

The Barremian coral fauna of the Serre de Bleyton mountain range (Drôme, SE France)

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(With 5 figures)

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Abstract

The corals of the Serre de Bleyton mountain range are determined and described. The fauna consists of very small coral remains and fragments rarely exceeding one centimetre in size. It is clearly dominated by a few solitary and small phaceloid forms, while other growth forms are very rare. The fauna comprises 26 species in 16 genera of the suborders *Amphiastraeina*, *Archeocaeniina*, *Caryophylliina*, *Faviina*, *Fungiina*, *Microsolenina*, and *Stylinina*. With the exception of one *Amphiastrea* species, all corals have small to very small calices. The faunal composition is typical of Hauterivian to Early Albian coral faunas. Palaeobiogeographically they are related to Barremian-Aptian faunas of the Central Tethys and the western hemisphere.

Keywords: Anthozoa, corals, Early Cretaceous, Tethys, palaeobiogeography.

Zusammenfassung

Die Korallen vom Serre de Bleyton Gebiet wurden taxonomisch bearbeitet. Die Fauna besteht aus kleinen und kleinsten Bruchstücken und Resten von Korallen, die selten größer als ein Zentimeter sind. Die Fauna wird von solitären oder phaceloiden Formen dominiert, während Korallen anderer Wuchsformen sehr selten sind. Die Fauna umfaßt 26 Arten in 16 Gattungen der Unterordnungen *Amphiastraeina*, *Archeocaeniina*, *Caryophylliina*, *Faviina*, *Fungiina*, *Microsolenina*, und *Stylinina*. Mit Ausnahme einer *Amphiastrea* Art haben alle Korallen kleine bis sehr kleine Kelche. Die Faunenzusammensetzung ist typisch für Faunen des Hauterive bis Unterhalb. Paläobiogeographische Beziehungen bestehen vor allem zu Barrême/Apt Faunen der zentralen Tethys und westlichen Hemisphäre.

Schlüsselwörter: Anthozoa, Korallen, Unter-Kreide, Tethys, Paläobiogeographie

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Introduction

The corals described herein were collected by Gero MOOSLEITNER (Salzburg) together with numerous other fossils of various groups in a very small outcrop area in Southern France. The fossil material of the fossil locality – which up to that time was unknown – derived from the weathering away of turbiditic sediments of an Early Cretaceous age. Through a number of years MOOSLEITNER collected fossil material, cleaned it and separated the samples into animal groups. An impressive number of samples belonging to a wide range of organism groups was amassed in the course of time (MOOSLEITNER 2007), and the idea was born to investigate the fossils in detail, clarify their taxonomy and compile a summarising volume on the Serre de Bleyton fauna. While various other organism groups allowed interesting discoveries, the corals only served to complete the fossil record. The small size of the samples decisively limited opportunities for proper examination, i.e. examination using thin sections in longitudinal and transverse orientation.

In recent years Barremian corals from Southern France have been made well known (LÖSER & FERRY 2006; MASSE & MORYCOWA 1994; MASSE et al. 2009; MORYCOWA & MASSE 1998, 2007, 2009), although these taxonomic reports relate to carbonatic Urgonian facies. The coral fauna studied herein derives from clastic sediments of uncertain provenance and comprises shallow marine (supposedly hermatypic) corals and solitary forms known from fine-grained siliclastic sediments of the Early Cretaceous, which significantly differ from the material described for carbonatic rocks, adding to our knowledge of corals from the Vocontian basin.

Study area

The outcrop area lies in the Vocontian Basin (SE France), at the SE flank of the Serre de Bleyton range. Serre de Bleyton is the name of a low hill about 2 km south-west of the Arnayon valley (Department Drôme, France; Fig. 1). The Barremian turbiditic sediments cropping out there comprise bioclastic grainstones which contain both autochthonous and allochthonous fossils. Some of the turbiditic beds are highly fossiliferous, containing size-sorted assemblages of small fossils near their base (MOOSLEITNER 2007). The samples studied herein were obtained from three small outcrops along a gravel road on the SE of Serre de Bleyton (ca. 44°28'55"N 05°18'05"E). Belemnites (JANSSEN 2010) from sample points 2 and 3 indicate an age of late Early Barremian to early Late Barremian, which approximately corresponds to the interval of the *moutoniceras* to *giraudi* ammonite zone (sensu HARDENBOL et al. 1998). The sample point 1 is undated but a comparable age is assumed. Corals were obtained from sample points 1 and 2.

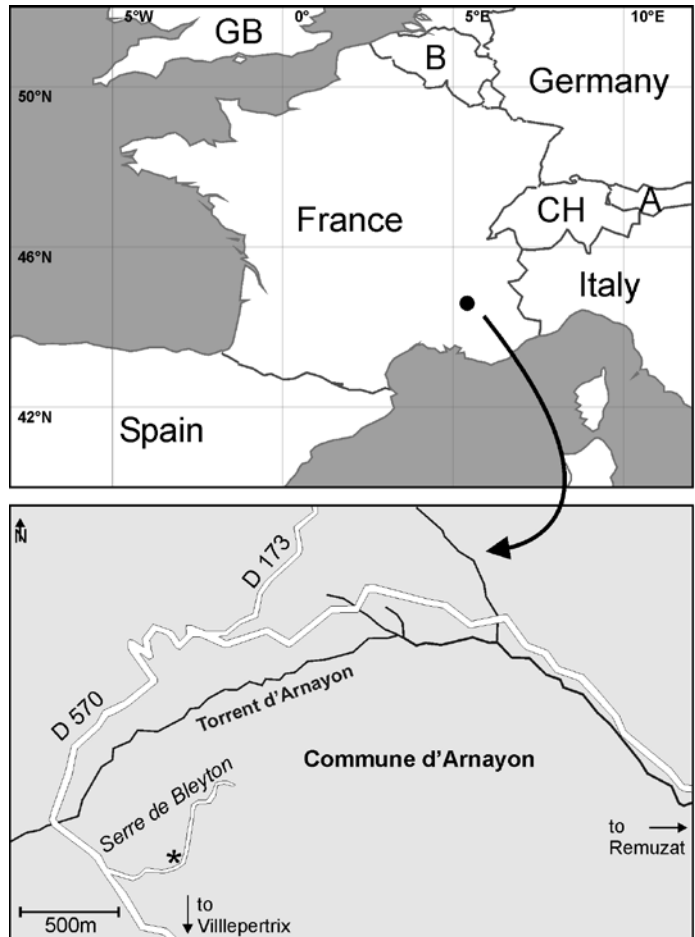


Fig. 1. Location of the study area.

Materials and Methods

The sample material was collected from weathered material of the above mentioned outcrops and processed by wet sieving. After separating the fossils from the sediment using a binocular the larger specimens were cleaned using the tenside Rewoquat (LIERL 1992). The coral fauna consists of a few hundred small remains of Scleractinian corals, most of them less than 10 mm in size. Only coral samples above a certain size could be considered. The smallest investigated colonies had a thickness of less than one millimetre and a surface of less than 15 square millimetres. In order to determine the genus and take dimensions to determine the species, coral specimens have been provided with a superficial polished section. Only a few thin sections were prepared, mainly from the more common species (solitary and phaceloid corals), as it seemed wiser to keep samples intact rather than destroy them obtaining thin sections. For illustrations, thin sections, acetate peels or polished surfaces were used. Thin sections, peels and slabs were scanned with transmitting or reflective light using an

Epson Perfection V750 Pro flatbed scanner with an optical resolution of 6400 dpi. In some cases no illustrations are provided because the sample quality decreased during the process of obtaining an illustrative surface. Due to the poor preservation conditions, the quality of the illustrations remains unsatisfactory. Descriptions could not be very detailed because of the lack of sufficient sample material – if only two or three corallites are clearly visible, a complete description cannot be given.

Only a very small part of the corals could be identified as colonial corals. The other consists of either fragments of solitary and phaceloid corals or of juveniles, some of which may be the initial stages of colonial corals. The small size of the corals was probably caused by size sorting through transportation. Complete (small) colonies and small solitary corals are mixed with fragments of corals. In those corals that can be clearly identified as solitary corals, the skeleton is made of dark calcite and the sediment is marly, which results in a very bright optical contrast. In colonial corals, the skeletal material is strongly recrystallized and partly silicified, which makes examination and the preparation of acetate peels and thin sections difficult. The optical contrast between sediment and skeleton is low. Solitary corals and fragments of phaceloid colonies form 95% of the association. Plocoid and thamnasterioid colonies are very rare. For the most part, these colonies or fragments are very small, often with a largest dimension of less than 5 mm. Colonies are often attached to serpulids or mollusc shells. Because of the suspected juvenile status of many of the corals, it was often not possible to decide whether a sample represents a solitary coral species or simply the beginning of a phaceloid or other coral colony. These corals were not considered in the present study.

The material described here is kept at the Vienna Natural History Museum (NHMW) under the numbers 2008z0096/0001 to 0045. Numbers 0029 to 0034 are from sample point 2, all others from sample point 1.

Abbreviations

Collection abbreviations are as follows:

BSPG	Bayerische Staatssammlung für Paläontologie und Geologie, München, Germany
CGS	Ceská geologická služba, Praha, Czech Republic
DW	Coll. Dan Woehr, San Antonio, Tex., USA
ERNO	Instituto de Geología, Estación Regional de Noroeste, Universidad Nacional Autónoma de México, Hermosillo, Mexico
IGM	Instituto de Geología, Mexico City, Mexico
IRScNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium
MB	Museum für Naturkunde der Humboldt-Universität, Berlin, Germany
MGSB	Museo Geológico del Seminario de Barcelona, Spain
MHNG	Muséum d'histoire naturelle de la Ville de Genève, Switzerland
MNHN	Muséum National d'Histoire Naturelle, Paris, France
MNHP	Narodni Muzeum, Praha, Czech Republic
MV	Vinseum, Vilafrance del Penedés, Spain
NHM	The Natural History Museum, London, United Kingdom
NHMW	Naturhistorisches Museum, Wien, Austria
PU	Museo di Geologia e Paleontologia dell' Università di Torino, Italy

RLM	Naturalis, Nationaal Natuurhistorisch Museum, Leiden, The Netherlands
TMM	Texas Memorial Museum, Austin, Tex., USA
TUM	The Tohoku University Museum, Sendai, Japan
UCGI	University of Cairo, Geological Institute, Egypt
UNAM/FI	Facultad de Ingeniería, Mexico City, Mexico
UP	Université de Provence, Coll. Masse, Marseille, France
USNM	United States National Museum, Washington, D.C., USA.

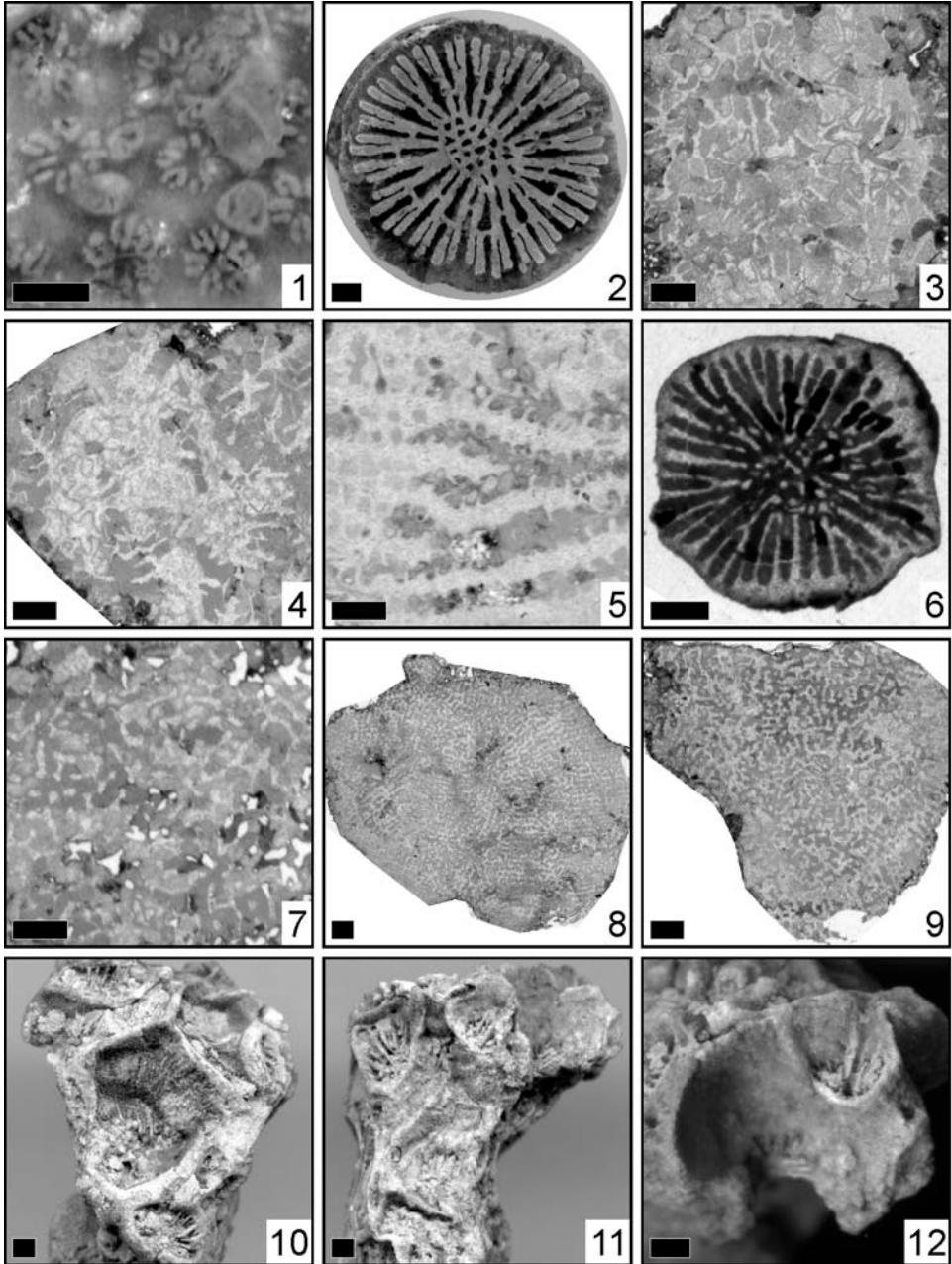
The following abbreviations are used for describing the dimensions of the corals:

c	calicular diameter
ccd	distance between calicular centres
cl	calicular diameter (calicular pit)
col	calicular diameter (oval calice – length)
cow	calicular diameter (oval calice – width)
crd	distance of calicular series
crw	width of calicular series
hcd	distance between conical collines in a hydnochoroid colony
hl	length of conical collines in hydnochoroid colony
s	number of radial elements in adult calices
sc	number of costae
sd	density of radial elements
sdt	density of trabeculae
sk	number of radial elements that reach the columella.

