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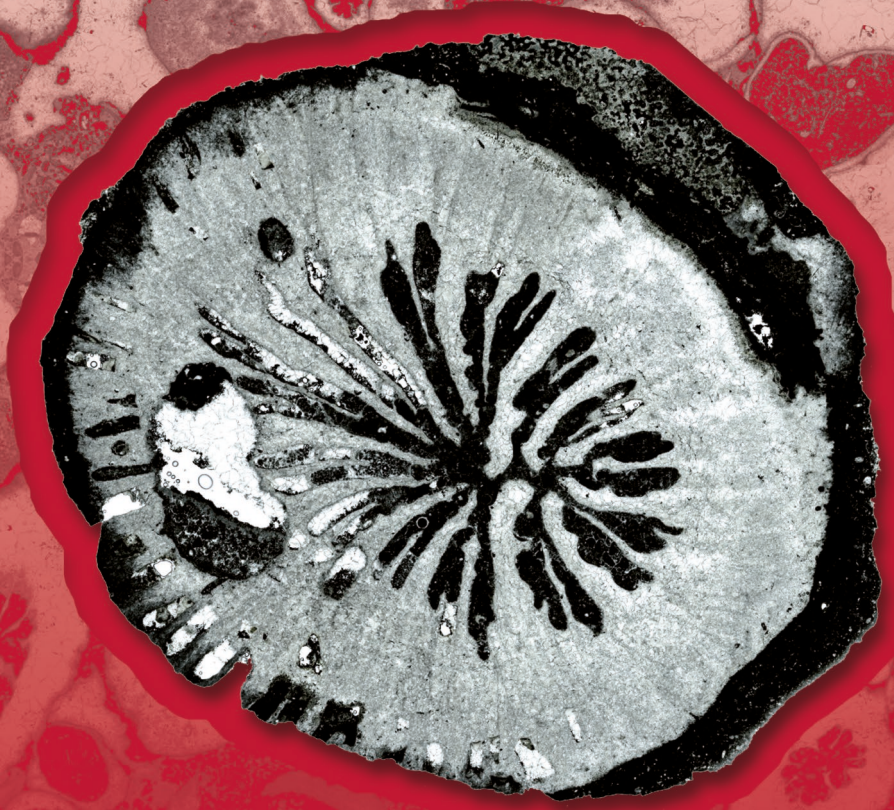

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Pliensbachian corals from the Western Tethys

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ABSTRACT
Late Liassic in the Western Tethys has been the cradle of Middle and Late Jurassic diversity of corals. This is what revised and enhanced taxonomy of corals from Pliensbachian and Toarcian stages reveals. The current new taxonomic study of Pliensbachian corals describes 66 species distributed in 41 genera and 20 identified families. It includes four new genera: *Podosmilia* n. gen., *Tubulosmilia* n. gen., *Prismastrea* n. gen. and *Spongiocoenia* n. gen.; and 20 new species: *Axosmilia amellagouensis* n. sp., *Apocladophyllia guigouensis* n. sp., *Coryphyllia bicuneiformis* n. sp., *Coryphyllia capillaria* n. sp., *Proleptophyllia calix* n. sp., *Proleptophyllia magna* n. sp., *Proleptophyllia subphaceloida* n. sp., *Fungiaphyllia praecursor* n. sp., *F. rotunda* n. sp., *Margarosmilia dividenda* n. sp., *Paravolzeia calabrensis* n. sp., *Distichophyllia pauciseptata* n. sp., *Retiophyllia zizensis* n. sp., *Epismiliopsis paraeudesi* n. sp., *Phacelostylophyllum* mg. *arbustulum* n. sp., *Podosmilia horologium* n. gen., n. sp., *Stylophyllopsis bovista* n. sp., *S. veracolumella* n. sp., *Tubulosmilia regularis* n. gen., n. sp. and *Prismastrea organum* n. gen., n. sp. So many new species appear surprising at first sight considering the special attention paid in this study to the correction of species diversity overestimations that took place in the literature of the last century as a consequence of a typological approach. Many taxa previously considered extinct at T-J boundary were still living during Pliensbachian times, various genera are known only for Pliensbachian. In addition, a small number of genera namely *Isastrea*, *Montlivaltia* and *Thamnasteria* have their first occurrence during this stage. Despite their low abundance during Pliensbachian, these genera will significantly increase their part in Middle and Upper Jurassic communities. Most collected coral assemblages come from both reefs and level-bottom assemblages found in carbonate platform situation.

KEY WORDS
Corals,
scleractinians,
Pliensbachian,
Lower Jurassic,
crisis,
new genera,
new species,
new combinations.

RÉSUMÉ
Coraux pliensbachiens de l'Ouest Téthysien.
L'Ouest Téthysien fût au Lias supérieur le berceau de la diversité corallienne développée au Jurassique Moyen et Supérieur. C'est ce que révèle la taxinomie révisée et augmentée des faunes de coraux des étages Pliensbachien et Toarcien. La présente étude taxinomique des coraux pliensbachiens décrit 66 espèces distribuées parmi 41 genres et 20 familles. Elle inclut quatre nouveaux genres : *Podosmilia* n. gen., *Tubulosmilia* n. gen., *Prismastrea* n. gen. et *Spongiocoenia* n. gen. ; et 20 nouvelles espèces : *Axosmilia amellagouensis* n. sp., *Apocladophyllia guigouensis* n. sp., *Coryphyllia bicuneiformis* n. sp., *Coryphyllia capillaria* n. sp., *Proleptophyllia calix* n. sp., *Proleptophyllia magna* n. sp., *Proleptophyllia subphaceloida* n. sp., *Fungiaphyllia praecursor* n. sp., *F. rotunda* n. sp., *Margarosmilia dividenda* n. sp., *Paravolzeia calabrensis* n. sp., *Distichophyllia pauciseptata* n. sp., *Retiophyllia zizensis* n. sp., *Epismiliopsis paraeudesi* n. sp., *Phacelostylophyllum* mg. *arbustulum* n. sp., *Podosmilia horologium* n. gen., n. sp., *Stylophyllopsis bovista* n. sp., *S. veracolumella* n. sp., *Tubulosmilia regularis* n. gen., n. sp. et *Prismastrea organum* n. gen., n. sp. ; un chiffre surprenant de prime abord compte tenu de l'attention particulière apportée à la correction des surproductions d'espèces induites par l'approche descriptive purement typologique symptomatique de la littérature du dernier siècle.

MOTS CLÉS
Coraux,
scléractiniaires,
Pliensbachien,
Jurassique inférieur,
crise,
genres nouveaux,
espèces nouvelles,
combinaisons nouvelles.

INTRODUCTION

Liassic times (= Lower Jurassic) are usually considered as a period of weak reefal development for corals (e.g. Leinfelder *et al.* 2002; Kiessling *et al.* 2009 and references therein). The expression of "reef eclipse" has been even used (Stanley 2001). In this context the Pliensbachian occupies a special place because, among the Lower Jurassic stages, it is the richest in reefs (Leinfelder *et al.* 2002; Kiessling *et al.* 2007). Even if these reefs are rather dominated by lithiotid bivalves, they left some space to the development of corals and the bibliographic approach provides a general view in which this very relative reefal high corresponds to a significant and also relative peak in diversity with regards to other Liassic stages (Lathuilière & Marchal 2009). This view on the coral Pliensbachian diversity is grounded on a rather restricted set of publications. Some of them deal with South American faunas (Tilmann 1917; Gerth 1928; Wells 1953; Prinz 1991; Morsch 1995, 2001), some others focus on non-reefal corals of Great Britain (Duncan 1868; Tomes 1878, 1882; Thomas 1935a; Beauvais 1976; Negus 1991). Solitary corals from Normandy (France) received a detailed ancient study from Fromentel & Ferry (1866) with a subsequent revision in Alloiteau (1957) that conducted to a multiplication of genus names. But corals were also described from Italy (Bellini 1903), Spain (Turnšek *et al.* 1975), Slovenia (Turnšek & Košir 2000; Turnšek *et al.* 2003), Austria (Hahn 1911) and Hungary (Dulai 1995).

Preceded by Le Maître (1935, 1937), Beauvais (1986) produced the most significant monography on Liassic corals in Morocco. Her article represents the richest work to approach the Lower Jurassic diversity and Morocco appears as the most significant center of diversity for this period. It is also clearly the place were Pliensbachian reefs were more developed. However, the taxonomical practice of Beauvais- as well as Alloiteau, Fromentel & Ferry - is obviously biaised by a general splitting tendency and an underestimation of intraspecific variability. For this reason, to clarify the responses of corals to the Pliensbachian-Toarcian biological crisis we decided to go back to the field.

MATERIAL AND METHODS

The present monograph results from a data gathering of a three-year PhD study (2015-2018) with five field missions in Morocco and one in Italy. New collections of material were also realised by Marc Chesnier from Normandy (France) and by Philippe Fauré from French Pyrenees. In addition, the document integrates revised descriptions from the literature (collections of the Muséum national d'Histoire naturelle [MNHN] in Paris, Muséum d'histoire naturelle de Genève). The whole set of Pliensbachian samples involved in this taxonomic study reaches a total of 333 specimens and the production of more than 200 thin sections.

This work provides updated descriptions of Tethyan Pliensbachian coral faunas, with arguments and figurations. Descriptions are based on macroscopic and microscopic observations of whole samples, polished sections and thin sections that have been produced by the thin section platform in Georessource lab or by the author with the precious help of the association Terrae Genesis (88, Le Syndicat, France).

