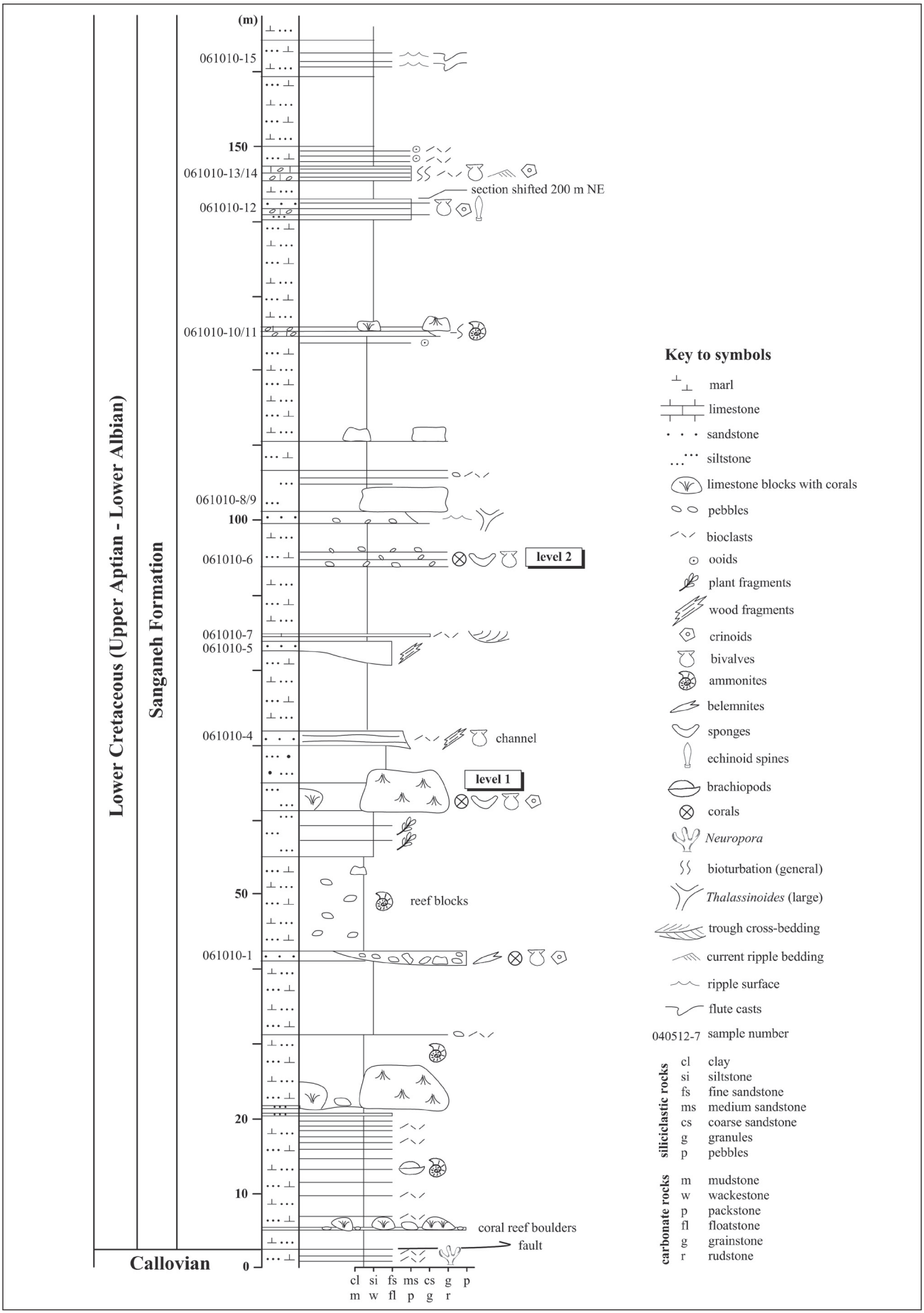


Textfigure 1: Geological sketch map of northeastern Iran with position of the "Radar" section ESE of Mashhad.

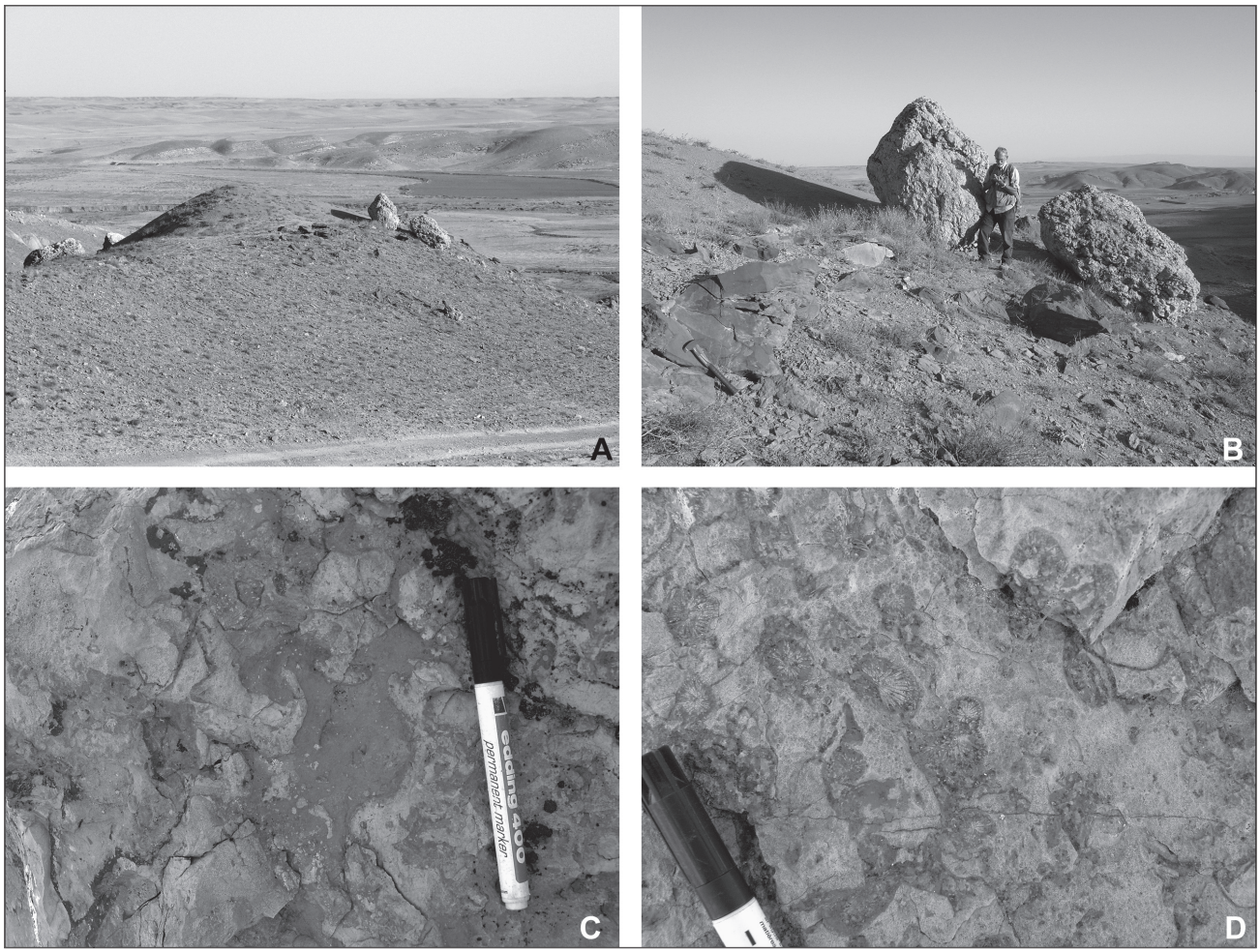
The Albian-Cenomanian Atamir Formation represents an up to 1000 m thick succession of fairly fossiliferous, fine- to medium-grained, often glauconitic and/or bioclastic sandstones of inner-shelf and dark-grey to green, silty to fine-sandy shales of mid- to outer-shelf origin. The ridge-forming sandstones may reach a thickness of up to several tens of metres and are fossiliferous, with ammonites, bivalves and gastropods being the most common fossils. Rarely, brown, sandy, bioclastic



Textfigure 2: Chrono- and lithostratigraphic position and biostratigraphic range of the Sanganeh Formation of the Koppeh Dagh.



Textfigure 3: Section through the Cretaceous succession at "Radar" Hill ESE of Mashhad, giving the position of the two levels from which the coral material was obtained. Note that the Cretaceous rocks are in fault contact with the underlying Callovian strata.



Textfigure 4: Field aspects of the Cretaceous part of the Radar section. A, Soft, greenish shales with re-deposited limestone blocks. B, Limestone boulders associated with a brown, cross-bedded sandy calcarenite bed intercalated between greenish shale. C, Detail of limestone block showing orange-brown internal sediment (dark) filling former dissolution cavities (palaeokarst). Marker pen is 140 mm long. D, Coral growth fabric within a limestone boulder (marker pen is 10 mm thick).

limestone beds are intercalated. The rich ammonoid fauna of the Atamir Formation has been documented by Immel et al. (1997) and Mosavinia et al. (2007).

The corals were discovered in a section exposed on the north-western slope of „Radar Hill", some 20 km SE of Mashhad in NE Iran, an isolated elongated hill situated just north of the suture line of the Palaeotethys. On the geological map (Afshar-Harb et al. 1986), the area has been mapped as Chaman Bid and Mozduran formations, lithostratigraphic units corresponding to the upper Middle (Callovian) and Upper Jurassic. However, logging of the exposed rocks of the area revealed a succession starting with the siliciclastic Upper Bajocian-Bathonian Kashafrud Formation, which grades into the mixed siliciclastic-carbonate Chaman Bid Formation with macrocephalitid and hecticoceratid ammonites (Callovian). In the upper part of the exposed succession, a major fault, the presence of which can be deduced only on biostratigraphic evidence, separates the Jurassic from the Cretaceous succession. The latter is shown in Textfigure 3. The Cretaceous rocks comprise 160 m (an additional 80 m on top of the measured section of Textfigure 2 are very poorly exposed and developed largely in a fine-grained silty-marly facies with occasional interbeds of sharp-based tempestitic or turbiditic sandstone). Finds of the ammonite *Hypacanthoplites* at several levels close to the base of the Cretaceous part give a Late Aptian-earliest Albian age for this part of the succession. Based on the chronostratigraphic data and a certain lithological similarity, the Cretaceous strata at Radar section must be regarded as lateral equivalents of the Sanganeh Formation of the Koppeh Dagh.

The Cretaceous succession (base measured at N 36° 10´ 32´´, E 59° 49´ 44´´) consists overwhelmingly of silty to fine-sandy marls, at some levels with intercalations of thin bioclastic or oolitic pack-, grain-, or rudstone beds. However, the most conspicuous feature of the section is the occurrence of large blocks of limestone that are intercalated between the fine-grained background sediment at several levels (Textfigs 3, 4). Most blocks are elongated. They are arranged more or less parallel to bedding, but some of them are overturned as is shown by geopetal fills. The blocks are up to 2.5 x 6 x 10 m in size. Most of them exhibit a reef framework, whereby differences exist between blocks with respect to the composition of the reef-building und reef-dwelling fauna. In blocks at the second olistolith level, for example, the reef framework consists of a low diversity coral fauna (largely thin, sheet-like microsolenids and *Thecosmilia*), and some calcareous sponges, associated with the bivalve *Chlamys* and some brachiopods. In contrast, the diversity of corals, calcare-

ous sponges, and of the associated reef-dwelling fauna at *level 1* is considerably higher. The latter includes several species of serpulids, terebratulid brachiopods, gastropods (ampullinids, *Pseudomelania*, *Ataphrus*), echinoderms (crinoid stems, cidaroid plates and spines), and bivalves (*Rastellum*, *Plagiostoma*, *Radulopecten*). The sedimentary matrix of the reef framework varies from mudstone to packstone. Other olistoliths consist of nodular mudstone. Smaller blocks (<1 m^3) may also consist of *Tubiphytes* rudstone, microbialite, oo-grainstone or calcareous fine-grained sandstone with superficial ooids. A characteristic feature of the blocks is that all of them show karst features in the form of solution cavities that are filled with reddish silt. Associated with the blocks are usually layers, a few decimetres in thickness, which consist of pebbly shelly micrite.

At several levels between the olistoliths, deeply incised channel structures, filled with chaotically arranged angular to rounded, polymict (limestone, chert or sandstone) clasts in a matrix of silty fine-grained sandstone, occur. Wood fragments and a variety of skeletal components (corals, sponges, crinoids and bivalves) are associated with the channel fills.

Coral level 2 (Textfig. 3) is a biodebris layer near the base of a purplish-greenish marly silt unit. Apart from corals, sphinctozoans, microbial lumps, bivalves and some serpulids occur.

Based on the observed features, the palaeoenvironmental setting of the Cretaceous strata can be summed up as follows: The fine-grained background sediment is characteristic of a basinal setting, which episodically received influx of sediment from a nearby carbonate platform. This sediment input occurred either in form of olistoliths, as debris flows within well defined channel structures, or as turbidites (particularly in the upper part of the section). Up-section, the influx of coarse clastic material diminished, suggesting that influence of the carbonate platform gradually decreased. The solution features occurring in the blocks indicate that they were fully lithified. Most likely they stem from reefs fringing the carbonate platform, which was occasionally subaerially exposed and underwent early diagenetic lithification. The reddish colour of some of the sediments may stem from lateritic soil that was washed into the basin. The wood fragments associated with the channel deposits also point to some land areas nearby, most likely in form of small islands (exposed parts of the carbonate platform). Olistolith formation possibly was triggered by earthquakes, which destroyed the margins of the platform. The platform edge and slope probably were arranged roughly east-west, because the direction of the largest channel structure was 160°/340°.

Interestingly, no Cretaceous rocks of carbonate platform origin exist today within the area. Therefore they must have become completely eroded. The platform most likely was situated in the south, extending northwards from the area of the present-day Binalud Mountains. A position in the north is less likely, because the facies of the Sanganeh Formation in the Koppeh Dagh area indicates a deep marine environment.

3. Material and terminology

Altogether 94 specimens were available for study. They are housed in the collections of the Bayerische Staatssammlung für Paläontologie und Geologie, Munich (prefix PIW2007II).

Abbreviations of measurements

Ab	angle of bifurcation
Att	diameter of attachment area
c'c'	distance between centers of corallites of adjacent series
cc	minimum distance between centers of corallites
Cf	calicular fossa
d	diameter of corallites
D	diameter of corallum
Dbr	diameter of branches
Dc	density of costae per 2 mm (when not mentioned otherwise)
Ds	density of septa at the periphery (or where septa are almost parallel) per 2 mm (when not mentioned otherwise)
Dt.c	depth of calice
Dt	number of trabeculae at the distal margin of the septa per 2 mm (when not mentioned otherwise)
Dtab	number of tabular dissepiments per 2 mm (when not mentioned otherwise)
H	height of corallum
Hbd	height of first budding
Lc	length of collines (in case of one measurement the value indicates maximum length)
Mls	maximum length of series
Nbr	number of branches
Nc	number of costae
Ns	number of septa
Shape	shape of corallum
TS	transverse section
Wp	width of peritheca
Ws	width of series

In the literature a few terms, not formally defined and therefore remaining unclear, were used by earlier workers in order to describe corals. In the present paper, we take the opportunity to define them.

rugae: means wrinkles or plicae.

4. Taxonomy

Class Anthozoa Ehrenberg, 1834
Subclass Zoantharia Blainville, 1830
Order Scleractinia Bourne, 1900
Suborder Astrocoeniina Vaughan & Wells, 1943
Family Actinastraeidae Alloiteau, 1952

Remarks: The morphological characters of the genera described here agree well with the diagnostic characters of the family. However, the pali at the inner edge of septa of the first two cycles are not uniformly developed. The genera *Columactinastrea* Alloiteau, 1952 and *Stephanastrea* Étallon, 1864 are mainly differentiated on the basis of pali arranged in one or two crowns, respectively (Wells 1956: F370). Our collection includes specimens of both genera, but in the same specimen it is occasionally impossible to recognize pali in some of the calices, whereas in adjacent calices they

Table 2: Dimensions (in mm) of *Actinastraea pseudominima* (Koby)

	H	Dbr	d	c-c	Ns
PIW2007II 89	36.8	11.6-9.0	1.8-3.5	1.5-3.2	13-23
PIW2007II 92	5.4	-	12.5-3.5	2.0-3.0	18-24

Table 3: Dimensions (in mm) of *Columactinastrea torallolensis* (Reig Oriol)

	H	Dbr	d	c-c	Ns	Ds
PIW2007II 66	45	7.3-13.6	2.8-3.8	2.9-3.3	25	4/ 2 mm
PIW2007II 91	37.3	5-6	3-4	3-4	22-29	4-5/ 2 mm
PIW2007II 94	27.5	8-11	3.5-4.0	3.7-4.0	30	5/ 2 mm

are well developed. In these cases the pali either constitute an epigenetic character or possibly became fused with the septa during diagenesis.

Genus *Actinastrea* d'Orbigny, 1849
Type species *Astrea goldfussi* d'Orbigny, 1849 [= *Astrea geminata* Goldfuss, 1826 (pars)].

Actinastraea pseudominima (Koby, 1897)
Pl. 1, Figs 1–2

*1897 *Astrocoenia pseudominima* sp. nov. – Koby: 59, pl. 15, figs 4, 4a.
1998 *Actinastraea* aff. *pseudominima* (Koby) – Morycowa & Masse: 738, pl. 10, fig. 2.
2003 *Actinastraea* aff. *pseudominima* (Koby) – Baron-Szabo et al.: 201, pl. 36, figs 5–6.

Material: Two specimens from level 1 (PIW2007II 89, 92).

Dimensions: see Table 2.

Description: Corallum colonial, small, ramose to flat, cerioid. Budding intracalicular. Calices subcircular to polygonal in outline. Septa compact, occasionally anastomosing, non-confluent to sub-confluent with those of adjacent calices, arranged in three cycles, inner margins of primary septa (up to 8 septa) fused in the center. Corallite wall septoparathecal. Columella well developed, thickened by the inner edges of the septa.

Remarks: The specimens are poorly preserved, hence details of the microarchitecture of septa could not be observed. However, morphological features such as cerioid colony, small diameter of calices with polygonal outline, a few compact, occasionally anastomosing septa, inner margin of primary septa fused in the center, septoparathecal wall and well developed columella thickened by the inner edges of the septa, and the dimensions match well *Actinastraea pseudominima* (Koby).

Genus *Columactinastrea* Alloiteau, 1952
Type species *Columactinastrea rennensis* Alloiteau, 1952

Columactinastrea torallolensis (Reig Oriol, 1989)
Pl. 1, Figs 3–5

*1989 *Placocolumastraea torallolensis* sp. nov. – Reig Oriol: 7, pl. 4, figs 1–2.
1998 *Columactinastrea guadelupae* (Wells) – Baron-Szabo: 130, pl. 1, fig. 2.
2000 *Columactinastrea guadelupae* (Wells) – Baron-Szabo: 98, pl. 1, fig. 5.
2006 *Columactinastrea torallolensis* (Reig Oriol) – Baron-Szabo: 23, pl. 2, fig. 4.

Material: Three specimens from level 1 (PIW2007II 66, 91, 94).

Dimensions: See Table 3.

Description: Corallum colonial, ramose, columnar and cerioid to superficially sub-thamnasterioid. Calices small, distinct, shallow, subcircular in outline. Septa compact, moderately thick, few, bipinnate, thickest at the periphery and thinning towards the center, confluent to sub-confluent with those of adjacent corallites, occasionally anastomosing, arranged in three cycles; the larger septa (numbering 6 or 9) nearly reaching the center. Septa of second and third cycles increasingly shorter. Pali next to inner edge of about 8 septa from the first and second cycle arranged roughly in one ring (one crown). Lateral surface of septa ornamented with fine granules and spinules. Dissepiments common. Budding intracalicular. Wall parathecal. Columella small, distinct, trabecular. One or a few of primary septa occasionally fused with columella.

Remarks: The morphological features, such as cerioid growth structure, small calices with a few septa, pali arranged in one crown, and distinct trabecular columella agree well with the genus. The superficially sub-thamnasterioid nature of septa is similar to *Columactinastrea dumortieri* de Fromentel, 1886 (Alloiteau 1952: 624, pl. 4, fig. 1), while the dimensions of the skeletal elements closely correspond to *C. torallolensis* (Reig Oriol, 1989).

Table 4: Dimensions (in mm) of *Stephanastrea simonneliana* (d'Orbigny)

	D	H	d	c-c	Ns
PIW2007II 56	130-121.5	84.5	2.1-4	2.1-4	18-23

Table 5: Dimensions (in mm) of *Enallocoenia crassoramosa* (Michelin)

	H	Dbr	d	c-c	Ns
PIW2007II 49	36	17.2-14.7	2.5-3.5	-	22-24 (7+7+10)
PIW2007II 51	45.2	24.2	2.5-3.5	2.9-3.9	12-20 (10+10)
PIW2007II 65	74.7	18-23	3-3.5	2.1-3.3	19-20 (10+10)

Genus *Stephanastrea* Étallon, 1864
Type species *Stephanastrea ramulifera* Étallon, 1864

Stephanastrea simonneliana (d'Orbigny, 1850)
Pl. 2, Fig. 1a–c

*1850 *Synastrea simonneliana* sp. nov. – d'Orbigny: 293.
1850 *Stephanocoenia bernardiana* sp. nov. – d'Orbigny: 292 [fide Lathuilière 2000a].
1966 *Stephanastrea montuosa* sp. nov. – Beauvais: 990, pl. 1, figs 1–2.
2000a *Stephanastrea simonneliana* (d'Orbigny) – Lathuilière: 53, figs 3.1–3.13 [cum syn.].
2006 *Stephanastrea simonneliana* (d'Orbigny) – Pandey & Fürsich: 46, pl. 1, figs 9a, b.

Material: One specimen from level 1 (PIW2007II 56).

Dimensions: See Table 4.

Description: Corallum colonial, large massive, conical, cerioid, sub-plocoid to sub-thamnasterioid. Upper surface of colony uneven, lower surface narrowing down to small attachment area. Corallites distinct, small, moderately deep, hexagonal, pentagonal, tetragonal to subcircular in outline, bordered by parathecal wall. Budding intracalicular. Septa compact, more or less uniformly thick, rarely anastomosing, arranged roughly in three cycles. Septa of first cycle longest, those of second and third cycles increasingly shorter, maximum thickness at periphery and thinning towards the center. At their inner edge septa of the first two cycles bulge out into pali, forming roughly two rings (crowns). Dissepiments common near the periphery of corallites. Columella small, trabecular. One or two primary septa occasionally fuse with the columella.

Remarks: The small, polygonal corallites with parathecal wall, a low number of septa, two rings of pali, and the trabecular columella refer the present specimen to *Stephanastrea* Étallon. The dimensions of the specimen are fully within the range of variation of *Stephanastrea simonneliana* (d'Orbigny, 1850).

Genus *Enallocoenia* d'Orbigny, 1849
Type species *Astrea crasso-ramosa* Michelin, 1840

Remark: The validity of the genus has been discussed in detail by Pandey & Fürsich (2003: 13).

Enallocoenia crassoramosa (Michelin, 1843)
Pl. 2, Figs 2a–b, Pl. 3, Figs 1a–b, 2a–b

*1843 *Astrea crasso-ramosa* sp. nov. – Michelin: 109, pl. 25, fig. 2.
2003 *Enallocoenia crassoramosa* (Michelin) – Pandey & Fürsich: 13, pl. 2, fig. 7 [cum syn.].

Material: Three specimens from level 1 (PIW2007II 49, 51, 65).

Dimensions: See Table 5.

Description: Corallum colonial, ramose and cerioid with a moderately large attachment area. Calices small, distinct, moderately deep, hexagonal, pentagonal to sub-polygonal in outline. Septa compact, moderately thick, few in number, thickest at the periphery and thinning towards the center, non-anastomosing to rarely anastomosing, non-confluent, arranged in three cycles; the larger ones (numbering 7–10) nearly reach-

Plate 1:
Figs 1–2: *Actinastraea pseudominima* (Koby, 1897) from level 1. **1:** Side view of a ramose, cerioid corallum. Note small diameter and polygonal outlines of the calices; scale bar 10 mm; PIW2007II 89. **2:** Close-up of a small part of colony showing compact, occasionally anastomosing septa. Note three distinct cycles of septa; scale bar 5 mm; PIW2007II 92.
Figs 3–5: *Columactinastrea torallolensis* (Reig Oriol, 1989) from level 1 showing ramose, columnar and cerioid to superficially sub-thamnasterioid colonies. **3:** Specimen PIW2007II 66, a) side view, scale bar 10 mm, b) close-up of small part of the colony showing pali arranged in one crown, scale bar 5 mm. **4:** Specimen PIW2007II 91, a) side view, scale bar 10 mm, b) close-up of small part of the colony showing a few corallites, scale bar 5 mm. **5:** Side view showing a superficially sub-thamnasterioid colony, pali arranged in one crown and a small, distinct, trabecular columella; scale bar 5 mm; PIW2007II 94.