The abbreviations used in the synonymy lists follow MATTHEWS (1973): *, earliest valid publication of the species name; ?, the assignation of this description to the species is doubtful (so marked quotations are not reflected in the stratigraphic and palaeobiogeographic distribution); non, the described material does not belong to the species concerned; p, the described material belongs only in part to the species concerned; v, the specimen was observed by the author. A year in italics indicates that the quotation is provided with neither a description nor an illustration.

Systematic Part

The classification used here is mainly based on the traditional scheme first introduced by ALLOTEAU (1952) and later improved by, among others, RONIEWICZ (1976) and MORYCOWA & RONIEWICZ (1995). The distribution data (as reflected in the synonymy lists) are almost entirely based on well-examined material. Material only mentioned in the literature and material not available or insufficiently described and illustrated in the literature has not been taken into account. To obtain better insight into the distribution patterns of the coral fauna of France, additional unpublished material – indicated by a collection acronym and sample number in parenthesis – has been included. Therefore, distribution data indicated under “Occurrence elsewhere” are also provided for species remaining in open nomenclature.



Suborder Amphiastraeina ALLOITEAU 1952

Family Amphiastraeidae OGILVIE, 1897

Genus *Amphiastrea* ETALLON, 1859***Amphiastrea* sp.**

Figs 2.10-12

Material: NHMW 2008z0096/0012.

Dimensions: cow, 3-4 mm; col, 4.5-5.5 mm; s, ca. 24.

Description: The sample represents a small fragment of a cerioid colony with dendroid growth form. The calices are polygonal or have an oval outline. The septa are compact and free. The septal symmetry is bilateral. Septa vary in length and thickness. One septum may be longer and slightly larger than all others, without being rhopaloid. A columella does not exist. The wall is probably trabecular. The endotheca is unknown.

Remarks: The sample is too small to allow a better determination. The most obvious feature is the prominent main septum and the taschenknospung type of budding which occurs only in Amphiastreids. Among the cerioid genera of the family, *Thecidiosmilia* and *Pleurostylina* have both a very thick and rhopaloid main septum, *Metaulastrea* has a marginarium, *Amphiaulastrea* shows a septal arrangement as in *Opisthophyllum*, and *Monoaulastrea* has only one septum (see also LÖSER 2009, fig. 93).

◀ Fig. 2. Corals from Serre de Bleyton, Drôme.

- 1: *Actinastrea hourcqi* ALLOITEAU, 1958, NHMW 2008z0096/0024, Transverse polished section.
 - 2: *Trochocyathus conulus* (PHILLIPS, 1829), NHMW 2008z0096/0035, Transverse polished section.
 - 3: *Eohydnophora* cf. *alloiteaui* (REIG ORIOL, 1991), NHMW 2008z0096/0004, Transverse acetate peel.
 - 4: *Eohydnophora tenuis* (TOULA, 1878), NHMW 2008z0096/0018, Transverse acetate peel.
 - 5: *Pseudomyriophyllia* sp., NHMW 2008z0096/0016, Transverse acetate peel.
 - 6: *Procladocora* sp., NHMW 2008z0096/0044, Transverse thin section.
 - 7: *Camptodocis* cf. *basiplana* (DIETRICH, 1926), NHMW 2008z0096/0005, Transverse acetate peel.
 - 8: *Camptodocis* sp., NHMW 2008z0096/0013, Transverse acetate peel.
 - 9: NHMW 2008z0096/0009, Transverse acetate peel.
 - 10: *Amphiastrea* sp., NHMW 2008z0096/0012, Lateral view.
 - 11: NHMW 2008z0096/0012, Lateral view.
 - 12: NHMW 2008z0096/0012, Top view with a new corallite forming at one side of a larger corallite.
- Scale 1 mm.

Suborder Archeocaeniina ALLOITEAU, 1952

Family Actinastreaeidae ALLOITEAU, 1952

Genus *Actinastrea* D'ORBIGNY, 1849

Remarks: Here and in the literature, the genus *Actinastrea* is used in a conceptual sense. The syntypes of the type species, *Actinastrea goldfussi* D'ORBIGNY, 1850 as well as topotypical material with preserved substance (see for instance LELOUX 2003, text-fig.3; RLM 29066, which was available to the author) differs from material generally named *Actinastrea*. The revision of the genus by ALLOITEAU (1954) was not based on type material.

***Actinastrea hourcqi* ALLOITEAU, 1958**

Fig. 2.1

- v 1909 *Astrocoenia minima* – PREVER, p. 129, pl. 14: 12-14
 *v 1958 *Actinastrea Hourcqi* ALLOITEAU, p. 108, pl. 6: 8, pl. 7: 3

Material: NHMW 2008z0096/0024.

Dimensions: cl, 0.9-1.1 mm; ccd, 1.3-1.6 mm; s, 12; sk, 6.

Description: A cerioid colony with circular calices. The septa are compact. The septal symmetry is radial in six systems and two septal cycles. The septa of the first cycle reach the columella, those of the second cycle are connected to them. Septal swellings present in the first cycle only. The columella is styliform. The wall is probably septothecal. The endotheca is unknown. Intercalicular chambers not visible.

Occurrence elsewhere: Late Aptian of Italy (Abruzzi, L'Aquila) Monti d'Ocre, Fossa Agnese (PU 17936). Early Albian of Mexico (Sonora) Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4213), Municipio Arizpe, Arizpe, Cerro La Ceja (ERNO L-4262), Municipio Naco, Naco, Sierra San Jose (ERNO L-4443), Municipio Ures, Cerro de Oro (ERNO L-4909). Late Albian of Madagascar (Mahajanga) Mokaraha. Late Cenomanian (*guerangeri* zone) of the Czech Republic (Central Bohemian region) Korycany (MNHP ex Zitt 4/27.4.00).

***Actinastrea paucipaliformis* (BARON-SZABO & GONZÁLEZ LEÓN, 1999)**

- vp 1933 *Astrocoenia whitneyi* WELLS 1932 – WELLS, p. 73, pl. 6: 7
 *v 1999 *Columastrea paucipaliformis* BARON-SZABO & GONZÁLEZ LEÓN, p. 472, figs 2g, k
 v 2003 *Columastrea paucipaliformis* BARON-SZABO & GONZÁLEZ-LEÓN, 1999 – BARON-SZABO & GONZÁLEZ LEÓN, p. 204, fig. 7J

Material: NHMW 2008z0096/0022.

Dimensions: cl, 1.1-1.3 mm; ccd, 1.4-2 mm; s, 12; sk, 6.

Description: A cerioid colony with circular to polygonal calices. The septa are compact and free. The septal symmetry is radial in six systems and two septal cycles. The septa of the first cycle reach the columella, whereas those of the second cycle reach about the half of the septa of the second cycle. Septal swellings are absent. Paliform lobes do not exist. The columella is styliiform. The wall is probably septothecal. The endotheca is unknown. Intercalicular chambers not visible.

Remarks: The small sample did not allow to prepare any peel.

Occurrence elsewhere: Late Barremian to Early Aptian (*lenticularis* zone) of Mexico (Sonora) Municipio Ures, Cerro de Oro. Aptian of Mexico (Puebla) San Juan Raya (IGM 9262). Early Albian of Mexico (Sonora) Municipio Opodepe, Tuape, Cerro de la Espina, Municipio Ures, Cerro de Oro (ERNO L-4379), Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4300). Middle Albian (*lautus* zone) of the USA (Texas) Hudspeth County, Quitman Canyon (USNM I-75209)

Suborder Caryophylliina VAUGHAN & WELLS, 1943

Family Caryophylliidae GRAY, 1847

Genus *Trochocyathus* MILNE-EDWARDS & HAIME, 1848

Remarks: The genus is poorly defined. ALLOITEAU (1958) ignored in his considerations that the type species was designated by MILNE-EDWARDS & HAIME (1851a) and used an invalid neotype of *Turbinolia plicata* MICHELOTTI, 1838. The type material of *Turbinolia mitrata* GOLDFUSS, 1826, type species of *Trochocyathus*, is poorly preserved and was never examined in detail.

***Trochocyathus conulus* (PHILLIPS, 1829)**

Fig. 2.2

Material: NHMW 2008z0096/0035-0043

Dimensions: c, 8-12 mm; s, 48.

Description: A small turbinate solitary coral with a circular or elliptical outline. Septa compact, mostly free and ornamented with thorns at their lateral faces. Septa in a regular radial symmetry of six systems and five septal cycles s.s. (6+6+12+12+12). The septa of the first to third cycles are almost indistinguishable; they have the same length and thickness. The only difference is that septa of the third cycle may have septa of the fourth and fifth cycles attached to it in places. Most of septa of the first to third cycle bear elongated pali. Their visibility also depend on the level of the section. In a high level

of the corallite 24 elongated pali can be counted, but in a deeper level of the calice, the pali are partly connected to the septa and cannot be distinguished. The first and second cycle possess another row of pali that are small and trabecular, and cannot distinguished from the columella. The columella itself is made up of about five or six small trabecular elements in the centre of the calice. Costae almost not visible at the outer surface due to the soft skeletal material. Endothecal elements almost do not exist; in places septa of the fourth and fifth cycle are connected to a larger septum by means of a small thin dissepiment. The wall is probably septothecal.

Remarks: The difficulties of this taxon have already been discussed in LÖSER & STOLARSKI (1997). The material corresponds to that illustrated by ALLOITEAU (1958: 123) with the difference that in the present material the septal symmetry is much more regular. A synonymy list cannot be given for this species. The illustration in PHILLIPS (1829) is poor and the type of *Caryophyllia conulus*, which still exists at the Yorkshire Museum, has been never examined in detail. Most quotations of the species in the literature are accompanied by poor or insufficient illustrations.

Suborder Faviina VAUGHAN & WELLS, 1943

Family Eugyridae EGUCHI, 1951

Genus *Eohydnophora* YABE & EGUCHI, 1936

Remarks: The examination of the type material of *Eohydnophora tosaensis* YABE & EGUCHI, 1936, type species of *Eohydnophora*, and those of *Felixigyra deangelisi* PREVER, 1909, type species of *Felixigyra* PREVER, 1909 revealed that *Felixigyra* s.s. is characterised by having exclusively conical monticules that are connected by the means of apophyses, and by showing distinctive calicular centres. *Eohydnophora* corresponds much better to the material assigned to *Felixigyra* after it was established by PREVER (1909). For details see LÖSER (in review).

***Eohydnophora* cf. *alloiteaui* (REIG ORIOL, 1991)**

Fig. 2.3

vp 1971 *Felixigyra patruliusi tenuiseptata* MORYCOWA, p. 64, pl. 11: 2

Material: NHMW 2008z0096/0004.

Dimensions: hcd, 1.3-1.5 mm; hl, 1.5-3 mm; sd, 4/1 mm.

Description: A hydnochoroid colony. The collines are short and straight. The septa are compact, free and alternate in size. The septal lateral faces bear few thorns. A columella does not exist. The endotheca is unknown.

Remarks: The material has slightly larger dimensions than *Eohydnophora alloiteau* (hcd, 0.9-1.1 mm; sd, 6/2 mm).

Occurrence elsewhere: Early Aptian (*lenticularis* zone) of Romania (Suceava) Pojorîta area, Cîmpulung-Moldovenesc, Valea Izvorul Alb. Latest Aptian to Early Albian of Greece (Viotia) Aliartos, Chiarmena (BSPG 2003 XX 6204).

***Eohydnophora tenuis* (TOULA, 1878)**

Fig. 2.4

- *v 1878 *Holocystis tenuis* TOULA, p. 281, pl. 9: 4
- v 1936 *Eohydnophora tosaensis* YABE & EGUCHI – YABE & EGUCHI, p. 142, figs1-3
- v 1951 *Eohydnophora* aff. *picteti* (Koby) – EGUCHI, p. 14, pl. 2: 7, 8
- v 1984 *Eugyra pusilla* Koby, 1895 – SCHOLZ, p. 475
- v 1998 *Felixigyra viai* (REIG ORIOL 1991) – SCHÖLLHORN, p. 78, fig. 37, pl. 19: 8, 9, pl. 29: 1
- v 2008 *Felixigyra tenuis* (TOULA, 1878) – TOMÁS et al., p. 522, figs 12G, H

Material: NHMW 2008z0096/0018.

Dimensions: hcd, 1.5 mm; sd, 3/1 mm.

Description: A hydnochoroid colony. The collines are straight and vary in length. The septa are compact and free. The septa almost do not differ in length and thickness. Their lateral faces bear few thorns. A columella does not exist. The endotheca is unknown.

Occurrence elsewhere: Late Barremian to Early Aptian (*sartousi* – *weissi* zone) of Germany (Bayern) Allgäuer Helvetikum, Rote Wand, Rohrmoos. Barremian of Japan (Kochi-ken) Nankoku-shi, Kureda, Ryoseki, Okuminodani. Late Barremian to Early Aptian of Bulgaria (Vrachanska oblast) Vratsa. Early Late Aptian of Spain (Cataluña, Lérida) Com. La Noguera, Mun. Vilanova de Meià, Montsec de Rubies, section NW La Cabrua quarry (BSPG 2003 XX 6346). Latest Aptian of Spain (Cataluña, Lérida) Com. Alt Urgell, Mun. Coll de Nargó, Set Comelles, El Caso section; Japan (Iwate-ken) Shimohai-gun, Tanohata-mura, Raga.

Genus *Pseudomyriophyllia* MORYCOWA, 1971

***Pseudomyriophyllia* sp.**

Fig. 2.5

Material: NHMW 2008z0096/0016.

Dimensions: crd, 1 mm; crw, 0.6-0.7 mm; sd, 7/2 mm.