In total, 66 species are described distributed in 41 genera and 20 identified families. Our global tendency to lump taxa in view to correct the overestimated number of species due to the typological approach of some predecessors that did not consider the intraspecific variability is obscured by the important quantity of material collected in the field that led to the description of 20 new species and four new genera.

For example, we grouped together three species of *Proleptophyllia* Alloiteau, 1952 created by Beauvais (1986): *P. multiradiata*, *P. rejuvenescens* and *P. subcylindrica* but we also transferred one species initially attributed to another genus into *Proleptophyllia*: *P. punctulum* (Fromentel & Ferry, 1866) n. comb. and we described three new species into this genus from our field samples: *P. calix* n. sp., *P. magna* n. sp. and *P. subphaceloida* n. sp. *Proleptophyllia bilobata* has not been considered as it has been produced on the basis of one single, poorly preserved sample that does not even allow a family-level attribution. From a genus that counted five species before this study we finished with a genus including six species despite merging three initial species together and deleting one (see Table 1).

TABLE 1. — Coordinates of samples studied in the descriptions. Note that a very few samples come from the Toarcian stage and have been included in the descriptions when the corresponding species belongs to both Pliensbachian and Toarcian stages.

Samples	Coord. (dec.)	Coord. (orth.)	Samples	Coord. (dec.)	Coord. (orth.)
1603A3E5	31.986517, -5.0444970	31°59'11"N, 5°2'40"W	AM16179-4	31.9570351, -5.0364242	31°57'25"N, 5°2'11"W
1703A2-1	31.9614506, -5.0290852	31°57'41"N, 5°1'44"W	AM16179-5	31.9570351, -5.0364242	31°57'25"N, 5°2'11"W
1703A4-1	31.95647, -5.03553	31°57'23"N, 5°2'7"W	AM16179-6	31.9570351, -5.0364242	31°57'25"N, 5°2'11"W
2210-E2	32.01361, -4.95884	32°0'48"N, 4°57'31"W	AM16179-8	31.9570351, -5.0364242	31°57'25"N, 5°2'11"W
2303A1-1	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16179-14	31.9570351, -5.0364242	31°57'25"N, 5°2'11"W
2303A1-2	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16180-2	31.95921, -5.03547	31°57'33"N, 5°2'7"W
2303A1-3	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16182-3	31.9606323, -5.0340395	31°57'38"N, 5°2'2"W
2303A1-5	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16182-7	31.9606323, -5.0340395	31°57'38"N, 5°2'2"W
2303A1-6	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16183-4	Unknown Amellagou (Pli)	
2303A1-7	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16184-3	31.97956, -5.01258	31°58'46"N, 5°0'45"W
2303A1-8	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16188-1	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A1-9	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16188-2	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A4	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16188-5	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A4(2)-3	31.96845, -5.02609	31°58'6"N, 5°1'33"W	AM16188-7	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A5-1	31.9582175, -5.03901	31°57'29"N, 5°2'20"W	AM16188-11	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A5-3	31.9582175, -5.03901	31°57'29"N, 5°2'20"W	AM16188-12	31.97528, -5.02038	31°58'31"N, 5°1'13"W
2303A6-1	31.9699744, -5.02153166	31°58'11"N, 5°1'17"W	AM16188-13	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A6-2	31.9699744, -5.02153166	31°58'11"N, 5°1'17"W	AM16188-15	31.97528, -5.02038°	31°58'31"N, 5°1'13"W°
2303A8-1	Unknown Amellagou (Pli)		AM16188-16	31.97528, -5.02038	31°58'31"N, 5°1'13"W
2310A2	31.93342, -5.00089	31°56'0"N, 5°0'3"W	AM16188-24	31.97528, -5.02038	31°58'31"N, 5°1'13"W
2703A1-4	31.9623280, -5.0315447	31°57'44"N, 5°1'53"W	AM16188-30	31.97528, -5.02038	31°58'31"N, 5°1'13"W
2703A3-3	31.9562722, -5.038142778	31°57'22"N, 5°2'17"W	AM16188-31	31.97528, -5.02038	31°58'31"N, 5°1'13"W
2703A3-4	31.9562722, -5.038142778	31°57'22"N, 5°2'17"W	AM16B236-1	31.94313, -5.03034	31°56'35"N, 5°1'49"W
2703A3-5	31.9562722, -5.038142778	31°57'22"N, 5°2'17"W	AML8-1	31.96922, -5.03311	31°58'9"N, 5°1'59"W
AM1603A8-2	31.9845943, -5.0491996	31°59'4"N, 5°2'57"W	Ca0111E3-18	39.507908, 16.659282	39°30'28"N, 16°39'33"E
AM16124	31.97296, -5.02263	31°58'22"N, 5°1'21"W	Ca0211E1-1	39.465234, 16.791365	39°27'54"N, 16°47'28"E
AM16132-2	31.95737, -5.03034	31°57'26"N, 5°1'49"W	Ca0211E1-2	39.465234, 16.791365	39°27'54"N, 16°47'28"E
AM16132-3	31.95737, -5.03034	31°57'26"N, 5°1'49"W	Ca0211E2-1	39.464210, 16.790572	39°27'51"N, 16°47'26"E
AM16160-1	31.9502735, -5.0424514	31°57'0"N, 5°2'32"W	Ca0211E2-6	39.464210, 16.790572	39°27'51"N, 16°47'26"E
AM16160-2	31.9502735, -5.0424514	31°57'0"N, 5°2'32"W	CDAm1	Unknown Amellagou (Pli)	
AM16160-3	31.9502735, -5.0424514	31°57'0"N, 5°2'32"W	CDAm2	Unknown Amellagou (Pli)	
AM16160-4	31.9502735, -5.0424514	31°57'0"N, 5°2'32"W	CDAm3	Unknown Amellagou (Pli)	
AM16160-6	31.9502735, -5.0424514	31°57'0"N, 5°2'32"W	CDAm4	Unknown Amellagou (Pli)	
AM16162-1	Unknown Amellagou (Pli)		CDAm5	Unknown Amellagou (Pli)	
DA3105E2-2	31.5684242, -5.8936434	31°34'6"N, 5°53'37"W	MA0704E3-6	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E2-3	31.5684242, -5.8936434	31°34'6"N, 5°53'37"W	MA0704E3-7	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E2-4	31.5684242, -5.8936434	31°34'6"N, 5°53'37"W	MA0704E3-8	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E2-5	31.5684242, -5.8936434	31°34'6"N, 5°53'37"W	MA0704E3-9	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E2-7	31.5684242, -5.8936434	31°34'6"N, 5°53'37"W	MA0704E3-10	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E2-8	31.5684242, -5.8936434	31°34'6"N, 5°53'37"W	MA0704E3-11	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E3-1	31.5685043, -5.8936157	31°34'6"N, 5°53'37"W	MA0704E3-12	33.452893, -4.922453	33°27'10"N, 4°55'20"W
DA3105E3-3	31.5685043, -5.8936157	31°34'6"N, 5°53'37"W	MA0704E4-2	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0805E4	33.477937, -4.931446	33°28'40"N, 4°55'53"W	MA0704E4-3	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0805E5	33.477967, -4.931018	33°28'40"N, 4°55'51"W	MA0704E4-4	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0905E4-1	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E4-5	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0905E4-2	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E4-6	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0905E4-3	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E4-7	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0905E4-4	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E4-8	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0905E4-5	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E4-9	33.452816, -4.922526	33°27'10"N, 4°55'21"W
Gu0905E4-6	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E5-2	33.452753, -4.922639	33°27'9"N, 4°55'21"W
Gu0905E4-7	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E5-3	33.452753, -4.922639	33°27'9"N, 4°55'21"W
Gu0905E4-8	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E5-4	33.452753, -4.922639	33°27'9"N, 4°55'21"W
Gu0905E4-9	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E6-1	33.452807, -4.922837	33°27'10"N, 4°55'22"W
Gu0905E4-10	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E6-2	33.452807, -4.922837	33°27'10"N, 4°55'22"W
Gu0905E4-11	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E6-3	33.452807, -4.922837	33°27'10"N, 4°55'22"W
Gu0905E4-12	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E6-4	33.452807, -4.922837	33°27'10"N, 4°55'22"W
Gu0905E4-13	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0704E8-4	33.452490, -4.924860°	33°27'8"N, 4°55'29"W°
Gu0905E4-14	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0904E9-2	33.452542, -4.924990	33°27'9"N, 4°55'29"W
Gu0905E4-15	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA0904E10	33.454526, -4.927693	33°27'16"N, 4°55'39"W
Gu0905E4-16	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA1004E1-5	33.191128, -5.351721°	33°11'28"N, 5°21'6"W°
Gu0905E4-17	33.459087, -4.948461	33°27'32"N, 4°56'54"W	MA1004E1-G	33.191128, -5.351721	33°11'28"N, 5°21'6"W
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Gu0905E9	33.461720, -4.945706	33°27'42"N, 4°56'44"W	MA1004E5-7	33.192311, -5.352480	33°11'32"N, 5°21'8"W
Gu1005E2	33.463681, -4.943931	33°27'49"N, 4°56'38"W	MAM16	Unknown Aïn Leuh (To)	
Gu1105E2-1	33.458436, -4.988101	33°27'30"N, 4°59'17"W	PFPyr6	Unknown Pyrenees (Pli)	

Abbreviations

Abbreviations and symbols used in the descriptions

s.l.	*sensu lato*;
s.s.	*sensu stricto*;
AM	Amellagou (Gueris Valley, Morocco);
BSP	collections from the Paleontological museum of Münich;
CPUN	Collections paléontologiques universitaires de Nancy/ Universitary Palaeontological Collections of Nancy; Morrocan specimens should be ultimately housed in Rabat (Morocco).
ENSG	École nationale supérieure de Géologie, Nancy;
Gu	Guigou;
LB	Louise Beauvais;
MAN	Muséum Aquarium de Nancy/Museum Aquarium of Nancy;
MGUW	Geological Museum of Wrocław University;
MHNG	Muséum d'Histoire naturelle de Genève/Natural History Museum of Geneva;
MHNLM	Muséum d'Histoire naturelle "Musée Vert", Le Mans/ Natural History Museum "Musée Vert", Le Mans.
MNHN	Muséum national d'Histoire naturelle de Paris/Natural History Museum of Paris;
MNHN.F	MNHN, Collections de Paléontologie.