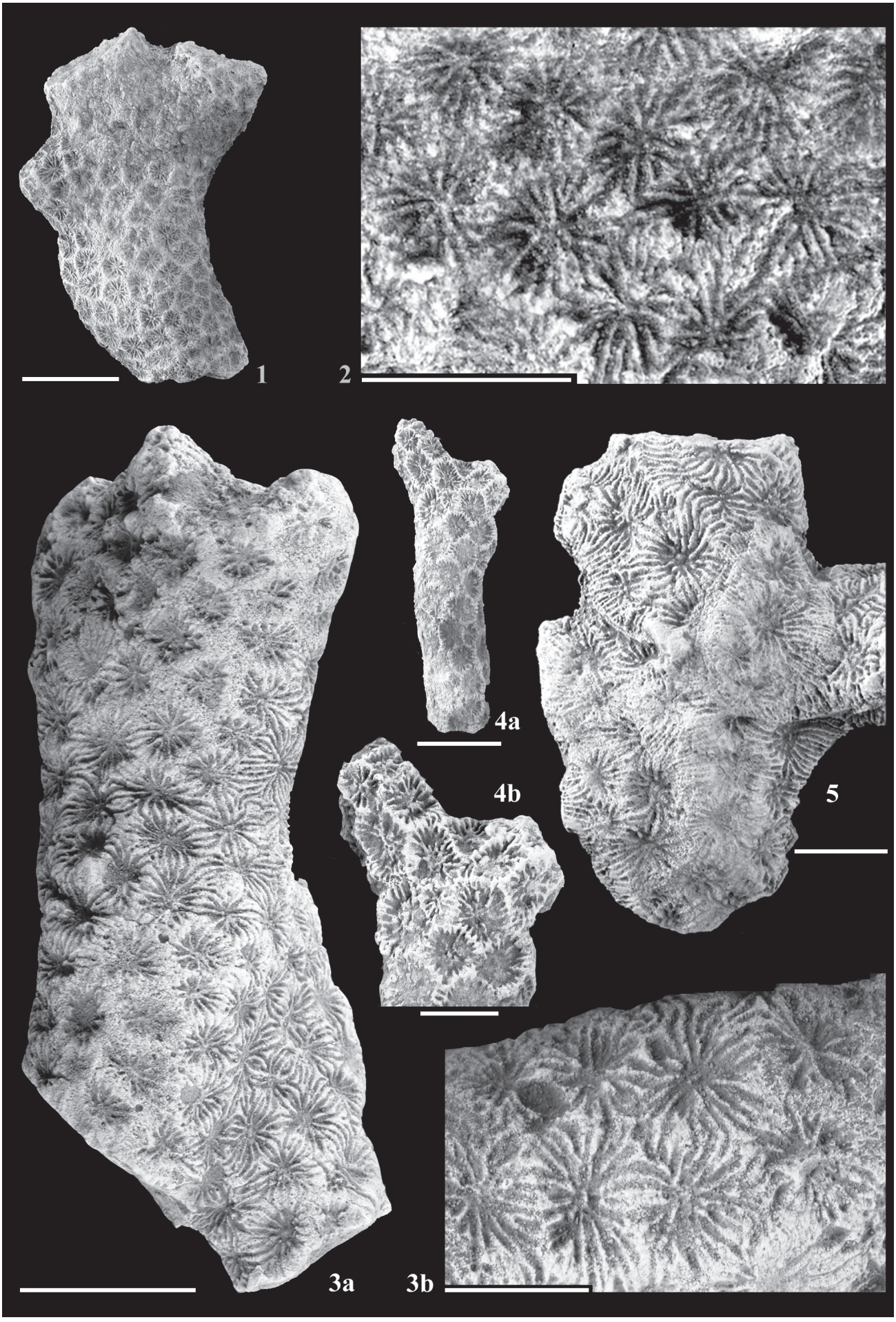

1
2
3a
3b
4a
4b
5

Table 6: Dimensions (in mm) of *Cladophyllia* cf. *furcifera* Roemer

	D	H	Ns	Ds/ 2 mm	att. area	Cf	Dt.c	shape
PIW2007II 26	14.3/12.5	10.5	34	2	broken	3, circular	2.6	cup-shaped

ing the center, occasionally joined to the columella. Septa of second cycle shorter and those of third cycle rudimentary or very short. Distal margin of septa finely denticulated. Lateral surfaces ornamented with very fine granules and spinules. Dissepiments common. Budding intracalicular. Wall thin, septoparathecal. Columella small, distinct, trabecular.

Remarks: The specimens are fragmentary. It seems that the rare cases of anastomosing septa are early stages of intracalicular budding. The columella is not seen in all corallites. The morphological features and dimensions match well those of *Enallocoenia crassoramosa* (Michelin) described by earlier worker from the Jurassic. One of the specimens differs in showing bulging inner edges of the primary septa. In this respect it is comparable to *Stephanastrea simonneliana* d'Orbigny (see above). However, the specimen can be readily distinguished from the latter species on the basis of its septoparathecal wall and alternating septa of adjacent calices. The bulges at the inner edge of septa may not correspond to pali, as it not a conspicuous and uniform feature.

Family Cladophylliidae Morycowa & Roniewicz, 1990

Genus *Cladophyllia* Milne Edwards & Haime, 1851b
Type species *Lithodendron dichotomum* Goldfuss, 1826, Upper Jurassic of Germany (Giengen)

Cladophyllia cf. *furcifera* Roemer, 1888
Pl. 5, Fig. 4a–b

cf. *1888 *Cladophyllia furcifera* sp. nov. – Roemer: 8, pl. 1, fig. 4a–b.
cf. 1933 *Cladophyllia furcifera* Roemer – Wells: 90, pl. 8, figs 5–8.
cf. 1993 *Cladophyllia furcifera* Roemer – Baron-Szabo: 160, pl. 4, fig. 3.
cf. 1997 *Cladophyllia furcifera* Roemer – Baron-Szabo & Fernández-Mendiola: 40, fig. 5a [cum syn.].

Material: One specimen from level 1 (PIW2007II 26).

Dimensions: see Table 6.

Description: Fragment of a dendroid colony. Calice shallow, circular in outline. Costo-septa thick, compact, distal margin asymmetrically curved with the maximum projection near the periphery. Septa of opposite sides merge in the manner of a beginning septal division (sensu Morycowa & Roniewicz 1990). Dissepiments common. Columella trabecular. Wall septo-parathecal.

Remarks: The merging of opposite septa, which divide the corallite and form two new corallites, is very typical of the genus *Cladophyllia* (see Morycowa & Roniewicz 1990: 172, fig. 2). The dimensions of the new corallites correspond to this species. The diameter (D) of the Iranian specimen (Table 6) is larger because it is in a budding stage and therefore represents two growing corallites.

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 regularis Fromentel, 1867
Pl. 3, Fig. 3a–b

*1867 *Stylina regularis* sp. nov. – Fromentel: 514, pl. 135, fig. 1.
1996 *Stylina regularis* Fromentel – Baron-Szabo & Steuber: 6, pl. 1, figs 3–4.
1997 *Stylina regularis* Fromentel – Turnšek: 192, pl. 192, figs A–E [cum syn.).
2002 *Stylina regularis* Fromentel – Baron-Szabo: 178, pl. 123, figs 2–5.

Material: Two specimens from level 1 (PIW2007II 50, 68).

Dimensions: See Table 7.

Description: Corallum colonial, moderately large to small, ramose to pedunculate, plocoid. Calices circular in outline. Coenosteum thin to thick, costate. Septocostae confluent to non-confluent, occasionally touching at right angles. Septa compact, hexamerally arranged in two cycles, those

Plate 2:
Fig. 1: *Stephanastrea simonneliana* d'Orbigny, 1850 from level 1. a) upper view, scale bar 10 mm, b) side view, scale bar 10 mm, c) close-up showing some calices. Note the cerioid, sub-plocoid to sub-thamnasterioid colony, pali forming roughly two rings (crowns), and one or two primary septa that occasionally fuse with the columella; scale bar 5 mm; PIW2007II 56.
Fig. 2: *Enallocoenia crassoramosa* (Michelin, 1843) from level 1, scale bar 5 mm; a) side view showing ramose and distinct cerioid colony, b) close-up view showing non-anastomosing septa with occasionally bulging inner edges and septoparathecal wall; PIW2007II 49.

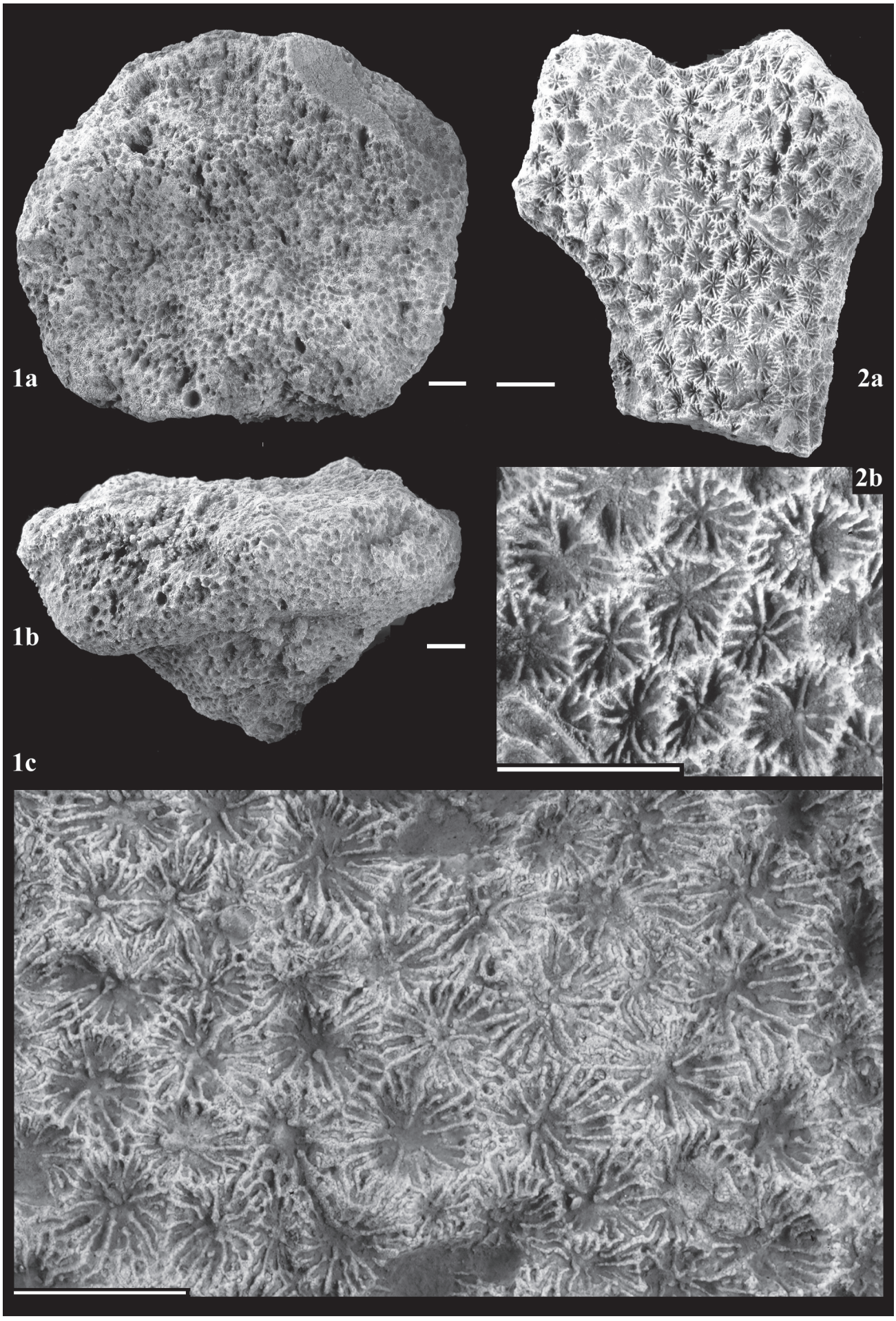

1a
2a
1b
2b
1c

Table 8: Dimensions (in mm) of *Stylina micropora* Koby

	d	Ns	Nc	c-c	Wp
PIW2007II 52	2.2-3.3	12 (6+6)	12	3.3	up to 2.1
PIW2007II 67	1.2-3.1	12 (6+6)	~12	1.8-3.0	up to 1.0
PIW2007II 69	1.0-1.6	12 (6+6), 16	~12	1.4-2.0	up to 1.0

of first cycle long, nearly reaching the center, most of them joined to the columella. Septa of second cycle shorter. Costae corresponding to septa, occasionally those of the third cycle just touching the wall. Endothecal and exothecal dissepiments common. Wall septoparathecal. Columella styliform, thickened by inner edges of first cycle of septa.

Remarks: Auriculae along the inner edge of the septa are not seen. Occasionally the inner edges of septa of the second cycle exhibit bulging. The present specimens are close to *Stylina microммata* Quenstedt (1857: 701, pl. 85, fig. 2, Pandey & Fürsich 2003: 16, pl. 2, fig. 6) with respect to the small diameter of corallites and the number of costosepta, but poorly developed auricles differentiate the present specimens from this Jurassic species. In this respect, and based on other morphological features as well as on dimensions, the present specimens closely match *Stylina regularis* Fromentel, 1867 described from Lower Cretaceous strata.

Stylina micropora Koby, 1896
Pl. 4, Fig. 4

*1896 *Stylina micropora* sp. nov. – Koby: 25, pl. 5, fig. 3, pl. 6, fig. 1 (non pl. 5, fig. 4).
2003 *Stylina micropora* Koby – Baron-Szabo et. al.: 208, pl. 36, figs 1–2 [cum syn].

Material: Three specimens from level 1 (PIW2007II 52, 67, 69).

Dimensions: See Table 8.

Description: Corallum colonial, small, nodular to club-shaped, plocoid. Calices circular in outline. Coenosteum thin to thick, costate. Septocostae non-confluent, occasionally touching at right angles. Septa compact, hexamerally arranged in two cycles, those of first cycle long, nearly reaching the center. Septa of second cycle shorter. Costae corresponding to septa. Endothecal and exothecal dissepiments common. Endothecal dissepiments both more tabular than vesicular. Wall septoparathecal. Columella styliform.

Remarks: This species and *Stylina regularis* Fromentel, 1867 described above are close to each other with respect to morphological features and dimensions. Baron-Sazabo et al. (2003: 208) mentioned that they can be differentiated on the basis of the number of costae (24 in *regularis* and 12 in *micropora*). However, a close look at the specimen assigned on this basis to *Stylina regularis* reveals that the costae of one calice may reach the wall of an adjacent calice. In this case the costae are confluent and their number increases correspondingly from 12 to 24. In other areas of the same corallum the costae are short and are not confluent with those of adjacent calices. This suggests that the true number of costae may be easily mistaken. Consequently, the independent status of *Stylina micropora* Koby is questionable. Secondly, the diameter of calices in the present specimens is slightly larger than that recorded in *Stylina micropora* (d: 0.9–1.5 mm). In this respect, the specimen described above as *Stylina regularis* Fromentel is also close to *Stylina micropora* Koby. Taking into account the variation of these two features, which form the main basis of differentiating the two species, we recommend to merge *Stylina micropora* Koby with *Stylina regularis* the latter having priority. However, until the type specimens of the two species are studied, we prefer to retain their present status.

Genus *Heliocoenia* Étallon, 1859
Type species *Heliocoenia variabilis* Étallon, 1859

Heliocoenia carpathica Morycowa, 1964
Pl. 4, Fig. 5a–b

*1964 *Heliocoenia carpathica* sp. nov. – Morycowa: 42, pl. 6, fig. 3, pl. 7, figs 4–5, pl. 8, figs 1a–c, 2, pl. 11, fig. 3, textfig. 5.
2002 *Heliocoenia carpathica* Morycowa – Baron-Szabo: 179, pl. 124, figs 2, 4.

Material: One specimen from level 1 (PIW2007II 48).
Dimensions: See Table 9.

Description: Corallum colonial, moderately large, hemispheroidal, massive and plocoid with large resting area.

Plate 3:
Figs 1–2: *Enallocoenia crassoramosa* (Michelin, 1843) from level 1. **1:** Specimen PIW2007II 51, a) side view showing ramose, cerioid colony, scale bar 10 mm, b) close-up view showing non-anastomosing septa with distinct columella, scale bar 2.5 mm. **2:** Specimen PIW2007II 65, a) side view showing ramose, cerioid colony, scale bar 10 mm, b) close-up view showing non-confluent septa, arranged in three cycles, scale bar 2.5 mm.
Fig. 3: *Stylina regularis* Fromentel, 1867 from level 1. a) Side view showing ramose, plocoid colony, scale bar 10 mm, b) close-up view showing columella thickened by inner edges of first cycle of septa and costae, scale bar 2.5 mm; PIW2007II 50.

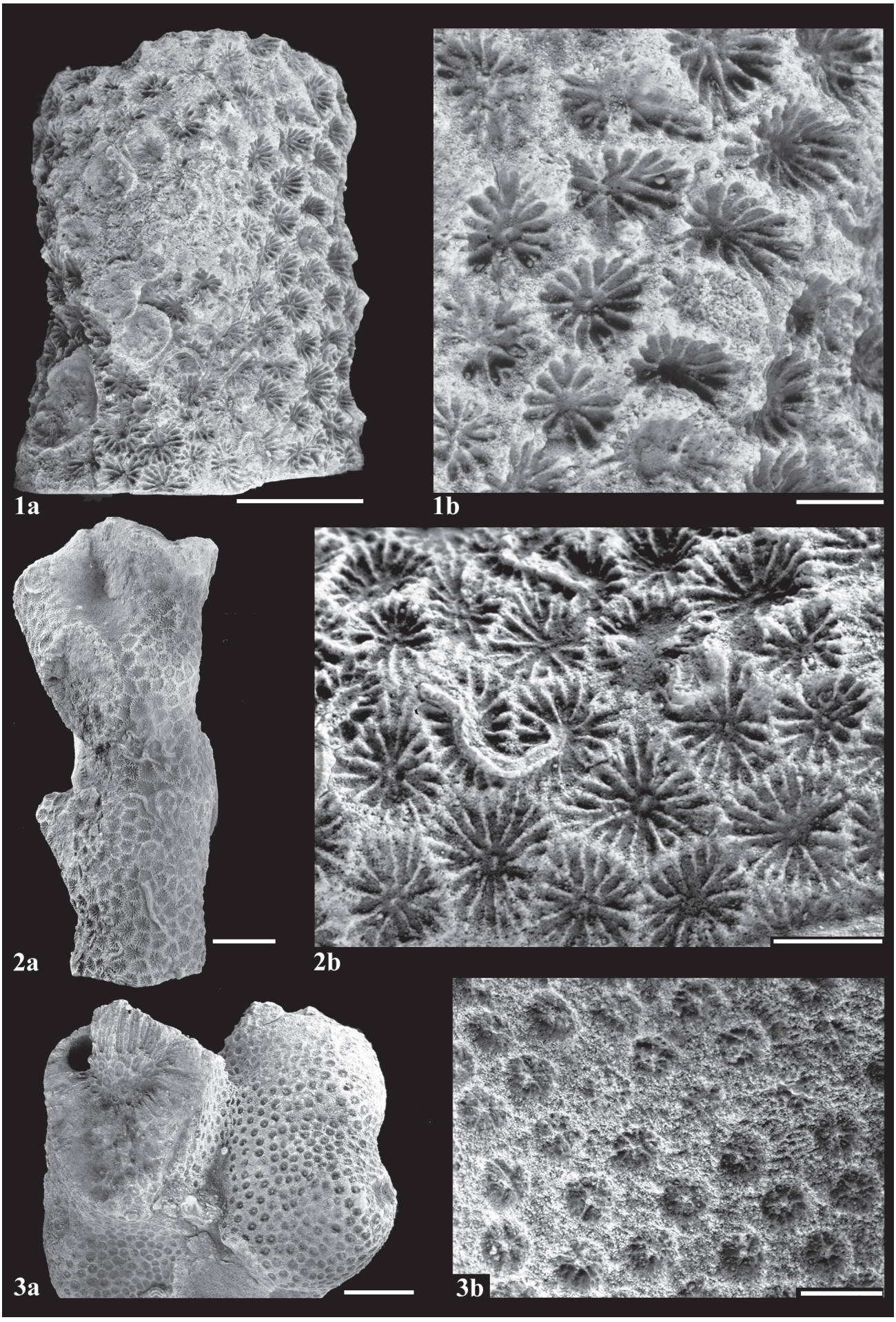

1a
1b
2a
2b
3a
3b

Table 9: Dimensions (in mm) of *Heliocoenia carpathica* Morycowa

	D	H	d	c-c	Ns	Wp
PIW2007II 48	71.5	61	d: 2-3.9	3-6	24 (6+6+12)	up to 3

Corallites small, densely packed, circular to subpolygonal in outline. Coenosteum thick, upper surface smooth. Budding extracalicular, intracalicular, biseptal, or marginal. Septa compact, thin to thick, hexameral in arrangement. Septa of first cycle long, nearly reaching the columella, occasionally joined to it. Septa of second and third cycle increasingly shorter. Auriculae along inner edges of septa common. Endothecal dissepiments common. Columella well developed, styliform, elongated in cross-section. Wall septoparathecal thickened by stereozone.

Remarks: Morphological features such as the plocoid colony, auriculae along the inner edge of the septa, an elongated cross-section of the columella, and smooth upper surface of coenosteum suggest that the specimen belongs to *Heliocoenia* Étallon. Costae are generally not preserved; they may have been obliterated during diagenesis. However, in a few cases costae can be observed to some extent, which suggests that their number is just twice the number of septa, i.e. 48. The present specimen closely matches *H. carpathica* recorded from the Lower Cretaceous of the Carpathian Mountains (Morycowa 1964).

Family Cyathophoridae Vaughan & Wells, 1943

Genus *Cyathophora* Michelin, 1843
Type species *Cyathophora richardi* Michelin, 1843

Remarks: The genus *Nowakocoenia* Kołodziej (in Kołodziej & Gedl 2000) appears very similar to *Cyathophora* Michelin and *Cryptocoenia* d'Orbigny. According to Kołodziej, the main difference between *Nowakocoenia* and other cyathophorid genera is the development of the corallite wall prior to the development of the septa. Löser (2006) questioned this conclusion, arguing that this kind of successive development of corallite wall and septa could only be seen in serial sections. According to him "serial sections beginning from the top of the colony would be needed to support these arguments, but no such sections were provided by the authors of *Nowakocoenia*. Until such is proven to be the case in the type material of *Nowakocoenia cieszynica*, it is considered synonymous with *Holocystis dupini*, and therefore the genus is synonymous with *Holocystis*" (Löser 2006: 290). However, Löser did not provide the evidence, which, according to him, would be the only way to prove the author of *Nowakocoenia* wrong. Also, he did not provide the same kind of evidence (serial sections) for the species *Holocystis dupini*, which according to his own arguments (Löser 2006) would be the only way of telling whether or not it was the same taxon, or for that matter, whether it belonged to *Holocystis* or *Nowakocoenia*. Thus, the merging of *Holocystis dupini* and *Nowakocoenia* lacks supporting evidence and is, therefore, rejected.

Cyathophora bourgueti (Defrance, 1826)
Pl. 4, Figs 2a–b, 3

*1826	*Astrea bourgueti* sp. nov. – Defrance: 380.
1990	*Cyathophora bourgueti* (Defrance) – Errenst: 166, pl. 2, fig. 3a–c [cum syn.].
1990	*Cyathophora claudiensis* Etallon – Errenst: 167, pl. 2, fig. 4a–d [cum syn.].
1991	*Cyathophora claudiensis* Etallon – Lauxmann: 114 [cum syn.].
1993	*Cyathophora bourgueti* (Defrance) – Bertling: 84, pl. 1, fig. 3 [cum syn.].
2002	*Cyathophora bourgueti* (Defrance) – Pandey, Lathuilière, Fürsich & Kuldeep: 350, figs 3–8 [cum syn.].

Material: Four specimens from level 1 (PIW2007II 53–54, 82–83).

Dimensions: See Table 10.