Description: A meandrinoid colony. Calicular rows straight and regular. The calices can almost not be distinguished. The septa are compact, free and slightly bent to a calicular centre. Two generations of septa can be distinguished that differ slightly in length and thickness. The lateral faces of the septa seem to be smooth. A columella exists only in places and is very small. The formation of the wall can not be recognized. The endotheca is unknown.

Family Faviidae MILNE-EDWARDS, 1857

Genus *Procladocora* ALLOITEAU, 1952

Remarks: The genus is poorly defined. There does not exist any illustration of the type of the type species which might give information on the characteristics of the genus. Its relationship to *Cladocora* is unclear.

***Procladocora* sp.**

Fig. 2.6

Material: NHMW 2008z0096/0044, 0045.

Dimensions: c, 4.5 mm; cl, 4 mm; s, ca. 60; sd, 6 / 2 mm.

Description: A phaceloid colony with circular or polygonal calices. The septa are compact and often connected to each other. The septal symmetry is radial in six systems. The septa of the different generations differ in length. They bear fine thorns at their lateral faces. Paliforme lobes are present. The columella is styliform or lamellar. The wall is probably septothecal. The endotheca is unknown.

Suborder Fungiina VERRILL, 1868-70

Family Haplaraeidae VAUGHAN & WELLS, 1943

Genus *Camptodocis* DIETRICH, 1926

***Camptodocis* cf. *basiplana* (DIETRICH, 1926)**

Fig. 2.7

Material: NHMW 2008z0096/0005.

Dimensions: ccd, 3-3.5 mm; s, 24; sd, 6/2 mm; sdt, 3/1 mm.

Description: A thamnasterioid colony where the calices can almost not be distinguished. The septa are irregularly perforated, generally straight and rarely connected to

each other. The septal symmetry is irregular. Septa are very regular in their thickness and differ only slightly in length. A small papilla probably marks the columella. Synapticulae are present. A wall does not exist. The endotheca is unknown.

Remarks: *C. basiplana* has a lower number and a lower density of septa.

***Camptodocis* sp.**

Figs 2.8, 9

Material: NHMW 2008z0096/0009, 0013.

Dimensions: ccd, 4-5.5 mm; s, 40-50; sd, 7/2 mm; sdt, 5/1 mm.

Description: A thamnasterioid colony. The calices are well distinguished. The septa are irregularly perforated, generally straight and rarely connected to each other. The septa show an irregular radial symmetry. They are very regular in their thickness and differ only slightly in length. A small papilla probably marks the columella. Synapticulae are abundant. A wall exists only in places and is made of synapticulae. The endotheca is unknown.

Family Thamnasteriidae REUSS, 1864

Genus *Mesomorpha* PRATZ, 1882-83

***Mesomorpha urgonensis* (KOBY, 1898)**

Fig. 3.1

- *v 1898 *Thamnastraea urgonensis* Koby, p. 82, pl. 19: 4-8, pl. 20: 1, 2
- 1981 *Mesomorpha excavata* (D'ORBIGNY 1850) – TURNŠEK & MIHAJLOVIC, p. 35, pl. 40: 1-5
- v 1998 *Mesomorpha* cf. *excavata* (D'ORBIGNY 1850) – SCHÖLLHORN, p. 92, pl. 22: 5
- v 1998 *Thamnasteria urgonensis* Koby 1898 – SCHÖLLHORN, p. 93, pl. 22: 4
- v 2003 *Mesomorpha ornata* MORYCOWA, 1971 – BARON-SZABO & GONZÁLEZ LEÓN, p. 200, fig. 5F

Material: NHMW 2008z0096/0001, 0017, 0033.

Dimensions: ccd, (1) 1.2-1.4 mm; s, 16-18 (21); sd, 5/1 mm; sk, 6-7.

Description: A thamnasterioid colony with small and well separated calices. They are confluent or sub-confluent. The septa are compact and often connected to each other. The septal symmetry is irregular. There exist different generations and only few septa reach the columella. Synapticulae are present. The wall is incomplete and consists of synapticulae. The endotheca is unknown.

Occurrence elsewhere: Early Hauterivian (*radiatus* zone) of France (Yonne) Gy-l'Evêque, fields NW Gy-l'Evêque (BSPG 2003 XX 6650). Early Hauterivian of France (Bouches-du-Rhône) Marseille, Calanque de la Mounine (BSPG 2003 XX 5194). Barremian of France (Doubs) Morteau. Early Aptian of Serbia (East Serbia) Zljebine. Early Late Aptian of Spain (Cataluña, Lérida) Com. Alt Urgell, Buerco section and Senyus section (BSPG 2003 XX 5375); Spain (Cataluña, Lérida) Com. La Noguera, Mun. Vilanova de Meià, Montsec de Rubies, section NW La Cabrua quarry (BSPG 2003 XX 6321). Late Aptian of Spain (Cataluña, Tarragona) Com. Baix Penedés, Mun. Montmell, Marmellà, Can Xuec (BSPG 2003 XX 6218). Latest Aptian to Early Albian of Greece (Viotia) Aliartos, Chiarmena (BSPG 2003 XX 6206). Early Albian of Mexico (Sonora) Municipio Ures, Cerro de Oro (ERNO 3076); the USA (Arizona) Douglas, Mexican Saddlehorn (BSPG 2003 XX 4782), (Texas) Comal County, Guadalupe River Ranch (TMM 1998-TX-7A). Early Cenomanian of France (Charente-Maritime) Fouras (BSPG 2003 XX 5602).

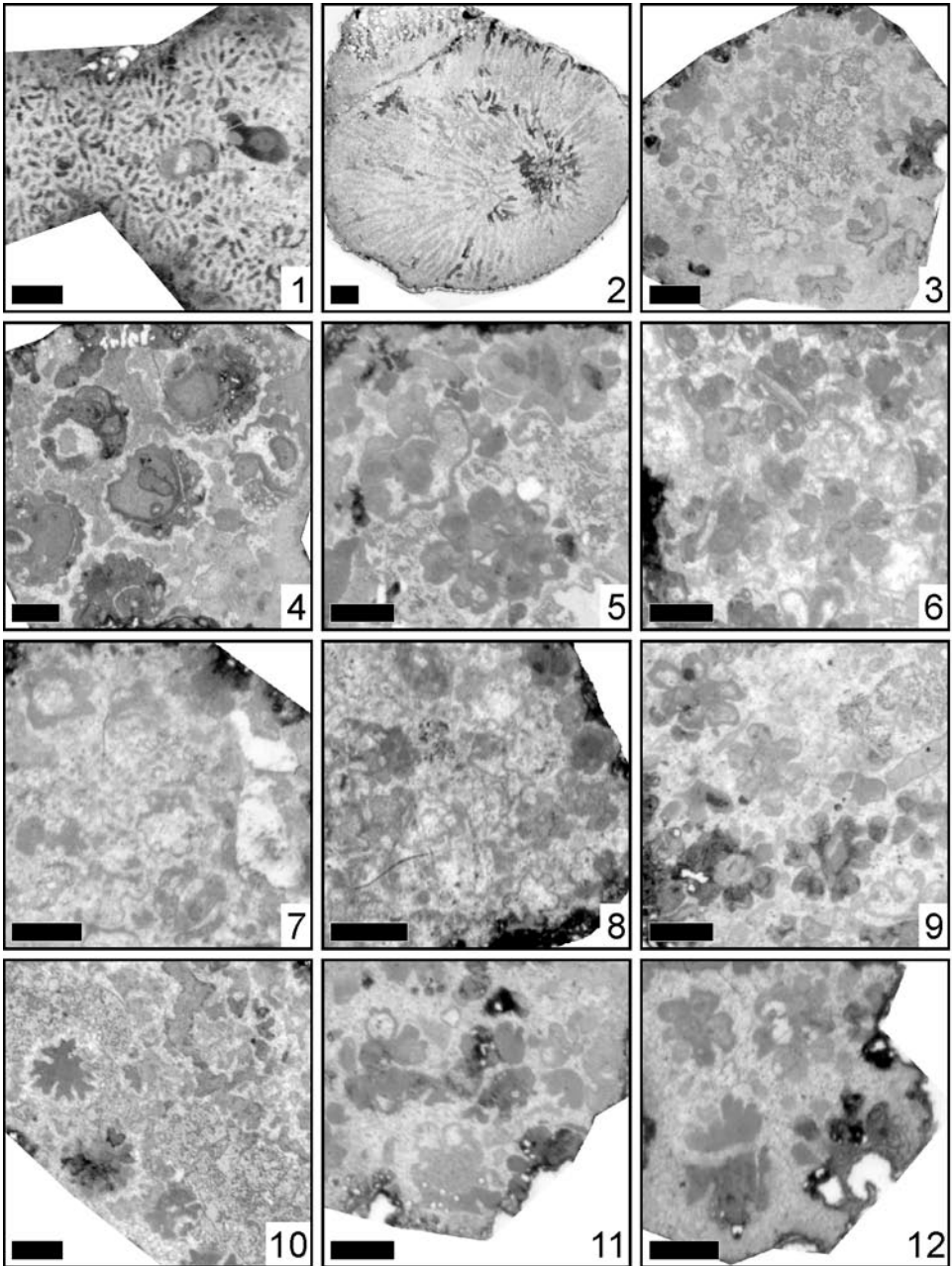
Suborder Microsolenina MORYCOWA & RONIEWICZ, 1995

Family Leptophylliidae VAUGHAN, 1905

Genus *Dimorphastrea* D'ORBIGNY, 1850

Fig. 3. Corals from Serre de Bleyton, Drôme. ▶

- 1: *Mesomorpha urgonensis* (Koby, 1898), NHMW 2008z0096/0033, Transverse acetate peel.
 - 2: *Dimorphastrea* sp., NHMW 2008z0096/0034, Transverse acetate peel.
 - 3: *Cryptocoenia almerai* (D'Angelis d'Ossat, 1905), NHMW 2008z0096/0010, Transverse acetate peel.
 - 4: *Cryptocoenia atempa* (Felix, 1891), NHMW 2008z0096/0020, Transverse thin section.
 - 5: *Cryptocoenia bulgarica* (Toula, 1884), NHMW 2008z0096/0007, Transverse acetate peel.
 - 6: *Cryptocoenia desori* (Koby, 1897), NHMW 2008z0096/0032, Transverse acetate peel.
 - 7: *Cryptocoenia miyakoensis* (Eguchi, 1936), NHMW 2008z0096/0031, Transverse acetate peel.
 - 8: *Cryptocoenia pygmaea* (Volz, 1903), NHMW 2008z0096/0015, Transverse acetate peel.
 - 9: *Cryptocoenia ramosa* Toula, 1889, NHMW 2008z0096/0029, Transverse acetate peel.
 - 10: *Holocystis dupini* (D'Orbigny, 1850), NHMW 2008z0096/0006, Transverse acetate peel.
 - 11: *Pentacoenia elegantula* D'Orbigny, 1850, NHMW 2008z0096/0008, Transverse acetate peel.
 - 12: *Pentacoenia* aff. *elegantula* D'Orbigny, 1850, NHMW 2008z0096/0027, Transverse acetate peel.
- Scale 1 mm.



***Dimorphastrea* sp.**

Fig. 3.2

Material: NHMW 2008z0096/0034.

Dimensions: crd, 3.5 mm; s, 16-20, sd 6 / 2 mm.

Description: A thamnasterioid colony with a circumoral arrangement of calices. The septa are straight, slightly perforated and in places connected to each other. Septal perforations occur mostly at the inner margin of the septa. The septal symmetry is irregular. There exist various generations of septa that differ in length and thickness. Septal faces with pennulae ornamented. Paliforme lobes are probably present. A small papilla probably marks the columella. A wall does not exist. The endotheca is unknown.

Remarks: The specimen is too small to assign it with certainty to *Dimorphastrea*. It could also belong to *Astraeofungia*.

Suborder Stylinina ALLOITEAU, 1952

Family Cyathophoridae VAUGHAN & WELLS, 1943

Genus *Cryptocoenia* D'ORBIGNY, 1849

Remarks: The species of the genus are distinguished on the base of the calicular diameter and the number of septal cycles. With exception of *Cryptocoenia pygmaea*, all types of the corresponding species has been examined.

Septal cycles	Diameter of calices (mm)	Species
1	0.6-0.7	<i>pygmaea</i>
	0.9-1.2	<i>miyakoensis</i>
	1.1-1.3	<i>almerai</i>
2	1.4-1.6	<i>desori</i>
	1.5-1.8	<i>ramosa</i>
	1.7-1.9	<i>bulgarica</i>
3	1.8-2	<i>atempa</i>

***Cryptocoenia almerai* (D'ANGELIS D'OSSAT, 1905)**

Fig. 3.3

- *v 1905 *Convexastrea Almerai* D'ANGELIS D'OSSAT, p. 213, pl. 14: 11
v 1909 *Polytremacis Blainvilleana* – PREVER, p. 67, pl. 1: 20, 21, 21a, 22
v 1964 *Cyathophora minima* ETALLON 1862 – MORYCOWA, p. 22, pl. 3: 1, pl. 5: 4
1997 *Pseudocoenia* cf. *slovenica* TURNŠEK 1972 – BARON-SZABO & FERNÁNDEZ-MENDIOLA, p. 43

Material: NHMW 2008z0096/0010.

Dimensions: cl, 1.1-1.3 mm; ccd, 1.5-2 mm; s, 12.

Description: A plocoid colony. The coenosteum is narrow. The septa are compact and free. The septal symmetry is radial in six systems and two septal cycles. The septa of the first cycle are larger than those of the second. The wall is probably paraseptothecal. The endotheca is unknown.

Occurrence elsewhere: Barremian of Mexico (Puebla) Tehuacán, La Compañía (UNAM/FI AC-89/6). Barremian to Aptian of Trinidad and Tobago (Trinidad) Central Range, Piparo River. Early Aptian of Greece (Viotía) Arachova (BSPG 2003 XX 5457); Poland (Malopolskie, Wadowice) Lanckorona, Jastrzebia. Late Aptian of Spain (Cataluña, Barcelona) Com. Garraf, Mun. Cubelles, Las Mesquitas; Spain (Cataluña, Tarragona) Com. Baix Penedès, Mun. Masllorenç, Masarbones (BSPG 2003 XX 6025); Italy (Abruzzi, L'Aquila) Monti d'Ocre, Fossa Cerasetti (PU 18105). Albian of Egypt (Shebh Gezirat Sena) Manzour Mt (UCGI GAMEIL 1242). Early Albian of Spain (Cantabria, Santander) Cabo de Ajo. Late Albian of United Kingdom (Devonshire) Exeter, Haldon Hill (NHM R. 5445). Late Albian to Cenomanian of United Kingdom (Cambridgeshire and Isle of Ely) Cambridge (NHM R. 6850). Cenomanian of Germany (Bayern) Rosstein-Alm (BSP 1955 XIX 27).