GEOLOGICAL SETTINGS

New material used in this study has been collected in the field in different localities described below. See Figure 1 for geographical location.

Bioconstructions and olistoliths of Pliensbachian from Amellagou (from Vasseur *et al.* 2019)

The village of Amellagou is in the southern part of the Central High Atlas rift basin in Morocco, in the Gueris Valley. Many samples were found in Pliensbachian-aged coral bioherms (from Ibex to Spinatum ammonite chronozones), which grew on the upper slope that bordered the thick southern carbonate platform. Abundant lithiotid communities developed in subtidal lagoon paleoenvironments on this platform, outcropping at the top of Jebel Taabest, for example. Numerous other specimens were collected in olistoliths that slipped eastwards and northwards, up to the lower slope, in a hemipelagic environment. These olistoliths are associated with slumps and calciturbidites, related to synsedimentary faults and tilting; they are attributed to the lateral transition between the Choucht and Ouchbis Formations. Olistoliths show a boundstone to floatstone texture, with solitary and colonial corals, sponges, gastropods, serpulid worms, crinoids, brachiopods, echinoid tests and spines, and occasional chaetetid sponges and microbialites. Some of the olistoliths also contain lithiotid bivalves (including *Cochlearites* and *Opisoma* genera). Numerous olistoliths originating from the carbonate platform slipped towards the basin during the latest Pliensbachian lowstand (Spinatum chronozone), just before the drowning of the Taabest platform, which occurred during the earliest Toarcian. Coral specimens older than those presently studied exist in the neighbouring Serdrar reef, a 200 meter-high basinal Sinemurian patch reef (Sarih 2008; Lachkar *et al.* 2009; Vasseur *et al.* 2019; Boivin 2019; Boivin *et al.* 2019).

Corals from Choucht Formation in Dades Valley (from Vasseur *et al.* 2019)

The Dades Valley also belongs to the southern margin of the central High Atlas rift basin (see Krencker *et al.* 2015). Specimens come from the upper part of the Choucht Formation, which is a proximal equivalent of the Ouchbis Formation. This interval is dated by ammonite biostratigraphy and corresponds to the late Pliensbachian Emaciatum ammonite chronozone, more specifically the Elisa sub-chronozone (Ettaki *et al.* 2000). The age is confirmed by the presence of the nannofossil *Lotharingius sigillatus* (a marker for the nannofossil subzone NJT5b) found below the Choucht Formation in the Tizguin section (Mattioli *et al.* 2013; Bodin *et al.* 2016). The Choucht Formation is a succession of shallow-water deposits made of packstone to mudstone beds deposited in a carbonate platform environment, including phaceloid coral reefs with rare lithiotid bivalves. Nonetheless, ammonites, belemnites and *Zoophycos* ichnofossils are observed in this formation, in close association with the reefs, suggesting relatively deep (shoreface to offshore transition) depositional conditions for this formation (wave controlled sedimentary structures have not been observed to date) (see Vasseur *et al.* 2019).

Corals from the Pliensbachian of Ait Athmane, Ziz Valley (from Brame *et al.* 2019)

The Pliensbachian-aged Aganane Formation at Ait Athmane is predominantly composed of shallowing upward sequences of limestones capped by paleosoils (Wilmsen & Neuweiler 2007; Krencker *et al.* 2014). Shallowing-upward hemicycles generally consist of shallow subtidal, cross-bedded floatstones to framestones with abundant lithiotids that transition into packstones and grainstones with evidence of subaerial exposure (e.g., sheet cracks, vugs, fenestral fabrics), lagoonal marls, and bioturbated red mudstones with root traces and calcrete. Based on these observations and the regional geological setting, the Aganane Fm has been interpreted as a shallow lagoon within a coralgal reef-rimmed carbonate platform (Wilmsen & Neuweiler 2007; Krencker *et al.* 2014). Within the upper part of the Aganane Fm (uppermost Pliensbachian, *Emaciaticeras emaciatum* ammonite zone; Krencker *et al.* 2014; Wilmsen & Neuweiler 2007), lithiotid and coral biostromes have been observed. The Aganane Fm terminates at an oyster-rich hardground, which is a hiatal surface that encompasses most of the early Toarcian, likely representing > 1 Myr based on integrated biostratigraphic and chemostratigraphic controls (Krencker *et al.* 2014). Therefore, the Pliensbachian/Toarcian stage boundary, as well as most of the T-OAE, is not preserved in this section (Krencker *et al.* 2014). Initiation of deposition of the overlying Ait Athmane Fm is dated from the latest *Hildaites levisoni* zone (after the onset of the T-OAE), marking the return of weak carbonate production.

Buildups of Upper Pliensbachian in Guigou Plateau

The Guigou Plateau is located in Middle Atlas, where several huge carbonate buildups from Carixian (lower Pliensbachian sub-stage) to Domerian (upper Pliensbachian sub-stage) shape the landscape. This carbonate platform is generally interpreted as

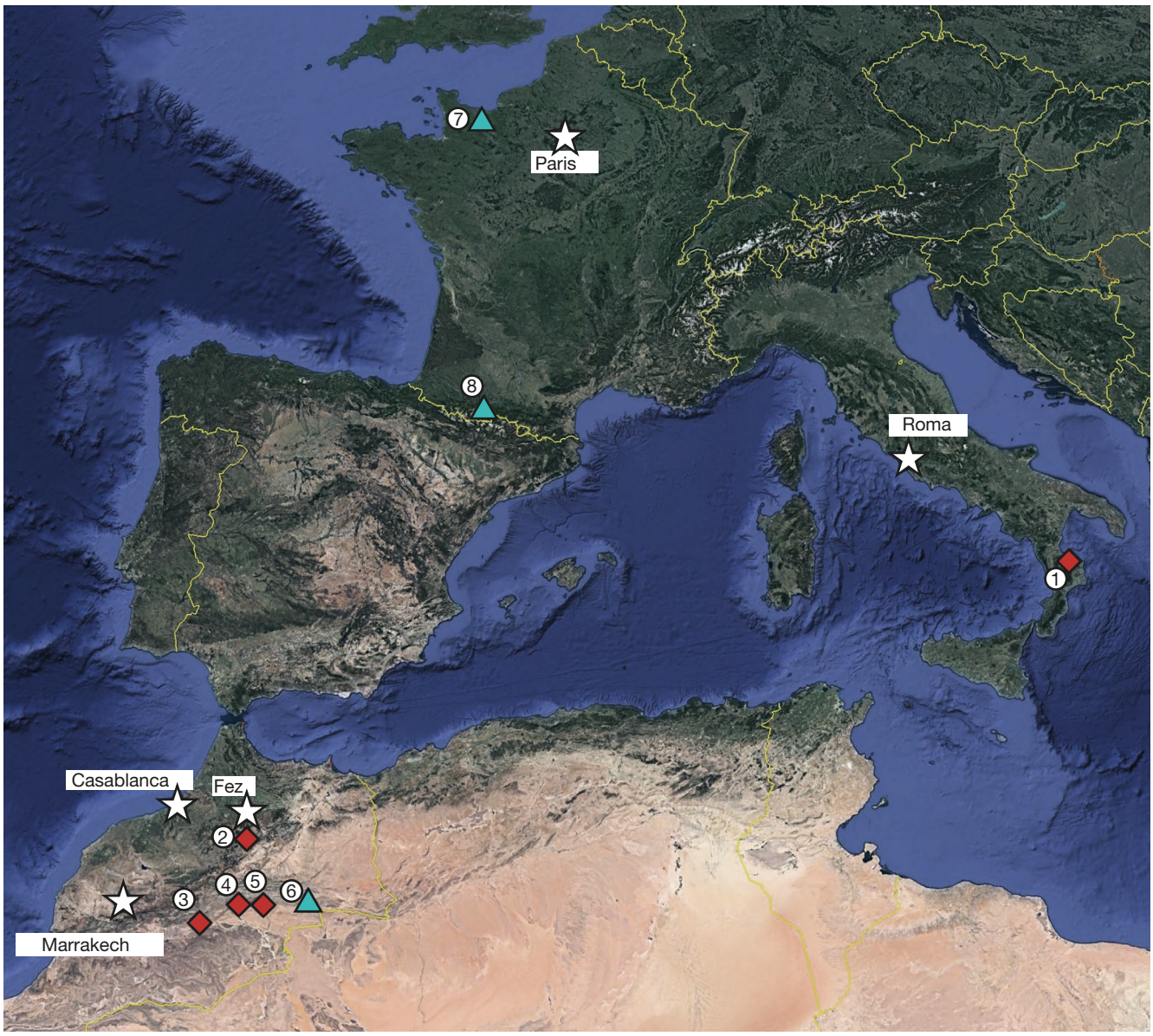

Fig. 1. — Geographic location map of the different sampling zones of the samples used in this study. Red diamonds correspond to sampling zones of new material collected for this study and blue triangles correspond to material that we do not sample ourselves. Sites: **1**, Longobucco basin; **2**, Guigou Plateau; **3**, Dadès Valley; **4**, Amellagou Plain; **5**, Ziz Valley; **6**, Jebel Bou Dahar; **7**, May-Sur-Ornes; **8**, Estivères Pass.