Description: Corallum colonial, small, discoidal, pebbly to columnar, plocoid to cerioid. Upper surface slightly arched to uneven. Corallites subcircular to polygonal in cross-section; mostly hexagonal, pentagonal, or tetragonal. Calices very conspicuous, deep. Budding both intercalicular and intracalicular-septal. Tabulae thin, common, convex-up, wavy to convex

Plate 4:
Fig. 1: *Myriophyllia propria* Sikharulidze, 1979 from level 1. a) Upper surface view, scale bar 10 mm, b) close-up view of the upper surface showing meandroid colony with calices arranged in irregularly ramified, wavy to straight series, scale bar 5 mm; PIW2007II 45.
Figs 2–3: *Cyathophora bourgueti* (Defrance, 1826) from level 1. **2:** Specimen PIW2007II 53, a) close-up of a small part of colony showing rudimentary septa, scale bar 5 mm, b) longitudinal section showing thin, convex-up, wavy to convex-down tabulae joining the wall asymmetrically, scale bar 4 mm. **3:** Specimen PIW2007II 54, scale bar 10 mm, upper surface view of the colony. Note the ploco-cerioid colony with sub-circular to polygonal outline of corallites.
Fig. 4: *Stylina micropora* Koby, 1896 from level 1. Side view showing club-shaped, plocoid colony. Note costate coenosteum, scale bar 5 mm; PIW2007II 52.
Fig. 5: *Heliocoenia carpathica* Morycowa, 1964 from level 1. a) Close-up view showing wall thickened by stereozone, scale bar 5 mm, b) side view showing hemispheroidal, massive and plocoid colony. Note densely packed corallites, scale bar 10 mm; PIW2007II 48.
Fig. 6: *Dermosmilia cretacica* Turnšek, 1974 from level 1. a) Side view showing colony dichotomising with large angle of bifurcation. Note the trend of costae at the point of bifurcation, b) calicular view of one of the corallites showing moderately thick septa and a papillose columella, scale bar 5 mm; PIW2007II 33.

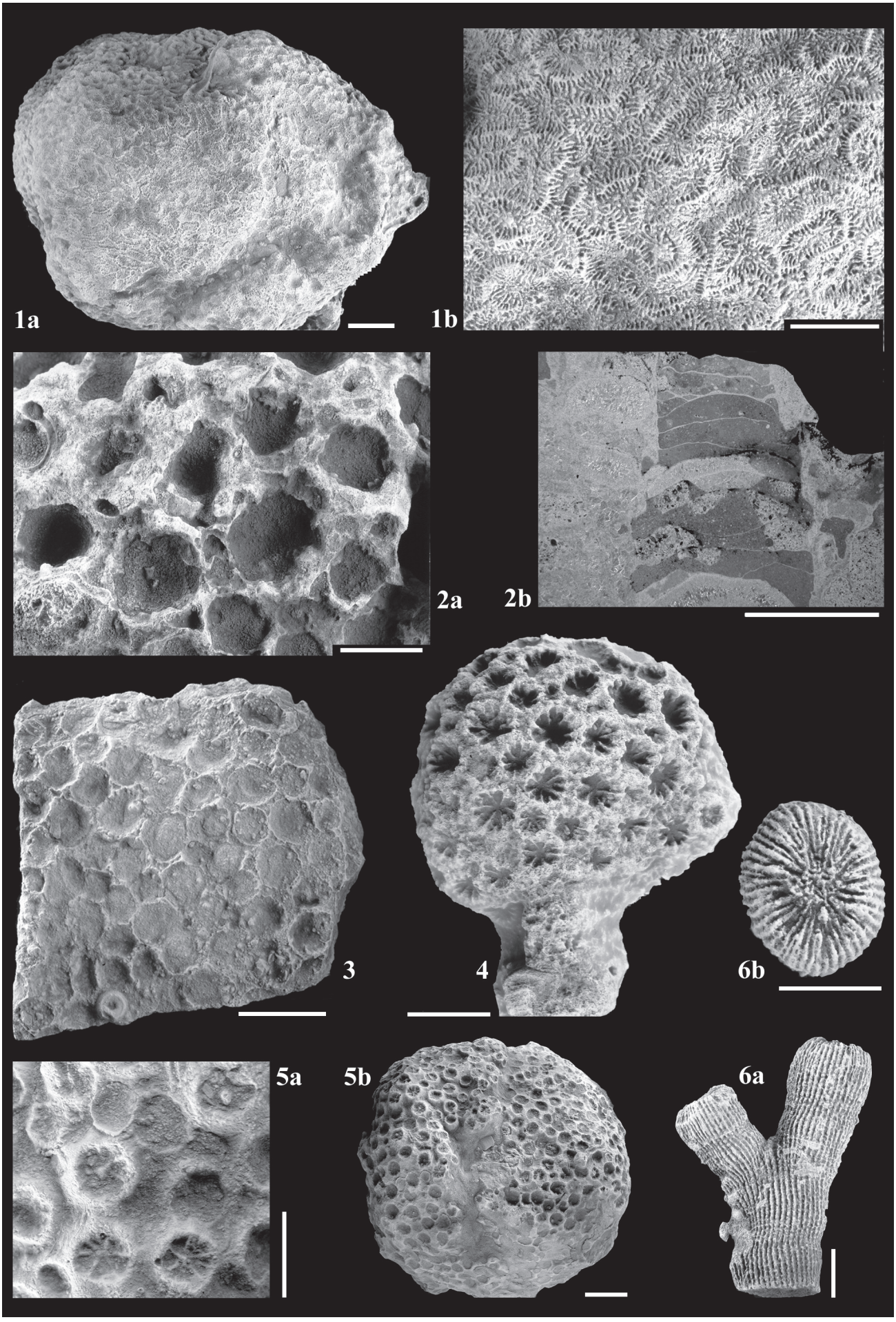

1a
1b
2a
2b
3
4
6b
5a
5b
6a

Table 10: Dimensions (in mm) of *Cyathophora bourgueti* (Defrance)

	D	H	d	c-c	Wp	Ns	Nc	Dtab
PIW2007II 53	45.0/32.3	45.0	6.5-3.5	5-3	up to 2.0	-	-	7-8/ 5 mm
PIW2007II 54	-	-	6.0-3.0	5.0-4.2	-	6	24	7/ 5 mm

Table 11: Dimensions (in mm) of *Rennensismilia inflexa* (Reuss)

	D	H	Ns	Ds/2mm	att/rest area	Cf	Dt.c	shape
PIW2007II 5	28.5/21.5	45	96	3	22.5	5, elongated	4	subturbinate

down, joining the wall asymmetrically. Septa rudimentary, only the first six septa extend from the wall by 1 mm, remaining septa confined to the wall. Wall parathecal.

Remarks: The diameter of corallites in different Jurassic species of *Cyathophora* is quite variable. The number of septa is also not easy to count. In contrast, the morphology and density of tabulae can be easily seen in longitudinal sections. The plocoid to cerioid form, diameter of corallites, number of septa and costae, and density of the prominent tabulae closely correspond to those seen in species of *Cyathophora*.

Cyathophora haysensis Wells (1932: 237, pl. 30, fig. 4; pl. 32, fig. 5; Baron-Szabo et al. 2003: 208, pl. 37, fig. 7; pl. 39. fig. 2), in addition of having small corallite diameters has a higher density of tabulae (4 in 2 mm, i.e. 10 in 5 mm).

Cyathophora steinmanni Fritzsche (1924: 316, pl. 3, fig. 8; pl. 4, fig. 3; Morycowa 1964: 24, pl. 3, fig. 2a–b; pl. 5, figs 2–3) has more septa (numbering 12–30) and a lower range of density of tabulae (5–7 per 5 mm).

Cyathophora pygmaea Volz (1903: 26, pl. 4, figs 4–7, Turnšek 1997: 65, pl. 65, figs A–F) has a similar density of tabulae (8 per 5 mm) but a very small corallite diameter (0.5–1.2 mm).

Cyathophora bourgueti (Defrance, 1826) sensu "Variation Typ a" of Lauxmann (1991: 114) is close to the present specimens regarding corallite diameter (3.5–7 mm), and radial elements i.e., only the first six septa extend from the wall for 1 mm and all the remaining ones are reduced to the wall. However, there septa are developed in 3–4 cycles. Considering the wide range of variation of this species (Pandey et al. 2002), the Iranian specimens have been assigned to *C. bourgueti* (Defrance).

Suborder Meandriina Alloiteau, 1952
Family Meandriidae Alloiteau, 1952

Genus *Rennensismilia* Alloiteau, 1952
Type species *Trochosmilia didyma* Fromentel, 1862 (non Goldfuss, 1826)

Rennensismilia inflexa (Reuss, 1854)
Pl. 5, Fig. 1a–c.

*1854	*Trochosmilia inflexa* sp. nov. – Reuss: 86, pl. 5, figs 3–5.
1995	*Ellipsosmilia inflexa* Reuss – Tchechmedijeva: 31, pl. 2, fig. 8, pl. 3, fig. 1.
1999	*Rennensismilia inflexa* (Reuss) – Baron-Szabo: 447, pl. 2, fig. 5, pl. 3, fig. 5, pl. 4, fig. 1.
2002	*Rennensismilia inflexa* (Reuss) – Baron-Szabo: 71, pl. 52, figs 4–5, pl. 33, fig. 1.
2006	*Rennensismilia inflexa* (Reuss) – Baron-Szabo: 78, pl. 18, figs 7a, b, 8, textfig. 34 [cum syn.].

Material: One specimen from level 1 (PIW2007II 5).

Dimensions: See Table 11.

Plate 5:

Fig. 1: *Rennensismilia inflexa* (Reuss, 1854) from level 1. a) Calicular view, scale bar 10 mm, b) side view showing a ring of epitheca, scale bar 10 mm, c) transverse section. Note fragments of septa in the axial part giving impression of a lamellar columella; scale bar 5 mm; PIW2007II 5.

Figs 2–3, 5, 7, 9: *Montlivaltia caryophyllata* Lamouroux, 1821. **2:** Specimen PIW2007II 12 from level 1, scale bar 5 mm, a) calicular view, b) side view showing corallum gradually tapering downwards surrounded by thin epithecal wall. **3:** Specimen PIW2007II 7, transverse-section, from level 2 showing compact septa. Note smooth lateral surfaces of septa due to addition of a secondary lamellar layer and abundant dissepiments; scale bar 5 mm. **5:** Specimen PIW2007II 24, part of longitudinal-section, from level 1 showing vesicular dissepiments on the left producing a parathecal wall and tabular dissepiments towards the axial part seen on the top right; scale bar 2.5 mm. **7:** Specimen PIW2007II 13 from level 1. Side view showing thin epitheca; scale bar 5 mm. **9:** Specimen PIW2007II 14 from level 1, a) calicular view, b) side view. Note most part of the epitheca is eroded;s scale bar 5 mm.

Fig. 4: *Cladophyllia* cf. *furcifera* Roemer, 1888 from level 1, a) calicular view, scale bar 5 mm, b) transverse section showing spongy columella. Note dissepiments along the peripheral part of the corallite; scale bar 2.5 mm; PIW2007II 26.

Figs 6, 10: *Montlivaltia moeschi* Koby, 1883 from level 1, scale bar 10 mm. **6:** Side view. Note septa showing trabeculae forming single fan system, PIW2007II 29. **10:** Specimen PIW2007II 4, a) calicular view showing thin septa twisted in the axial part, b) view from below showing twisting of septa in the axial part, c: side view.

Fig. 8: *Montlivaltia cornutiformis* Gregory, 1900 from level 1, scale bar 10 mm, a) calicular view, b) side view. Note truncated base and completely eroded epitheca; PIW2007II 40.

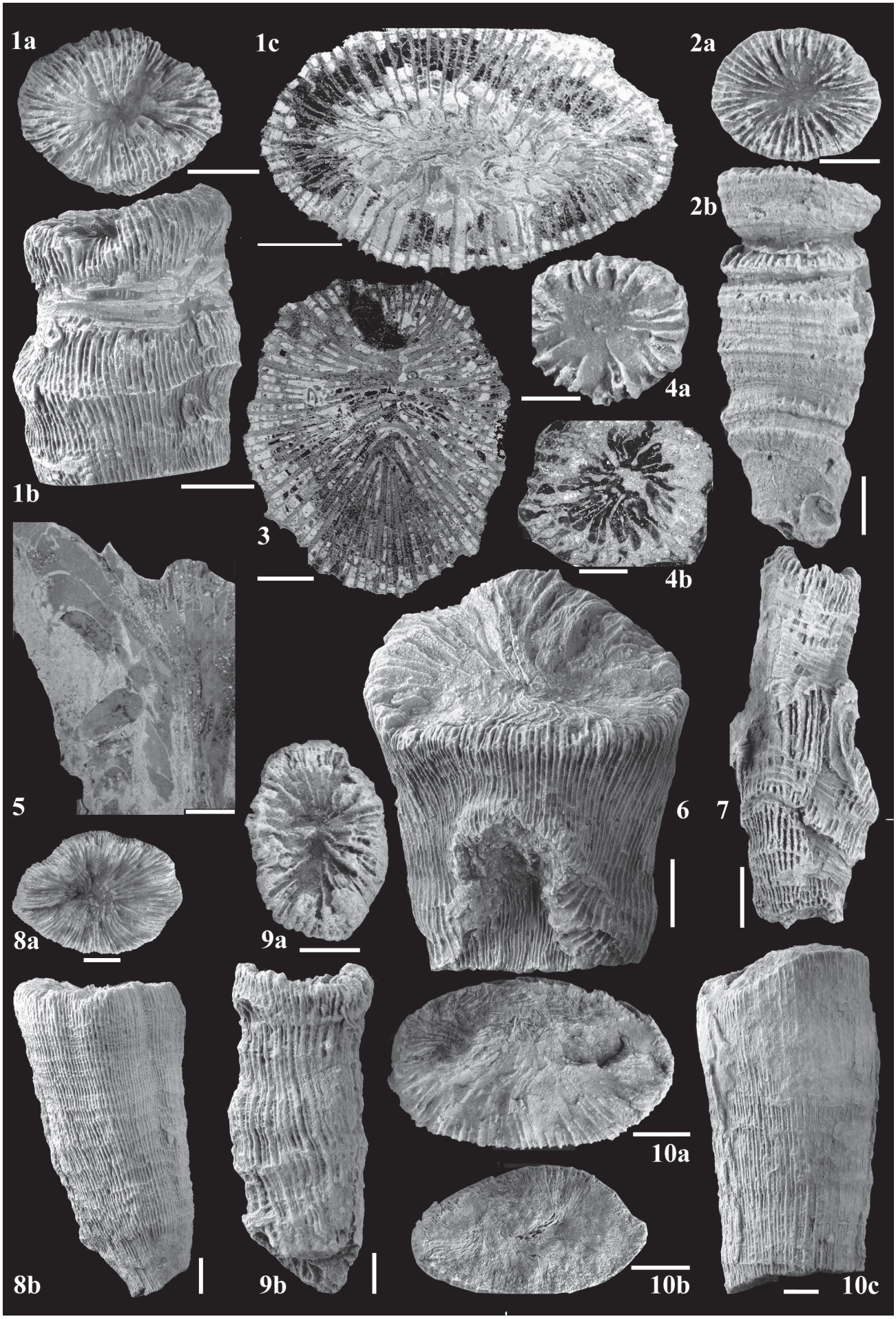

1a
1c
2a
2b
1b
4a
3
4b
5
6
7
8a
9a
8b
9b
10a
10b
10c

Table 12: Dimensions (in mm) of *Montlivaltia caryophyllata* Lamouroux

	D	H	Ns	Ds/2mm	att/rest area	Cf	Dt.c	shape
PIW2007II 6	35.0/27.0	41.5	70	2	26.5	-	>2.5	cup-shaped
PIW2007II 7	30.0/5.0	73	87	3	1/17	Nil	broken	subtrochoid -subcylindrical
PIW2007II 12	14/11	31	71	3	6.5	2.5, oval	2	subturbinate
PIW2007II 13	17.4/10	32	67	4-5	6.5	1.5 subcircular	2	subturbinate
PIW2007II 14	16.5/11.0	39	60	3	12	2, linear	2.5	subturbinate
PIW2007II 21	11.5/8.5	16	51	4-5	6	1, oval	1.8	subturbinate
PIW2007II 22	21/15	25.5	~80	4-5	10	-	-	curved
PIW2007II 24	20/15	23	49	2-3	11.2	Nil	3.4	curved
PIW2007II 25	14/11	26	58	5	9	Nil	1.2	curved

Description: Corallum solitary, moderately large, subturbinate, cross-section near base oval. Calice moderately deep, oval in outline. Septa compact, thick, arranged in five complete cycles, laterally ornamented with small granules. Distal margin of septa asymmetrically curved with the maximum convexity near the periphery, denticles obtusely rounded. Trabecular density 6 per 2 mm. Endothecal vesicular dissepiments abundant near the wall. Columella narrow, the longer axis parallel to the maximum diameter. Wall parathecal, surrounded occasionally by thin epitheca.

Remarks: The specimen is moderately well preserved. The epitheca is mostly eroded and only present in form of rings. The morphological features of the present specimen fall within the range of variation of *R. inflexa* (Reuss). The septa are fragmented along the axial part of the corallum and give the impression of a lamellar columella as observed in *Kobyphyllia* by Baron-Szabo & Fernández-Mendiola (1997: 47) and Baron-Szabo (2002: 55, pl. 38, fig. 5).

Suborder Faviina Vaughan & Wells, 1943
(nom. corr. ex Faviida Vaughan & Wells 1943; after Wells 1956)
Family Faviidae Gregory, 1900, emend. Alloiteau, 1952

Genus *Myriophyllia* d'Orbigny, 1849
Type species *Meandrina rastellina* Michelin, 1843

Myriophyllia propria Sikharulidze, 1979
Pl. 4, Fig. 1a–b

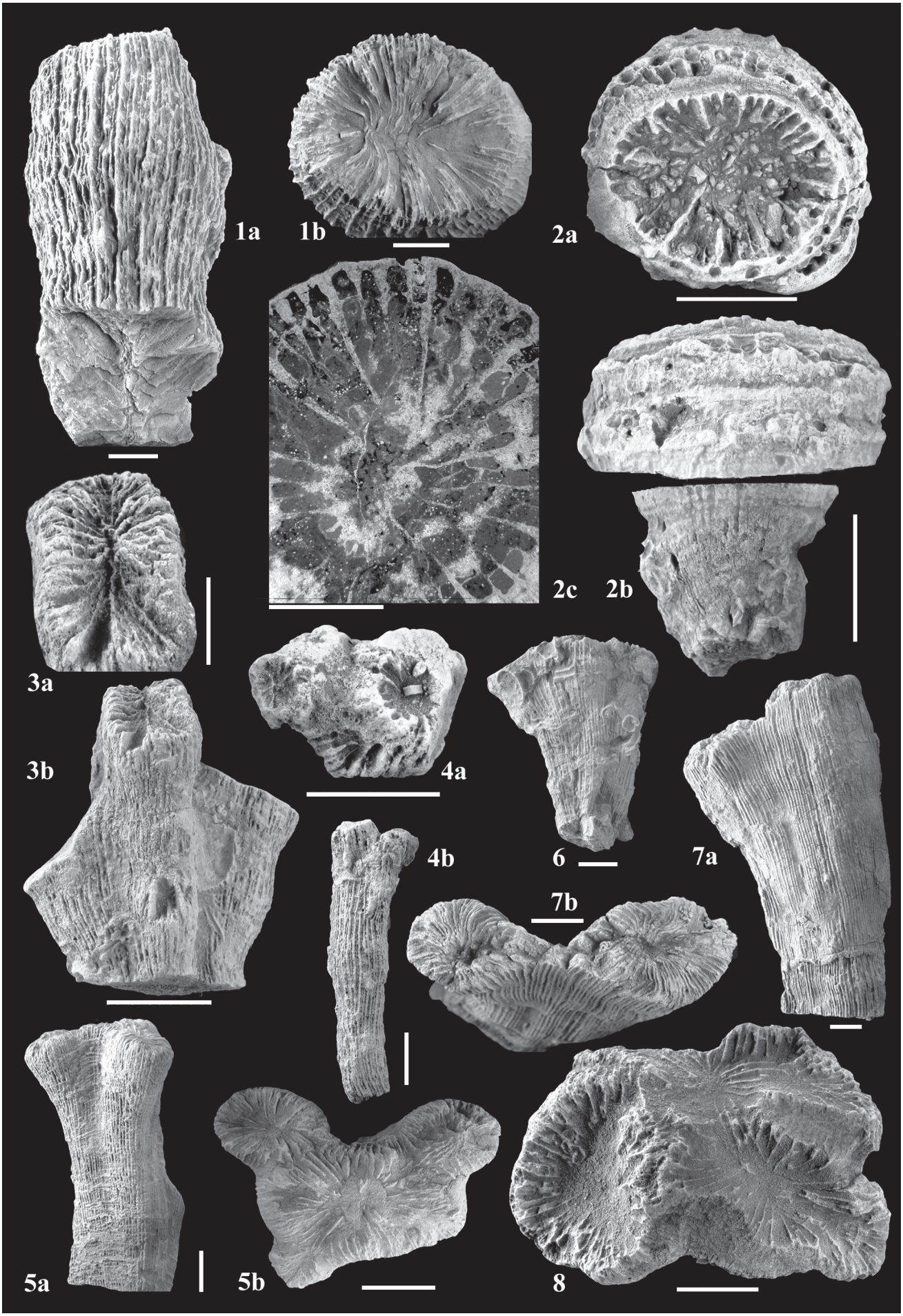
*1979	*Myriophyllia propria* sp. nov. – Sikharulidze: 14, pl. 1, fig. 2; pl. 7, fig. 1a, b; textfig. 6.
1999	*Myriophyllia propria* Sikharulidze – Baron-Szabo & González-León: 469, fig. 2b [cum syn.].
2003	*Myriophyllia propria* Sikharulidze – Baron-Szabo & González-León: 191.

Material: One specimen from level 1 (PIW2007II 45).

Description: Corallum colonial, meandroid, budding intramural-intracalicular. Calices distinct, arranged in irregularly ramified, wavy to straight series (width: 1.5–2.5 mm, length: up to 20 mm). Series demarcated by thin parathecal, septothecal, and synapticulathecal collines. Septa moderately thick (density: 16–20 per 5 mm), occasionally anastomosing at the inner end, occasionally with a paliform lobe near the inner edge, those of corallites of adjacent series confluent to non-confluent. Endothecal vesicular dissepiments common. Columella lamellar, discontinuous.

Remarks: Most morphological features of the corallum match those of the genus (Baron-Szabo 2002: 30) and of various species of *Myriophyllia* described by Koby (1881: 56–60), Felix (1891: 161), Wells (1944: 436), Beauvais (1964: 150–153), Roniewicz (1976: 68), Turnšek (1997: 136), etc. According to the original description by Sikharulidze (1979), this species

Plate 6:
Fig. 1: *Montlivaltia truncata* (Defrance, 1817) from level 1. a) Side view, b) calicular view, scale bar 10 mm; PIW2007II 39.
Fig. 2: *Montlivaltia* sp. from level 1. a) Calicular view, scale bar 10 mm, b) side view, scale bar 10 mm, c) part of transverse section, scale bar 5mm; PIW2007II 11.
Figs 3–4: *Thecosmilia cumanensis* Wells, 1944 from level 1. **3:** Specimen PIW2007II 31, a) calicular view of one of the corallites, scale bar 5 mm, b) side view showing low angle of bifurcation, scale bar 10 mm. **4:** Specimen PIW2007II 32, a) upper view, scale bar 10 mm, b) side view. Note almost simultaneous budding into four corallites, scale bar 10 mm.
Fig. 5: *Thecosmilia langi* Koby, 1884 from level 1. a) Side view showing low angle of bifurcation, b) upper view showing four corallites, scale bar 10 mm; PIW2007II 3.
Figs 6–7: *Thecosmilia gresslyi* Koby, 1884 from level 1, scale bar 10 mm. **6:** Specimen PIW2007II 28, side view. **7:** Specimen PIW2007II 1, a) side view showing low angle of bifurcation, b) upper view showing two corallites.
Fig. 8: *Complexastraea lobata* Geyer, 1965 from level 2, view from upper surface. Note formation of lobes, scale bar 10 mm; PIW2007II 30.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7a
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8

Table 13: Dimensions (in mm) of *Montlivaltia cornutiformis* Gregory

	D	H	Ns	Ds	Dt	att	Cf	Dt.c	shape
PIW2007II 40	46-32	88.6	131	5-8/ 5 mm	9-10/ 5 mm	18	3.5	7.5	curved
PIW2007II 41	40.7-24.4	46.2	99	5-6/5 mm	8/ 5 mm	23.8	12	-	curved

is characterized by a series width of 2–2.5 mm and a septal density of 14 per 5 mm. However, measuring the skeletal elements of the holotype presented in her paper, it appears that the septal density is up to 17 per 5 mm and the series width, while mainly around 2–2.5 mm, ranges between 1.5 to nearly 3 mm in a few areas.

Family Montlivaltiidae Dietrich, 1926, emend. Alloiteau, 1952

Genus *Montlivaltia* Lamouroux, 1821

Type species *Montlivaltia caryophyllata* Lamouroux, 1821

Remarks: Montlivaltiids in the present collection show forms transitional between *Montlivaltia, Thecosmilia,* and *Complextraea* similar to forms occurring in the Jurassic part of the Shemshak Group (Pandey & Fürsich 2006: 47). For this reason, here too, they have been described as morphological units sensu Lathuilierè (1996). Some of the specimens (e.g., PIW2007II 12, 21, 26) are broken either from the side or from the base. They might be part of *Thecosmilia*, but as this could not be ascertained they have been included in *Montlivaltia*. The species closest to specimens PIW2007II 12 and 21 is *Thecosmilia trichotoma* (Goldfuss, 1826: 45, pl. 13, fig. 6; see also Roniewicz 1960: 454, pl. 1, figs 1–2).