***Cryptocoenia atempa* (FELIX, 1891)**

Fig. 3.4

- *vp 1891 *Cyathophora atempa* FELIX, p. 155, pl. 25: 7, 8
- v 1963 *Cyathophora atempa* FELIX 1891 – REYEROS NAVARRO, p. 8, pl. 4: 7, 8
- v 1989 *Cyathophora atempa* FELIX – CARREÑO et al., p. 91, fig. 31b
- v 1996 *Pentacoenia elegantula* D'ORBIGNY, 1850 – BARON-SZABO & STEUBER, p. 8, pl. 3: 3
- v 1996 *Pseudocoenia annae* (VOLZ, 1903) – BARON-SZABO & STEUBER, p. 8, pl. 2: 1

Material: NHMW 2008z0096/0020.

Dimensions: cl, 1.8-2 mm; ccd, 2-2.5 mm; s, 24.

Description: A plocoid colony. The calices are circular and regular in size. The coenosteum is filled with the non-confluent to sub-confluent costae and thin dissepiments. The septa are compact, free and very short. The septal symmetry is radial in six septal systems and three cycles. The septa of all cycles have almost the same length and thickness. The wall is parathecal. The endotheca consists probably of tabulae.

Occurrence elsewhere: Barremian of Mexico (Puebla) Tehuacán, San Antonio Texcala. Aptian of Mexico (Puebla) San Juan Raya. Early Aptian of Greece (Viotía) Arachova (MB K579). Late Aptian of Mexico (Sonora) Municipio Opodepe, Rancho El Pimiento (ERNO L-4420).

***Cryptocoenia bulgarica* (TOULA, 1884)**

Fig. 3.5

- *v 1884 *Astrocoenia bulgarica* TOULA, p. 1317, pl. 6: 4
 v 1884 *Cryptocoenia antiqua* – DE FROMENTEL, p. 543, pl. 148: 1
 1884 *Cyathophora* (*Cyathocoenia*) *regularis* – DE FROMENTEL, p. 540, pl. 149: 2
 vp 1891 *Cyathophora atempa* – FELIX, p. 155 [non pl. 25: 7, 8]
 v 1909 *Cyathophora turonensis* – PREVER, p. 124, pl. 5: 12, pl. 13: 20
 v 1932 *Cyathophora haysensis* WELLS, p. 237, pl. 30: 4, pl. 32: 5
 1981 *Cyathophora steinmanni* FRITZSCHE 1924 – TURNŠEK & MIHAJLOVIC, p. 18,
 pl. 13: 3, 4
 v 1996 *Pentacoenia tombecki* FROMENTEL, 1857 – BARON-SZABO & STEUBER, p. 9, pl. 2: 5
 v 1997 *Cyathophora miyakoensis* EGUCHI, 1936 – BARON-SZABO, p. 40, pl. 3: 5, 6
 v 2006b *Cryptocoenia bulgarica* (TOULA, 1884) – LÖSER, p. 14

Material: NHMW 2008z0096/007, 0019, 0021.

Dimensions: cl, 1.7-1.9 (2.2) mm; ccd, 2.5-3 mm; s, 12.

Description: A plocoid colony. The calices are circular but irregular in their shape. The coenosteum is narrow and is filled with the non-confluent costae and some dissepiments. The septa are compact, free and short. The septal symmetry is radial in six systems and two septal cycles. The septa of the first cycle are larger than those of the second. The wall is parathecal. The endotheca is unknown.

Occurrence elsewhere: Late Barremian to Early Aptian (*sartousi* – *weissi* zone) of Germany (Bayern) Allgäuer Helvetikum, Brandalpe. Early Hauterivian (*radiatus* zone) of France (Haute-Marne) Saint Dizier and Morancourt, France (Yonne) Fontenoy (BSPG 2003 XX 5027) and Gy-l'Évêque (BSPG 2003 XX 6537). Barremian of Mexico (Puebla) Tehuacán, San Antonio Texcala. Early Aptian of France (Aude) Les Corbières, Bugarach, Le Mas (NHM R. 34224); Greece (Viotía) Arachova; Greece (Viotía) Levadia, Perachorion (BSPG 2003 XX 5748); Serbia (East Serbia) Pirot, Bela Palanka and Zljebine. Late Aptian of Spain (Cataluña, Tarragona) Com. Baix Penedès, Mun. Masllorenç, Masarbones, field N (BSPG 2003 XX 6028), Mun. Montmell, Marmellà, Can Xuec (BSPG 2003 XX 6223), Com. Alt Penedès, Castellvi de la Marca, Can Pascual, section loc. 2 (BSPG 2003 XX 6299); Italy (Abruzzi, L'Aquila) Monti d'Ocre, Fossa Agnese (PU 17968). Early Albian (*tardefurcata* zone) of the USA (Texas) Hays County, Blanco River, Pleasant Valley Crossing. Early Albian of Spain (Cantabria, Santander) Cabo de Ajo. Middle Cenomanian (*mantelli* – *rhotomagense* zone) of Belgium (Hainaut) Tournai (IRScNB I. G. 3354 / LOE 14).

***Cryptocoenia desori* (KOBY, 1897)**

Fig. 3.6

- v 1884 *Columnastraea* cf. *striata* GLDF. sp. – TOULA, p. 1317, pl. 6: 5
 *v 1897 *Convexastraea Desori* KOBY, p. 30, pl. 2: 9, 10

- v 1924 *Cyathophora steinmanni* FRITZSCHE, p. 316, pl. 3: 8, pl. 4: 3
v 1958 *Cryptocoenia parvistella* ALLOTEAU, p. 110, pl. 16: 2, pl. 21: 15, 16, pl. 20: 1
v 1994 *Adelocoenia carantonensis* (ORBIGNY 1850) – LÖSER, p. 12, pl. 2: 3, 4
v 1996 *Cyathophora steinmanni* FRITZSCHE, 1924 – BARON-SZABO & STEUBER, p. 8, pl. 1: 5, 6
1997 *Pentacoenia pulchella* D'ORBIGNY 1850 – BARON-SZABO & FERNÁNDES-MENDIOLA, p. 43, fig. 5b
v 2004 *Adelocoenia desori* (KOPY, 1897) – LÖSER & MOHANTI, p. 580, fig. 2ab

Material: NHMW 2008z0096/0028, 0030, 0032.

Dimensions: cl, 1.4-1.6 mm; ccd, 1.5-2 mm; s, 12; sc, 12.

Description: A plocoid colony. The calices are circular and vary in size. The coenosteum is narrow. The septa are compact, free and short. The septal symmetry is radial in six systems and two septal cycles. The septa of the first cycle are larger than those of the second. The wall is parathecal. The endotheca is unknown.

Occurrence elsewhere: Early Valanginian of France (Bouches-du-Rhône) Marseille, Butte de L'Escalette, onshore sample locality. Hauterivian to Barremian of Chile (Atacama) Copiapo, Chañareillo, Molle-Alto. Barremian of France (Doubs) Morteau. Barremian to Early Aptian of France (Bouches-du-Rhône) La Fare, Canal EDF (UP 4758.5). Aptian of Mexico (Puebla) San Juan Raya (IGM 9256). Early Aptian of Greece (Viotía) Arachova, Serbia (East Serbia) Pirot, Bela Palanka. Late Aptian of Spain (Cataluña, Tarragona) Com. Baix Penedés, Mun. Montmell, Marmellà, Can Xuec (BSPG 2003 XX 6221), Mun. Sant Martí Sarroca, Can Grau (MV 12751); Japan (Iwate-ken) Shimohei-gun, Iwaizumi-cho, Omoto (TUM 65984). Albian of Madagascar (Mahajanga) Ampanihy. Early Albian of Spain (Cantabria, Santander) Cabo de Ajo; Mexico (Sonora) Municipio Opodepe, Tuape, Cerro de la Espina (ERNO 2201), Municipio Arizpe, Arizpe, Cerro La Ceja (ERNO L-4267). Early to Middle Albian of Spain (Valencia, Alicante) Sierra de Seguili (MGSB 74336). Late Albian of Spain (Valencia, Alicante) Sierra de Llorençá (MGSB 74332). Cenomanian of India (Tamil Nadu) Kunnam. Early Cenomanian (*mantelli* zone) of Germany (Nordrhein/Westfalen) Mülheim/Ruhr, Kassenberg. Early Cenomanian of France (Charente-Maritime) Fouras (BSPG 2003 XX 1710) and La Rochelle, Ile d'Aix (MNHN nn); Greece (Kozani) Kozani, Nea Nikopolis (BSPG 2003 XX 5848). Middle Cenomanian (*mantelli* – *rhotomagense* zone) of Belgium (Hainaut) Tournai (IRScNB I. G. 5496 / LOE 16). Late Cenomanian (*guerangeri* zone) of Czech Republic (Central Bohemian region) Korycany (MNHP OS 512/6).

Cryptocoenia miyakoensis (EGUCHI, 1936)

Fig. 3.7

- *v 1936 *Miyakopora miyakoensis* EGUCHI, p. 70, figs 4, 4 a
v 1964 *Cyathophora minima* ETALLON 1862 – MORYCOWA, p. 22, pl. 3: 1, pl. 5: 4

- v 1976 *Cyathophora miyakoensis* (EGUCHI 1936) – TURNŠEK & BUSER, p. 11, 38, pl. 1: 3-5
- 1981 *Cyathophora pygmaea* VOLZ 1903 – TURNŠEK & MIHAJLOVIC, p. 18, pl. 13: 1, 2
- v 1992 *Cyathophora pygmaea* VOLZ 1903 – TURNŠEK, PLENICAR & SRIBAR, p. 213, pl. 5: 1, 2
- v 1997 *Cyathophora miyakoensis* EGUCHI, 1936 – BARON-SZABO, p. 40, pl. 3: 5, 6
- v 1997 *Cyathophora miyakoensis* (EGUCHI) 1936 – TURNŠEK, p. 64
- v 1998 *Adelocoenia fontseri* (BATALLER 1947) – SCHÖLLHORN, p. 74, pl. 18: 7, pl. 27: 2-4
- v 1999 *Cyathophora miyakoensis* (EGUCHI, 1936) – BARON-SZABO & GONZÁLEZ LEÓN, p. 478, fig. 4b
- v 2008 *Cryptocoenia* aff. *pygmaea* (VOLZ, 1903) – TOMÁS et al., p. 522, fig. 13A
- v 2008 *Cryptocoenia* sp. n. aff. *C. pygmaea* (VOLZ, 1903) – LÖSER & SALDAÑA-VILLODRE, p. 3, fig. 3ab

Material: NHMW 2008z0096/0002,0031.

Dimensions: cl, 0.9-1.2 mm; ccd, 1.1-1.4 (1.6) mm; s, 6; sc, 12.

Description: A plocoid colony. The calices are circular but irregular in shape. The coenosteum is narrow. The septa are compact, free and very short. The septa show an irregular radial symmetry. The septal symmetry is radial, generally in six systems and one septal cycle. The wall is parathecal. The endotheca is unknown.

Remarks: The species (not only the present material, also the type material) show calices varying in size, and few and irregular developed septa similar to *Confusaforma*. However, a hexamerous symmetry is clearly visible, so the species cannot be assigned to *Confusaforma*.

Occurrence elsewhere: Late Barremian to Early Aptian (*sartousi* – *weissi* zone) of Germany (Bayern) Allgäuer Helvetikum, Brandalpe and Falkenberg. Cretaceous of Slovenia (West Slovenia) Banjska planota, Levpa and Kanalski Lom. Late Barremian of Poland (Malopolskie, Tarnów) Tarnów, Trzemesna. Early Aptian of Spain (Murcia) Jumilla, Solano del Sopalmu; Poland (Malopolskie, Wadowice) Lanckorona, Jastrzebia. Early Late Aptian of Spain (Cataluña, Lérida) Com. La Noguera, Mun. Vilanova de Meià, Montsec de Rubies, section NW La Cabrua quarry (BSPG 2003 XX 6312); Spain (Cataluña, Lérida) Com. Alt Urgell, Mun. Cabó, Senyús section (BSPG 2003 XX 4002). Late Aptian of Spain (Cataluña, Barcelona) Com. Alt Penedès, Castellvi de la Marca, Can Pascual (BSPG 2003 XX 6295); Spain (Valencia, Castellón) Benicasin, La Venta; Japan (Iwate-ken) Miyako-shi. Late Aptian to Middle Albian of Slovenia (South Slovenia) Kocevje region, Slovenski vrh, horizon A-C. Latest Aptian of Japan (Iwate-ken) Shimohei-gun, Tanohata-mura, Hiraiga and Miyako-shi. Latest Aptian to Early Albian of Mexico (Sonora) Municipio San Pedro de la Cueva, Lampazos area. Early Albian of Mexico (Sonora) Municipio Cucurpe, Cucurpe, La Mesa (ERNO L-4278), Municipio Naco, Naco, Sierra San Jose (ERNO L-4411), Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4431), Municipio Arizpe, Arizpe, Cerro La Ceja (ERNO L-4488), Municipio Santa Ana, Santa Ana (ERNO L-4950).