capping a tilted block limited in the southeast by the "Northern Middle-Atlasic Accident" (Colo 1961; El Arabi *et al.* 1987), which marks the boundary between tabular Middle-Atlas and folded Middle-Atlas, and by the Tizin'Trettène accident in the northwest, which separates two distinct plateaus of the Tabular Middle Atlas. One of the sampling areas has been concentrated especially on one of these bioconstructions: the Koudiat Ech Chehem. It is an approximately 100 meter-high buildup prograding towards the southwest and rising above limestone-marls deposits including early Domerian ammonites *Protogrammoceras* (Morabet 1974 according to El Arabi *et al.* 1987). The other outcrop for sampling is part of the "Taililout" section located in the western part of the Guigou Plateau, directly west from Koudiat Ech Chehem. This outcrop corresponds to lower or middle Carixian stage; it is topped by a level that stratigraphically corresponds to the Maftah 2 Formation (comforted by personal communications from André Charrière in the field), which contains the middle Carixian ammonite *Tropidoceras* (see Charrière *et al.* 2011: 62). The sampling site corresponds to the transition between the Maftah 1 and Maftah 2 formations. In fact, the core of Maftah 1 Formation shows mudstone to packstone limestone alternations containing bivalves, foraminifera, and algae, sometimes with cross-bedding. Then, the top of Maftah 1 Formation is made of cross-bedded oolitic and bioclastic calcarenites including corals in some beds. A major discontinuity showing a ferruginous hardground, including wood, marks the top of this Formation. The Maftah 2 Formation includes more silicified bioclastic and oolitic limestones or thin argillaceous limestones and is dated by the presence of

middle Carixian ammonite *Tropidoceras* at the base and the upper Carixian ammonites *Becheiceras gallicum* and *Fuciniceras* aff. *bastianii* (Davoei zone) in the core of the member. The subsequent Maftah 3 Formation records deeper depositional environments with clay and limestones alternations including lower to middle Domerian ammonites (Vasseur *et al.* 2019).

Bioherms and biostromes of Longobucco basin (from Santantonio *et al.* 2016 and Innamorati & Santantonio 2018)
These build-ups lie at the base of Caloveto Formation in NE Calabria (Italy) that consists in a succession of relatively thin deposits of offshore highs that were separated from Calabrian continent by the Longobucco basin during the Jurassic. The base of Caloveto Fm is dominated by grainstones including crinoids, gastropods, bivalves, benthic foraminifera, tubiphytes and micro-oncoids with crystal nucleus. Locally, corals assemblages are associated with rough conglomerates and neptunian dykes. They produce fringing carbonate platforms according to the definition used by Gréselle & Pittet (2005) representing the fault-bounded highs of the Paleozoic basement and took place during Sinemurian and Pliensbachian stages (Santantonio *et al.* 2016). Consequently, their position is quite distal from the palaeocoastline. The morphology of the fringing carbonate body could be altered due to collapses (rockfalls) occurring along the platform margin, as testified by the olistoliths embedded in the Trionto Formation.

Coral assemblages from Pyrenees (from Fauré 2002)
The studied specimens come from the Upper Domerian of Estivère pass (Fauré 2002: 230) or around (Comminges, Foix). At the Estivère pass, a 4 to 5 meters thick Upper Domerian carbonate strata including sponges has been identified as a "reef" by J. Delfaud (1968, 1979). It is absent 500 meters eastward and shows an important angle of dip with southward azimuth when the whole Liassic succession is inclined northward. This strata bears unconformably on black shales of the Rebouc Formation and is overlain by Toarcian clay-limestones including *Sphaeroidothyris vari* seemingly in sedimentary continuity. It is made of several compact, coalescent beds of white patina limestones that are rich in corals, porifera and bryozoans. The reworked and more or less destroyed skeletons are irregularly distributed in the carbonate matrix and never form a build-up, which demonstrates a lateral transport suggesting that the fauna of this bed has been supplied by a nearby reef or a coral meadow.

Description of coral assemblages from Pliensbachian
In the field, the Pliensbachian coral assemblages are quantitatively dominated by solitary and phaceloid forms in terms of biomass and diversity. The more integrated forms (i.e. plocoid, cerioid, thamnasterioid and meandroid) are rare and small-sized (colonies of a few centimeters) with an exception in Middle Atlas and Calabria where bigger highly-integrated forms have been observed (genera *Hispaniastraea*, *Pseudodiplocoenia*, *Prismastrea* n. gen., *Thamnasteria*, *Vallimeandropsis*).

In Amellagou, phaceloid and solitary forms are often observed in association with lithiotids, which is not the case in Calabria and Middle Atlas where inner platform facies are not developed.

Pliensbachian assemblages of corals are constituted from an important proportion of genera that took root in the Triassic or Lower Liassic. They include a very small proportion of genera that maintained during Dogger or Malm. Indeed, a small number of genera namely *Isastrea*, *Montlivaltia* and *Thamnasteria* have their first occurrence during this stage. Despite their low abundance during Pliensbachian, these genera will significantly increase their part in Middle and Upper Jurassic communities. This stage records 7 genera that have never been found in any other stage.

The Pliensbachian is marked by a significant radiation phenomenon with 23 genera occurring during this stage including 11 exclusively solitary taxa and 5 phaceloid ones. For 12 genera the biostratigraphic distribution is extended through this study:

For *Astraeomorpha*, *Distichophyllia*, *Pachydendron*, *Paravolzeia* and *Protostylophyllum* the last occurrence is rising up to the Plienbachian;

For *Calamophylliopsis*, *Complexastrea*, *Icaunhelia*, *Isastrea*, *Pseudodiplocoenia*, *Thamnasteria* and *Vallimeandropsis* the first occurrence is dated back to the Pliensbachian.

Based on morphological considerations that have been developed in detail in the literature (Barnes 1973; Coates & Oliver 1973; Geister 1984; Coates & Jackson 1987; Lathuilière 2000b; Rosen 2000; Gill *et al.* 2004; Cipriani *et al.* 2019) the question of photosymbiosis remains open for Pliensbachian assemblages. The highly-integrated forms are rare (meandroid forms, the only present-day colonial structure that is exclusively photosymbiotic, are absent in sampling except a few specimens found in Guigou Plateau). Also, the great majority of solitary corals that flourished during the Pliensbachian do not provide more arguments for photosymbiosis, neither by their size nor by their growth rate, which is often unknown. It appears at first sight that Pliensbachian coral communities could presumably be constituted of azooxanthellate forms as well as zooxanthellate forms in proportions that we cannot estimate.

However, some elements lead us to favour the hypothesis of photosymbiosis. Firstly, big-sized solitary forms of *Coryphyllia* and sometimes *Icaunhelia* are probably zooxanthellates because of their high dimensions (some specimens of *Icaunhelia* pictured in the field reached 48 mm in diameter and some *Coryphyllia* can reach 53 mm in diameter as well). On the other hand, big cerioid colonies of *Hispaniastraea* observed in Calabria and in Middle Atlas show morphological variations similar to the ones linked to the light capture observed for example in the recent zooxanthellate coral *Synaraea convexa* (Jaubert 1977). Another argument is the total lack of autochthonous corals in the hemipelagic plain of Amellagou: they are only found in olistoliths that come from the more inner platform, associated with lithiotids or reworked without matrix in bioclastic channels (which testify an early reworking). These observations suggest that among the numerous solitary and phaceloid forms found in these platform detachments, no coral was totally emancipated from its light dependence. In distal environments in Guigou Plateau, we observed one solitary form (*F. praecursor* n. sp.) that possess a very lacunar

TABLE 2. — List of species organised in families with number of samples for all sampling zones or museum collections that are used in this study. Abbreviations: **Gu**, Guigou plateau; **Zi**, Ziz valley; **Da**, Dades valley; **Am**, Amellagou plain; **Lo**, Longobucco basin; **Es**, Estivère pass; **Br**, Brûlon; **Mu**, Museums collections.