Montlivaltia caryophyllata Lamouroux, 1821
Pl. 5, Figs 2a–b, 3, 5, 7, 9a–b

*1821 *Montlivaltia caryophyllata* sp. nov. – Lamouroux: 78, pl. 79, figs 8–10.
2003 *Montlivaltia caryophyllata* Lamouroux – Pandey & Fürsich: 32, pl. 7, figs 1–8, pl. 9, fig. 5 [cum syn.].
2006 *Montlivaltia caryophyllata* Lamouroux – Pandey & Fürsich: 47, pl. 1, fig. 2.

Material: Nine specimens from level 1 (PIW2007II 6, 12–14, 16, 21–22, 24–25) and 1 specimen from level 2 (PIW2007II 7).

Dimensions: See Table 12.

Description: Corallum solitary, small to moderately large, subtrochoid, turbinate, curved to cylindrical. Corallum gradually tapering downwards, base either truncated or pointed, cross-section near base subcircular, attachment area either very small with a moderately large resting area or large. Calice shallow to moderately deep, subcircular to oval in outline. Septa compact, thick, laterally ornamented with small granules, secondary laminar layers common. Distal margin of septa asymmetrically curved with the maximum convexity near the periphery, denticles obtusely rounded. Endothecal vesicular dissepiments abundant. Columellar cavity oval, narrow to linear, the longer axis parallel to the maximum diameter. In a few specimens, the inner edges of opposite septa either touch or alternate, leaving no columellar space (PIW2007II 7). Wall parathecal, surrounded occasionally by epitheca. Epitheca thin.

Remarks: The corals described here are poorly to moderately preserved. They range in size from small juveniles to moderately large forms. The epitheca is mostly eroded and only present in form of rings in a few specimens. Rejuvenation during the ontogenetic growth, encrustation by serpulids, sponges, oysters, etc., bite marks, and borings are common features observed in these specimens. The morphological features of the present specimens fall within the range of variation of *M. caryophyllata* Lamouroux described from Jurassic strata by earlier workers (e.g., Koby 1884: 130, pl. 35, figs 4–14; Pandey & Fürsich 2003: pl. 7, figs 1–8, pl. 9, fig. 5).

Montlivaltia cornutiformis Gregory, 1900
Pl. 5, Fig. 8a–b

*1900 *Montlivaltia cornutiformis* sp. nov. – Gregory: 85, pl. 4, figs 5–8; pl. 5, figs 1–3; pl. 9, fig. 11.
1958 *Montlivaltia cornutiformis* Gregory, var. *elliptica* Gregory – Alloiteau: 41, pl. 6, fig. 4; pl. 37, fig. 15; pl. 38, fig. 6.
1972 *Montlivaltia cornutiformis* Gregory – Beauvais: 49, pl. B, fig. 1.
1993 *Montlivaltia cornutiformis* Gregory – Pandey & Fürsich: 14, pl. 2., figs 1–3.
2003 *Montlivaltia cornutiformis* Gregory – Pandey & Fürsich: 35, pl. 8, figs 1–3.

Material: Two specimens from level 1 (PIW2007II 40–41).

Plate 7:
Fig. 1: *Thecosmilia longimana* Quenstedt, 1881 from level 1. a) Close-up view of transverse polished surface. Note intracalicular budding seen in the top left corner of the photograph, scale bar 10 mm, b) side view, scale bar 20 mm; PIW2007II 37.
Fig. 2: *Ceratothecia carniolica* Turnšek, 1972 from level 2. a) Side view, b) close up view of transverse polished surface. Note two distinct cycles of septa and intracalicular budding, scale bar 10 mm; PIW2007II 38.
Fig. 3: *Peplosmilia austeni* Milne Edwards & Haime, 1850 from level 1, calicular view, scale bar 10 mm; PIW2007II 86.

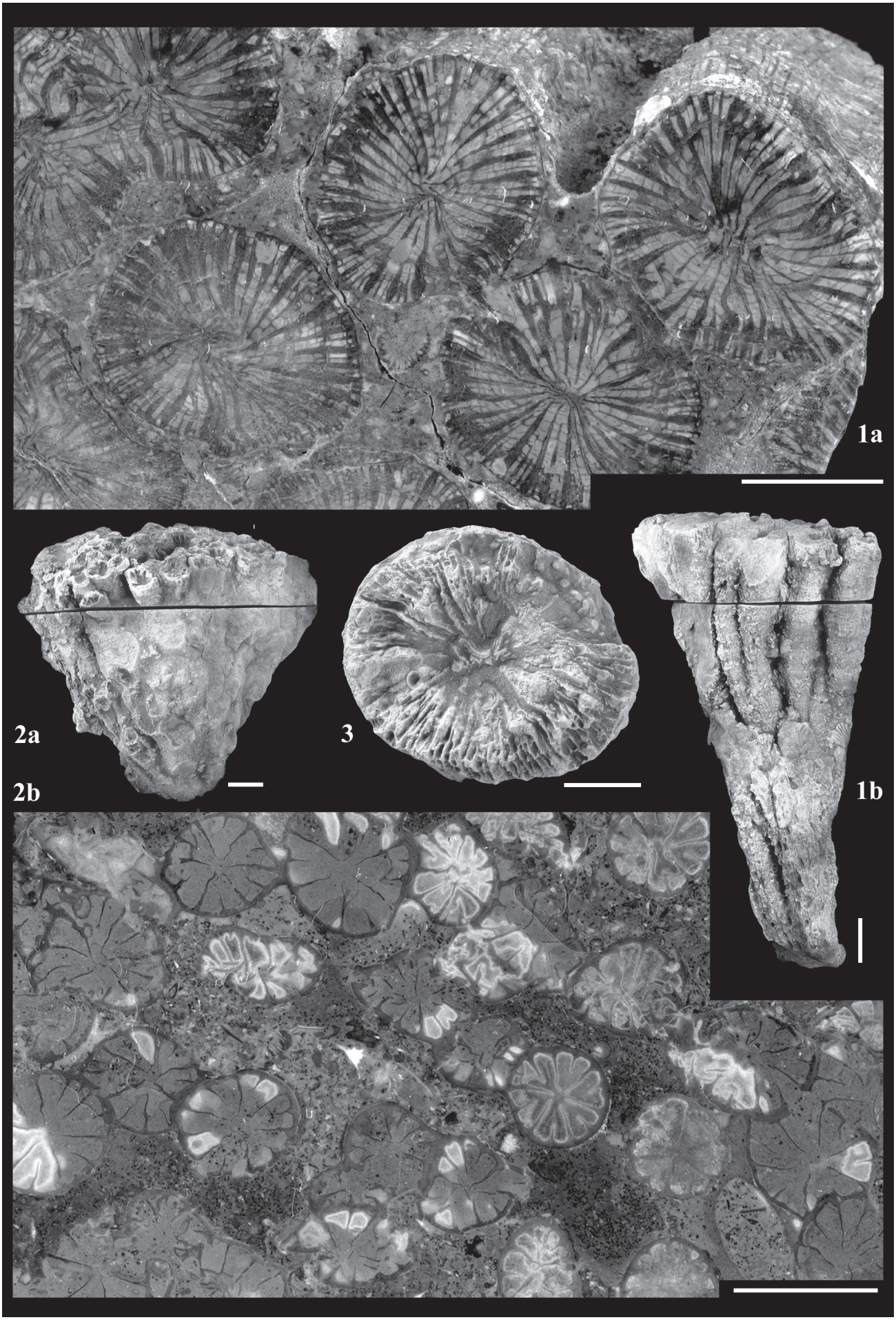
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Table 14: Dimensions (in mm) of *Montlivaltia moeschi* Koby

	H	D	Ns	Ds	Dt	Att.
PIW2007II 4	96.0	49.0/30.3	107	7-8/ 5 mm	6-8/ 5 mm at the costae	40
PIW2007II 29	60	47.3/26.3	136	8-9/ 5 mm	9/5 mm along the distal margin	31.5

Table 15: Dimensions (in mm) of *Montlivaltia truncata* (Defrance)

	H	D	Ns	Ds	Dt	Att.
PIW2007II 39	80	40-34.5	103	4-7/ 5 mm	8-10/ 5 mm at the distal margin	29

Dimensions: see Table 13.

Description: Corallum solitary, short to long, trochoid, with truncated base. Calice moderately deep to surficial, suboval in outline. Costosepta compact, moderately thick, distinct, consisting of divergent trabeculae. Distal margin of septa asymmetrically curved with the maximum projection at the periphery, distal margins with fine denticles. Dissepiments abundant, arranged in horizontal rows. Columellar cavity linear in outline. Wall parathecal.

Remarks: The corals are moderately well preserved. The epitheca, if there was any, has been completely eroded. There is even no trace of it below a *Neuropora* and another coral encrusting the lower surface of the specimen. The morphological features and the dimensions agree well with specimens of *Montlivaltia cornutiformis* Gregory described earlier from Jurassic strata of Kachchh and Iran.

Montlivaltia moeschi Koby, 1883
Pl. 5, Figs 6, 10a–c

*1883 *Montlivaltia moeschi* sp. nov – Koby: 126, pl. 35, fig. 1.
2003 *Montlivaltia moeschi* Koby – Pandey & Fürsich: 40, pl. 9, figs 1, 4, 6.

Material: Two specimens from level 1 (PIW2007II 4) and level 2 (PIW2007II 29).

Dimensions: see Table 14.

Description: Corallum solitary, medium to large, subcylindrical, with oval outline of the upper surface. Attachment area large and truncated. Septa compact, thin. Septa of first four orders reaching the center, their interior part curved or twisted, leaving no columellar space. Lateral septal surfaces covered with granules, trabeculae forming single fan system. Distal edges of septa with very fine, low, equal denticles. Endothecal vesicular dissepiments common.

Remarks: Both specimens are moderately well preserved. The morphological features such as numerous thin septa and fine denticles fit *Montlivaltia moeschi* Koby, 1883. The twisted interior part of the septa may not be a specific character as it could be a secondary feature.

Montlivaltia truncata (Defrance, 1817)
Pl. 6, Fig. 1a–b

*1817 *Caryophylla truncata* sp. nov. – Defrance: 198.
1884 *Montlivaltia truncata* Defrance – Koby: 118, pl. 38, figs 1–2, pl. 39, figs 1–2, pl. 43, fig. 1 [cum syn.].

Material: One specimen from level 1 (PIW2007II 39).

Dimensions: See Table 15.

Description: Corallum solitary, large, sub-cylindrical, with oval upper surface. Attachment area large and truncated. Septa compact, thin or thick, arranged in at least six but incomplete cycles. Septa of first three cycles thicker at the inner end, reaching the center, leaving a linear columellar space. Lateral septal surfaces covered with granules, trabeculae forming a single fan system. Distal edges of septa with very fine, low, equal denticles. Endothecal vesicular dissepiments common.

Remarks: The specimen is moderately well preserved and broken proximally. The broken part provides the opportunity to observe the septal ornamentation. The striking thickness of primaries in comparison with septa of higher cycles easily distinguishes the present species from other species of

Plate 8:
Fig. 1: *Paraclausastrea* cf. *pulchra* Morycowa & Masse, 1998 from level 1. a) Upper surface view showing thamnasterioid colony, b) lower surface view showing thin holotheca. Note irregular surface of attachment area, c) transverse polished surface showing parallel septa of two corallites in series. Note very faint traces of centers of calcification of trabeculae ; scale bar 5 mm; PIW2007II 93.
Figs 2–3: *Isastrea richardsoni* Milne Edwards & Haime, 1851 from level 1. **2:** Specimen PIW2007II 55, a) side view, scale bar 10 mm, b) close-up showing a few calices, scale bar 5 mm, c) longitudinal section of a single corallite showing compact septa and dissepiments, scale bar 1 mm. **3:** Side view of a broken piece of a colony, scale bar 10 mm; PIW2007II 15.
Fig. 4: *Isastrea* sp. A from level 1, upper surface view showing cerioid colony with septoparathecal wall, scale bar 10 mm; PIW2007II 58.
Fig. 5: *Isastrea* sp. B from level 2. a) Close-up view of a part of the lower surface, b) upper surface view showing polygonal, moderately deep calices, scale bar 10 mm; PIW2007II 85.

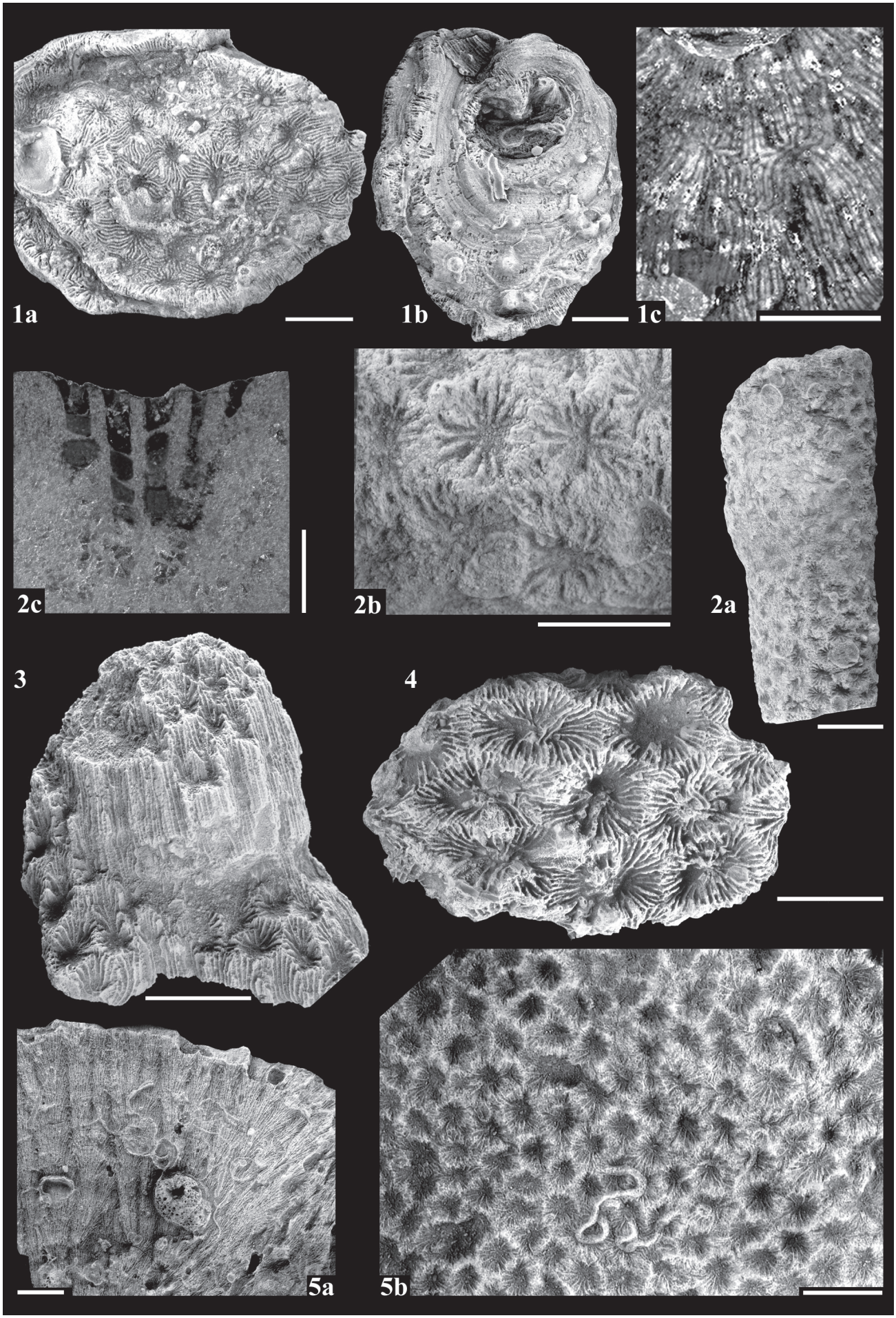
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Table 16: Dimensions (in mm) of *Montlivaltia* sp.

	D	H	Ns	Ds	Att.
PIW2007II 11	20-23	>28	45-50	2-3/ 2 mm	10

Table 17: Dimensions (in mm) of *Thecosmilia cumanensis* Wells

	H	D	Nbr	Hbd	Dbr	c-c	Ns	Dc	Dt at the wall	Att.
PIW2007II 31	-	27.5	4	-	12.3-7.2	14.5	48	10/ 5 mm	-	-
PIW2007II 32	53.0	16	4	10	9.5-6.2	9.0-4.5	24-16	9/ 5 mm	~11/ 5 mm	8
PIW2007II 34	21.8	10	2	6.5	6.3-6.0	6.0	28	12/ 5 mm	-	5

Montlivaltia, but this feature may result from deposition of a secondary laminar layer as is been observed commonly in *Montlivaltia* (e.g. Gill 1970: pl. 2, figs A–H; Pandey & Fürsich 1993: 16, textfig. 11).

Montlivaltia sp.
Pl. 6, Fig. 2a–c

Material: One specimen from level 1 (PIW2007II 11).

Dimensions: See Table 16.

Description: Corallum solitary, medium in size, turbinate, with moderately large attachment area. Calicular surface moderately depressed, oval in outline. Epitheca of lower surface covered with concentric rugae. Septa compact, thin to thick, *Montlivaltia*-like, arranged in four cycles. Septa of first cycle reaching columellar area. Septa of second and third cycles almost equal in length but thinner and shorter than those of first cycle. Septa of fourth cycle still shorter. Dissepiments vesicular, common. Columella absent or indistinct. Wall parathecal.

Remarks: Morphological features such as solitary corallum, thick, compact septa, common dissepiments, and absence of a columella suggest that the specimen belongs to *Montlivaltia*. The genus *Paramontlivaltia* Alloiteau (1952: 633; Löser 1994: 21; Baron-Szabo 2002: 123) differs by its strongly granulated lateral septal surfaces, and *Saltocyathus urgonensis* Morycowa & Masse (1998: 734, figs 7.1–5, 8A, B) because of the presence of lonsdaleoid septa and the rhipidogyrid aspect of the microstructure. The genus *Peplosmilia* Milne Edwards & Haime (see below) differs in possessing a columella.

Genus *Thecosmilia* Milne-Edwards & Haime, 1848

Type species *Lithodendron trichotomum* Goldfuss, 1826

Thecosmilia cumanensis Wells, 1944
Pl, 6, Figs 3a–b, 4a–b

*1944 *Thecosmilia cumanensis* sp. nov. – Wells: 441, pl. 71, fig. 2, pl. 73, figs 4–7, pl. 74, fig. 1.

Material: Three specimens from level 1 (PIW2007II 31–32, 34).

Dimensions: See Table 17.

Description: Corallum colonial, dendroid, tall, attachment area small. Budding intracalicular, into two or four corallites more or less simultaneously, which bifurcate from the axis with a low angle. Calices subcircular to oval in outline, shallow to moderately deep. Septa compact, moderately thick, those of the first two cycles of equal thickness, joining in the center. Septa of third cycle short and thin. Dissepiments common. Costae distinct, corresponding to septa. Trabeculae along the outer edge of costae numbering about 11 per 5 mm. Wall septoparathecal.

Remarks: Features such as the diameter of branches, the joining of inner margins of the compact septa in the axial space, and the costate outer surface match the species described by Wells (1944) from the Lower Cretaceous of Venezuela.

Plate 9:

Figs 1–2: *Meandrastraea* aff. *corbariensis* (Alloiteau, 1957) from level 1. **1:** Specimen PIW2007II 64, a) upper surface view, scale bar 10 mm, b) close-up view of a small part of upper surface showing mono- to tri-centric calices and septoparathecal wall, scale bar 5 mm. **2:** Specimen PIW2007II 75, a) upper surface view, b) surface broken along septal plane showing lateral surfaces of septa covered with fine granules and spinules arranged in vertical rows, and endothecal dissepiments, scale bar 5 mm.

Figs 3–5: *Maeandrella wellsi* (Reig Oriol, 1995), scale bar 10 mm. **3:** Specimen PIW2007II 76 from level 1, a) upper surface view showing mono- to polycentric calices, b) lower surface view. **4:** Specimen PIW2007II 61 from level 2, a) upper surface view showing tholiform collines with flattened top. Note septa of adjacent calice series interrupted at collines by a thin ambulacrum, b) side view of broken surface showing septal ornamentation similar to that of Fig. 2b. **5:** Specimen PIW2007II 63 from level 2, upper surface view showing tholiform collines.

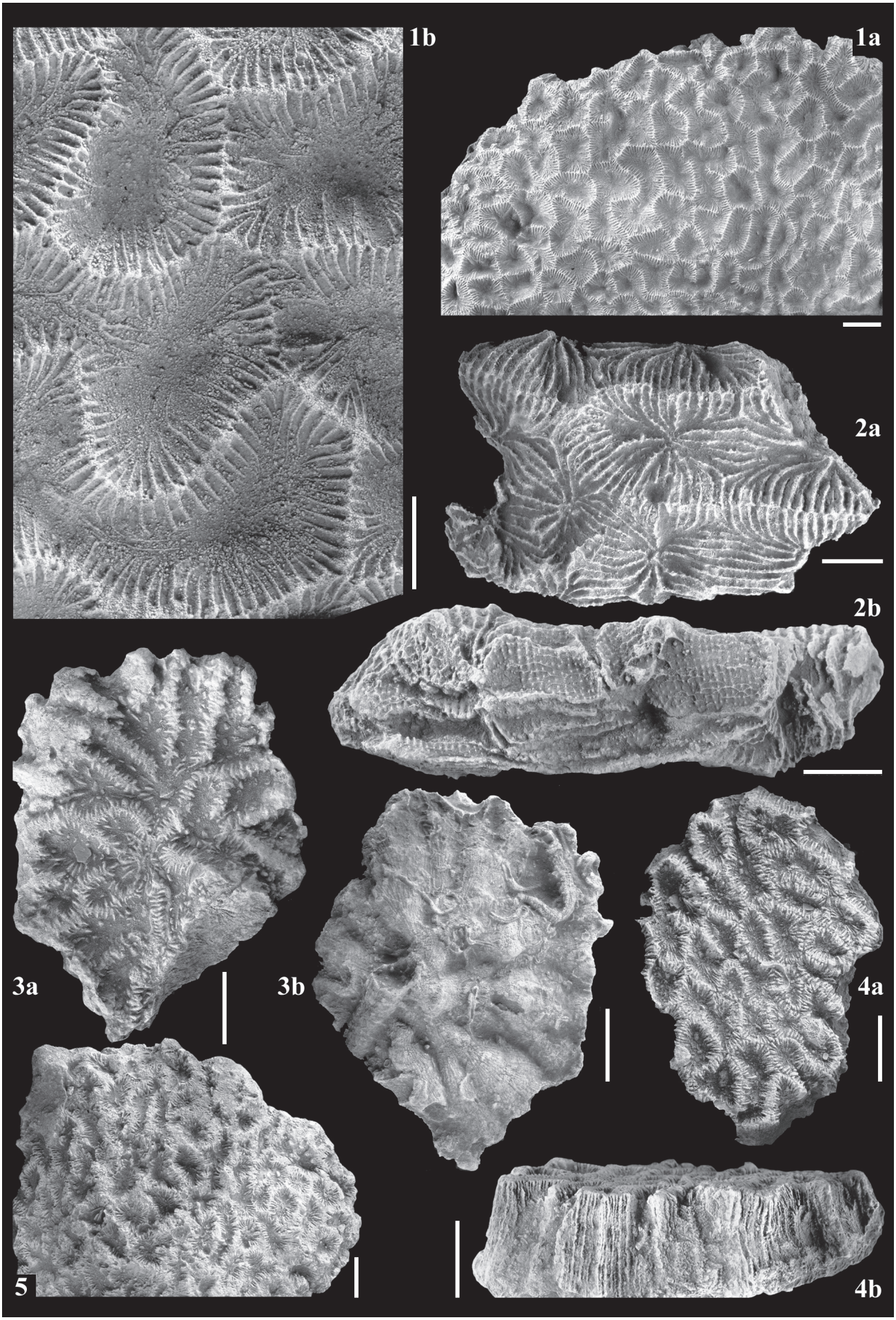
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Table 18: Dimensions (in mm) of *Thecosmilia langi* Koby

	H	D	Nbr	Hbd	Dbr	c-c	Ns	Dc	Dt at the wall	Att.
PIW2007II 3	70.0	40.0	4	~23.5	24.5-7.0	16.5-10	61-44	8/ 5 mm	7-8/ 5 mm	26.4

Table 19: Dimensions (in mm) of *Thecosmilia gresslyi*

	H	D	Nbr	Hbd	Dbr	Ns	Dc	Dt at the wall
PIW2007II 1	111.0	63.5/ 35.0	2	~40.0	32.5-28.0	47-54	4-5/ 5 mm	9-10/ 5 mm
PIW2007II 8	72.0	36.5	2	~40.0	21.0-14.0	48-45	6-7/ 5 mm	-
PIW2007II 2	65.0	39.0/ 21.0	>3	~20.0	15.0-12.0	-	5-8/ 5 mm	-
PIW2007II 28	56.5	45.5/ 14.5	3	~13	16.3-11.0	40-26	7/ 5 mm	-

Thecosmilia langi Koby, 1884
Pl, 6, Fig. 5a–b

*1884 *Thecosmilia langi* sp. nov. – Koby: 161, pl. 49, figs 1–9.
1976 *Thecosmilia langi* Koby – Roniewicz: 63, pl. 11, fig. 2a, b.
1990 *Thecosmilia langi* Koby – Errenst: 189, pl. 9, fig. 3.
2003 *Thecosmilia langi* Koby – Pandey & Fürsich: 48, pl. 14, fig. 1.
2006 *Thecosmilia langi* Koby – Pandey & Fürsich: 52, pl. 1, figs 6–8.