***Cryptocoenia pygmaea* (VOLZ, 1903)**

Fig. 3.8

- * 1903 *Cyathophora pygmaea* VOLZ, p. 26, pl. 4: 4-7
- v 1909 *Polytremacis Kiliansi* – PREVER, p. 67, pl. 1: 15, 19
- v 1964 *Orbignycoenia pygmaea* (VOLZ, 1903) – MORYCOWA, p. 30, pl. 4: 1, pl. 7: 1
- 1971 *Cyathophora pygmaea* VOLZ, 1903 – MORYCOWA, p. 40, text-figs 6b, 6c, pl. 5: 1
- v 1974 *Cyathophora pygmaea* VOLZ – TURNŠEK & BUSER, p. 12, 33, pl. 4: 1
- v 1976 *Cyathophora miyakoensis* (EGUCHI 1936) – TURNŠEK & BUSER, p. 11, 38, pl. 1: 3-5
- v 1976 *Cyathophora pygmaea* VOLZ 1903 – TURNŠEK & BUSER, p. 11, 38, pl. 1: 1, 2
- non 1981 *Cyathophora pygmaea* VOLZ 1903 – TURNŠEK & MIHAJLOVIC, p. 18, pl. 13: 1, 2
[= *Cryptocoenia miyakoensis*]
- v 1992 *Cyathophora pygmaea* VOLZ 1903 – TURNŠEK, PLENICAR & SRIBAR, p. 213, pl. 5: 1, 2
- v non 1994 *Adelocoenia pygmaea* (VOLZ 1903) – LÖSER, p. 10, text-figs 4, 5, pl. 12: 1, 2
[= *Cryptocoenia reussi*]

Material: NHMW 2008z0096/0015, 0023.

Dimensions: cl, 0.6-0.7 (1) mm; s, 6.

Description: A plocoid colony. The calices are circular but irregular in shape. The coenosteum is narrow. The septa are compact, free and short. The septal symmetry is radial in six systems with one septal cycle. The wall is parathecal. The endotheca is unknown.

Occurrence elsewhere: Cretaceous of Slovenia (West Slovenia) Banjska planota, Kanalski Lom and Levpa. Barremian of France (Doubs) Morteau (MHNG 4759). Late Barremian of Poland (Malopolskie, Tarnów) Tarnów, Trzemesna. Early Aptian of Poland (Malopolskie, Wadowice) Lanckorona, Jastrzebia; Slovenia (West Slovenia) Banskja Planota, Osojnica. Early Aptian (*lenticularis* zone) of Romania (Suceava) Pojorita area, Cimpulung-Moldovenesc, Valea Seaca and Valea Izvorul Alb. Late Aptian of Italy (Abruzzi, L'Aquila) Monti d'Ocre, Fossa Cerasetti, Fossa Agnese (BSPG 2003 XX 5312), Fossa Cerasetti. Late Aptian to Middle Albian of Slovenia (South Slovenia) Kocevje region, Slovenski vrh, horizon A-C. Early Albian of Mexico (Sonora) Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4238), Municipio Arizpe, Arizpe, Cerro La Ceja (ERNO L-4269), Municipio Agua Prieta, San Bernardino Valley, Cordon Caloso (ERNO L-4305), Municipio Ures, Cerro de Oro (ERNO L-4369)

***Cryptocoenia ramosa* TOULA, 1889**

Fig. 3.9

- *v 1889 *Cryptocoenia ramosa* TOULA, p. 83, pl. 5: 10, 11
- vp 1891 *Cyathophora atempa* – FELIX, p. 155 [non pl. 25: 7, 8]
- 1944 *Cyathophora hedbergi* WELLS, p. 434, pl. 69: 7, 8

- v 1946-47 *Cyathophoropsis Hupei* ALLOITEAU, p. 200, pl. 3: 5, pl. 1: 23
 v p 1964 *Adelocoenia biedai* MORYCOWA, p. 26, text-fig. 2, pl. 4: 2, pl. 5: 5
 1993 *Pseudocoenia beskidena* ELIÁŠOVÁ 1981 – BARON-SZABO, p. 155, text-fig. 3, pl. 2: 1
 v 1995 *Procyathophora biedai* (MORYCOWA 1964) – LÖSER & RAEDER, p. 43
 v 1996 *Pentacoenia elegantula* D'ORBIGNY, 1850 – BARON-SZABO & STEUBER, p. 8, pl. 3: 3
 v 2004 *Adelocoenia desori* (KOPY, 1897) – LÖSER & MOHANTI, p. 580, figs 2ab
 v 2006b *Cryptocoenia bulgarica* (TOULA, 1884) – LÖSER, p. 14

Material: NHMW 2008z0096/0026, 0029.

Dimensions: cl, 1.5-1.8 mm; ccd, 1.5-2 mm; s, 8-12.

Description: A plocoid colony. The calices are circular and regular in size. The coenosteum is narrow and filled with the non-confluent costae and some dissepiments. The septa are compact and free. The septal symmetry is radial in six systems and two septal cycles. The septa of the first cycle are larger than those of the second. The wall is parathecal. The endotheca is unknown.

Occurrence elsewhere: Early Cretaceous of Bulgaria (Veliko Tarnovska oblast) Dobromirka. Barremian of Mexico (Puebla) Tehuacán, San Antonio Texcala. Barremian to Aptian of Bulgaria (Veliko Tarnovska oblast) Veliko Tarnovo, Arbanasi, Lyaskovets Monastir Sv.Peter. Late Barremian of Poland (Malopolskie, Tarnów) Tarnów, Trzemesna. Early Aptian of Greece (Viotía) Arachova (MB K426); Mexico (Michoacán) Turitzio, Lomo de San Juan (BSPG 2003 XX 4878); Serbia (East Serbia) Pirot; Venezuela (Sucre) Cumaná, Las Cinco Ceibas. Early Late Aptian of Spain (Aragón, Huesca) Mun. Espés, Las Aras. Late Aptian to Middle Albian of USA (Texas) Comal County, North side Canyon Lake (DW n/n). Latest Aptian to Early Albian of Spain (Vascongadas, Vizcaya) Gamecho, Playa de Laga. Early Albian of Mexico (Sonora) Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4296) and Municipio Cucurpe, Cucurpe, La Mesa (ERNO L-4829). Early Albian (*mammillatum* zone) of France (Aude) Padern (BSPG 2003 XX 4579). Middle Albian of Greece (Viotía) Aliartos, Korónia (BSPG 2003 XX 1893). Late Albian of United Kingdom (Devonshire) Exeter, Haldon Hill (NHM R. 23570). Cenomanian of Germany (Bayern) Rosstein-Alm (BSP 1955 XIX 28); Greece (Fokída) Kiona massif, Panourgias [= Dremisa] (BSPG 2003 XX 5904); India (Tamil Nadu) Kunnam. Early Cenomanian of Greece (Kozani) Kozani, Nea Nikopolis (BSPG 2003 XX 5881). Early Cenomanian (*saxbii – dixonii* zone) of Germany (Sachsen) Meißen-Zscheila, Trinitatis church (BSPG 2003 XX 6041). Late Cenomanian (*guerangeri* zone) of the Czech Republic (Central Bohemian region) Korycany, Netreba (CGS HF 1481).

Genus *Holocystis* LONSDALE, 1849

***Holocystis dupini* (D'ORBIGNY, 1850)**

Fig. 3.10

- * 1850 *Tetracoenia Dupiniana* D'ORBIGNY, (2), p. 121
- 1851 *Tetracoenia Dupiniana* – D'ORBIGNY, p. 166, fig. 303
- 1971 *Holocystis bukowinensis* VOLZ, 1903 – MORYCOWA, p. 44, pl. 6: 4
- 1987 *Holocystis bukowinensis* VOLZ, 1903 – KUZMICHEVA, p. 222, pl. 1: 3
- 1988 *Holocystis bukowinensis* VOLTZ, 1903 – KUZMICHEVA & ALIEV, p. 157, pl. 1: 4
- 2000 *Nowakocoenia cieszynica* KOŁODZIEJ & GEDL, p. 187, figs 3, 8, 9
- v 2003 *Holocystis elegans* (LONSDALE, 1849) – BARON-SZABO & GONZÁLEZ LEÓN, p. 204, figs 6A, B
- v 2006a *Holocystis dupini* (D'ORBIGNY, 1850) – LÖSER, p. 291, fig. 1d

Material: NHMW 2008z0096/0006.

Dimensions: c, 1.4-1.5 mm; ccd, 1.8-2.1 mm; s, 16.

Description: A plocoid colony. The calices are circular and regular in size. The coenosteum is narrow and is filled with the non-confluent costae and some dissepiments. The septa are compact and free. The septal symmetry is radial in four systems and three cycles. The septa of the different cycles differ in length. The wall is parathecal. The endotheca is unknown.

Remarks: The material shows also affinities to *Pseudocoenia* (sensu D'ORBIGNY 1850, see below) because the septa of the first cycle differ only slightly in length which gives the coral an octomeral appearance. – PANDEY et al. (2007: 16) argued in reference to LÖSER (2006a) that it would have been necessary to make serial sections of *Holocystis dupini* to prove its identity with *Nowakocoenia* KOŁODZIEJ & GEDL, 2000. This might probably not solve the problem: (1) these serial sections would not help to distinguish *Holocystis* from *Nowakocoenia* since serial sections are not available from *Nowakocoenia*; (2) the authors of *Nowakocoenia* need to prove that their material is new and something different from *Holocystis*, not a third party; (3) there exist no illustrations that show that *Nowakocoenia* really represents the characteristics ascribed to it. Until that proof is available, the material is taken as it appears – a *Holocystis*.

Occurrence elsewhere: Early Hauterivian (*radiatus* zone) of France (Yonne) Seignelay. Barremian of Azerbaijan (Kubatlinskij r.) Alikuliushagi. Early Barremian of Turkmenistan (Krasnovodskaya obl.) Small Balkans. Late Barremian to Early Aptian (*lenticularis* zone) of Mexico (Sonora) Municipio Ures, Cerro de Oro. Late Barremian to Early Aptian (*sarasini* – *weissi* zone) of Poland (Slaskie, Bielsko-Biala) Bielsko-Biala, Rudzica. Early Aptian of France (Aube) Les Croûtes. Early Aptian (*lenticularis* zone) of Romania (Suceava) Pojorîta area, Cîmpulung-Moldovenesc, Valea Izvorul Alb. Late Aptian of Spain (Cataluña, Tarragona) Com. Baix Penedés, Mun. Sant Martí Sarroca, Can Grau.

Genus *Pentacoenia* D'ORBIGNY, 1850***Pentacoenia elegantula* D'ORBIGNY, 1850**

Fig. 3.11

- * 1850 *Pentacoenia elegantula* D'ORBIGNY, (2), p. 92
- 1857 *Pentacoenia elegantula* – DE FROMENTEL, p. 51, pl. 7: 6, 7
- 1884 *Pentacoenia elegantula* – DE FROMENTEL, p. 557, pl. 158: 1
- v 1964 *Pentacoenia elegantula* D'ORBIGNY, 1850 – MORYCOWA, p. 31, text-fig. 3 a, pl. 6: 4
- v 1964 *Pentacoenia pulchella* D'ORBIGNY, 1850 – MORYCOWA, p. 33, text-fig. 3 b, pl. 6: 5, pl. 7: 2, 3
- v 1971 *Pentacoenia pulchella* D'ORBIGNY, 1850 – MORYCOWA, p. 43, text-fig. 6e, pl. 6: 2, 3
- 1977 *Pentacoenia elegantula* ORBIGNY, 1850 – SIKHARULIDZE, p. 76, pl. 12: 3
- v 1996 *Pentacoenia elegantula* D'ORBIGNY, 1850 – BARON-SZABO & STEUBER, p. 8, pl. 3: 3
- 1999 *Pentacoenia elegantula* D'ORBIGNY – BUGROVA, p. 35, 37, pl. 1: 1
- 2002 *Pentacoenia elegantula* D'ORBIGNY, 1850 – KUZMICHEVA, p. 166, pl. 24: 1

Material: NHMW 2008z0096/0008.

Dimensions: cl, 1.6-1.7 mm; ccd, 1.5-2 mm; s, 20.

Description: A plocoid colony. The calices are circular and vary in size. The coenosteum is very narrow. The septa are compact and free. The septal symmetry is radial in five systems and three cycles. The septa of the different cycles differ in length. The wall is parathecal. The endotheca is unknown.

Occurrence elsewhere: Early Hauterivian (*radiatus* zone) of France (Haute-Marne) Saint Dizier; France (Yonne) Fontenoy and Gy-l'Évêque. Early Hauterivian of Ukraine (Krymskaya) Bakhchisarajskij district, Bodrak river, Trudolyubovka, Patil. Early Barremian of Georgia (Kartli) Ali; Turkmenistan (Krasnovodskaya obl.) Small Balkans. Late Barremian of Poland (Malopolskie, Tarnów) Tarnów, Trzemesna. Aptian of Mexico (Puebla) San Juan Raya, Lomo de los Gatos (BSPG 2003 XX R-10957). Early Aptian of Greece (Viotía) Arachova; Mexico (Michoacán) Turitzio, Lomo de San Juan (BSPG 2003 XX 4881); Poland (Malopolskie, Wadowice) Lanckorona, Jastrzebia. Early Aptian (*lenticularis* zone) of Greece (Viotía) Levadia, roadcut near Perachorion NW Levadia (BSPG 2003 XX 5744); Romania (Suceava) Pojorîta area, Cîmpulung-Moldovenesc, Valea Izvorul Alb.

***Pentacoenia* aff. *elegantula* D'ORBIGNY, 1850**

Fig. 3.12

- v 1999 *Cyathophora miyakoensis* (EGUCHI, 1936) – BARON-SZABO & GONZÁLEZ LEÓN, p. 478, fig. 4 b

Material: NHMW 2008z0096/0027.

Dimensions: cl, 1.3-1.6 mm; ccd, 1.5-1.8 mm; s, 10.

Description: A plocoid colony. The calices are circular and vary in size. The coenosteum is narrow. The septa are compact and free. The septal symmetry is radial in five systems and two cycles. The septa of the first cycle are larger than those of the second one. The wall is parathecal. The endotheca is unknown.

Remarks: *P. elegantula* is poorly defined. A type specimen does not exist. An invalid neotype (neotypes are only valid established in conformity with the International Code of Zoological Nomenclature, ICZN 1999, Art.75) was mentioned by WERY (1954; MNHN Coll. D'ORBIGNY 5278) but was not found nowadays (November 2009) at the MNHN. Thin sections labelled as *Pentacoenia elegantula* in the MNHN without number but labelled as "néoholotype" do not correspond to the description given by WERY (1954: 79) and could not be compared to the illustration provided by WERY because of the poor quality and small size of the latter. Generally it is believed that this species is characterised by a calicular diameter of ca. 2 mm and three septal cycles, resulting in 20 septa. The present sample differs from this definition by its smaller calicular diameter and a lower number of septa.