Species	Family	Gu	Zi	Da	Am	Lo	Es	Br	Mu
Allocoenia sp.	Actinastreidae	2	–	–	–	–	–	–	–
Alloiteausmilia boudaharensis Beauvais, 1986	Archaeosmiliidae	–	–	1	–	–	–	–	1
Icaunhelia menchikoffi (Beauvais, 1986)	Archaeosmiliidae	–	–	–	7	–	–	–	2
Astraeomorpha confusa (Winkler, 1861)	Astraeomorphidae	–	–	–	1	–	–	–	–
Axosmilia amellagouensis n. sp.	Axosmiliidae	–	–	–	1	–	–	–	–
Apocladophyllia guigouensis n. sp.	Cladophylliidae	2	–	–	–	–	–	–	–
Araiophyllum liasicum Beauvais, 1986	Comoseridae (= Microsolenidae)	–	–	–	–	–	–	–	1
Eocomoseris minima (Beauvais, 1986), n. comb.	Comoseridae (= Microsolenidae)	–	–	–	–	–	–	–	9
Trocharea cf. *cupuloides* Fischer, 1969	Comoseridae (= Microsolenidae)	–	–	–	2	–	–	–	–
Trocharea sp. 1	Comoseridae (= Microsolenidae)	–	–	–	2	–	–	–	–
Trocharea sp. 2	Comoseridae (= Microsolenidae)	–	–	–	1	–	–	–	–
Trocharea tenuilamellosa (Gregory, 1900)	Comoseridae (= Microsolenidae)	–	–	–	2	–	–	–	–
Coryphyllia bicuneiformis n. sp.	Coryphylliidae	1	–	–	6	–	–	–	–
Coryphyllia capillaria n. sp.	Coryphylliidae	4	–	–	4	–	1	–	–
Coryphyllia regularis Cuif, 1975	Coryphylliidae	4	–	–	3	–	–	–	–
Coryphyllia subregularis Beauvais, 1986	Coryphylliidae	1	–	–	–	–	–	–	1
Fungiaphyllia praecursor n. sp.	Deltocyathidae	21	–	–	–	–	–	–	–
Fungiaphyllia rotunda n. sp.	Deltocyathidae	6	–	–	3	–	–	–	–
Calamophylliopsis phaceloida (Beauvais, 1986)	Dermosmiliidae	20	–	–	–	–	–	–	2
Phacelophyllia? sp.	Dermosmiliidae	1	–	–	–	–	–	–	–
Proleptophyllia calix n. sp.	Dermosmiliidae	–	–	–	4	–	–	–	–
Proleptophyllia granulum (Fromentel & Ferry, 1866)	Dermosmiliidae	16	–	–	5	–	–	–	1
Proleptophyllia magna n. sp.	Dermosmiliidae	–	–	–	1	–	–	–	–
Proleptophyllia multiradiata Beauvais, 1986	Dermosmiliidae				2	–	–	–	20
Proleptophyllia punctulum (Fromentel and Ferry, 1866), n. comb.	Dermosmiliidae	–	–	–	–	–	–	–	1
Proleptophyllia subphaceloida n. sp.	Dermosmiliidae	–	–	–	1	–	–	–	–
Epismilia? sp.	Epismiliidae ?	–	–	–	–	–	–	–	3
Hispaniastraea murciana Turnšek & Geyer, 1975	Hispaniastraeidae	–	–	4	2	–	–	–	1
Hispaniastraea ousriorum Boivin *et al.*, 2019	Hispaniastraeidae	–	–	–	3	–	–	–	–
Gen. indet. sp.	*Incertae sedis*	–	–	2	–	–	–	–	–
Neorylstonia pseudocolumellata (Beauvais, 1986)	*Incertae sedis*	4	–	2	11	–	–	–	14
Pseudodiplocoenia cf. *soltanensis* Beauvais, 1966	*Incertae sedis*	5	–	–	–	–	–	–	–
Spongiocoenia liasica (Turnšek & Geyer, 1975), n. comb.	*Incertae sedis*	–	–	3	4	–	–	–	–
Dimorphastrea? *menchikoffi* Beauvais, 1986	Latomeandridae	–	–	–	–	–	–	–	1
Margarosmilia dividenda n. sp.	Margarophylliidae	1	–	–	–	–	–	–	–
Margarosmilia? sp.	Margarophylliidae	–	–	2	–	–	–	–	–
Margarosmilia? *gemminata* Beauvais, 1986	Margarophylliidae	–	–	–	–	–	–	–	1
Paravolzeia calabrensis n. sp.	Protoheterastraeidae	–	–	–	–	5	–	–	–
Distichophyllia cf. *norica* (Frech, 1890)	Reimaniphylliidae	–	–	–	2	–	–	–	–
Distichophyllia norica (Frech, 1890)	Reimaniphylliidae	–	–	–	2	–	–	–	–
Distichophyllia pauciseptata n. sp.	Reimaniphylliidae	–	–	–	3	–	–	–	–
Distichophyllia sp.?	Reimaniphylliidae	–	–	–	3	–	–	–	–
Retiophyllia zizensis n. sp.	Reimaniphylliidae	–	4	–	–	–	–	–	–
"*Stylosmilia*" *dresnayi* Beauvais, 1986	Stylinidae	1	–	–	–	–	–	–	1
Epismiliopsis liasicus (Fromentel & Ferry, 1865)	Stylophyllidae	–	–	–	–	–	–	–	1
Epismiliopsis paraeudesi n. sp.	Stylophyllidae	–	–	–	6	–	–	–	1
Gillismilia fromenteli (Alloiteau, 1956)	Stylophyllidae	–	–	–	–	–	–	–	1
Phacelostylophyllum mg. *arbustulum* n. sp.	Stylophyllidae	–	–	–	–	–	2	–	–
Phacelostylophyllum mg. *martini* (Fromentel, 1860)	Stylophyllidae	–	–	–	–	–	3	–	–
Podosmilia horologium n. gen., n. sp.	Stylophyllidae	1	–	–	6	–	9	–	–
Protostylophyllum praenuntians (Volz, 1896)	Stylophyllidae	–	–	–	2	–	–	–	–
Rodinosmilia elegantula Beauvais, 1986	Stylophyllidae	–	–	–	6	–	–	–	1
Stylophyllopsis bovista n. sp.	Stylophyllidae	–	–	–	–	–	6	–	–
Stylophyllopsis fritillus (Fromentel & Ferry, 1866)	Stylophyllidae	–	–	–	1	–	–	–	2
Stylophyllopsis veracolumella n. sp.	Stylophyllidae	–	–	–	–	–	–	13	–
Stylophyllopsis vetusum (Beauvais, 1986)	Stylophyllidae	–	–	–	–	–	–	–	1
Stylophyllopsis zitteli Frech, 1890	Stylophyllidae	–	–	–	2	–	–	–	–
Tubulosmilia regularis n. gen., n. sp.	Stylophyllidae	–	–	–	1	–	–	–	–
Thamnasteria cf. *mettensis* Milne Edwards & Haime, 1851	Thamnasteriidae	–	–	2	–	–	–	–	–
Complexastrea cf. *gregaria* (M'Coy, 1848)	Thecosmiliidae (= Montlivaltiidae)	2	–	–	–	–	–	–	–
Isastrea aff. *bernardiana* (d'Orbigny, 1850)	Thecosmiliidae (= Montlivaltiidae)	9	–	–	–	–	–	–	–
Montlivaltia fragilis Fromentel & Ferry, 1866	Thecosmiliidae (= Montlivaltiidae)	–	–	–	–	–	–	–	1
Montlivaltia subcaryophyllata Alloiteau, 1957	Thecosmiliidae (= Montlivaltiidae)	–	–	–	–	–	–	–	1
Prismastrea organum n. gen., n. sp.	Thecosmiliidae (= Montlivaltiidae)	4	–	–	–	–	–	–	–
Vallimeandropsis sp.	Thecosmiliidae (= Montlivaltiidae)	1	–	–	–	–	–	–	–
Pachydendron microthallos Cuif, 1975	Zardinophyllidae	1	–	–	–	–	–	–	–
Total		107	0	16	91	5	21	0	68

skeleton and could have possibly lived under the photic zone or in darker environments than other Pliensbachian corals. This species is absent from reefs.

Finally, the peculiarly abundant and diversified genus *Proleptophyllia* and the phaceloid genera *Phacelophyllia* and gen. indet. 1 sp. 1 which are highly representative in terms of biomass in proximal bioconstructions are all taxa holding pennular septal structures. The function of such pennulae in relationship with a filter-feeding activity (see Schlichter 1991; Gill *et al.* 2004) is another argument in favour of a moderate photosymbiotic activity, supplemented with a mixotrophic diet (Table 2).

SYSTEMATIC DESCRIPTIONS

We have chosen a presentation of taxa according to their families. A classification of families into suborders seems meaningless in the present state of coral taxonomy. Old classifications of Wells (1956) and Alloiteau (1957) never found an agreement for suborders before the first results of molecular phylogenies that produce two large branches (named complex and robust by Romano & Palumbi 1996) and a new small basal one illustrated by *Gardineria* (Stolarski *et al.* 2011). We understand that none of the previous classification can be used and, if we guess that microstructure is a fruitful track to follow for attaching Mesozoic family branches to the tree, the present state of our knowledge in microstructure and taxonomy of corals does not allow a solid classification at the suborder scale.

Family Actinastreidae Alloiteau, 1952 (or Astrocoeniidae Koby, 1889?)

Genus *Allocoenia* Etallon, 1859

Species originally included. — *Astrea trochiformis* Michelin, 1847*, Allocoenia furcata* Etallon, 1859.

Type species. — *Allocoenia furcata* Etallon, 1859, subsequent designation by Wells (1936: 100).

Remarks

Alloiteau (1952) and several subsequent authors indicated erroneously *A. trochiformis* Michelin, 1847 as type species.