Material: One specimen from level 1 (PIW2007II 3).

Dimensions: See Table 18.

Description: Corallum colonial, dendroid, tall, attachment area large, truncated. Budding intracalicular, simultaneously into four corallites, angle of bifurcation from the axis low. Corallites oval to subcircular in outline. Calice almost flat. Septa compact, thin to moderately thick, of *Montlivaltia*-type, those of the first two cycles of equal thickness, reaching the center. Septa of higher cycles increasingly shorter and thinner. Dissepiments common. Costae corresponding to septa. Trabeculae along the outer edge of costae numbering 7–8 per 5 mm.

Remarks: Features such as simultaneous budding into more than three corallites, a low angle of divergence, and *Montlivaltia*-type septa closely correspond to *Thecosmilia langi* Koby, 1884. The lone colony in the present collection is tall and looks like a long flower-vase.

Thecosmilia gresslyi Koby, 1884
Pl, 6, Figs 6, 7a–b

*1884 *Thecosmilia gresslyi* sp. nov. – Koby: 167, pl. 44, fig. 4, pl. 45, figs 12, 12a.

Material: Four specimens from level 1 (PIW2007II 1–2, 8, 28).

Dimensions: see Table 19.

Description: Corallum colonial, tall, flabelliform, branching with low angle of divergence. Budding intracalicular. Corallites subcircular to oval in outline. Calices flat to moderately deep. Costo-septa compact, lamellar, alternating thin and moderately thick, of *Montlivaltia*-type, arranged in at least four incomplete cycles. Septa of the first two cycles almost equal in length, nearly reaching the center, occasionally twisted at the inner end, leaving an indistinct columellar area, septa of third and fourth cycles increasingly shorter and thinner. Distal margin arched. Dissepiments abundant. Wall septo-parathecal.

Remarks: The specimens seem to be laterally compressed and the large diameter of the corallites is mostly due to this distortion. Nevertheless, they show the characteristic features of *Thecosmilia gresslyi* Koby, 1884. The one consistent feature of these colonies is that branches are never completely separated. Three of the specimens (PIW2007II 2, 8, 28) are encrusted by serpulids, oysters, and *Neuropora*.

Plate 10:
Figs 1–2: *Lamellofungia* sp. A. **1:** Specimen PIW2007II 81 from level 1, a) oblique view of upper surface showing upper rejuvenated part. Note that the cerio-meandroid older part of the colony has changed to cerio-thamnasterioid in the younger part, scale bar 10 mm, b) transverse polished surface showing sub-compact septa. Note ornamentation on the lateral surfaces of septa and traces of centers of calcification of trabeculae, scale bar 2.5 mm, c) close up view of upper surface of the early part of colony showing mono- to tricentric calices; scale bar 5 mm. **2:** Specimen PIW2007II 88 from level 2, close -up view of upper surface showing a cerio-thamnasterioid to meandroid colony, scale bar 10 mm.
Fig. 3: *Periseris elegantula* (d'Orbigny 1850) from level 1. a) Longitudinal thin-section showing pennular structures, synapticulae, and dissepiments. Note the concavity of upper surface of pennulae, scale bar 0.5 mm, b) close-up view of broken lateral surface of colony showing closely spaced maenianae and vesicular dissepiments, scale bar 2.5 mm; PIW2007II 79.

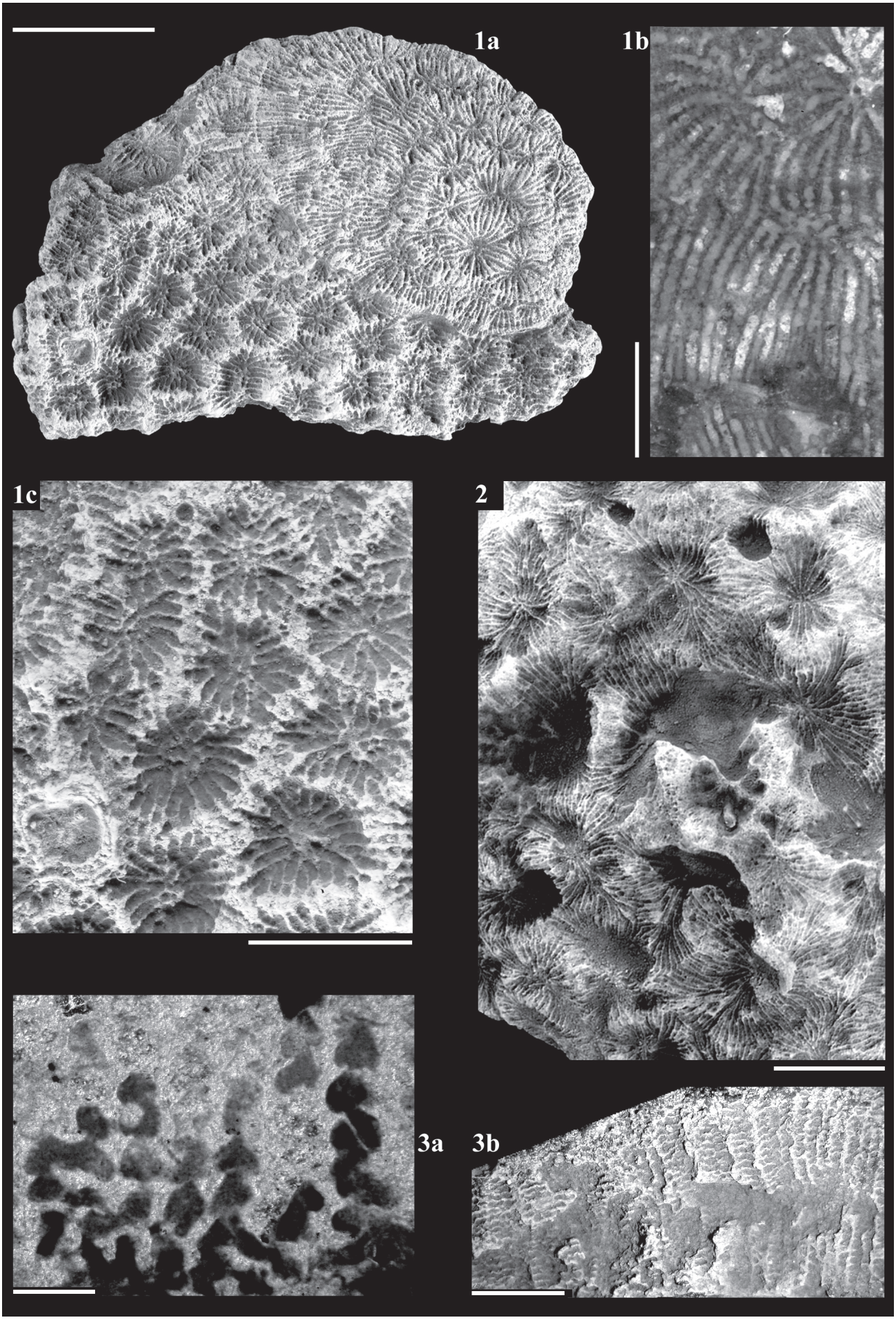
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Table 20: Dimensions (in mm) of *Thecosmilia longimana* Quenstedt

	H	D	Nbr	Hbd	Dbr	Ns	Dc	Dt at the wall	Att.
PIW2007II 30	25.0	47.50	5	-	10.0-25.0	75-18	7-8/ 5 mm	-	5

Table 21: Dimensions (in mm) of *Complexastraea lobata* Geyer

	H	D	Nbr	Dbr	Ns	c-c	Ds
PIW2007II 37	210.0	120	>18	17.5-20	71-79	11-25	8-10/ 5 mm

Thecosmilia longimana Quenstedt, 1881
Pl. 7, Fig. 1a–b

*1881 *Thecosmilia longimana* sp. nov. – Quenstedt: 698, pl. 170, fig. 17.
1932 *Thecosmilia* (?) sp. – Wells: 240, pl. 30, fig. 3.
1990 *Thecosmilia longimana* Quenstedt – Errenst: 188, pl. 9, figs 2a–d [cum syn.].

Material: One specimen from level 1 (PIW2007II 37).

Dimensions: See Table 20.

Description: Corallum large, conical, tall, phaceloid, branches diverging at low angles. Budding intracalicular. Corallites sub-cyindrical, sub-circular in outline. Calices moderately deep to deep. Costo-septa compact, lamellar, thin to moderately thick, of *Montlivaltia*-type, arranged in at least six incomplete cycles. Septa of first two cycles almost equal in length, nearly reaching the center, those of third to sixth cycles increasingly shorter and thinner. Dissepiments abundant, dense, numbering from 8 to 12 within each interseptal space. Wall parathecal.

Remarks: The specimen is moderately well preserved. Most of the morphological features have been observed on the polished surface. Features such as the tall colony, the very low angle of divergence of branches, subcylindrical corallites, *Montlivaltia*-like septa, and abundant dissepiments closely correspond to the Jurassic species *Thecosmilia longimana* Quenstedt, 1881, as described by earlier workers (e.g., Errenst 1990; Koby 1884: 161, pl. 49, figs 3–9).

Genus *Complexastraea* d'Orbigny, 1849
Type species *Astraea rustica* Defrance, 1826

Complexastraea lobata Geyer, 1965
Pl. 6, Fig. 8

*1965 *Complexastraea lobata* sp. nov. – Geyer: 237, pl. 21, figs 1–2.
1990 *Complexastraea lobata* Geyer – Errenst: 191, pl. 10, figs 2a–c [cum syn.].

Material: One specimen from level 2 (PIW2007II 30).

Dimensions: See Table 21.

Description: Corallum colonial, low, lobate, with small attachment area. Budding intracalicular, with a low angle of divergence. Corallites oval to subcircular in cross-section. Calices moderately deep. Septa compact, moderately thin to thick, *Montlivaltia*-like, those of the first two cycles of equal thickness, nearly reaching the center. Septa of higher cycles increasingly shorter and thinner. Dissepiments common. Costae corresponding to septa.

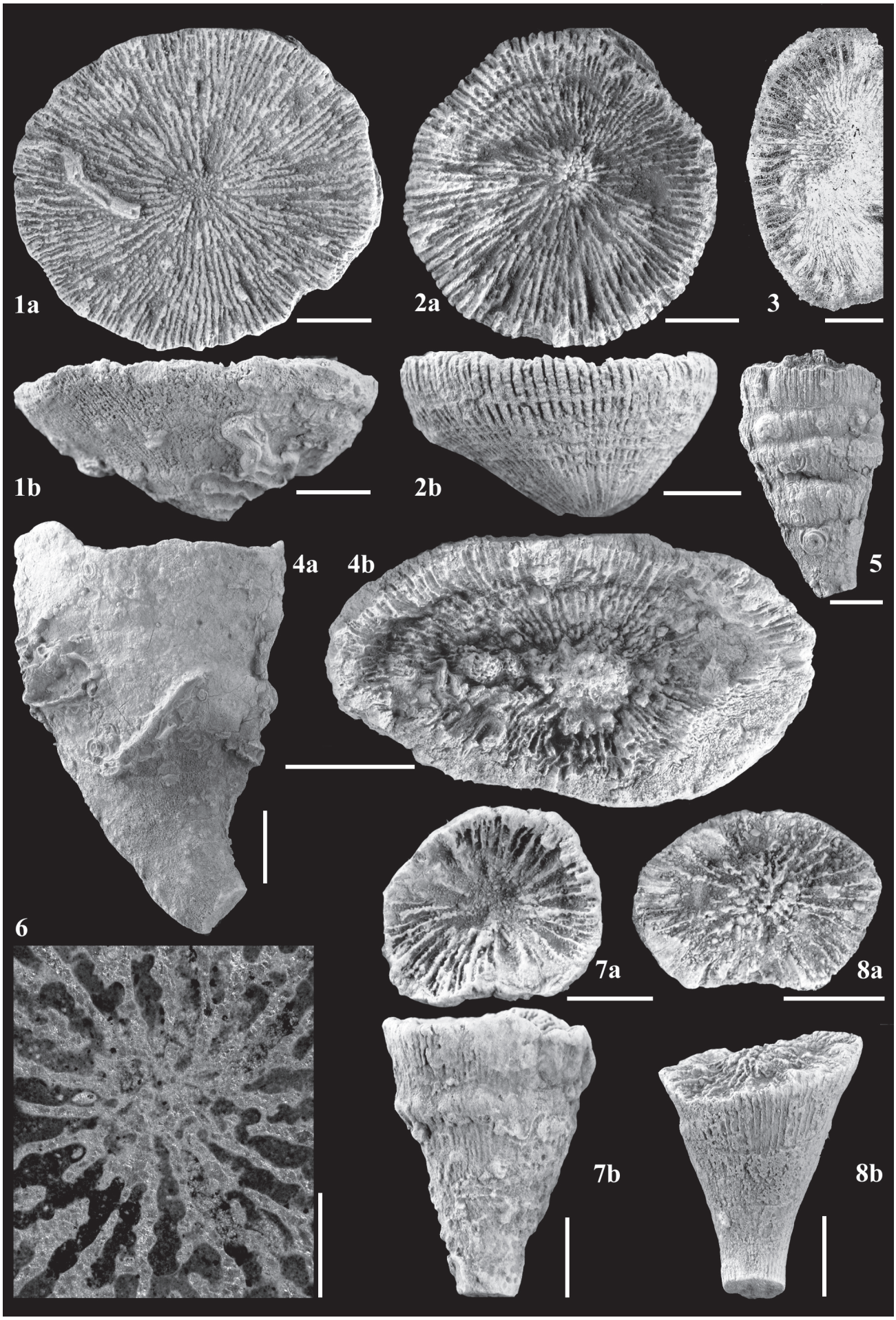
Remarks: The morphological features of the specimen such as intracalicular budding, formation of lobes, and *Montlivaltia*-like septa match *Complexastraea lobata* Geyer, 1965. The specimen corresponds particularly well to figures of the species published by Errenst (1990). It is interesting to note here that the colony shows budding very similar to that illustrated by Roniewicz (1960: pl. 8, figs A–F) in *Complexastraea thevenini* (Étallon), but that species does not exhibit any lobes.

Genus *Ceratothecia* Turnšek, 1972
Type species *Ceratothecia carniolica* Turnšek, 1972

Ceratothecia carniolica Turnšek, 1972
Pl. 7, Fig. 2a–b

*1972 *Ceratothecia carniolica* sp. nov. – Turnšek: 178, pl. 16, figs 1–8, pl. 17, figs 1–4.
1990 *Ceratothecia carniolica* Turnšek – Errenst: 187, pl. 8, fig. 5a–5c.
1994 *Ceratothecia carniolica* Turnšek – Liao & Xia: 172, pl. 51, figs 4–6.
1997 *Ceratothecia carniolica* Turnšek–Turnšek: 32, pl. 32, figs A–J.

Plate 11:
Figs 1–2: *Acrosmilia conica* d'Orbigny, 1850 from level 1. **1:** Specimen PIW2007II 43, a) upper surface, b: side view. **2:** Specimen PIW2007II 44, a) upper surface, b) side view, scale bar 5 mm.
Figs 3–5: *Epistreptophyllum flabelliforme* (Milaschewitsch, 1876) from level 1. **3:** Transverse thin-section showing sub-compact septa and papillose columella, scale bar 5 mm; PIW2007II 10. **4:** Specimen PIW2007II 9, a) side view, b) upper surface. Note oval outline of corallum, scale bar 10 mm. **5:** Side view, scale bar 10 mm; PIW2007II 19.
Figs 6–8: *Epistreptophyllum cornutiformis* (Gregory, 1900). **6:** Specimen PIW2007II 90 from level 1. Close-up transverse thin-section showing sub-compact septa and papillose columella. Note the ornamentation along the lateral surface of septa; scale bar 1 mm. **7:** Specimen PIW2007II 18 from level 2, scale bar 5 mm, a) upper surface; note circular outline of corallum, b) side view. **8:** Specimen PIW2007II 20 from level 1, a) upper surface, b) side view, scale bar 5 mm.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2b
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6
7a
8a
7b
8b

Table 22: Dimensions (in mm) of *Ceratothecia carniolica* Turnšek

	H	D	Nbr	Dbr	Ns	c-c	Ds/ 5 mm
PIW2007II 38	85	91	>45	7.0-9.0	12-14	8.0-10	4-5

Table 23: Dimensions (in mm) of *Peplosmilia austeni* Milne Edwards & Haime

	D	H	Ns	Ds	L. col
PIW2007II 86	39.3/30.5	34.8	>87	3/ 2 mm	5.6

Material: One specimen from level 2 (PIW2007II 38).

Dimensions: See Table 22.

Description: Corallum large, conical, colonial, dendroid, branching with low angle of divergence. Budding intracalicular, marginal, showing aphroid condition. Individual branch ceratoid in shape, sub-circular in cross-section. Calices moderately deep to deep. Septa compact, lamellar, moderately thick, arranged in at least three cycles. Septa of first two cycles complete, those of third cycle represented by one or two septa. Septa of first cycle long, nearly reaching the center, those of second and third cylces increasingly thinner and shorter. Dissepiments tabular, common in proximal part. Wall thin, septoparathecal.

Remarks: The specimen is moderately well preserved. Most of the morphological features have been observed on the polished surface. The dendroid colony, intracalicular marginal budding, small diameter of corallites, compact nature and low number of septa, tabular endothecal dissepiments and uniformly thick septoparathecal corallite wall closely match *Ceratothecia carniolica* from the Jurassic, described by Turnšek (1972) and Errenst (1990).

Genus *Peplosmilia* Milne Edwards & Haime, 1850

Type species *Peplosmilia austeni* Milne Edwards & Haime 1850

Peplosmilia austeni Milne Edwards & Haime, 1850

Pl. 7, Fig. 3

*1850 *Peplosmilia austeni* sp. nov. – Milne Edwards & Haime: 57, pl. 10, figs 1, 1a, 1b.

1857 *Peplosmilia austeni* Milne Edwards: 181.

1857 *Peplosmilia austeni* Milne Edwards & Haime – Pictet: 384, pl. 104, fig. 7.

1881 *Peplosmilia austeni* Milne Edwards & Haime – Quenstedt: 986, pl. 181, fig. 30.

1956 *Peplosmilia austeni* Milne Edwards & Haime – Wells: F400, fig. 3a, b.

Material: One specimen from level 1 (PIW2007II 86).

Dimensions: See Table 23.

Description: Corallum solitary, medium in size, turbinate, with moderately large attachment area. Calicular surface moderately depressed in center, oval in outline. Lower surface covered with thin epitheca. Septa compact, composed of trabeculae, *Montlivaltia*-like, uniformly moderately thick, arranged in five cycles. Septa of first two cycles reaching the columellar area. Septa of the third and fourth cycle only slightly shorter, those of the fifth cycle much shorter. Distal margin denticulate; denticles sharp, corresponding to trabeculae. Dissepiments vesicular, abundant along the periphery. Columella lamellar, thick, well developed, parietal, spongy.

Remarks: Morphological features such as the solitary corallum, *Montlivaltia*-like septa, a thick, elongated columella, and the dimensions suggest an assignment of the specimen to *Peplosmilia austeni* Milne Edwards & Haime, 1850. The dimensions of the present specimen are also similar to *Peplosmilia* (?) sp. recorded by Wells (1932: 233, pl. 30, fig. 1) from the Cretaceous of central Texas.

Because *Peplosmilia austeni* is the type species of the genus *Peplosmilia*, it has been mentioned quite frequently since its first description by Milne Edwards & Haime in 1850. However, it has been documented in more detail only in a few papers (see synonmy list above). Here, we present the first detailed description including photographic documentation of a representative of *Peplosmilia austeni* Milne Edwards & Haime, 1850.

Plate 12:

Fig. 1: *Calamophylliopsis* sp. from level 1. a) Side view showing very low-angle, dichotomous branching and smooth surface, scale bar 5 mm, b) upper view showing thick wall and anastomosing septa, scale 2.5 mm, c) close-up view of distal margin of a few septa showing fine denticles, scale bar 1.25 mm; PIW2007II 36.

Fig. 2: *Craterastraea crateriformis* (Gregory, 1900) from level 1. View of upper surface showing ploco-thamnasterioid corallum. Note low-density septa in the inner parts of the calices as compared to the periphery, scale bar 10 mm; PIW2007II 57.

Figs 3–5: *Dimorphastraea renevieri* (Koby, 1887) from level 1. **3:** Specimen PIW2007II 46, a) close-up view of upper surface showing circumoral budding, scale bar 10 mm, b) longitudinal thin-section showing sub-compact septa. Note occasionally well-developed mi-pennulae-like structures along the lateral margin of septa, scale bar 2.5 mm. **4:** Close-up view of upper surface showing circumoral budding, scale bar 5 mm; PIW2007II 84. **5:** Transverse polished surface showing papillose columella, scale bar 2.5 mm; PIW2007II 80.

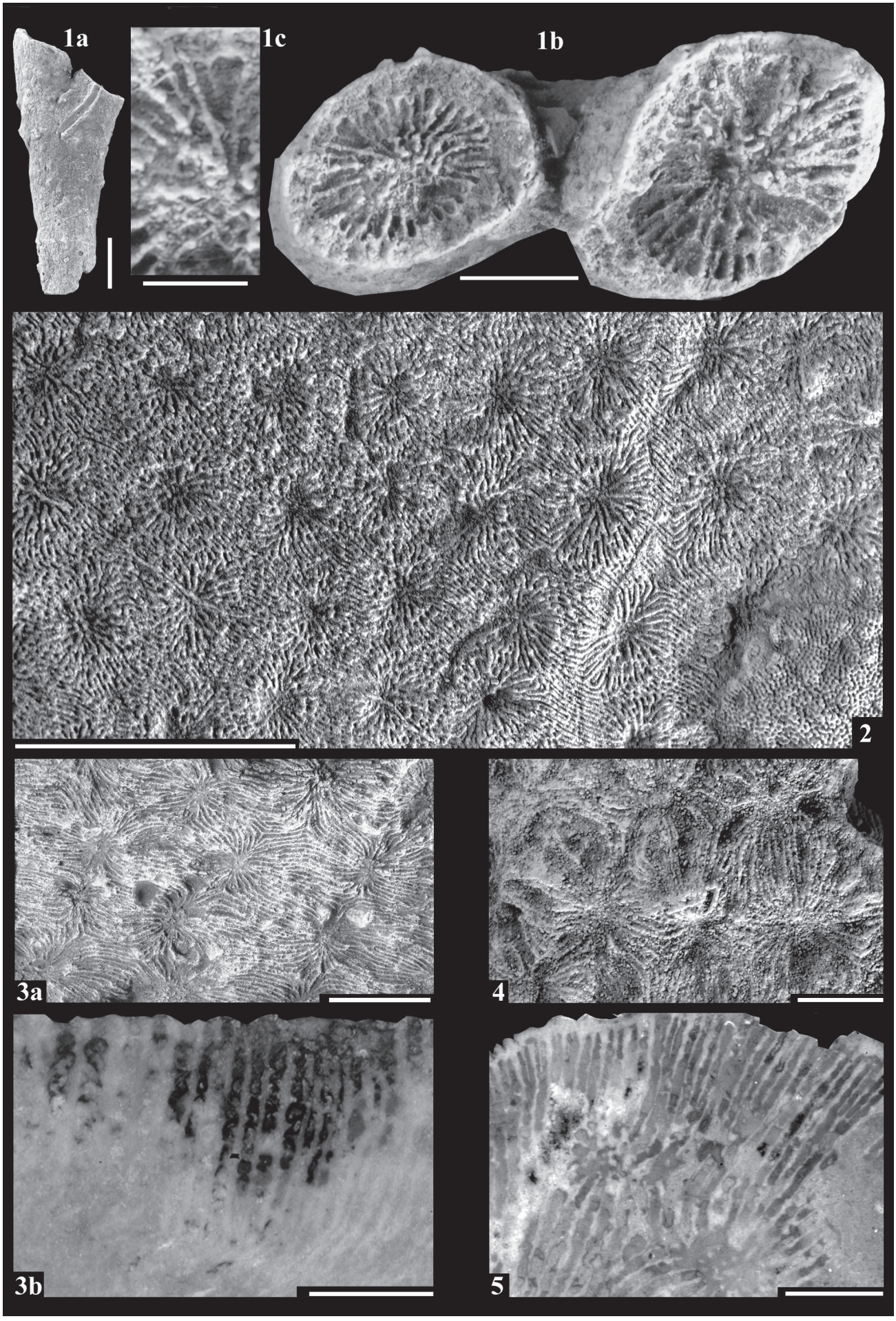

1a
1c
1b
2
3a
4
3b
5

Table 24: Dimensions (in mm) of *Paraclausastrea* cf. *pulchra* Morycowa & Masse

	D	H	c-c	c'-c'	Ns	Ds
PIW2007II 93	29.0/23.5	4.6	3	4	28-33	7-9/ 2 mm

Table 25: Dimensions (in mm) of *Trochosmilia communis* Prever

	D	H	Ns	Ds/2 mm	att/rest area	Dt.c	shape
PIW2007II 35	15/10	24	60	3-4	11	1.0	curved

Genus *Paraclausastrea* Zlatarski, 1968
Type species *Paraclausastrea chevalieri* Zlatarski, 1968

Paraclausastrea cf. *pulchra* Morycowa & Masse, 1998
Pl. 8, Fig. 1a–c

cf. *1998 *Paraclausastrea pulchra* sp. nov. – Morycowa & Masse : 750, figs 14.7, 15.4–6, 17.