Occurrence elsewhere: Early Hauterivian (*radiatus* zone) of France (Yonne) Fontenoy, field S the junction to Les Merles (BSPG 2003 XX 5036). Early Hauterivian of France (Bouches-du-Rhône) Marseille, Calanque de la Mounine (BSPG 2003 XX 5195). Barremian of Mexico (Puebla) Tehuacán, La Compañía (UNAM/FI CIA-23/1). Aptian of Mexico (Puebla) San Juan Raya (IGM 9239). Early Aptian of Greece (Viotía) Arachova (BSPG 2003 XX 5458); Mexico (Michoacán) Turitzio, Lomo de San Juan (BSPG 2003 XX 4868). Latest Aptian to Early Albian of Mexico (Sonora) Municipio San Pedro de la Cueva, Lampazos area (ERNO 2178). Late Albian to Early Cenomanian of Mexico (Guerrero) Charácuaro (BSPG 2003 XX 4880).

Genus *Pseudocoenia* D'ORBIGNY, 1850

***Pseudocoenia* sp.**

Fig. 4.1

Material: NHMW 2008z0096/0011.

Dimensions: c, 1.8-2 mm; ccd, 2-2.7 mm; s, 16.

Description: A plocoid colony. The calices are circular and regular in size. The coenosteum is very narrow. The septa are compact, free and short. The septal symmetry is radial in eight systems and two septal cycles. The septa of the first cycle are larger than those of the second. The wall is parathecal. The endotheca is unknown.

Remarks: *Pseudocoenia* is used here in the sense of D'ORBIGNY as a cyathophoride coral with an octomeral septal system. In the Cretaceous the genus is rather rare.

Family Stylinidae D'ORBIGNY, 1851

Genus *Cladophyllia* MILNE-EDWARDS & HAIME, 1851b

Remarks: In the literature, the genus *Cladophyllia* is used in a conceptual sense. The type of the type species, *Lithodendron dichotoma* GOLDFUSS, 1826, is silicified and very poorly preserved. The remarks on the genus provided by MORYCOWA & RONIEWICZ (1990) are not based on type material.

***Cladophyllia gracilis* (D'ORBIGNY, 1850)**

Fig. 4.2

- * 1850 *Enallhelia gracilis* D'ORBIGNY, (2), p. 91
- 1934 *Enallhelia gracilis* D'ORB. – COTTREAU, p. 29
- v 1935 *Enallhelia gracilis* D'ORB. – COTTREAU, pl. 73: 21, 22
- v 1983 *Cladophyllia stewartae* WELLS, 1944 – REYEROS DE CASTILLO, p. 26, pl. 16: 3, pl. 17: 1

Material: NHMW 2008z0096/0025.

Dimensions: c, 2.5-3 mm; cl, 2.5 mm; s, 32.

Description: A phaceloid colony with circular or polygonal calices. The septa are compact and often connected to each other. The septa show an irregular radial symmetry. The septal symmetry is radial in six systems with three complete cycles and the beginning of a fourth one. The columella is probably styliform. The wall is probably paraseptothecal. The endotheca is unknown.

Occurrence elsewhere: Early Hauterivian (*radiatus* zone) of France (Yonne) Chenay, Fontenoy (BSPG 2003 XX 5262), Leugny (BSPG 2003 XX 5123), Gy-l'Évêque (BSPG 2003 XX 6521). Aptian of Mexico (Puebla) San Juan Raya (IGM 9235). Early Late Aptian of Spain (Cataluña, Lérida) Com. La Noguera, Mun. Vilanova de Meià, Montsec de Rubies, section NW La Cabrua quarry (BSPG 2003 XX 6336). Late Aptian of Spain (Cataluña, Tarragona) Com. Baix Penedés, Mun. Montmell, Marmellà, Can Xuec (BSPG 2003 XX 6244). Early Albian of Mexico (Sonora) Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4425). Middle Albian of Mexico (Oaxaca) Coixtlahuaca (IGM 2732).

***Cladophyllia organisans* (D'ORBIGNY, 1850)**

Fig. 4.3

- * 1850 *Stylosmilia organisans* D'ORBIGNY, (2), p. 91
- v 1873 *Stylosmilia organizans* – DE FROMENTEL, p. 422, pl. 84: 1
- v 1891 *Cladophyllia Miroi* – FELIX, p. 153, pl. 25: 10, 10 a
- v 1999 *Cladophyllia mexicana* BARON-SZABO & GONZÁLEZ LEÓN, p. 477, fig. 3h, k

- v 2001 *Cladophyllia organisans* (D'ORBIGNY 1850) – LÖSER, p. 42, pl. 1: 4
 v 2006b *Cladophyllia miroi* FELIX, 1891 – LÖSER, p. 21, fig. 2D

Material: NHMW 2008z0096/0014.

Dimensions: c, 2-2.3 mm; cl, 1.5-1.5 mm; s, 32.

Description: A phaceloid colony. The calices are circular and vary in size. The septa are compact and often connected to each other. The septal symmetry is radial in six septal systems and three cycles. The columella is styliiform or lamellar. The wall is probably paraseptothecal. The endotheca is unknown.

Occurrence elsewhere: Early Hauterivian (*radiatus* zone) of France (Aube) Troyes, Valières; France (Yonne) Venoy, Gy-l'Évêque, Fontenoy, Leugny. Barremian of Mexico (Puebla) Tehuacán, San Antonio Texcala and La Compañía (BSPG 2003 XX R-10937). Early Aptian (*lenticularis* zone) of Greece (Viotía) Levadia, roadcut near Perachorion NW Levadia (BSPG 2003 XX 5727). Latest Aptian to Early Albian of Mexico (Sonora) Municipio San Pedro de la Cueva, Lampazos area (ERNO 2179). Early Albian of Mexico (Sonora) Municipio San Pedro de la Cueva, Lampazos area, Espinazo de Diablo (ERNO L-4311) and Municipio Opodepe, Tuape, Cerro de la Espina (ERNO L-4255).

Genus *Stylina* LAMARCK, 1816

Stylina regularis DE FROMENTEL, 1862

Fig. 4.4

- * 1862 *Stylina regularis* DE FROMENTEL, p. 410, 430
 v 1883 *Stylina regularis* – DE FROMENTEL, p. 514, pl. 135: 1
 vp 1896 *Stylina micropora* – KOPY, p. 25, pl. 6: 1 [non pl. 5: 3, 4]
 v 1944 *Stylina sucrensis* WELLS, p. 435, pl. 70: 1
 v 1964 *Stylina regularis* FROMENTEL 1862 – MORYCOWA, p. 34, pl. 10: 7, pl. 15: 3, pl. 19: 1, 2
 v 1971 *Stylina regularis* DE FROMENTEL, 1862 – MORYCOWA, p. 47, text-fig. 6 d, pl. 5: 2
 non 1974 *Stylina regularis* FROMENTEL – TURNŠEK & BUSER, p. 13, 33, pl. 4: 2, 3 [= *Stylina carpathica*]
 1977 *Stylina regularis* FROMENTEL, 1862 – SIKHARULIDZE, p. 82, pl. 13: 4
 non 1981 *Stylina regularis* FROMENTEL 1867 – TURNŠEK & MIHAJLOVIC, p. 15, pl. 8: 4, 5 [= *Stylina carpathica*]
 v non 1983 *Stylina sucrensis* WELLS, 1944 – REYEROS DE CASTILLO, p. 17, pl. 4: 1 [= *Actinastrea pattoni*]
 1989 *Stylina regularis* FROMENTEL, 1862 – MORYCOWA, p. 62, pl. 20: 4, 5
 1993 *Stylina regularis* DE FROMENTEL, 1862 – MORYCOWA & DECROUEZ, p. 204, pl. 1: 2
 v 1996 *Stylina regularis* FROMENTEL, 1862 – BARON-SZABO & STEUBER, p. 6, pl. 1: 3, 4
 non 1997 *Stylina regularis* FROMENTEL 1867 – TURNŠEK, p. 192 [= *Stylina carpathica*]
 1997 *Stylina regularis* FROMENTEL, 1862 – BUGROVA, p. 25, pl. 1: 2, pl. 2: 2
 1998 *Stylina regularis* FROMENTEL, 1862 – MORYCOWA & MASSE, p. 742, fig. 12.3

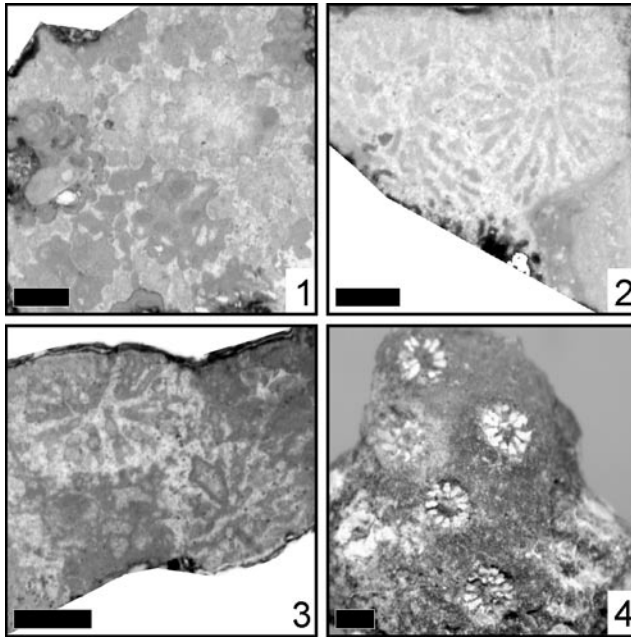


Fig. 4. Corals from Serre de Bleyton, Drôme.

- 1: *Pseudocoenia* sp., NHMW 2008z0096/0011, Transverse acetate peel.
 - 2: *Cladophyllia gracilis* (D'ORBIGNY, 1850), NHMW 2008z0096/0025, Transverse acetate peel.
 - 3: *Cladophyllia organisans* (D'ORBIGNY, 1850), NHMW 2008z0096/0014, Transverse acetate peel.
 - 4: *Styliina regularis* DE FROMENTEL, 1862, NHMW 2008z0096/0003, Sample.
- Scale bar equals 1 mm.

Material: NHMW 2008z0096/0003.

Dimensions: cl, 1.2-1.4 mm; ccd, 2.5-3 mm; s, 12.

Description: A plocoid colony. The calices are circular and regular in size. The coenosteum is wide. The septa are compact and free. The septal symmetry is radial in six systems and two septal cycles. The columella is styliiform. The wall and endotheca are unknown. Confluence of costae and presence of auriculae unknown because the sample is completely filled with coarse calcite crystals and could therefore not be sectioned.

Occurrence elsewhere: Late Barremian to Early Aptian (*sartousi* – *weissi* zone) of Switzerland (Schwyz) Drusberg, Käsernalp. Tithonian to Berriasian of Japan (Kochiken) Takaoka-gun, Sakawa-cho, Nishiyamagumi, Togano, Tenmangu (TUM 37927). Late Tithonian to Berriasian of Ukraine (Krymskaya) Crimea Mts. Early Barremian of France (Bouches-du-Rhône) Calissane; France (Haute-Savoie) Bornes, Pointe Blanche; Georgia (Kartli) Ali. Late Barremian of France (Bouches-du-Rhône) Orgon (UP 32);

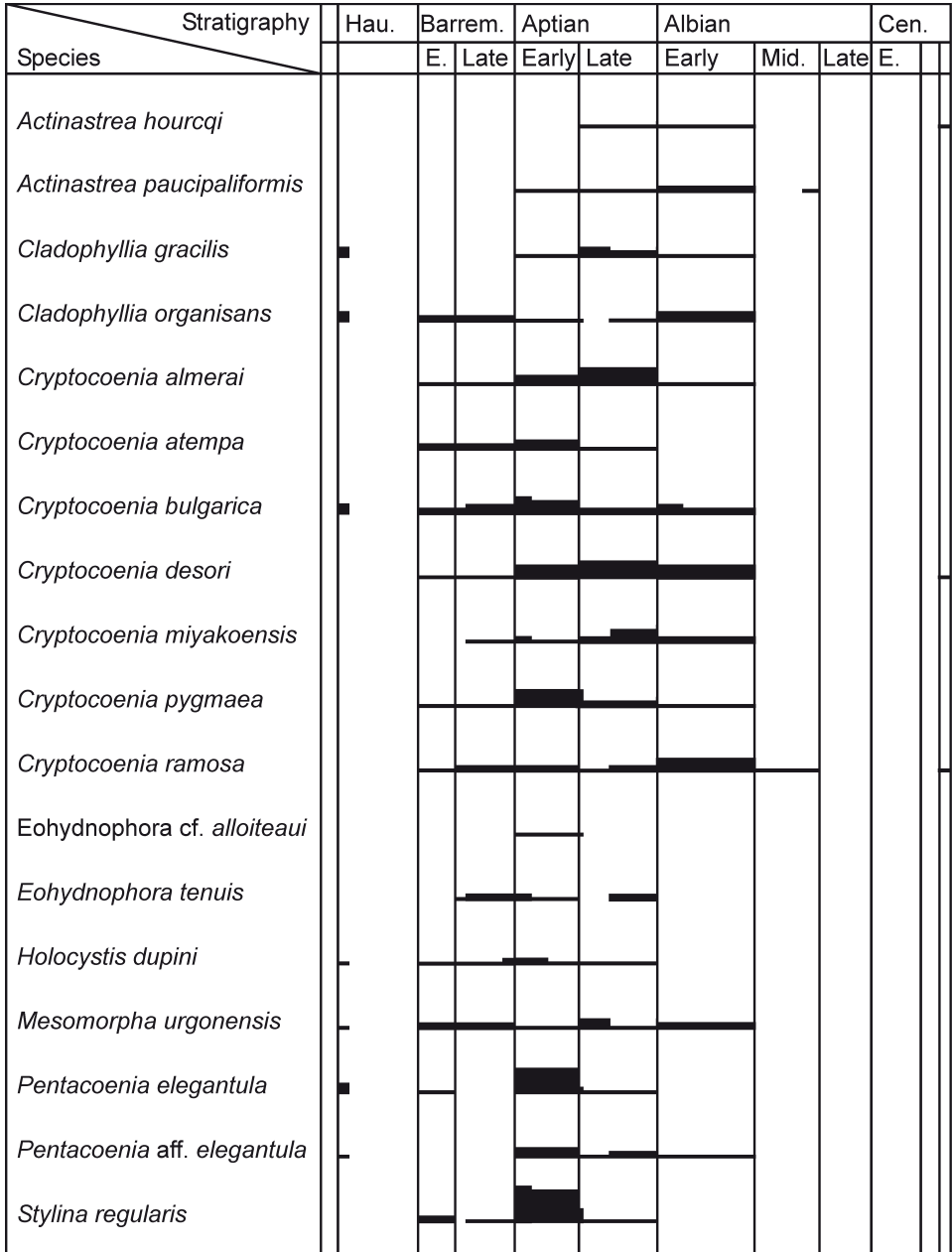


Fig. 5. Stratigraphic distribution and commonness of species of the Serre de Bleyton fauna. The thickness of the bars indicates the number of regions (not localities) in which the species concerned was found. The regions group localities together that have the same age and that are located in the same basin, in the same continental margin, or on the same intra-oceanic carbonate platform.