The differences between the genera *Actinastrea* d'Orbigny, 1849, *Allocoenia* Etallon, 1859, *Stephanastrea* Etallon, 1864, *Stelidioseris* Tomes, 1893 *Allocoeniopsis* Alloiteau, 1956 and *Chondrocenia* Roniewicz, 1989 remain very difficult and we propose here an assignment to the genus *Allocoenia* for the following reasons:

The genus *Actinastrea* being the most anciently described was defined in the Late Cretaceous and was used in the most lumping practices (see for instance Geyer 1955 who grouped in *Actinastrea* three species that are today considered as belonging to, at least, two different genera). Despite recent revisions (Löser 2012), the status of the genus remains nomenclaturally problematic in the sense that the currently admitted type species *A. goldfussi* d'Orbigny was not a part of the originally included nominal species (opposition to article 67-2 ICZN). On a taxonomic point of view, it seems that the lectotype of *A. goldfussi* (if, after all, we use it as a reference) and also the lectotype of *Stelidioseris gibbosa* (another probable species of Late Cretaceous) show septal strong granules near the wall. In *Stelidioseris*, these granules have been misinterpreted by Löser (2012) who considered these septal parts, trabecular in nature and dark in thin section, as lacunae. We cannot assign the Liassic samples to these taxa and prefer to place temporarily our samples within *Allocoenia,* a genus that would also deserve a revision.

The groupings proposed by Geyer (1955) that placed within *Actinastrea* the type species of *Coenastrea* Etallon, 1862 and *Enallocoenia* d'Orbigny, 1849 seem immoderate. The occurrence of S2 with paliform inner edge, with S3 tending to join on S2 (the septa are free in both latter genera), and globally smaller calices are characteristic for the forms named *Allocoenia* in the present work.

These forms are distinguished from *Cyathocoenia* Duncan, 1867 by the occurrence of a styliform columella.

In the end, the genus differs from *Isastrea* Milne Edward & Haime, 1851 by its straight septa with an often marked angle between confluent septa and the presence of a columella.

Allocoenia sp. (Fig. 2)

Allocoenia sp. 1 – Vasseur 2018: 109-110, fig. 3.2.

Studied samples. — Five specimens: 1603A3E5, DA3005E1, DA0106E2-2, MA0504E7-9, MA1004E4-11 (collections CPUN).

Geographic and stratigraphic ranges. — Pliensbachian of Koudiat Ech Chehem (Guigou plateau, Middle Atlas of Morocco) and Toarcian of Amellagou and Dadès Valley (High Atlas of Morocco).

Description

Cerioid massive corallum forming small, rounded, pluricentrimetric colonies. The calices are subcircular to polygonal and multiply by extracalicular increase. Radial elements are straight, free or joined, subcompact septa with well-defined but quite irregular trabecular structure producing irregular granules on lateral faces. The inner edge of septa is sometimes swollen or paliform. The septal apparatus is organized in 3 distinct size orders and sometimes the first-order septa reach the axial styliform columella. Endotheca made of many vesicular dissepiments. Synapticulae not observed. Wall present, of undetermined nature. No holotheca observed.

Calicular diameter: 1.1 to 4.2 mm – Distance between calice centers: 1.5 to 3.5 mm – Number of septa: 16 to 32 – Septal density: 3 to 5 per 1 mm.

Similarities and differences

The comparison with the numerous Triassic and Jurassic species of the genera cited above is still to be done.

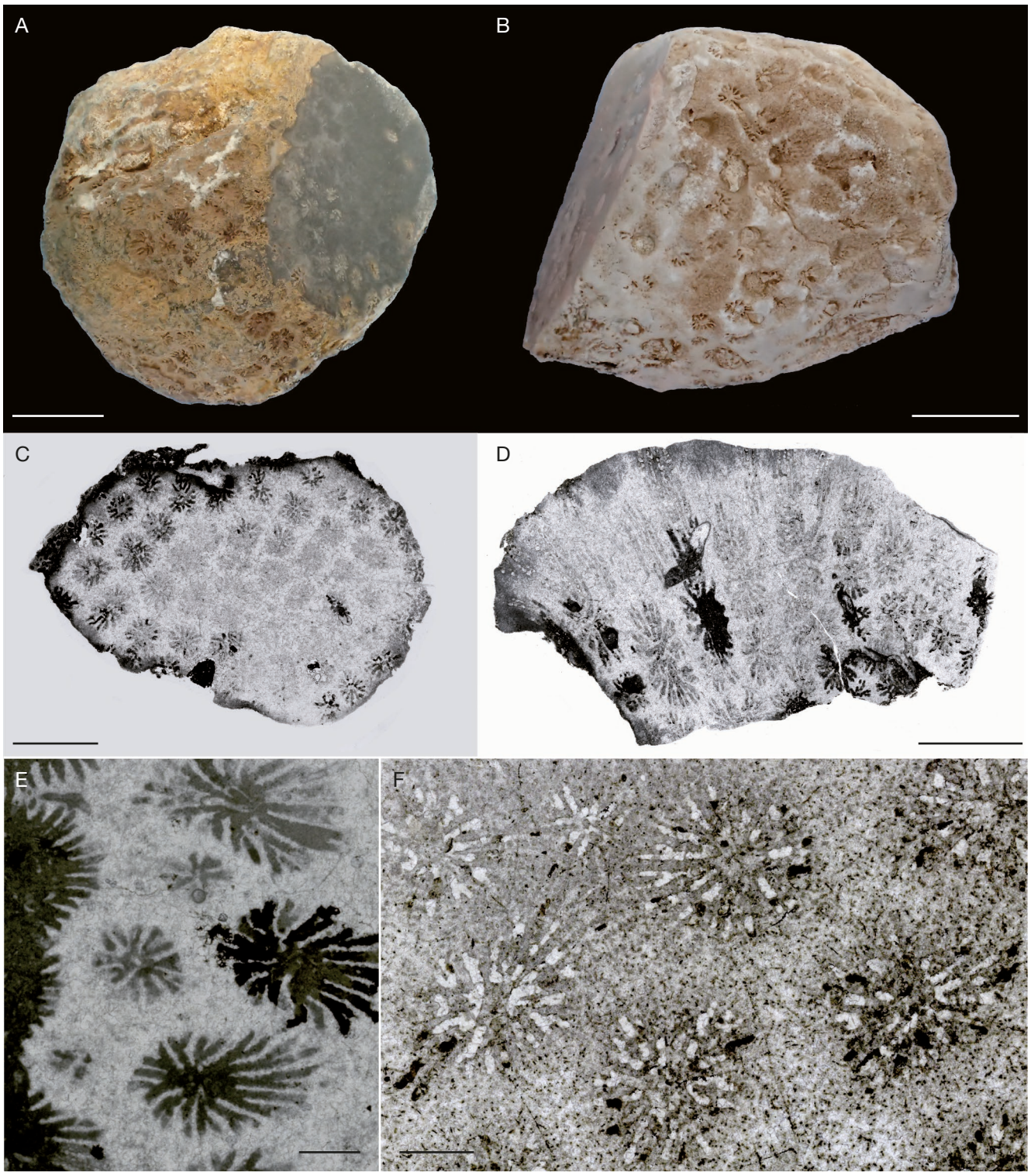

FIG. 2. — *Allocoenia* sp.: **A**, distal view of the specimen CPUN DA0106E2-2; **B**, distal view of the specimen CPUN MA0504E7-9; **C**, superficial transverse thin section in the specimen CPUN DA0106E2-2; **D**, Oblique thin section in the specimen CPUN DA0106E3-2; **E**, transverse thin section in the specimen CPUN MA1004E4-11; **F**, transverse thin section in the specimen CPUN 1603A3E5. Scale bars: A, B, 1 cm; C, D, 5 mm; E, F, 1 mm.

Family ARCHAEOSMILIIDAE Melnikova, 1975

Genus *Alloiteausmilia* Beauvais, 1986

SPECIES ORIGINALLY INCLUDED. — Only the type species.

TYPE SPECIES. — *Alloiteausmilia boudaharensis* Beauvais, 1986, by original designation (Beauvais 1986: 16, pl. 3, fig. 3 and text-figs 8 and 9).