Material: One specimen from level 1 (PIW2007II 93).

Dimensions: See Table 24.

Description: Corallum colonial, small, thin, flat, thamnasterioid. Lower surface covered with thin holotheca and faint concentric rugae. Attachment area small, resting area large. Budding intracalicular, circumoral to submeandroid. Calices small, with depressed center, distinct. Septa consisting of closely spaced trabeculae, rarely anastomosing, showing isotropic arrangements near the calice centers, becoming parallel between corallites of two adjacent corallite series. Distal margin with very fine denticles, occasionally beaded. Septa arranged in four cycles, those of the first two cycles nearly reaching the center and leaving a small, more or less circular columnar area. Septa of third and fourth cycles increasingly shorter. Lateral surfaces of septa covered with spinules, rounded granules, and carinae. Vesicular dissepiments abundant. Synapticulae present.

Remarks: The present specimen is a juvenile form. However, the nature of the colony, septal arrangement, presence of vesicular dissepiments and synapticulae, septal ornamentation, and absence of a columella suggest that the specimen belongs to the genus *Paraclausastrea* Zlatarski, 1968. The size of corallites is smaller, and the number of septa is larger than in the known species of *Paraclausastrea*. Our specimen shows affinities to *P. pulchra* Morycowa & Masse (1998: 750, figs 14.7, 15.4–6, 17; Baron-Szabo et al. 2003: 204, pl. 39, figs 1, 5), but in *pulchra* the corallites are around 3–6 mm in diameter and spaced up to 8 mm apart. In addition, the number of septa in our specimen is around twice as high as in *pulchra*. However, since we are dealing with a very juvenile specimen, it cannot be ruled out that it represents an early growth stage of *pulchra*. This would be the case if, during subsequent ontogeny, the septa would have thickened. The thickening of septa would result in a reduction of septal density and also in a slight increase in corallite size. These features have been reported, for example, in *Fungiastrea exigua* (Reuss, 1854) (see Baron-Szabo 2003: 140–141).

Genus *Trochosmilia* Milne Edwards & Haime, 1848
Type species *Turbinolia cornicula* Michelin, 1846

Trochosmilia communis Prever, 1909
Pl. 16, Fig. 3a–b

*1909 *Trochosmilia communis* sp. nov. – Prever: 106, pl. 10, fig. 4, textfigs 8–10.

Material: One specimen from level 1 (PIW2007II 35).

Dimensions: See Table 25.

Description: Corallum solitary, small, subturbinate, curved, attached with expanded base. Calice moderately deep, oval in outline. Septa compact, moderately thick to thin, anastomosing, laterally ornamented with small rounded and spiniform granules. Septa arranged in five incomplete cycles in six systems. About 15 septa fuse with columella. Remaining septa alternate in length and thickness. Costae thin, equal in thickness. Endothecal vesicular dissepiments abundant. Columella spongy-papillose. Wall septothecal-septoparathecal.

Remarks: The specimen is moderately well preserved. In some cases strongly arched dissepiments form wide, rod-like structures that might look like synapticulae. In having a corallum that is subturbinate in shape with expanded base and costosepta, the axial ends of which generally fuse with

Plate 13:
Fig. 1: *Fungiastrea* aff. *arachnoides* (Parkinson, 1808) from level 1. a) Side view of a large club-shaped corallum, scale bar 10 mm, b) thamnasterioid colony, scale bar 5 mm; PIW2007II 47.
Fig. 2: *Comoseris meandrinoides* Michelin, 1843 from level 1. a) Upper surface showing meandroid to thamno-meandroid colony, scale bar 10 mm, b) close-up view showing a few indistinct calices, scale bar 2.5 mm; PIW2007II 78.
Fig. 3: *Kobya crassolamellosa* Gregory, 1900 from level 1. a) Upper surface showing circumoral budding, fenestrate anastomosing septa with moniliform distal margin, and papillose to spongy columella, b) lower surface showing thin holotheca, scale bar 5 mm; PIW2007II 70.

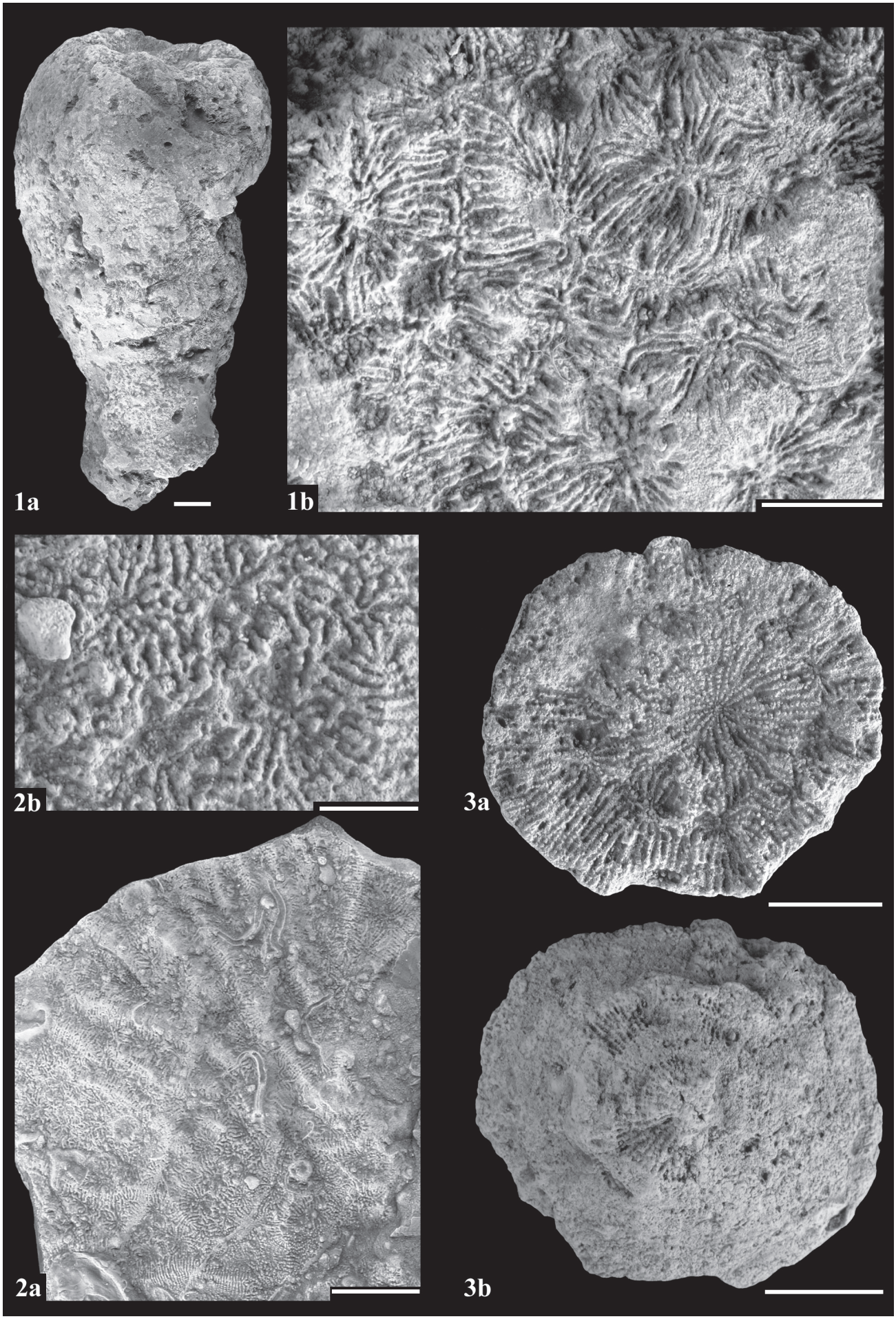

1a
1b
2b
3a
2a
3b

Table 26: Dimensions (in mm) of *Meandrastraea* aff. *corbariensis* (Alloiteau)

	D	H	d	Ns	Ds	c'c'	Mls
PIW2007II 59	68	36	5.5-8	35-44	3-4/ 2 mm	5-7.5	up to 3 calices
PIW2007II 60	128	58	6-11	31-51	5-6/ 2 mm	6-10	up to 2 calices
PIW2007II 62	73.5	37.0	6.5-9	25-38	4/ 2 mm	4-6	up to 3 calices
PIW2007II 64	>150	53.5	12-13.8	45-47	3-4/ 2 mm	8-10	up to 3 calices

the well-developed spongy-papillose columella, the present specimen shows affinities to *Bathycyathus* Milne Edwards & Haime (1850: 13). However, in possessing abundant vesicular dissepiments, septal flanks ornamented with rounded and spiniform granules, and a septothecal-septoparathecal wall, the Iranian specimen closely corresponds to *Trochosmilia* Milne Edwards & Haime. Besides the original report of *Trochosmilia communis* by Prever the present record is the second description of this species.

Genus *Meandrastraea* d'Orbigny, 1849
Type species *Astrea pseudomeandrina* Michelin, 1841

Meandrastraea aff. *corbariensis* (Alloiteau, 1957)
Pl. 9, Figs 1a–b, 2a–b

aff. *1957 *Comophyllastraea corbariensis* sp. nov. – Alloiteau: 253, pl. 9, fig. 11.
aff. 2002 *Meandrastraea corbariensis* (Alloiteau). – Baron-Szabo: 49.

Material: Five specimens from level 1 (PIW2007II 59, 64, 75) and 2 specimens from level 2 (PIW2007II 60, 62).

Dimensions: See Table 26.

Description: Corallum massive, cerioid to meandroid, flat to umbrella-shaped, with small attachment area. Upper surface almost flat to convex. Calices shallow to deep, tetra-, penta-, hexa- to polygonal, and mono-, di-, or tri-centric. Budding intracalicular. Corallite series separated by tectiform collines. Septa thin, consisting of trabeculae (Dt: 4 per 2 mm), compact, occasionally anastomosing, arranged in at least four cycles. Septa of adjacent corallites across walls non-confluent to confluent. Lateral surfaces of septa covered with fine granules and spinules arranged in vertical rows along the trabeculae. Endothecal dissepiments thin, small, and common. Wall parathecal. Columella parietal; papillose to spongy, occasionally lamellar. Lower surface of the corallum covered with holotheca, which exhibits coarse radial folds corresponding to corallites.

Remarks: The morphological characters such as a cerioid to meandroid colony, corallite series separated by tectiform collines, compact and non-confluent to confluent septa, parathecal wall along the collines, and parietal to lamellar columella agree well with the generic characters of *Meandrastraea* rewritten by Vaughan & Wells (1943: 161) and Baron-Szabo (2002: 49). The dimensions in the present specimens correspond to those of *Meandrastraea corbariensis* (Alloiteau, 1957: 253, pl. 9, fig. 11). However, because in the Iranian specimen the development of a parathecal wall in combination with alternate septa (see Pl. 9, Fig. 1b) of the adjacent corallites, as seen, for example, in *Isastrea* (Roniewicz 1982: figs 6–8; Lathuilière 1988: pl. 1, fig. 1, pl. 6, figs 1–6, 2000a: figs 6.6, 6.8; Pandey & Fürsich 2006: 53, pl. 3, figs 1, 3–4) seems atypical for this taxon, it was here assigned to *Meandrastraea corbariensis* (Alloiteau, 1957) with reservation.

Family Isastraeidae Alloiteau, 1952

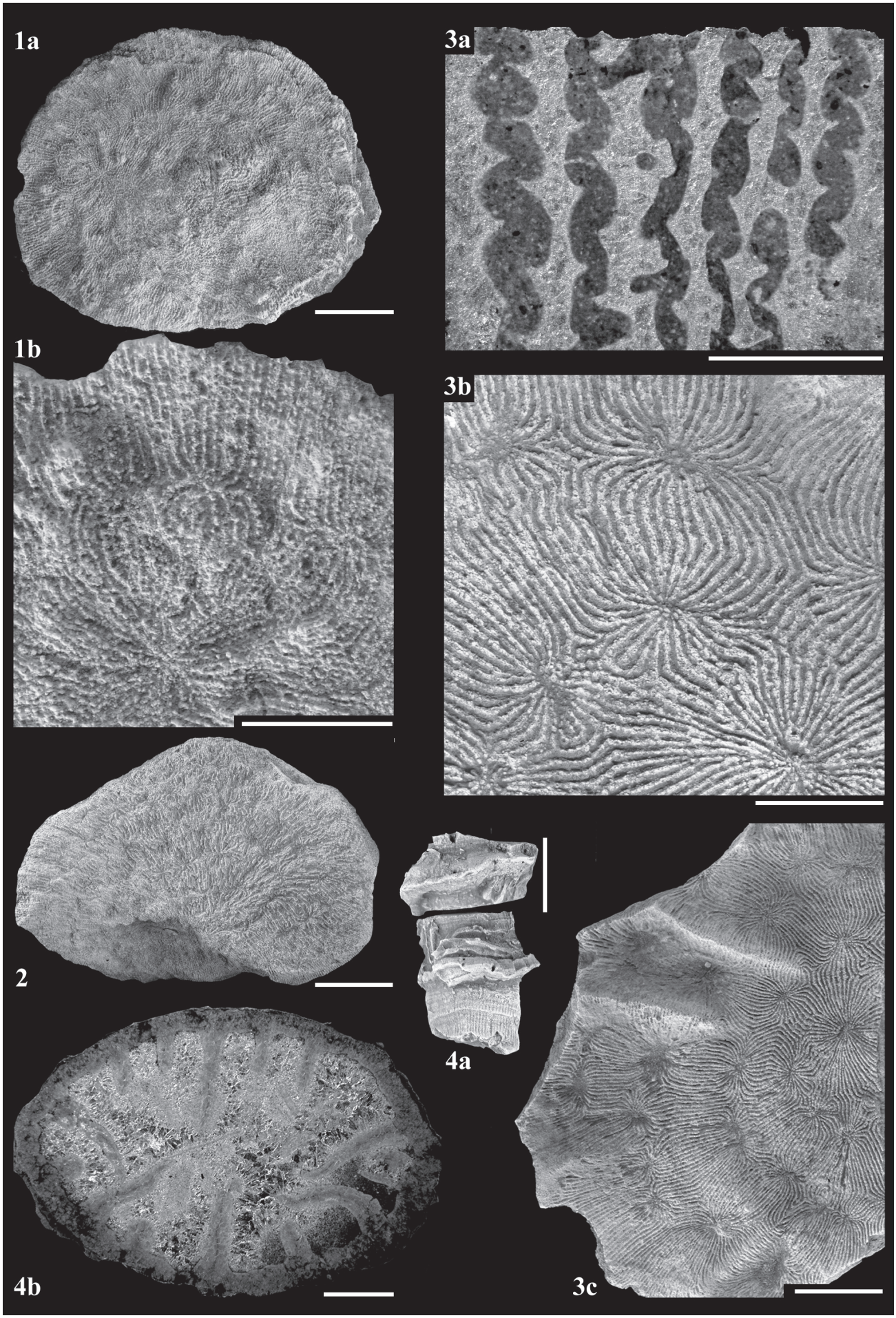
Genus *Isastrea* Milne-Edwards & Haime, 1851
Type species *Astrea helianthoides* Goldfuss, 1826

Isastrea richardsoni Milne Edwards & Haime, 1851
Pl. 8, Figs 2–3

*1851 *Isastrea richardsoni* sp. nov. – Milne Edwards & Haime: 138, pl. 29, figs 1, 1a.
1885 *Isastrea richardsoni* Milne Edwards & Haime – Koby: 286, pl. 85, fig. 11.

Material: Two specimens from level 1 (PIW2007II 15, 55).

Plate 14:
Figs 1–2: *Microsolena barcenai* (Felix, 1891) from level 1. **1:** Specimen PIW2007II 71, a) upper surface view, scale bar 10 mm, b) close-up view showing circumoral budding. Note moniliform distal margin of septa, scale bar 5 mm. **2:** Specimen PIW2007II 72, upper surface view, scale bar 10 mm.
Fig. 3: *Comophyllia polymorpha* (Koby, 1905) from level 1. a) Longitudinal transverse section showing distinct pennulae and dissepiments, scale bar 1 mm, b) close-up view of upper surface showing circumoral budding, scale bar 5 mm, c) upper surface view of thamnomeandroid colony. Note tholiform, slightly sinuous collines, scale bar 10 mm; PIW2007II 77.
Fig. 4: *Smilotrochus* sp. from level 1. a) Side view, scale bar 10 mm, b) transverse thin-section showing a few,compact, thick septa and septothecal wall thickened by exothecal stereozone. Note traces of trabecular centers, scale bar 2 mm; PIW2007II 42.


1a
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2
3a
3b
3c
4a
4b

Description: Corallum colonial, small, massive or columnar, cerioid (c-c: 2.3–3.5), budding intracalicular, biseptal. Calices small (diameter 3.1–4.4 mm), polygonal, distinct, moderately deep, Septa compact, moderately thick, non-anastomosing, ranging from 17–23 (Ds: 4–5 per 2 mm), arranged in three cycles. Septa of first and second cycles long, extending for two-thirds of the radius and slightly bulging at their inner end, those of the third cycle incomplete and short. Endothecal vesicular dissepiments abundant. Wall septoparathecal, distinct, *Isastrea*-like (Roniewicz 1982: figs 6–8; Lathuilière 1988: pl. 1, fig. 1; pl. 6, figs 1–6, 2000a: figs 6.6, 6.8; Pandey & Fürsich 2006: 53, pl. 3, figs 1, 3–4).

Remarks: *Isastrea whitneyi* Wells (1932: 245, pl. 39, figs 4–5, 1946: 3, pl. 2, fig. 1–3) from the Lower Cretaceous of Texas differs in having more (30–50), anastomosing, and imperforate septa at a similar corallite diameter (possibly it belongs to *Trigerastrea*) than the present specimens. In this respect, *Isastrea propinqua* Étallon, 1864 (in Thurmann & Étallon 1864: 392, pl. 55, fig. 13) and *Isastrea parva* Gregory (1900: 129, pl. 15, fig. 4–5; Pandey & Fürsich 2005: 20, pl. 6, fig. 2) are the closest comparable species, but the inner ends of septa do not bulge in these two species. In addition, *Isastrea propinqua* Étallon from the Jurassic of the Kachchh Basin, western India, shows a rudimentary wall (Pandey & Fürsich 1993: 18, pl. 5, figs 2–3, 7, textfig. 12). The species closest to the present specimens with respect to morphological features including dimensions is *Isastrea richardsoni* Milne Edwards & Haime (1851: 138, pl. 29, figs 1, 1a) described from the Inferior Oolite (Middle Jurassic) of England and the Swiss Jura.

Isastrea sp. A
Pl. 8, Fig. 4

Material: 1 specimen from level 1 (PIW2007II 58).

Description: Corallum colonial, cerioid, budding intracalicular. Calices large (d: 9–11 mm, c-c: 8–12 mm), polygonal, distinct, moderately deep. Septa compact, moderately thick, ranging from 44–49 (Ds: 3–4 per 2 mm), arranged in four cycles Septa of first cycle long, extending nearly up to the axis, those of second and third cycles increasingly short, and those of fourth cycle very short. Endothecal vesicular dissepiments abundant. Wall septoparathecal, distinct, *Isastrea*-like (Roniewicz 1982: figs 6–8; Lathuilière 1988: pl. 1, fig. 1; pl. 6, figs 1–6, 2000a: figs 6.6, 6.8; Pandey & Fürsich 2006: 53, pl. 3, figs 1, 3–4).

Remarks: Most previously described species of the genus possess either a higher septal density or a smaller corallite diameter. The nearest species is *Isastrea crassa* (Goldfuss, 1826) of Koby (1885: 273, pl. 30, fig. 2; Beauvais 1964: 169; Errenst 1990: 194, pl. 11, fig. 3a–b) from the Jurassic, but its number of septa is slightly higher (Pandey & Fürsich 2006: 56).

Isastrea sp. B
Pl. 8, Fig. 5a–b

Material: One specimen from level 2 (PIW2007II 85).

Description: Corallum colonial, flat, cerioid, budding intracalicular, upper surface slightly arched, lower surface covered with costae. Calices small (d: 3.2–5.4 mm, c-c: 3.5–5.5 mm), polygonal, moderately deep, columellar area distinct, fossa circular in outline. Septa compact, *Isastrea*-like, uniformly thin, non-anastomosing, numbering from 24–31 (Ds: 4–5 per 2 mm), confluent with those of adjacent calices. Septa arranged in four cycles, about 10 septa of the first and second cycle long, nearly reaching the axis, remaining septa of higher cycles increasingly shorter. Endothecal vesicular dissepiments abundant. Wall predominantly parathecal, occasionally *Isastrea*-like.

Remarks: The dimensions in the present specimen are similar to those found in *Isastrea richardsoni* Milne Edwards & Haime (see above), except that the number of septa is higher, and the septa are confluent across the wall with those of adjacent calices.

Family Placocoeniidae Alloiteau, 1952

Remark: The diagnostic characters have been emended by Baron-Szabo (2002: 38).

Genus *Paraplacocoenia* Beauvais, 1982
Type species *Placocoenia orbignyana* Reuss, 1854

Paraplacocoenia pruvosti Beauvais, 1982
Pl. 16, Fig. 1a–d

1982 *Paraplacocoenia pruvosti* sp. nov. – Beauvais: 116, pl. 9, fig. 3a, b.

Material: One specimen from level 1 (PIW2007II 74).

Description: Corallum colonial, large (H: 97 mm, D: 116 mm), plocoid to plocoid-subfasciculate, corallites often united by a well-developed granular perithecal wall. Corallites elevated, generally circular in outline, diameter ranging from 5 to 7 mm. Budding extracalicular. Costosepta compact, non-confluent, but sometimes costae of neighbouring corallites joined at acute angles, arranged in four with a beginning fifth cycle. Septa of first and second cycles long, cuneiform, with acutely curved distal margin. Costosepta alternate in length and thickness, numbering up to 35, of which 6 to 12 are more dominant and reach the corallite center; occasionally bulging at their inner edge (claviform; Pl. 16, Fig. 1d). Lateral surfaces of septocos-

Plate 15:

Fig. 1: *Kobya crassolamellosa* Gregory, 1900 from level 1. a) upper surface view, scale bar 10 mm, b) magnified view of upper surface showing circumoral budding, scale bar 10 mm, c) longitudinal thin-section showing pennular trabeculae, scale bar 2.5 mm; PIW2007II 73.

Fig. 2: *Turnsekophyllia cantabrica* Baron-Szabo, 2002 from level 1. a) Side view of a single corallite, scale bar 5 mm, b) transverse thin-section showing sub-compact septa and papillose columella, scale bar 2.5 mm; PIW2007II 23.