Poland (Malopolskie, Tarnów) Tarnów, Trzemesna. Late Barremian to Early Aptian of France (Vaucluse) Colline St. Jaques, Cavaillon. Aptian of Mexico (Puebla) San Juan Raya (IGM 9261). Early Aptian (*tuarkyricus* – *weissi* zone) of France (Vaucluse) Sault. Early Aptian of France (Vaucluse) Sault, Col des Fourches; France (Vaucluse) Sault, Gigery; Greece (Viotía) Arachova; Poland (Malopolskie, Wadowice) Lanckorona, Jastrzebia; Slovenia (West Slovenia) Banskja Planota, Osojnica; Venezuela (Sucre) Cumaná, Las Cinco Ceibas. Early Aptian (*lenticularis* zone) of Greece (Viotía) Levadia, roadcut near Perachorion NW Levadia (BSPG 2003 XX 5735); Romania (Suceava) Pojorîta area, Cîmpulung-Moldovenesc, Valea Izvorul Alb. Late Aptian of France (Vaucluse) Ventoux Mts, Fessonière – Pied-Gros.

Results

Faunal composition

Corals appearing as solitary forms representing either true solitary forms or the juvenile stages of colonial forms clearly dominate over colonial corals. Within the colonial corals, phaceloid corals dominate. Cerioid, plocoid and thamnasterioid forms are rare. These latter colonies are mainly very small (less than 7 mm in diameter). When larger, they always have a ramose colony growth form (*Cryptocoenia*, even *Amphiastrea*, *Mesomorpha*).

Not only are the colonies small, but also the dimensions of the calices. All colonial corals share the same characteristic: they have small corallites throughout. Cerioid and plocoid forms have a calicular diameter of less than two millimetres, phaceloid forms of less than five millimetres. Meandrinoid and hydnochoroid forms show very low distances of their calicular rows or monticules. Thamnasterioid forms show slightly larger dimensions than the plocoid forms but they are small compared to other species of the respective genera. Only the cerioid *Amphiastrea* species has large calices compared to the other colonial corals.

The fauna includes species from seven suborders: Archeocaeniina, Caryophylliina, Faviina, Fungiina, Amphiastreaeina, Microsolenina, and Stylinina. The suborders Caryophylliina, Amphiastreaeina, Microsolenina are represented by only one species, the suborder Archeocaeniina by two species, Fungiina by three species, Faviina by four species and the remaining suborder Stylinina by 14 species. The species of the Caryophyllia suborder is – besides differing in lithology as explained above – taken as an indication that the fauna does not represent an original composition.

The fauna shows a high number of *Cryptocoenia* species. This genus is widely distributed from the Middle Jurassic (PANDEY et al. 2002) to the Late Cenomanian (LÖSER 2005). In

Early Cretaceous faunas it is a very abundant element. About 20 species can be distinguished in the Early Cretaceous on the basis of their calicular diameter and the number of regular septal cycles (LÖSER 2009: fig. 270). Except for *Holocystis*, *Pseudocoenia* and *Amphiastrea*, the genera of the Bleyton fauna are common genera and found frequently in Early Cretaceous faunas. Late Cretaceous corals, with the exception of *Actinastrea hourcqi* and two *Cryptocoenia* species do not form part of the Bleyton fauna, underlining its typical Early Cretaceous composition. The only exotic specimen is the small dendroid colony of *Amphiastrea*. This genus is rare in the Cretaceous.

The faunal diversity is relative high, but it is likely that the corals were brought together from different places. Those places were probably located in different palaeoecological zones since shallow marine colonial corals were found with deeper marine solitary corals.

Palaeobiogeography

For the most part, the Bleyton fauna is composed of common species, which also finds its expression in the wide range of localities listed under 'Occurrences'. The Bleyton fauna shares most species with species rich faunas, such as the Hauterivian of the Paris Basin (with more than 150 species; LÖSER 2001), the southern margin of the Pelagonium (Greece; BARON-SZABO & STEUBER 1996; LÖSER & RAEDER 1995), the Caribbean province (San Juan Raya Fauna in Puebla, Mexico; REYEROS NAVARRO 1963, and works under progress), East Iberia (SCHÖLLHORN 1998; TOMÁS et al. 2008) and the Bisbee Basin (LÖSER & MINOR 2007).

Stratigraphy

Most species found in the Bleyton area occur elsewhere in the Barremian to Early Albian (Fig. 5). Few species have ranges from the Hauterivian, as well into the Middle Albian or Cenomanian. The gap in the Late Hauterivian can be explained by the relative rarity of coral localities of this age, as is the case for the Middle to Late Albian. Early Cenomanian coral faunas are rare, but the time between the Middle to Late Albian was marked by the extinction of genera and species representing a small faunal turnover in corals. The abundance of indications in the Early Aptian is caused by the extremely high number of coral faunas known from this time interval.

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References

- ALLOITEAU, J. (1946-47): Paléontologie. – In: HUPÉ, P. & ALLOITEAU, J. (eds): Polypiers du Gargasien aragonais. – *Anales de la Escuela de Peritos Agrícolas y de Especialidades Agropecuarias y de los Servicios Técnicos de Agricultura*, **6**: 187-243.
- (1952): Embranchement des coelentérés. – In: PIVETEAU, J. (ed.): *Traité de Paléontologie* (1). – p. 376-684, Paris (Masson).
- (1954): Le genre *Actinastrea* d'Orbigny 1848 dans le Crétacé supérieur français. – *Annales Hebert et Haug*, **4/8**: 1-104.
- (1958): Monographie des Madréporaires fossiles de Madagascar. – *Annales géologiques de Madagascar*, **25**: 218 pp.
- ANGELIS D'OSSAT, G. DE (1905): Coralli del Cretacico inferiore della Catalogna. – *Palaeontographia Italica*, **9**: 169-251.
- BARON-SZABO, R.C. (1993): Korallen der höheren Unterkreide („Urgon“) von Nordspanien (Playa de Laga, Prov. Guernica). – *Berliner geowissenschaftliche Abhandlungen (E)*, **9**: 147-181.
- (1997): Die Korallenfazies der ostalpinen Kreide (Helvetikum: Allgäuer Schratzenkalk; Nördliche Kalkalpen: Brandenberger Gosau) Taxonomie, Palökologie. – *Zitteliana*, **21**: 3-97.
- & FERNÁNDES-MENDIOLA, P.A. (1997): Cretaceous scleractinian corals from the Albian of Cabo de Ajo (Cantabria Province, N-Spain). – *Paläontologische Zeitschrift*, **71/1-2**: 35-50.
- & GONZÁLEZ LEÓN, C. M. (1999): Lower Cretaceous corals and stratigraphy of the Bisbee Group (Cerro de Oro and Lampazos areas), Sonora, Mexico. – *Cretaceous Research*, **20**: 465-497.
- & GONZÁLEZ LEÓN, C. M. (2003): Late Aptian-Early Albian corals from the Mural Limestone of the Bisbee Group (Tuape and Cerro de Oro areas), Sonora, Mexico. – In: SCOTT, R.W. (ed.): *Bob F. Perkins Memorial Volume: Special Publications in Geology*. – p. 187-225, Houston (Gulf Coast Section SEPM Foundation).
- & STEUBER, T. (1996): Korallen und Rudisten aus dem Apt im tertiären Flysch des Parnass-Gebirges bei Delphi-Arachowa. – *Berliner geowissenschaftliche Abhandlungen (E)*, **18**: 3-75.
- BUGROVA, I.YU. (1997): [Corals.] – In: ARKABEVA, V.V. & BOGDANOVA, T.N. (eds): [Atlas of the Cretaceous fauna in the south-west Crimea.] – p. 18-39, Moskva (Nauka).
- (1999): [New data about the Scleractinia of the Lower Barremian sediments of south-west Turkmenistan.] – *Voprosy paleontologii*, **11**: 33-42.
- CARREÑO, A.L., PERRILLIAT, M.C., GONZÁLES-ARREOLA, C., APPLGATE, S.P., CARRANZA-CASTAÑEDA, O. & MARTINEZ HERNANDEZ, E. (1989): *Fosiles Tipo Mexicanos*. – 531 p., Mexico City (Universidad Nacional Autónoma de México).
- COTTREAU, J. (1934): Types du prodrome de paléontologie stratigraphique universelle (10). – *Annales de Paléontologie*, **23/2**: 1-36.
- (1935): Types du prodrome de paléontologie stratigraphique universelle (11). – *Annales de Paléontologie*, **24**: 37-52.

- DIETRICH, W.O. (1926): Steinkorallen des Malms und der Unterkreide im südlichen Deutsch-Ostafrika. – *Palaeontographica* (suppl. 7), **1**: 43-62.
- EGUCHI, M. (1936): Three new genera of corals from the Lower Cretaceous of Japan. – *Proceedings of the Imperial Academy of Japan*, **12/3**: 70-72.
- (1951): Mesozoic hexacorals from Japan. – *Science Reports of the Tohoku Imperial University* (2: Geology), **24**: 1-96.
- ETALLON, A. (1859): Études paléontologiques sur le Haut-Jura. Rayonnés du Corallien. – *Mémoires de la Société d'émulation du département du Doubs*, (3), **3**: 401-553.
- FELIX, J. (1891): Versteinerungen aus der mexicanischen Jura und Kreideformation. – In: FELIX, J. & LENK, H. (eds): *Beiträge zur Geologie und Paläontologie der Republik Mexico* (3). – *Palaeontographica*, **37**: 140-194.
- FRITZSCHE, C.H. (1924): Neue Kreidefaunen aus Südamerika (Chile, Bolivien, Peru, Kolumbien) (3:.) Eine neokome Schwamm- und Korallenfauna aus Chile. – *Neues Jahrbuch für Mineralogie, Geologie und Paläontologie, Beil.-Band*, **50**: 313-334.
- FROMENTEL, E. DE (1857): Description des polypiers fossiles de l'étage Néocomien. – *Bulletin de la société des sciences historiques et naturelles de l'Yonne*: 1-78.
- (1862): (Polypiers). – In: GRAS, S. (ed.): *Description géologique du département de Vaucluse*. – p. 429-431, Paris (F.Savy).
- (1873): Zoophytes, terrain crétacé (9). – *Paléontologie française*, **8**: 385-432.
- (1883): Zoophytes, terrain crétacé (12). – *Paléontologie française*, **8**: 513-528.
- (1884): Zoophytes, terrain crétacé (13). – *Paléontologie française*, **8**: 529-560.
- GOLDFUSS, A. (1826): *Petrefacta Germaniae* (1,1). – 76 p., Düsseldorf (Arnz).
- GRAY, J.E. (1847): An outline of an arrangement of the stony corals. – *Annals and Magazine of natural History*, **19**: 120-128.
- HARDENBOL, J., THIERY, J., FARLEY, M.B., JACQUIN, T. & GRACIANSKY, P.C. de (1998): Cretaceous biostratigraphy. – In: GRACIANSKY, P.C., HARDENBOL, J., JACQUIN, T. et al. (eds): *Mesozoic-Cenozoic Sequence Stratigraphy of Western European basins*. – *Society of Economic Paleontologists and Mineralogists (SEPM). Special Publications*, **60**.
- ICZN (1999): *International code of zoological nomenclature*. – 306 pp.; London (The International Trust of Zoological Nomenclature).
- JANSSEN, N.M.M. (2010): Barremian invertebrates from Serre de Bleyton (Drôme, SE France): Belemnites. – *Annalen des Naturhistorischen Museums in Wien, Serie A*, **112**: 659-672. (this volume).
- KOBY, F. (1888): *Monographie des polypiers jurassiques de la Suisse* (8). – *Abhandlungen der Schweizerischen Paläontologischen Gesellschaft*, **15**: 401-456.
- (1896): *Monographie des polypiers crétacés de la Suisse* (1). – *Abhandlungen der Schweizerischen Paläontologischen Gesellschaft*, **22**: 1-28.
- (1897): *Monographie des polypiers crétacés de la Suisse* (2). – *Abhandlungen der Schweizerischen Paläontologischen Gesellschaft*, **23**: 29-62.
- (1898): *Monographie des polypiers crétacés de la Suisse* (3). – *Abhandlungen der Schweizerischen Paläontologischen Gesellschaft*, **24**: 63-100.