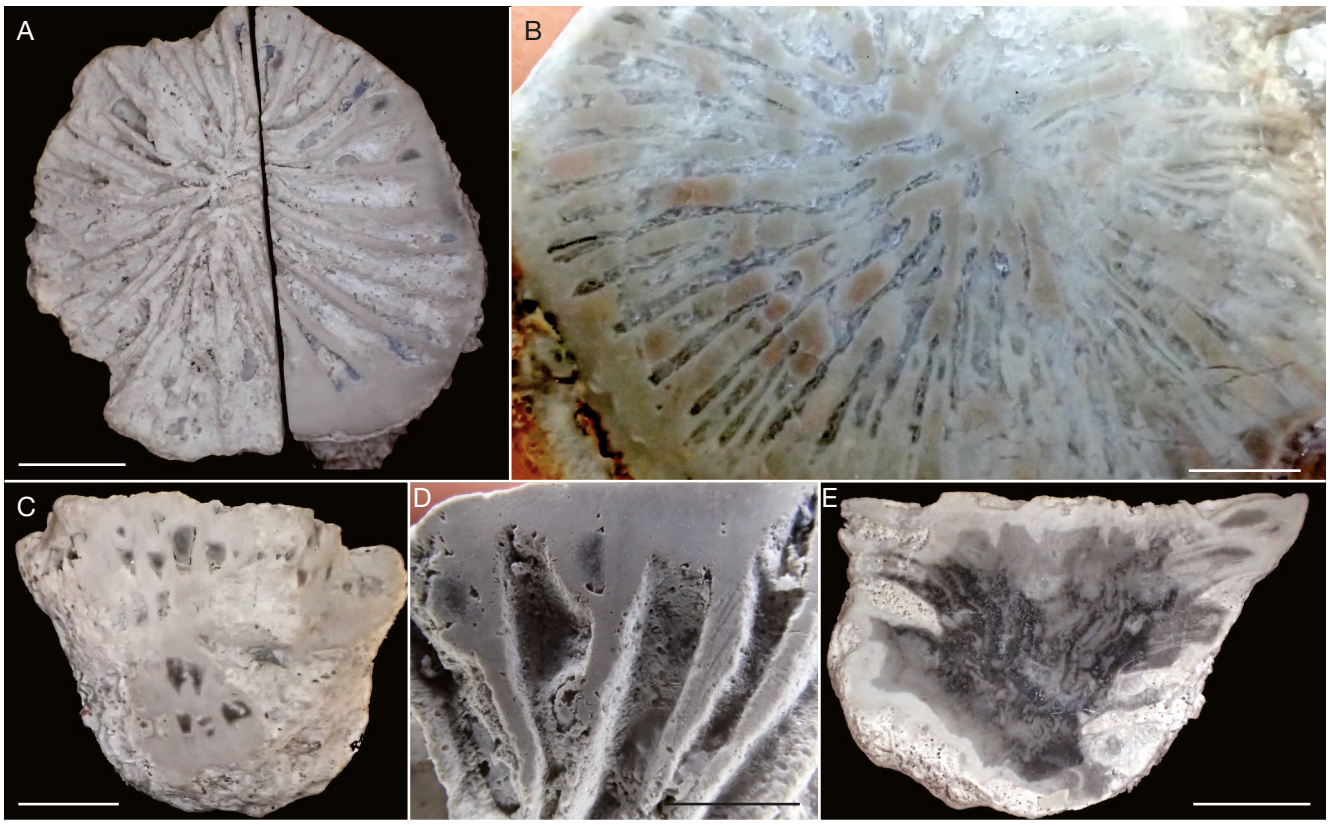

Fig. 3. — *Alloiteausmilia boudaharensis* Beauvais, 1986: **A**, distal view of the holotype MNHN.F.R11603; **B**, transverse section in the specimen CPUN DA2905E1'-1; **C**, partially polished lateral view of holotype MNHN.F.R11603; **D**, detail in distal view of the holotype MNHN.F.R11603 showing the link between endotheca and septa; **E**, longitudinal section of the holotype MNHN.F.R11603. Scale bars: A, C, E, 1 cm; B, D, 5 mm.

Alloiteausmilia boudaharensis Beauvais, 1986 (Fig. 3)

Alloiteausmilia boudaharensis Beauvais, 1986: 16, pl. 3, fig. 3 and text-fig. 8-9. — Vasseur 2018: 114-115, fig. 3.4.

Type material. — Holotype MNHN.F.R11603.

Type horizon. — Pliensbachian.

Type locality. — Beni Tadjit, Morocco.

Studied samples. — Two specimens: holotype MNHN.F.R11603; CPUN DA2905E1'-1.

Geographic and stratigraphic ranges. — Pliensbachian of High Atlas in Morocco (Dades Valley, Beni Tadjit).

Description

Solitary coral with circular to elliptical calice. Radial elements are septa generally flexuous, free or joined by their inner edge, compact, commonly with a rhopaloid inner edge when free. Lateral faces seem sometimes smooth, sometimes irregularly granulated and septa appear to grow by successive deposits of stereome layers providing a lamellar aspect in transverse section as for the genus *Archaeosmilia* Melnikova, 1975. No columella nor synapticulae. Endotheca made of large vesicular dissepiments in continuity with septal thickening. The curved septa and fossa elongation seem to define a bilateral symmetry. An epitheca *s.l* of undefined nature enwraps the corallite.

Calicular diameter: approximately 45 mm – Number of septa: 41 to 68 (this last value according to Beauvais 1986) – Septal density: 3 to 5 for 5 mm.

Genus *Icaunhelia* Beauvais, 1958

Icaunhelia Beauvais, 1958: 621.

Archaeosmilia Melnikova, 1975a: 110.

Species originally included. — *Icaunhelia michelini* Beauvais, 1958.

Type species. — *Icaunhelia michelini* Beauvais, 1958, by original designation (Beauvais 1958: 621, pl. 32b, fig. 1, 2).

Remark

We decide to merge the Liassic genus *Archaeosmilia* Melnikova, 1975 with the Oxfordian genus *Icaunhelia* Beauvais, 1958 because only their age allows a distinction. According to the ICZN 1999: art. 40.1, the family name Archaeosmiliidae is preserved.

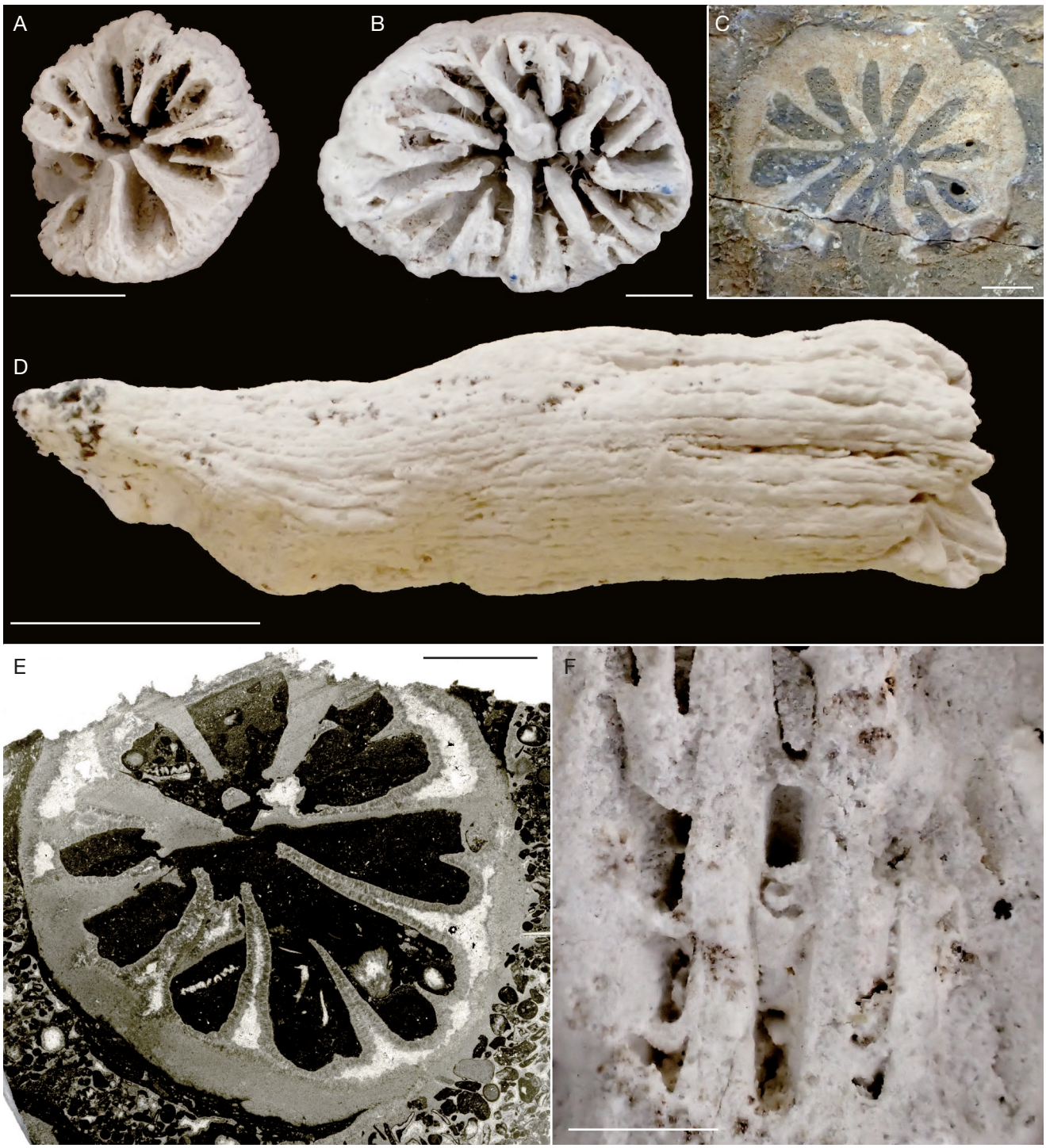

Fig. 4. — *Icaunhelia menchikoffi* (Beauvais, 1986): **A**, distal view of the holotype MNHN.F.R11594; **B**, distal view of the specimen MNHN.F.R11595; **C**, distal view of the specimen CPUN 2303A1-7, **D**, lateral view of the holotype MNHN.F.R11594; **E**, transverse thin section in sample CPUN 2303A1-5; **F**, lateral peripheral view of the endotheca in continuity with septa in the specimen MNHN.F.R11595. Scale bars: A, B, C, E, F, 5 mm; D, 1 cm.

Icaunhelia menchikoffi (Beauvais, 1986), n. comb. (Fig. 4)

Archaeosmilia menchikoffi Beauvais, 1986: 12, pl. 2, fig. 3 and txt-fig. 4. — Vasseur 2018: 127-128, fig. 3.9.

Type material. — Holotype MNHN.F.R11594 (Beauvais 1986: 12, pl. 2, fig. 3 and txt-fig. 4).

Type horizon. — Pliensbachian.

Type locality. — Beni Tadjit, Maroc.

Studied samples. — Nine specimens: holotype: MNHN.F.R11594; paratypes: MNHN.F.R11595, CPUN1703A4-1, CPUN 2303A1-5, CPUN 2303A1-7, CPUN 2303A1-8, CPUN 2303A4, CPUN AM16177-7, CPUN AM16188-13.

Geographic and stratigraphic ranges. — Pliensbachian from Beni Tadjit and Amellagou (Morocco).