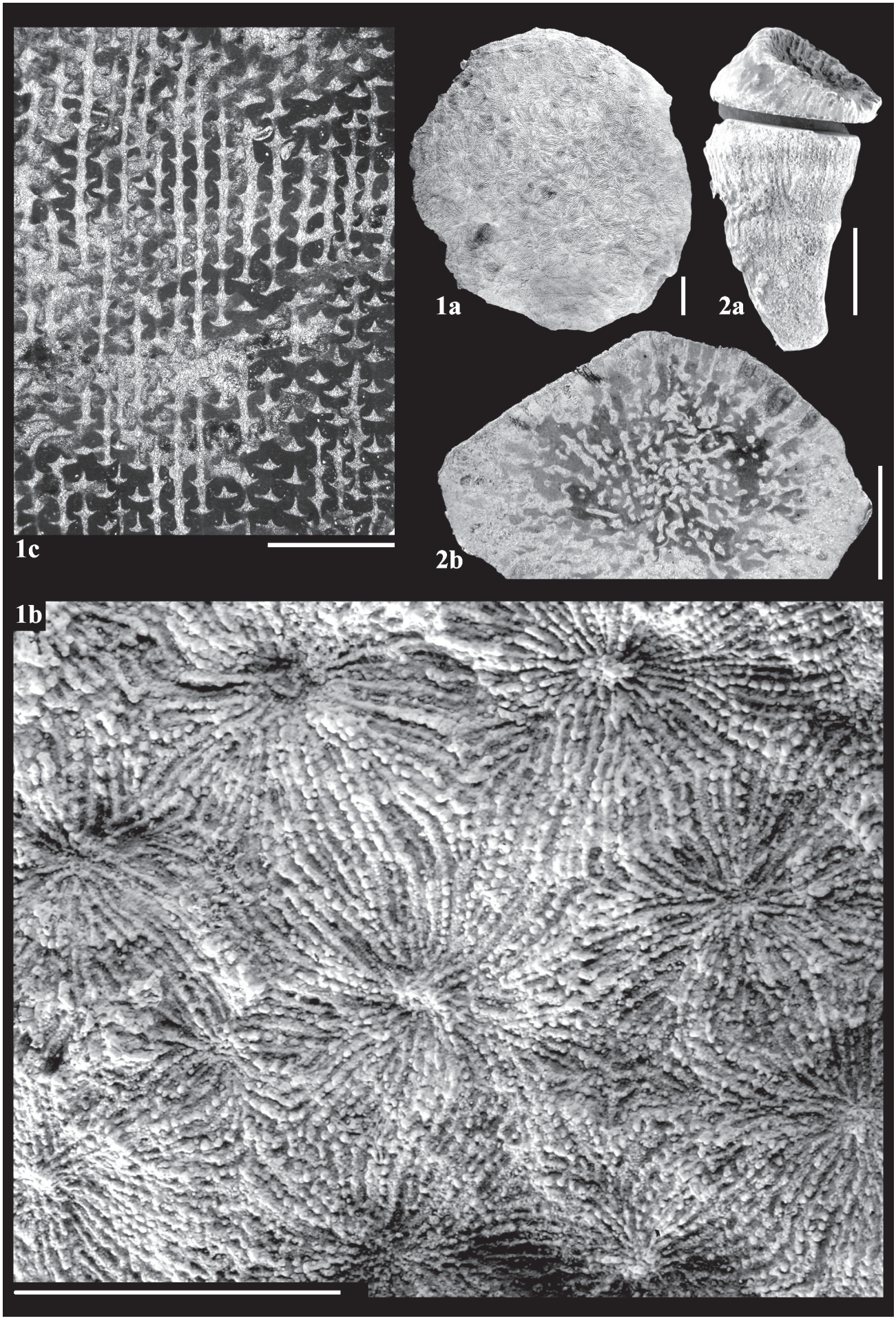
1a
2a
1c
2b
1b

Table 27: Dimensions (in mm) of *Acrosmilia conica* D'Orbigny

	D	H	Ns	Ds	Dt	cf	att. area
PIW2007II 43	24.5/21.7	8.7	156	14-15/ 5 mm	14/ 5 mm	2	3.0
PIW2007II 44	21.7/21.0	10.3	106	10/ 5 mm	14/ 5 mm	4	4.7

tae covered with granules. Costae well developed, thickest at corallite wall, proximally often dissociating into trabecular segments. Dissepiments thin, vesicular to subtabulate, common in the lower part of the corallite. Columella deep, trabecular, often appearing short-lamellar. Wall septoparathecal.

Remarks: The septa are arranged radially. However, in corallites that are densely spaced, e.g., in areas of intense budding, the arrangement of septa of the first cycle may appear in bilateral symmetry. The morphological features such as development of peritheca, compact septocostae in six systems, abundant, thin vesicular to subtabulate dissepiments, trabecular columella, often occurring short-lamellar, corallites united by granulated peritheca, and extracalicinal budding point to *Paraplacocoenia*. Elevated corallites that are exposed to the environment tend to form secondarily thickened outer surfaces. This feature has been reported from various Jurassic and Cretaceous environments (Errenst 1990; Beauvais 1982; Baron-Szabo 1997, 2003).

The specimen closely corresponds to *Paraplacocoenia pruvosti*, which is characterized by a corallite diameter of 5-7 mm, up to 8 mm in latest adult stages, and a septal development of three cycles with an incomplete fourth cycle in six systems. *P. pruvosti* Beauvais exhibits thinner septocostae at the distal margin than are seen in the present specimen. In this respect the present specimen is more similar to *P. kitteliana* (Felix 1903: 301), which has smaller dimensions (d: 4–6 mm and s: 24). However, the development of thickened septa in this group is not a taxonomically decisive feature as septa that significantly vary in thickness can be present in different corallites of the same specimen.

Suborder Fungiina Duncan, 1884
(nom corr. ex Fungiida Duncan, 1884)
Family Acrosmiliidae Alloiteau, 1952

Genus *Acrosmilia* d'Orbigny, 1849
Type species *Turbinolia cernua* Michelin, 1846

Remarks: According to Eliášová (1996: 127) the genera *Leptophyllia* Reuss, 1854 and *Acrosmilia* d'Orbigny, 1849 differ from each other in their septal micro-architecture. The septa in the former show pennular ornamentation, while in the latter they exhibit granules. In contrast, the specimens described here and placed in *Acrosmilia* d'Orbigny exhibit a well preserved pennular structure. Wells (1956: F385) and Baron-Szabo (2002: 99) already considered *Leptophyllia* Reuss, 1854 as junior synonym of *Acrosmilia* d'Orbigny, 1849.

Acrosmilia conica d'Orbigny, 1850
Pl. 11, Figs 1–2

*1850 *Acrosmilia conica* sp. nov. – d'Orbigny: 203.
1854 *Leptophyllia clavata* sp. nov. – Reuss: 101, pl. 6, figs 3–6.
Pars 1867 *Leptophyllia conica* (D'Orbigny) – de Fromentel: 302, pl. 45, non figs 2 a–c.
1880 *Turbinoseris epithecata* sp. nov. – Duncan: 49, pl. 7, figs 8–9.
1880 *Turbinoseris ranikoti* sp. nov. – Duncan: 49, pl. 7, figs 10–11.
1880 *Turbinoseris haimei* sp. nov. – Duncan: 50, pl. 7, figs 4–7.
1880 *Turbinoseris indica* sp. nov. – Duncan: 50, pl. 7, figs 1–3.
1903 *Leptophyllia clavata* Reuss – Felix: 200.
1941 *Haplaraea ? discrepans* sp. nov. – Wells: 289, pl. 1, fig. 2.
?1978 *Acrosmilia conica* d'Orbigny – Turnšek: 82, 113, pl. 16, figs 1–7.
1981 *Trochosmilia tuba ?* Fromentel – Abed & El-Asaad: 275, pl. 1, fig. 3a–b.
1982 *Acrosmilia conica* d'Orbigny – Beauvais: 138, pl. 40, figs 2–3. [cum syn.].
1997 *Acrosmilia conica* d'Orbigny – Turnšek: 3, pl. 3, figs A–G.
1999 *Acrosmilia conica* d'Orbigny – Baron-Szabo: 459, pl. 1, fig. 3.
2002 *Acrosmilia conica* d'Orbigny – Baron-Szabo: 99, pl. 66, figs 1, 3, 5.
2004 *Acrosmilia conica* d'Orbigny – Moosleitner: 177, pl. 75, figs 12–13.

Material: Two specimens from level 1 (PIW2007II 43–44).

Dimensions: See Table 27.

Description: Corallum solitary, small, patellate with small attachment area. Calice shallow, sub-circular in outline. Costosepta thin, sub-compact, anastomosing, arranged in six

Plate 16:

Fig. 1: *Paraplacocoenia pruvosti* Beauvais, 1982 from level 1. a) Close-up of side view of the colony showing well-developed perithecal wall and extracalicular budding, b) side view of the colony showing plocoid-subfasciculate colony, c) oblique polished surface showing inner edge of septa and vesicular to subtabulate dissepiments in longitudinal section, d) oblique polished surface showing inner edge of septa and dissepiments in the transverse section, scale bar 10 mm; PIW2007II 74.

Fig. 2: ?*Tiarasmilia* sp. from level 1. a) Calice view of thick costo-septa, scale bar 5 mm, b) side view, scale bar 5 mm, c) transverse thin-section showing paliform swelling and lobes, scale bar 2.5 mm; PIW2007II 27.

Fig. 3: *Trochosmilia communis* Prever, 1909 from level 1. a) Side view showing subturbinate curved corallum with expanded base, scale bar 10 mm, b) transverse thin-section showing dissepiments, columella, septal ornamentation, and wall, scale bar 5 mm; PIW2007II 35.

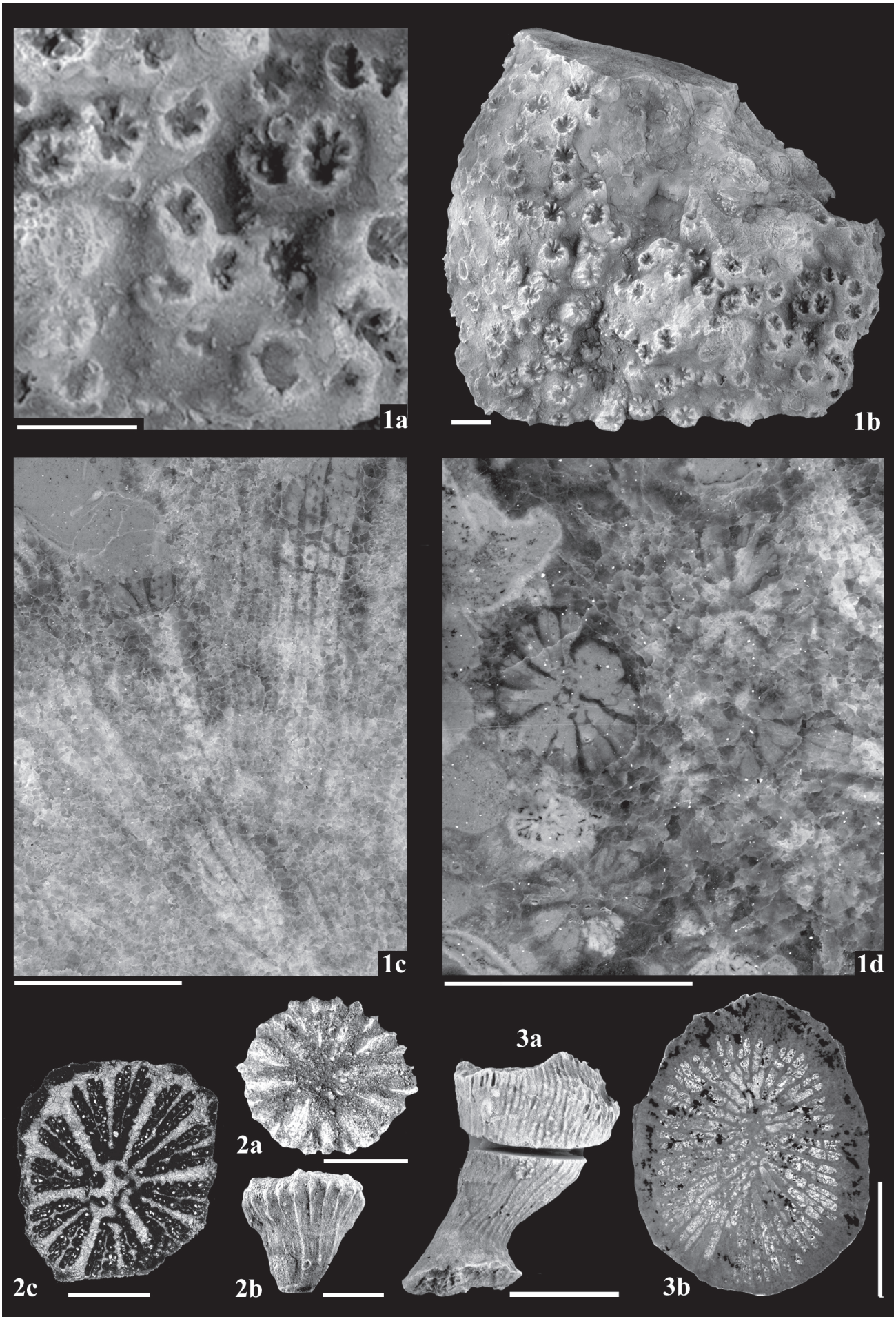
1a
1b
1c
1d
2a
2b
2c
3a
3b

Table 28: Dimensions (in mm) of *Dermosmilia cretacica* Turnšek

	H	Nbr	Dbr	Ns	Ds/ 2 mm	Att.	Ab	shape
PIW2007II 33	26.5	2	8.3, 7	49-41	4-5	8.6	50	dendroid

Table 29: Dimensions (in mm) of *Epistreptophyllum flabelliforme* (Milaschewitsch)

	H	D	Ns	Ds	Dt	Att	shape
PIW2007II 9	34 at proximal end:	37.8/21.5 9.0/7.5	approx. 138	5/ 2 mm	3/ 2 mm	8.6	flabelliform
PIW2007II 10	44.6 at proximal end:	26.7/17.5 9.3/7.0	>95	4-5/ 2 mm	-	8.5	cuneiform
PIW2007II 19	45 at proximal end:	26.5/15.0 8.6/7.5	-	4-5/ 2 mm	-	7.5	cuneiform

cycles. Septa of first three cycles reaching columella, those of higher cycles increasingly shorter and thinner. Septa of sixth cycle incomplete. Septa composed of trabeculae, distal margin occasionally moniliform. Trabeculae pennular. Dissepiments and synapticulae common. Columellar area sub-circular. Columella parietal, papillose. Epitheca thin.

Remarks: The morphological characters (e.g., solitary patellate shape, sub-compact pennular septa with beaded distal margin, and papillose columella) and the dimensions suggest assignment of the present specimens to *Acrosmilia conica* d'Orbigny, 1850. *Acrosmilia* cf. *thurmanni* (Koby) of Pandey & Fürsich (2003: 61, pl. 17, fig. 11) from the Jurassic of Iran has a lower septal density.

Possessing thick, rounded granules on septal flanks, a possible lack of synapticulae, large claviform swellings of axial ends of septa, and a para- to septoparathecal wall, the material presented by Turnšek (1978, 1997) most likely represents a meandriniid form such as *Rennensismilia* Alloiteau (1952) or *Placosmilia* Milne Edwards & Haime (1848).

Family Dermosmiliidae Koby, 1887

Genus *Dermosmilia* Koby, 1884
Type species *Dermosmilia divergence* Koby, 1884

Dermosmilia cretacica Turnšek, 1974
Pl. 4, Fig. 6a–b

*1974 *Dermosmilia cretacica* sp. nov. – Turnšek in Turnšek & Buser: 103, 104, 108, pl. 12, figs 1–2, pl. 13, figs 1–3.
1999 *Dermosmilia cretacica* Turnšek – Baron-Szabo & González-León: 471, fig. 2H–I [cum syn.].

Material: One specimen from level 1 (PIW2007II 33).

Dimensions: See Table 28.

Description: Corallum small, colonial, dendroid, dichotomosing with large angle of bifurcation (50°). Budding intracalicular. Corallite small in diameter, circular in outline, calices surfacial with slightly depressed central part. Septa sub-compact, moderately thick, occasionally anastomosing, lateral surfaces covered with coarse granules, distal margin with denticles corresponding to trabeculae. Columella parietal, papillose to spongy. Costae distinct, parallel, corresponding to septa, of uniform thickness throughout their length. Endothecal dissepiments present. Wall synapticuloparathecal.

Remarks: The morphological features and dimensions, such as wall diameter of corallites and number of septa of the specimen, agree well with *Dermosmilia cretacica* Turnšek, 1974. *D. tuapensis* Baron-Szabo & González-León (2003: 201, figs 5E, G, I, J) from the Lower Cretaceous of Mexico has smaller corallites and fewer septa (d: 2.5–6mm, Ns: 30). The branching nature of the colony, compact nature of septa and papillose to spongy columella also compare well with *Rhabdophyllia phillipsi* Milne Edwards & Haime (1851: 87, pl. 15, figs 3, 3a–c), but in the present specimen the costae do not bifurcate, unlike shown in the illustrations of *R. phillipsi*. Wells (1956: F380) considered *Rhabdophyllia* Milne Edwards & Haime (1851: 83) as a junior synonym of *Calamophyllia* Blainville (1830). In contrast, Baron-Szabo (2002: 33) doubtfully included *Rhabdophyllia* in the synonymy of *Cladocora* Ehrenberg, 1834.

Genus *Epistreptophyllum* Milaschewitsch, 1876
Type species *Epistreptophyllum commune* Milaschewitsch, 1876

Epistreptophyllum flabelliforme (Milaschewitsch, 1876)
Pl. 11, Figs 3–5

*1876 *Phlegmatoseris flabelliforme* sp. nov. – Milaschewitsch in Becker & Milaschewitsch: 212, pl. 50, figs 5, 5a.
1954 *Epistreptophyllum flabelliforme* Milaschewitsch – Geyer: 144, pl. 10, fig. 5a, b.

Material: Three specimens from level 1 (PIW2007II 9–10, 19).

Dimensions: See Table 29.

Description: Corallum solitary, moderately large, flabelliform to cuneiform, with small attachment area. Calice moderately deep, subcircular to oval in outline. Costo-septa

Table 30: Dimensions (in mm) of *Epistreptophyllum cornutiformis* (Gregory)

	D	H	Ns	Ds	Att	shape
PIW2007II 18	13/11.5	18	>70	5/ 2 mm	3.8	turbinate
PIW2007II 20	12.5/9.0	15.5	>69	5/ 2 mm	3.8	turbinate
PIW2007II 90	12.8-13.5	22	93	7/ 2 mm	8.0	turbinate

Table 31: Dimensions (in mm) of *Calamophylliopsis* sp.

	H	D	Dbr	Ab	Ns	c-c	Att
PIW2007II 36	26.1	11	6.3-5.3	very low	37-44	7	4.5

sub-compact, irregularly perforated near the inner-distal margin. Denticles at the distal margins of septa prominent. Dissepiments abundant. Columellar area oval. Wall parathecal and epithecal. Columella parietal, papillose, prominent. Epitheca thin.

Remarks: The specimens are moderately well preserved. Epitheca partially eroded. Some parts of the epitheca have been preserved below encrusting serpulids and sponges. Corallum, septa, and columella exhibit features characteristic of *Epistreptophyllum flabelliforme* (Milaschewitsch) described from Jurassic strata by earlier workers mentioned in the list of synonymies.

Epistreptophyllum cornutiformis (Gregory, 1900)
Pl. 11, Figs 6–8

*1900 *Frechia cornutiformis* sp. nov. – Gregory: 168, pl. 21, figs 1–3.
1900 *Protethmos oldhami* sp. nov. – Gregory: 164, pl. 18, figs 10, 12–13.
1900 *Protethmos duncani* sp. nov. – Gregory: 164, pl. 18, fig. 7.
1900 *Metethmos blanfordi* sp. nov. – Gregory: 165, pl. 18, figs 4–6, 11.
1978 *Protethmos oldhami* Gregory – Beauvais: 59, pl. 4, figs 4–5.
1997 *Epistreptophyllum cornutiformis* (Gregory) – Pandey & lathuilière: 565, pl. 7.1–7.7, 7.12–7.17, 8.7–8.12, 9.1–9.12, 10.1–10.12 [cum syn.].
2003 *Epistreptophyllum cornutiformis* (Gregory) – Pandey & Fürsich: 62, pl. 17, figs1–10, pl. 18, figs 1–2.

Material: Three specimens from level 2 (PIW2007II 18) and level 1 (PIW2007II 20, 90).

Dimensions: See Table 30.

Description: Corallum solitary, small, turbinate, with very small attachment area. Calice moderately deep, subpolygonal in outline. Costo-septa sub-compact, irregularly perforated near the inner-distal margin, distal margin slightly arched, sloping steeply from wall to center. Lateral surfaces of septa exhibiting granules. Dissepiments arranged along the wall. Columellar area circular. Wall parathecal and epithecal. Columella parietal, papillose. Epitheca moderately thick.

Remarks: Out of three specimens one (PIW2007II 90) had just begun to bud. This specimen is distinctly taller than the other two (see also Pandey & lathuilière 1997). The morphological features and the dimensions closely match *Epistreptophyllum cornutiformis* (Gregory) from the Jurassic of Kachchh.

Genus *Calamophylliopsis* Alloiteau, 1952
Type species *Calamophyllia flabellata* de Fromentel, 1861

Calamophylliopsis sp.
Pl. 12, Fig. 1a–c

Material: One specimen from level 1 (PIW2007II 36).

Dimensions: See Table 31.

Description: Corallum small, colonial, branching dichotomous with a very low angle. Budding intracalicular, marginal. Corallites oval in outline, calices monocentric. Septa thin, occasionally anastomosing, laterally covered with spinules and granules, distal margin with fine denticles. Septa arranged in four cycles. Septa of first three cycles of more or less equal thickness extending up to the center where they join. Septa of fourth cycle thinner and shorter. Endothecal vesicular dissepiments common. Wall septoparathecal, thickened by holotheca.

Remarks: In the present juvenile coral the inner parts of septa, together with dissepiments, look like a spongy columella. The calice of one of the branches shows an aphroid condition. The morphological features and the dimensions of the corallum are comparable to *Calamophylliopsis cervina* (Etallon in Thurmann & Etallon 1864: 380, pl. 54, fig. 1) and *C. simonyi* Reuss (1854: 112, pl. 12, figs 5–7; Baron-Szabo 2000: 108, pl. 9, fig. 4). However, because the Iranian specimen represents a poorly preserved juvenile form, it was not assigned to any species.

Family Agariciidae Gray, 1847

Remark: For diagnosis of the family see Baron-Szabo (2002: 117).

Table 32: Dimension (in mm) of *Craterastraea crateriformis* (Gregory)

	d	c-c	Ns	Ds
PIW2007II 57	2	3-4	20-31	10-11

Table 33: Dimensions (in mm) of *Maeandrella wellsi* (Reig Oriol)

	d	Ns	Ds	c'c'	Mls
PIW2007II 61	5.5-7.8	29-45	4/ 2 mm	4.8-6.5	up to 2 calices
PIW2007II 63	8.0-10.5	31-36	3/ 2 mm	4.5-8.0	up to 4 calices
PIW2007II 76	8.5	24	3-4/ 2 mm	6-7	up to 2 calices

Genus *Craterastraea* Beauvais, 1978
Type species *Thamnastraea crateriformis* Gregory, 1900

Craterastraea crateriformis (Gregory, 1900)
Pl. 12, Fig. 2

*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 et al.: 10, pl. 2, fig. 1.
2003 *Craterastraea crateriformis* (Gregory) – Pandey & Fürsich: 79, pl. 23, figs 1, 3–5.

Material: One specimen from level 1 (PIW2007II 57).

Dimensions: See Table 32.

Description: Corallum colonial, flat, ploco-thamnasterioid. Budding intracalicular, circumoral. Calices small, distinct, slightly depressed, subcircular in outline. Costosepta few in numbers within the calice, but dense along the periphery of the calices, confluent, occasionally anastomosing, composed of pennular trabeculae. Septa sub-compact, arranged in at least three cycles. About 10 of the septa reaching the center, the others remaining short. A few septa of the first cycle joined to the columella. Distal margin of septa denticulated. Lateral surfaces covered with spinules. Endotheca consisting of vesicular dissepiments. Synapticulae along the periphery common. Columella papillose. Lower surface covered with thin costae.

Remarks: Compared to earlier illustrated specimens of this species, the septa in the present specimen are more parallel arranged between adjacent calices. Features, such as the ploco-thamnasterioid colony, depressed crater-like calices, anastomosing, sub-compact, low-density septa in calices as compared to the periphery of the calices, presence of dissepiments and synapticulae, and a papillose columella as well as the dimensions closely correspond to *Craterastraea crateriformis* until now only known from the Jurassic.

Genus *Maeandrella* Oppenheim, 1930
Type species *Meandrina michelini* Reuss, 1854

Maeandrella wellsi (Reig Oriol, 1995)
Pl. 9, Figs 3a–b, 4a–b, 5

*1995 *Astrogyropsis wellsi* sp. nov. – Reig Oriol: 18, pl. 2, fig. 6.
2002 *Maeandrella wellsi* (Reig Oriol) – Baron-Szabo: 124.

Material: Three specimens from level 1 (PIW2007II 76) and level 2 (PIW2007II 61, 63).

Dimensions: See Table 33.

Description: Corallum colonial, flat, cerioid to meandroid. Upper surface convex to almost flat. Calice or calice series moderately deep, polygonal in outline, and mono-, di-, tri- to polycentric. Collines tholiform with flattened top, thick. Budding intracalicular. Costosepta moderately thick, sub-compact, non-confluent between series, rarely anastomosing towards center of calice, arranged in at least four cycles, ambulacrum irregularly present. Septa of first three cycles equal in thickness, those of fourth cycle thin and slightly shorter. Septa of corallites of same series confluent to non-confluent. Lateral surfaces of septa covered with medium-sized, coarse granules and spinules. Endothecal dissepiments vesicular, common. Wall predominantly septoparathecal. Columella parietal, papillose to spongy.

Remarks: The dimensions differ slightly from the ones originally given by Reig Oriol (1995). We took the dimensions (diameter of calices: predominantly 3–7 mm, 2 mm in early budding stages, and up to 9 mm in latest budding stages; density of septa on calicinal ridge 3–6 per 2 mm) from the original illustrations of the holotype. So far, this taxon had been reported only from the type locality. Baron-Szabo (2002) included these forms in the synonymy of the genus *Maeandrella*.

Genus *Lamellofungia* Alloiteau, 1957
Type species *Lamellofungia rennensis* Alloiteau, 1957

Lamellofungia sp. A
Pl. 10, Figs 1a–c, 2

Material: Two specimens, 1 from level 1 (PIW2007II 81) and 1 from level 2 (PIW2007II 88).