- KOŁODZIEJ, B. & GEDL, E. (2000): *Nowakocoenia cieszyńska* gen. et sp. nov. (Scleractinia) and its Barremian-Aptian age based on Dinocysts (Polish Outer Carpathians). – *Annales Societatis Geologorum Poloniae*, **70**: 181-192.
- KUZMICHEVA, E.I. (1987): [Corals from Lower Barremian organogenous buildups in the Malyy Balkhan and Tuarkyr.] – In: AMANNIYAZOV, K.N. (ed.): *Geologicheskoe stroenie Turkmenistana*. – p. 217-262, Ashabad (Ylum).
- (2002): [Skeletal morphology, systematics and evolution of the Scleractinia.] – *Trudy Paleontologicheskogo instituta*, **286**: 1-211.
- & ALIEV, O.B. (1988): [Corals.] – In: ALI-ZADE, A.A., ALIEV, G.A. & ALIEV, M.M. (eds): *Cretaceous fauna of Azerbaijan*. – p. 153-184, Baku (Elm).
- LAMARCK, J.B.P. DE (1816): *Histoire naturelle des animaux sans vertèbres* (2). – 568 p., Paris (Verdière).
- LELOUX, J. (2003): *Columactinastraea anthonii* sp. nov. (Scleractinia, Astrocoeniina), a new coral species from the Maastrichtian (Upper Cretaceous) of The Netherlands. – *Scripta Geologica*, **126**: 185-201.
- LIERL, H.-J. (1992): Tenside – ihre Verwendung für die Präparation geologisch-paläontologischer Objekte. – *Der Präparator*, **38/1**: 12-17.
- LONSDALE, W. (1849): Notes on fossil Zoophytes found in the deposits described by Dr. Fitton in his Memoir entitled “A stratigraphical account of the section from Atherfield to Rocken End”. – *Quarterly Journal of the Geological Society of London*, **5**: 55-103.
- LÖSER, H. (1994): La faune corallienne du mont Kassenberg à Mülheim-sur-la-Ruhr (Bassin crétacé de Westphalie, Nord Ouest de l’Allemagne). – *Coral Research Bulletin*, **3**: 1-93.
- (2001): Le site de Vallières (département de l’Aube, France): résultats préliminaires sur des coraux de l’Hauterivien inférieur (Crétacé). – *Bulletin annuel de l’Association géologique de l’Aube*, **22**: 39-53.
- (2005): Stratigraphy of Cretaceous coral genera. – *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*, **238**: 231-277.
- (2006a): Taxonomy, stratigraphic distribution and palaeobiogeography of the Early Cretaceous coral genus *Holocystis*. – *Revista mexicana de ciencias geológicas*, **23/3**: 288-301.
- (2006b): Barremian corals from San Antonio Texcala, Puebla, Mexico – A review of the type material of Felix 1891. – *Boletín del Instituto Geológico de México*, **114**: 1-68.
- (2009): Fossile Korallen aus Jura und Kreide. Aufbau, Klassifikation, Bestimmung und Fundmöglichkeiten. – 206 p.; Dresden (CPress Verlag).
- (in review): Morphology, taxonomy and distribution of the Early Cretaceous coral genus *Felixigyra* (Late Aptian; Scleractinia). – *Rivista italiana di paleontologia e stratigrafia*.
- & FERRY, S. (2006): Coraux du Barrémien du Sud de la France (Ardèche et Drôme). – *Geobios*, **39/4**: 469-489.
- & MINOR, K. (2007): Palaeobiogeographic aspects of Late Barremian to Late Albian coral faunas from Northern Mexico (Sonora) and the southern USA (Arizona, Texas). – *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*, **245/2**: 193-218.
- & MOHANTI, M. (2004): A Cenomanian coral assemblage from southern India. – *Neues Jahrbuch für Geologie und Paläontologie, Monatshefte*, **10**: 577-594.

- & RAEDER, M. (1995): Aptian/Albian coral assemblages of the Helicon Mountains (Boeotia, Greece): palaeontological, palaeoecological and palaeogeographical aspects. – *Coral Research Bulletin*, **4**: 37-63.
- & SALDAÑA-VILLODRE, J.C. (2008): Colonial corals from the Early Aptian siliciclastic Montlivaltia Marls of Jumilla (Murcia, Spain). – *Revista Española de Paleontología*, **23/1**: 1-6.
- & STOLARSKI, J. (1997): Les scléactiniaires solitaires de la carrière du Gaty (Crétacé: Albien moyen, Géraudot, département de l'Aube, France). – *Bulletin annuel de l'Association géologique de l'Aube*, **17-18**: 30-37.
- et al. (2005): List of Localities. – *Catalogue of Cretaceous Corals*, **3**: 1-366.
- MASSE, J.P. & MORYCOWA, E. (1994): Les Scléactiniaires hydno-phoroïdes du Crétacé inférieur (Barrémien-Aptien inférieur) de Provence (S.E. de la France). *Systématique, stratigraphie et paléobiogéographie*. – *Geobios*, **27/4**: 433-448.
- , MORYCOWA, E. & FENERCI-MASSE, M. (2009): Valanginian-Hauterivian scleractinian coral communities from the Marseille region (SE France). – *Cretaceous Research*, **30/1**: 178-192.
- MATTHEWS, S.C. (1973): Notes on open nomenclature and on synonymy lists. – *Palaeontology*, **16/4**: 713-719.
- MICHELOTTI, G. (1838): *Specimen Zoophytologiae diluvianae*. – 227 p., Torino (Heredes Seb. Botta).
- MILNE-EDWARDS, H. (1857): *Histoire naturelle des coralliaires ou polypes proprement dits (1+2)*. – 326+633 p., Paris (Librairie encyclopédique de Roret).
- & HAIME, J. (1848): *Recherches sur les polypiers (2) Monographie des Turbinolides*. – *Annales de Sciences naturelles (3)*, **9**: 211-344.
- & HAIME, J. (1851a): *A monograph of the British fossil corals (1) Introduction. Tertiary and Cretaceous*. – *Palaeontographical Society monographs*, **3**: i-lxxxv, 1-71.
- & HAIME, J. (1851b): *Monographie des polypiers fossiles des terrains paléozoïques*. – *Archives du Muséum d'histoire naturelle*, **5**: 1-502.
- MOOSLEITNER, G. (2007): Winzig, aber sensationell! Meine kleinste Fossilfundstelle. – *Fossilien*, **24/5**: 288-298.
- MORYCOWA, E. (1964): Hexacoralla des couches de Grodziszczce (Néocomien Carpathes). – *Acta Palaeontologica Polonica*, **9/1**: 1-114.
- (1971): Hexacorallia et Octocorallia du Crétacé inférieur de Rarau (Carpathes orientales roumaines). – *Acta Palaeontologica Polonica*, **16/1-2**: 1-149.
- (1989): Class Anthozoa Ehrenberg, 1834. – In: MALINOWSKI, L. (ed.): *Geology of Poland (3): Atlas of guide and characteristic fossils (2c): Mesozoic, Cretaceous*. – p.58-67, Warszawa (Wydawnictwa Geologiczne).
- & DECROUEZ, D. (1993): Description de quelques coraux des calcaires urgoniens du domaine Delphino-Helvétique (Bornes, Haute-Savoie, France), première partie. – *Revue de Paléobiologie*, **12/1**: 203-215.
- & MASSE, J.P. (1998): Les Scléactiniaires du Barrémien-Aptien inférieur de Provence (SE de la France). – *Geobios*, **31/6**: 725-766.

- & MASSE, J.P. (2007): *Actinaraeopsis ventosiana*, a new scleractinian species from the Lower Cretaceous of Provence (SE France). – *Annales Societatis Geologorum Poloniae*, **77**: 141-145.
- & MASSE, J.P. (2009): Lower Cretaceous Microsolenina (Scleractinia) from Provence (Southern France). – *Annales Societatis Geologorum Poloniae*, **79**: 97-140.
- & RONIEWICZ, E. (1990): Revision of the genus *Cladophyllia* and description of *Apoclado-phyllia* gen.n. (Cladophylliidae fam.n.; Scleractinia). – *Acta Palaeontologica Polonica*, **35/3-4**: 165-190.
- & RONIEWICZ, E. (1995): Microstructural disparity between Recent fungiine and Mesozoic microsolenine scleractinians. – *Acta Palaeontologica Polonica*, **40/4**: 361-385.
- OGILVIE, M.M. (1897): Die Korallen der Stramberger Schichten. – *Palaeontographica*, (suppl. 2), **7**: 74-282.
- ORBIGNY, A. DE (1849): Note sur les polypiers fossiles. – 12 p., Paris (Masson).
- (1850): Prodrôme de Paléontologie stratigraphique universelle des animaux mollusques et rayonnés (1-2). – 394 p., 428 p., Paris (Masson).
- (1851): Cours élémentaire de Paléontologie (3:) Polypiers ou Zoophytes. – 189 p.; Paris (Masson).
- PANDEY, D.K., FÜRSICH, F.T., BARON-SZABO, R.C. & WILMSEN, M. (2007): Lower Cretaceous corals from the Koppeh Dagh, NE-Iran. – *Zitteliana* **A47**: 3-52.
- , LATHUILLIÈRE, B., FÜRSICH, F.T. & KULDEEP, S. (2002): The oldest Jurassic cyathophorid coral (Scleractinia) from siliciclastic environments of the Kachchh Basin, western India. – *Paläontologische Zeitschrift*, **76/2**: 347-356.
- PHILLIPS, J. (1829): Illustrations of the geology or a description of the strata and organic remains of Yorkshire coast. – 192 p., York (Thomas Wilson and sons).
- PRATZ, E. (1882-83): Über die verwandschaftlichen Beziehungen einiger Korallengattungen mit hauptsächlichlicher Berücksichtigung ihrer Septalstructur. – *Palaeontographica*, **29**: 81-124.
- PREVER, P.L. (1909a): Anthozoa. – In: PARONA, C.F. (ed.): La fauna coralligena del Cretaceo dei Monti d'Ocre nell'Abruzzo Aquilano. – *Memorie descrittive della carta geologica d'Italia*, **5/1**: 51-147.
- REIG ORIOL, J. (1991): Fauna coralina cretácica del nordeste de España. – 53 p., Barcelona (privately published).
- REUSS, A.E. (1864): Die fossilen Foraminiferen, Anthozoen und Bryozoen von Oberburg in Steiermark. – *Denkschriften der Akademie der Wissenschaften, Mathematisch-naturwissenschaftliche Klasse*, **23**: 1-38.
- REYEROS NAVARRO, M.M. (1963): Corales del Cretacico inferior de San Juan Raya, Estado de Puebla. – *Paleontologia mexicana*, **17**: 1-21.
- REYEROS DE CASTILLO, M.M. (1983): Corales de algunas formaciones cretácicas del estado de Oaxaca. – *Paleontologia mexicana*, **47**: 1-67.
- RONIEWICZ, E. (1976): Les scléactiniaires du Jurassique supérieur de la Dobrogea centrale Roumanie. – *Palaeontologia Polonica*, **34**: 17-121.
- SCHOLZ, H. (1984): Bioherme und Biostrome im Allgäuer Schrattenkalk (Helvetikum, Unterkreide). – *Jahrbuch der Geologischen Bundesanstalt*, **127/3**: 471-499.

- SCHÖLLHORN, E. (1998): Geologie und Paläontologie des Oberapt im Becken von Organyà (Nordspanien). – *Coral Research Bulletin*, **6**: 1-139.
- SIKHARULIDZE, G.YA. (1977): [Lower Cretaceous hexacorals from the Georgia.] – *Paleontologiya i stratigrafiya mezozojskikh otlozhenij Gruzii*, **3**: 66-109.
- TOMÁS, S., LÖSER, H. & SALAS ROIG, R. (2008): Low-light and nutrient-rich coral assemblages in an Upper Aptian carbonate platform of the southern Maestrat Basin (Iberian Chain, eastern Spain). – *Cretaceous Research*, **29**: 509-534.
- TOULA, F. (1878): Geologische Untersuchungen im westlichen Theile des Balkans und in den angrenzenden Gebiete (5:) Ein geologisches Profil von Sofia über den Berkovica Balkan nach Bercovar. – *Sitzungsberichte der Mathematisch-Naturwissenschaftliche Classe der Kaiserlichen Akademie der Wissenschaften* (1), **77**: 247-317.
- (1884): Geologische Untersuchungen im westlichen Theile des Balkans und in den angrenzenden Gebiete (10:) Von Pirot nach Sofia auf den Vitos, über Pernik nach Trn und über Stol nach Pirot. – *Sitzungsberichte der Mathematisch-Naturwissenschaftliche Classe der Kaiserlichen Akademie der Wissenschaften*, (1), **88**: 1279-1348.
- (1889): Geologische Untersuchungen im centralen Balkan. – *Denkschriften der Kaiserlichen Akademie der Wissenschaften, Mathematisch-Physikalische Klasse*, **55**: 1-108.
- TURNŠEK, D. (1997): Mesozoic Corals of Slovenia. – *Zbirca ZRC (ZRC Series)*, **16**: 1-512.
- & BUSER, S. (1974): Spodnjekredne korale, hidrozoji in hetetide z Banjske Planote in Trnovskega Gozda. – *Razprave Slovenska akademija znanosti in umetnosti* (4), **17/2**: 81-124.
- & BUSER, S. (1976): Knidarijska favna iz senonijske brece na Banjski Planoti. – *Razprave Slovenska akademija znanosti in umetnosti* (4), **19/3**: 37-88.
- & MIHAJLOVIC, M. (1981): Lower Cretaceous Cnidarians from eastern Serbia. – *Razprave Slovenska akademija znanosti in umetnosti* (4), **23/1**: 1-54.
- , PLENICAR, M. & SRIBAR, L. (1992): Lower Cretaceous fauna from Slovenski Vrh near Kocevje (South Slovenia). – *Razprave Slovenska akademija znanosti in umetnosti* (4), **33/8**: 205-257.
- VAUGHAN, T.W. (1905): A critical review of the literature of the simple genera of Fungida, with a tentative classification. – *Proceedings of the United States National Museum*, **28/1401**: 371-424.
- & WELLS, J.W. (1943): Revision of the suborders, families and genera of scleractinia. – *Special Papers. Geological Society of America*, **44**: 1-363.
- VERRILL, A.E. (1868-70): Notes on the Radiata in the museum of Yale College, with descriptions of new genera and species. No. 6. Review of the corals and polyps of the West Coast of America. – *Transactions of the Connecticut Academy of Arts and Sciences*, **1/2**: 377-567.
- VOLZ, W. (1903): Über eine Korallenfauna aus dem Neokom der Bukowina. – *Beiträge zur Paläontologie und Geologie Österreich-Ungarns und des Orients*, **15/1**: 9-30.
- WELLS, J.W. (1932): Corals of the Trinity Group of the Commanchean of central Texas. – *Journal of Paleontology*, **6/3**: 225-256.
- (1933): Corals of the Cretaceous of the Atlantic and Gulf Coastal Plains and W-Interior of the United States. – *Bulletins of American Paleontology*, **18**: 83-292.

- (1944): Cretaceous, Tertiary and Recent corals, a sponge and a alga from Venezuela. – Journal of Paleontology, **18**: 429-447.
- WERY, G. (1954): Contribution à la révision des Madréporaires du Néocomien de la Haute-Marne. Diplôme. – 97 p., Dijon (Université de Dijon).
- YABE, H. & EGUCHI, M. (1936): *Eohydnophora*, a new genus of Cretaceous corals. – Proceedings of the Imperial Academy of Japan, **12/5**: 141-143.