Table 34: Dimension (in mm) of *Lamellofungia* sp. A

	D	H	d	Ns	Ds	c'c'	Mls
PIW2007II 81	>42.3	8.7	3.0-4.3	23-31	4-6/ 2 mm	3.2-4.3	up to 3 calices
PIW2007II 88	73.5	33.8	7-14	52-68	4-5/ 2 mm	9-11	up to 2 calices

Table 35: Dimensions (in mm) of *Dimorphastraea renevieri* (Koby)

	D	H	d	c-c	c'-c'	Ns	Ds
PIW2007II 46	~240	35	5.5-7.5	6.6-9	10-13	28-47	13/ 5 mm
PIW2007II 80	62.3	28.0	-	-	10	-	17/ 5 mm
PIW2007II 84	43.4	15	-	5.6-6	6-7.5	45	13/ 5 mm

Dimensions: See Table 34.

Description: Corallum colonial, cerio-meandroid, cerio-thamnasterioid to meandroid, flat, discoidal with small attachment area. Upper surface almost flat to faintly convex. Calices moderately deep, subrounded to tetra-, penta-, hexa- or polygonal, and mono- to tricentric. Budding intracalicular. Septa equal in thickness, thin, compact with dissociated axial end, anastomosing, arranged in at least four cycles. Septa of first two cycles reach corallite center, those of third to fifth cycles alternate in length. Septa confluent to non-confluent. Lateral surfaces of septa covered with fine granules and spinules. Distal margin of septa covered with sharp denticles. Endothecal dissepiments common. Wall predominantly parathecal. Columella parietal. Lower surface of corallum covered with costae.

Remarks: One of the colonies shows rejuvenation in a small area. This part, which occurs on the upper surface, might have grown in a different micro-environment, which resulted in the change of type of polyp integration from cerio-meandroid to cerio-thamnasterioid to meandroid.

So far, only one species of this genus, the type species *Lamellofungia rennensis* Alloiteau (1957: 230, pl. 7, fig. 2, pl. 19, fig. 8), has been described. However, its dimensions, particularly the number of septa (Ns: mainly 18–22) does not correspond with either of the specimens. Owing to the limited material we restrain from creating a new species.

Family Latomeandridae Alloiteau, 1952

Genus *Dimorphastraea* de Fromentel, 1857

Type species *Dimorphastraea grandiflora* de Fromentel, 1857

Dimorphastraea renevieri (Koby, 1887)

Pl. 12, Figs 3–5

*1887 *Thamnasteria renevieri* sp. nov. – Koby: 379, pl. 103, fig. 2.
1966 *Dimorphastraea renevieri* (Koby) – Beauvais: 1013, pl. 11, fig. 4, pl. 12, fig. 3.
2003 *Dimorphastraea renevieri* (Koby) – Pandey & Fürsich: 93, pl. 24, figs 2–3.

Material: Three specimens from level 1 (PIW2007II 46, 80, 84).

Dimensions: See Table 35.

Description: Corallum compound, large, discoidal, thamnasterioid, budding circumoral. Upper surface flat to slightly concave, calices distinct, slightly depressed, arranged in concentric rings. Septa sub-compact, uniformly thick, occasionally anastomosing, confluent, parallel between two calices of adjacent rings, less dense near the center of the corallites, arranged in five cycles. Distal margin with acute to rounded denticles. Septa of first two cycles complete, nearly reaching the center and occasionally developing a trabecular lobe at the inner edge and joined to the center. Septa of third cycle short, anastomosing. Septa of fourth and fifth cycles incomplete and very short. Lateral surfaces of septa ornamented with granules, spinules, and occasionally well developed mi-pennulae-like structures (balconies), occasionally arranged in rows parallel to distal margin. Pores near the distal margin of the septa present. Vesicular dissepiments common. Columella small, feeble, papillose, fused with the trabecular lobes.

Remarks: The various morphological features such as septal ornamentation, circumoral budding, parallel arrangement of septa, papillose columella, and long intercalicinal distances, as well as the dimensions agree well with the Middle Jurassic species *Dimorphastraea renevieri* Koby described earlier from Switzerland and Iran.

Genus *Fungiastrea* Alloiteau, 1952

Type species *Astrea laganum* Michelin, 1841

Fungiastrea aff. *arachnoides* (Parkinson, 1808)

Pl. 13, Fig. 1a–b

aff. *1808 *Madrepora arachnoides* sp. nov. – Parkinson: 54, pl. 6, fig. 4, pl. 7, fig. 11.
aff. 1887 *Thamnastrea arachnoides* (Parkinson) – Koby: 358, pl. 97, figs 5–7, pl. 99, figs 6–7.
aff. 1997 *Fungiastrea arachnoides* (Parkinson) – Turnšek: 93, pl. 93, figs A–F [cum syn.].

Material: One specimen from level 1 (PIW2007II 47).

Table 36: Dimensions (in mm) of *Fungiastrea* aff. *arachnoides* (Parkinson)

	D	H	d	c-c	Ns	Ds
PIW2007II 47	73.5	138	4.0-6.0	5-7	39-41	18/ 5 mm

Table 37: Dimensions (in mm) of *Comophyllia polymorpha* (Koby)

	D	H	c-c	c´-c´	Lc	Ns	Ds	Dt
PIW2007II 77	63.3	33.6	4.6-6.6	6-10	>18	37-60	5/ 2 mm	7/ 2 mm

Dimensions: See Table 36.

Description: Corallum compound, large, club-shaped, thamnasterioid to sub-meandroid, budding intracalicular. Calices distinct. Septa sub-compact, thin to thick, occasionally anastomosing, confluent, with both isotropic and parallel arrangement between two adjacent calices. Septa arranged in five cycles, those of the first two cycles complete, nearly reaching the center and joined to the papillose to spongy columella. Septa of third to fifth cycles increasingly shorter and thinner. Lateral surfaces of septa ornamented with granules and pennulae. Vesicular dissepiments abundant. Columella papillose to spongy. Wall between two series septoparatheal.

Remarks: The septoparatheal wall between two series of corallites is unusual, but features such as a thamnasterioid to sub-meandroid colony, sub-compact, anastomosing septa, papillose to spongy columella, abundant vesicular dissepiments, and presence of pennulae suggest an assignment of the specimen to *Fungiastrea* Alloiteau (1952: 661; Baron-Szabo 2002: 147). The dimensions agree well with *Fungiastrea arachnoides* (Parkinson) described by earlier workers (see synonymy list), except for a slightly lower septal density in the latter (12–15/ 5 mm).

Genus *Periseris* Ferry, 1870
Type species *Agaricia elegantula* d'Orbigny, 1850

Periseris elegantula (d´Orbigny, 1850)
Pl. 10, Fig. 3a–b

*1850	*Agaricia elegantula* sp. nov. – d´Orbigny: I, 293.
1990	*Periseris elegantula* (d´Orbigny 1850) – Lathuilière: 38, pl. 1, figs 1–2, pl. 2, figs 1–4, pl. 3, figs 1–6, pl. 4, figs 1–7, pl. 5, figs 1–6 [cum syn.].
1993	*Periseris elegantula* (d´Orbigny, 1850) – Pandey & Fürsich: 37, pl 11, fig. 2, textfig. 22.
1993	*Periseris* cf. *renevieri* (Koby) – Pandey & Fürsich: 37, pl. 6, fig. 14, textfig. 23.
2000b	*Periseris elegantula* (d´Orbigny, 1850) – Lathuilière: 157, figs 13.1–13.2.
2003	*Periseris elegantula* (d´Orbigny, 1850) – Pandey & Fürsich: 94, pl. 28, figs 1–6.

Material: One specimen from level 1 (PIW2007II 79)

Description: Corallum colonial, thamnasterioid, upper surface flat. Calices superficial, indistinct. Septa thin, density 7–8 per 2 mm, sub-compact, confluent, composed of pennular trabeculae. Pennulae concave upward-directed. Maeniana continuous, running parallel to each other, density 10–11 per 2 mm. Synapticulae and dissepiments common. Columella very small, trabecular.

Remarks: The specimen is poorly preserved and encrusted with serpulids and calcareous material. The thamnasterioid nature of the colonies and the septal microarchitecture, which can be observed on the broken surface of the colony, correspond to *Periseris elegantula* (d´Orbigny).

Genus *Comophyllia* d´Orbigny, 1849
Type species *Comophyllia elegans* d´Orbigny, 1849

Comophyllia polymorpha (Koby, 1905)
Pl. 14, Fig. 3a–c

*1905	*Dimophastraea polymorpha* sp. nov. – Koby: 109, pl. 17, figs 1–4, pl. 19, figs 4–5.
1955	*Comophyllia polymorpha* (Koby) – Geyer: 233.
1972	*Comophyllia polymorpha* (Koby) – Beauvais: 79, pl. E, figs 4–6.
1976	*Comophyllia polymorpha* (Koby) – Roniewicz: 100, pl. 29, figs 3–4.
1985	*Comophyllia polymorpha* (Koby) – Rosendahl: 61, pl. 6, fig. 6.
1991	*Comophyllia polymorpha* (Koby) – Errenst: 20, pl. 18, fig. 1.
2003	*Comophyllia polymorpha* (Koby) – Pandey & Fürsich: 86, pl. 26, figs 3–7.

Material: One specimen from level 1 (PIW2007II 77).

Dimensions: See Table 37.

Description: Corallum colonial, moderately large, massive, sub-patellate, with small attachment area, thamno-meandroid. Upper surface flat to slightly concave, lower surface slightly lobed near the periphery. Lower surface covered with very fine costae and thin holotheca. Corallites formed by intracalicular, circumoral budding. Collines tholiform, slightly sinuous, radiating, confined to outer two-thirds of upper surface. Calices slightly depressed, centers distinct, arranged in three concentric rings. Septa sub-compact, occasionally anastomosing, confluent, consisting of trabeculae, with distal edge denticulated. Pennulae distinct, square to rectangular in outline when seen from the distal end, pores circular in outline and common. Maeniana denticulated. Synapticulae and dissepiments common. Wall along collines synapticulothecal or septothecal. Columella parietal, rudimentary, papillose to spongy.

Table 38: Dimensions (in mm) of *Turnsekophyllia cantabrica* Baron-Szabo

	D	H	Ns	Ds/2 mm	att/rest area	Cf	Dt.c
PIW2007II 23	8/5.5	20	~50	5	2	2, oval	1.6

Table 39: Dimensions (in mm) of *Comoseris meandrinoides* (Michelin)

	D	H	d	c-c	Ns	Ds	Dt	Lc	Ws
PIW2007II 78	78	18	2.5	3.2	26-30	6-7/ 2 mm	7/ 2 mm	>18	4.5

Remarks: The thamno-meandroid colony, radial collines, circumoral budding, sub-compact pennular septa, and dimensions of the present specimen agree well with the morphological characters of *Comophyllia polymorpha* (Koby) described by earlier workers (e.g., Pandey & Fürsich 2003).

Family Agathiphylliidae Vaughan & Wells, 1943

Remark: For diagnostic characters see Baron-Szabo (2002: 125).

Genus *Turnsekophyllia* Baron-Szabo, 2002
Type species *Turnsekophyllia cantabrica* Baron-Szabo, 2002

Turnsekophyllia cantabrica Baron-Szabo, 2002
Pl. 15, Fig. 2–b

*2002 *Turnsekophyllia cantabrica* sp. nov. – Baron-Szabo: 126, pl. 88, figs 1–4, pl. 89, fig. 1).

Material: One specimen from level 1 (PIW2007II 23).

Dimensions: See Table 38.

Description: Corallite curved. Calice moderately deep, suboval in outline. Septa sub-compact, pores larger then the thickness of trabeculae, moderately thick, laterally ornamented with small granules, spinules and pennulae-like structures. Costae corresponding to septa, equally thick. Endothecal vesicular dissepiments common. Columella papillose. Wall parathecal.

Remarks: The Iranian specimen is moderately well preserved. It corresponds to a corallite of a phaceloid-reptoid colony of the genus *Turnsekophyllia* Baron-Szabo (2002: 126). Due to the large diameter of pores and septal ornamentation, it is difficult to trace the septal cycles. The morphological features of the present specimen correspond well with the type material of the type species *T. cantabrica* Baron-Szabo (2002).

Suborder Microsolenina Morycowa & Roniewicz, 1995
Family Microsolenidae Koby, 1890

Genus *Comoseris* d´Orbigny, 1849
Type species *Pavonia meandrinoides* Michelin, 1843

Comoseris meandrinoides (Michelin, 1843)
Pl. 13, Fig. 2a–b

1843 *Pavonia meandrinoides* sp. nov. – Michelin: 100, pl. 22, fig. 3.
1964 *Comoseris meandrinoides* (Michelin) – Beauvais: 236 [cum syn.].
2002 *Comoseris meandrinoides* (Michelin) – Baron-Szabo: 137, pl. 96, fig. 1.

Material: One specimen from level 1 (PIW2007II 78).

Dimensions: See Table 39.

Description: Corallum compound, massive, meandroid to thamno-meandroid, foliaceous. Upper surface slightly arched. Budding intracalicular. Calices superficial, center indistinct, arranged in series demarcated by tholiform collines, more or less radially arranged towards periphery. Costosepta moderately thick, fenestrate, anastomosing, isotropic in arrangement in and around calices, confluent and parallel, crossing the collines at right angles. Pennulae along the lateral surfaces of septa poorly developed, sub-rectangular in outlines with fine denticles along the margins. Synapticulae and dissepiments common. Columella indistinct.

Remarks: The specimen is poorly preserved. Because of this, the colony resembles locally *Meandrophyllia* d´Orbigny, 1849 (=*Meandrarea* Étallon, 1864) described by Wells (1932: 251, 1944: 439) and Löser (1994: 53) from the Cretaceous. However, morphological characters such as the thamno-meandroid colony, fenestrate and pennular septa, and common synapticulae suggest that the specimen should be placed in *Comoseris*. The dimensions, i.e. distance between centers of adjacent calices, number of septa in each corallite, density of septa along the collines, and trabecular density match *Comoseris meandrinoides* (Michelin, 1843), described from Jurassic strata by earlier workers (e.g., Beauvais 1964: 236). The other species of *Comoseris* differ by having fewer or more septa and a lower or higher septal density (Thurmann & Étallon 1864: 405–406; Koby 1888: 404; Beauvais 1964: 237; Roniewicz 1976: 107).

Genus *Microsolena* Lamouroux, 1821
Type species *Microsolena porosa* Lamouroux, 1821

Remark: *Microsolena* Lamouroux, 1821 also includes *Dimorpharaea* de Fromentel, 1861 (Pandey & Fürsich 2003: 100).

Table 40: Dimensions (in mm) of *Microsolena barcenai* (Felix)

	D	H	c-c	c'-c'	Ns	Ds	Dt
PIW2007II 71	47	20	2-3.2	5.7	34-25	6/ 2 mm	6-7/ 2 mm
PIW2007II 72	45.7	20	3-4	4-6	48	9/ 2 mm	9/ 2 mm

Table 41: Dimensions (in mm) of *Kobya crassolamellosa* Gregory

	D	H	c-c	c'-c'	Ns	Ds	Dt
PIW2007II 70	18.3	6.5	3.5	4.5-6.2	52-21	6/ 2 mm	9/ 2 mm
PIW2007II 73	85 60	33 55	8.3-8.8 7.5-9.7	-	42 56	7/ 2 mm 5/ 2 mm	6/ 2 mm 6/ 2 mm

Microsolena barcenai (Felix, 1891)
Pl. 14, Figs 1a–b, 2

*1891 *Thamnastraea barcenai* sp. nov. – Felix: 144, pl. 23, fig. 7, pl. 22, fig. 3.
1900 *Dimorpharaea barcenai* (Felix) – Gregory: 189.
1932 *Dimorpharaea* cf. *barcenai* (Felix) – Wells: 253, pl. 37, fig. 4.

Material: Two specimens from level 1 (PIW2007II 71–72).

Dimensions: See Table 40.

Description: Corallum compound, massive, thamnasterioid, sub-patellate with small attachment area. Upper surface sub-circular in outline. Sub-conical lower surface covered with thin holotheca. Colony formed by intracalicular circumoral budding. Calices superficial, center distinct, arranged in rings. Costosepta moderately thin to thick, fenestrate, anastomosing, arranged parallel, composed of pennular trabeculae. Pennulae well developed, sub-rectangular to sub-quadrangular in outline with concave upper surface and fine denticles along the margins. Maeniana discontinuous, running parallel along both sides of the septum. Distal margin moniliform. Synapticulae and dissepiments common. Columella indistinct.

Remarks: The specimens are moderately well preserved and occasionally encrusted with serpulids on the lower surface. They show all diagnostic features of the genus *Microsolena*. The flat top of the colony (Gregory 1900: 189), number of septa, septal densities, and distances between corallites of different series in the present specimens match well *Microsolena barcenai* from the Cretaceous of Mexico (Felix 1891) and central Texas (Wells 1932). *Microsolena texana* Wells (1932: 252, pl. 35, fig. 2, pl. 37, fig, 5) exhibits similar parallel septa, but possesses a much lower septal density (6 per 5 mm) and thus can be easily differentiated.

Genus *Kobya* Gregory, 1900
Type species *Kobya crassolamellosa* Gregory, 1900

Remark: For diagnostic characters and remarks see Pandey & Fürsich (2003: 108).

Kobya crassolamellosa Gregory, 1900
Pl. 13, Fig. 3–b, Pl. 15, Fig. 1a–c

*1900 *Kobya crassolamellosa* sp. nov. – Gregory: 170, pl. 21, figs 15–17, pl. 22, figs 2, 5–8, pl. 23, fig. 1, pl. 2A, fig. 7.
1900 *Kobya cancellata* sp. nov. – Gregory: 171, pl. 23, fig. 2.
1900 *Kobya lenticulata* sp. nov. – Gregory: 172, pl. 22, figs 3–4.
1970 *Kobya crassolamellosa* Gregory – Beauvais: 1123, pl. 3, fig. 4, pl. 4, fig. 1.
1978 *Kobya crassolamellosa* Gregory – Beauvais: 50, pl. 2, fig. 1 (non pl. 7, fig. 1).
1993 *Kobya crassolamellosa* Gregory – Pandey & Fürsich: 22, pl. 6, figs 6, 8–9, textfig. 14.
1993 *Kobya lenticulata* Gregory – Pandey & Fürsich: 23, pl. 6, fig. 7.
1993 *Kobya* sp. A – Pandey & Fürsich: 23, pl. 11, fig. 9.
2003 *Kobya crassolamellosa* Gregory – Pandey & Fürsich: 110, pl. 33, fig. 5.
2003 *Kobya* aff. *crassolamellosa* Gregory – Baron-Szabo et al.: 212, pl. 38, fig. 4.

Material: Two specimens from level 1 (PIW2007II 70, 73).

Dimensions: See Table 41.

Description: Corallum compound, massive, small to large, thamnasterioid, patellate, with small to very large attachment area. Upper surface flat to slightly arched, sub-circular in outline. Conical lower surface covered with thin holotheca. Colony formed by intracalicular circumoral budding around a central corallite. Calices superficial, center distinct, arranged in rings. Costosepta thin to moderately thick, fenestrate, anastomosing, isotropic to parallel, composed of pennular trabeculae. Pennulae well developed, sub-rectangular to sub-quadrangular in outline with concave upper surface and fine denticles along the margins. Maeniana continuous to discontinuous, running parallel along both sides of septum. Distal margin moniliform. Synapticulae and dissepiments common. Columella papillose to spongy.

Remarks: Features such as thamnasterioid growth structure, circumoral arrangement of calices, anastomosing fenestrate septa, pennular trabeculae, moniliform distal margin of septa, common synapticulae and dissepiments, spongy papillose columella, and dimensions agree well with *Kobya*

Table 42: Dimensions (in mm) of *Smilotrochus* sp.

	H	D	Ns	Dc
PIW2007II 42	>29	12-13.5/9	>14 (6+6+2) (seen in TS)	4-5/ 2 mm

Table 43: Dimensions (in mm) of ?*Tiarasmilia* sp.

	D	H	Ns	Ds/2 mm	att. area	Cf	Dt.c	shape
PIW2007II 27	11.2/10	10.0	24	2	1	circular	Nil	conical

crassolamellosa. The dimensions of *Kobya* aff. *crassolamellosa* Gregory described from the Lower Cretaceous north of Esfahan, Iran (Baron-Szabo et al. 2003: 212, pl. 38, fig. 4) fall within the range of variation of the species recorded from the Lower Callovian of east-central Iran (Pandey & Fürsich 2003) and the Middle to Upper Bathonian of the Kachchh Basin (Gregory 1900; Pandey & Fürsich: 1993), and therefore has been included into the synonymy.

Kobya rigausensis Beauvais (1982: 42, pl. 26, fig. 3; Baron-Szabo 1999: 462, pl. 3, fig. 3, pl. 7, fig. 6) from the Gosau Group (Upper Cretaceous, Weissenbachalm, Steiermark, Austria) does not show regularly perforated septa (see Pandey & Fürsich 2003: 108), hence the identification should be reviewed.

Suborder Caryophylliina Vaughan & Wells, 1943
Family Caryophylliidae Gray, 1847
Subfamily Desmophyllinae Vaughan & Wells, 1943

Genus *Smilotrochus* Milne Edwards & Haime, 1851
Type species *Trochosmilia tuberosa* Milne Edwards & Haime, 1851

Smilotrochus sp.
Pl. 14, Fig. 4a–b

Material: One specimen from level 1 (PIW2007II 42).

Dimensions: See Table 42.

Description: Corallum solitary, subcylindrical-turbinate, oval in outline. Epitheca thin, with growth rugae. Septa few, compact, thick, arranged in three incomplete cycles. Number of septa unknown. Dissepiments present near the wall. Wall septothecal, thickened by exothecal stereozone.

Remarks: The specimen is poorly preserved. In places where the epitheca is eroded, thin costae form a reticulate pattern with concentric growth rugae. Although the microstructure is poorly preserved, traces of trabecular centers, which produce a line along the axis of the septa can be seen. Dissepiments can be observed in traces along the wall. There is no columella. The straight object inside the corallite does not seem to belong to the specimen and the other segments seen in the corallite center are septal fragments. The occurrence of strongly bent septa, septothecal wall, and very sparse endothecal dissepiments is very typical of *Smilotrochus* Milne Edwards & Haime. However, because in some areas traces of recrystallized septa are present, the original number of septa in the specimen is unknown. For this reason, the Iranian specimen is not assigned to any species.

Genus *Tiarasmilia* Wells, 1932
Type species *Tiarasmilia casterasi* Wells, 1932

?*Tiarasmilia* sp.
Pl. 16, Fig. 2a–b

Material: One specimen from level 1 (PIW2007II 27).

Dimensions: See Table 43.

Description: Corallum solitary, small, conical with very small attachment area. Calice circular in outline. Costo-septa thick, prominent, compact, unequal, arranged in three cycles. Distal margin of septa asymmetrically curved with the maximum projection near the periphery, laterally ornamented with spinules and thick, rounded granules. Primary septa long, their trabecular extensions fused with columella, septa of higher orders successively shorter and thinner. Paliform swellings and lobes present. Columella spongy (seen in transverse section only). Wall septo-parathecal.

Remarks: In possessing thick, compact and generally strongly ornamented septa, as well as paliform swellings that extend to, and fill, the corallite center, the Iranian specimen corresponds to the genus *Tiarasmilia*. However, because *Tiarasmilia* is supposed to lack a columella, the specimen is only provisionally assigned to this genus.

6. Conclusions

The 92 coral specimens collected from a Lower Cretaceous section of the Koppeh Dagh, described and illustrated above, represent a highly diverse taphocoenosis. They have been assigned to 48 taxa, which belong to seven suborders. The fauna is dominated by members of the suborder Faviina both with respect to numbers of specimens and species. Together with members of the suborder Fungiina they constitute more than 50 per cent of the taxa. The Montlivaltiidae are with 15 taxa the most diverse family and represent 38 per cent of the specimens.

Solitary corals contribute only around 30 per cent (29 specimens and 13 taxa). Colonial corals exhibit a wide range of growth forms, from dendroid (14 specimens, 9 species), phaceloid-raptoid (1 specimen, 1 species), plocoid (7 specimens, 4 species), ploco-thamnasterioid (1 specimen, 1 species) or ploco-cerioid (4 specimens, 1 species), cerioid (13 specimens, 7 species), cerio-meandroid (10 specimens, 3 species), meandroid (1 specimen, 1 species), thamno-meandroid (2 specimens, 2 species), to thamnasterioid (10 specimens, 6 species).

The generic and specific identification of the corals is mainly based on morphological features (including micro-architecture) and dimensions. Several corals show significant morphological plasticity in response to environmental factors. Modern phylogenetic studies have revealed that some morphological features have developed several times in the course of evolution (van Oppen et al. 2001). This may explain why this Early Cretaceous coral assemblage includes several taxa which are also very common in the Jurassic. In a few cases it was very difficult to distinguish between a well established taxon from the Jurassic and a comparable form described by previous authors from the Cretaceous.

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