Description

Solitary corallum of various morphologies: tends to be cylindrical, ceratoid or subconical, circular to elliptic in outline. Radial elements are compact, free, straight or curved septa with smooth lateral faces. The inner edge is sometimes rhopaloid in depth. Septa show a lamellar mode of growth with successive deposits of sclerenchyme (as "glove fingers" according to Beauvais 1986), resulting in wedge-shaped septa characteristic of Archaeosmiliidae family. Endotheca sometimes observed, made of vesicular dissepiments in continuity with the wall and septa. Parathecal wall. An epitheca *s.l.* wraps the corallum.

Calicular diameter: 11 to 26 mm – Number of septa: 12 to 20 – Septal density: 1 to 3 for 5 mm.

Family Astraeomorphidae Frech, 1890

Genus *Astraeomorpha* Reuss, 1854

Species originally included. — *A. goldfussi* Reuss, 1854 and *A. crassisepta* Reuss, 1854.

Type species. — *A. crassisepta* Reuss, 1864, designation by Vaughan & Wells (1943). Strangely, these authors used the term monotypy but cited the two initial nominal species of the genus that they considered as subjective synonyms.

Remarks

According to Roniewicz (1989) the genus is morphologically and microstructurally close to *Parastraeomorpha* Roniewicz, 1989 that differs in the lack of meniana and development of thick synapticulae, and horizontal axes of synapticulae whilst oblique in *Astraeomorpha*.

Initially only known in the Triassic of the Tethyan realm, the biostratigraphic distribution of this genus is here extended up to the Pliensbachian (Liassic).

The genus differs from *Periseris* Ferry, 1870 that shows a more pronounced trabecular structure providing teeth along the pennular edges. Septa are longer and more numerous in *Periseris* and the curved-upward pennulae are often visible in transverse section.

Astraeomorpha confusa (Winkler, 1861) (Fig. 5)

Thamnastraea confusa Winkler, 1861: 488, pl. 8, fig. 10.

Astraeomorpha confusa – Roniewicz 1989: 96 pl. 28, fig. 1-2, pl. 29, fig. 1-3, *cum syn.* — Vasseur 2018: 131-132, fig. 3.11.

Type material. — Holotype BSP AS XII 133 (Winkler 1861: pl. 8, fig. 10).

Type horizon. — Upper Rhaetian, Kössen Beds.

Type locality. — Kothalp (Austria).

Studied sample. — CPUN AM16165-1.

Geographic and stratigraphic ranges. — Norian / Rhaetian of the Alps, Caucasus, Austria, North America, Central Asia, Timor; Pliensbachian of Amellagou (High Atlas of Morocco).

Description

Thamnasterioid, ramose colony made up of small calices with poorly defined boundaries. Septa are generally straight, free or joined, sometimes linked to the columella, with pennular lateral faces showing meniana. Paliform structures sometimes appear at the inner edge of septa, particularly when two adjacent septa join. Microstructure unknown because of recrystallization. Styliform columella. Thick synapticulae.

Calicular diameter: approximately 1 mm – Distance between calicularcenters: 0.8 to 1.4 mm – Number of septa: 11 to 15 – Vertical density of meniana: 4 to 5 per 1 mm.

Similarities and differences

Resembles *A. crassisepta* but, according to Roniewicz (1989), meniana are vertically more densely packed, calices are smaller and septa are thinner in the taxon herein. A case of intraspecific variability is not excluded.

Family Axosmiliidae Geyer, 1955

Genus *Axosmilia* Milne Edwards, 1848

urn:lsid:zoobank.org:act:561BD0F8-08B6-4FCD-A050-3319A15E0CFE

Axosmilia Milne Edwards, 1848: 467.

Pleurosmilia Fromentel, 1856: 853.

Axotrochus Beauvais, 1986: 23.

Parapleurosmilia Beauvais, 1986: 15.

Type species. — *Caryophyllia extinctorium* Michelin, 1841 (Michelin 1841: 9, pl. 2, fig. 3b), by monotypy.

Remarks

Roniewicz (2008) differentiated *Pleurosmilia* Fromentel, 1856 and *Axosmilia* on the basis of the presence of exsert septa (*Pleurosmilia*) or an infundibuliform calice (*Axosmilia*). Given that some transition exists we choose here to consider this variability as intrageneric among the genus *Axosmilia*. In addition, the distinction is not supported by the type material of *Pleurosmilia* that shows an infundibuliform calice.

Beauvais (1986) made a distinction between *Parapleurosmilia* Beauvais, 1986 and *Pleurosmilia* Fromentel, 1856 based on the presence of a mid-septal line with calcification centers distant of approximately 20 micrometers and sparse lateral centers of calcification in the type material of *Pleurosmilia* but this argument is weak considering the preservation of the material used to create *Parapleurosmilia* that does not allow to confirm the lack of such structures.

Axosmilia amellagouensis n. sp.
(Fig. 6)

urn:lsid:zoobank.org:act:C15279BE-8D58-4334-A6B9-CA2FC354803D

Axosmilia sp. 1 – Vasseur 2018: 137-138, fig. 3.13.

TYPE MATERIAL. — Holotype CPUN AM16164bis2.

ETYMOLOGY. — From the type locality Amellago in the High Atlas of Morocco.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Amellagou, 31°56'58"N, 5°2'31"W, Morocco.

STUDIED SAMPLE. — CPUN AM16164bis2.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou (High Atlas of Morocco).

DESCRIPTION
Solitary, subcylindrical corallum with successive constrictions and expansions (probably rejuvenescences). Radial elements are exsert, straight or slightly wavy, free costosepta with much reduced costal part. The inner edge of major septa is rhopaloid. Lateral faces are ornamented with irregular small granules. An elongated columella of trabecular structure appears at the middle of the calice, defining a bilateral symmetry. Endotheca made of dissepiments that look vesicular. Parathecal wall. An epitheca *s.l.* wraps the corallite.

Calicular diameter: 15 mm – Calicular height: 45 mm – Number of septa: >140 – Septal density: approximately 7-8 per 2 mm.

SIMILARITIES AND DIFFERENCES
The exsert septa make this taxon closer to the genus *Pleurosmilia* that we merge here with *Axosmilia*. If they should be splitted again in the future, it would then likely correspond to this first genus. If the rhopaloid character of inner edge of septa and the trabecular structure of the columella reveals to be constant in a more extensive sampling a new genus could be justified.

Compared to all other Jurassic species of *Axosmilia* Milne Edwards, 1848, *Pleurosmilia* Fromentel, 1856, *Axiphyllum* Quenstedt, 1880 and *Bathmosmilia* Alloiteau, 1958 the ratio between dimensions of calice and number of septa is unique. The thickness of major septa is also especially low in this new species.

Despite the fact that only one single sample has been known up until now, this taxon resembles nothing else in the Pliensbachian nor in the other known Jurassic Axosmiliidae and corresponds undoubtedly to a new species.

Family CLADOPHYLLIIDAE Morycowa & Roniewicz, 1990

Genus *Apocladophyllia* Morycowa & Roniewicz, 1990

urn:lsid:zoobank.org:act:61974293-DE0B-4092-83B3-6A96638CC8AF

SPECIES ORIGINALLY INCLUDED. — *A. nowaki* Morycowa & Roniewicz, 1990 and *A. koniakensis* (Ogilvie, 1897).

TYPE SPECIES. — *Apocladophyllia nowaki* Morycowa & Roniewicz, 1990 (Morycowa & Roniewicz 1990: 180, pl. 19: l a-f, pl. 20: l a-d, pl. 21: l a-d, pl. 22: 2, figs 1, 5, 6, 7), by original designation.

REMARKS
Differs from the genus *Cladophyllia* Milne Edwards & Haime, 1851 by the presence of apophyses that connect the calices.

Apocladophyllia guigouensis n. sp.
(Fig. 7)

urn:lsid:zoobank.org:act:71E2FE19-B178-4A5A-A46A-7E2BFB42808B

Apocladophyllia sp. 1 – Vasseur 2018: 122-123, fig. 3.7.

TYPE MATERIAL. — Holotype: CPUN MA0704E5-4; paratype: CPUN MA0904E10.

STUDIED SAMPLES. — Two specimens: CPUN MA0704E5-4, CPUN MA0904E10.

ETYMOLOGY. — Refers to the geographic origin of the type material, the Guigou Plateau.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Guigou Plateau, 33°27'9"N, 4°55'21"W, Middle Atlas of Morocco.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Koudiat Ech Chehem (Middle Atlas of Morocco).

DESCRIPTION
Phaceloid colony with subcircular calices multiplying by dichotomous division. Corallites sometimes connected by apophyses typical for the genus (see Morycowa & Roniewicz 1990). Radial elements are compact septa, free or joined to the columella by their inner edges, with sharp granules on the lateral faces. A small styliform columella is sometimes present. Wall probably septothecal. A wrinkled epitheca *s.l.* covers the external parts of the corallites.

Calicular diameter: 2 to 3.3 mm – Distance between calices: 2.1 to 7 mm – Number of septa: 28 to 31 – Septal density: 5 per 1 mm.

SIMILARITIES AND DIFFERENCES
The colony is not submassive as in *A. nowaki* and shows less apophyses. The calicular diameters and number of septa are higher than in *A. koniakensis*.

Family COMOSERIDAE Fromentel, 1861

Comoseridae Fromentel, 1861: 170.

Microsolenidae Koby, 1889: 569.

REMARK
The priority belongs to Comoseridae but Microsolenidae is by far more widely used. The question of the phyletic posi-

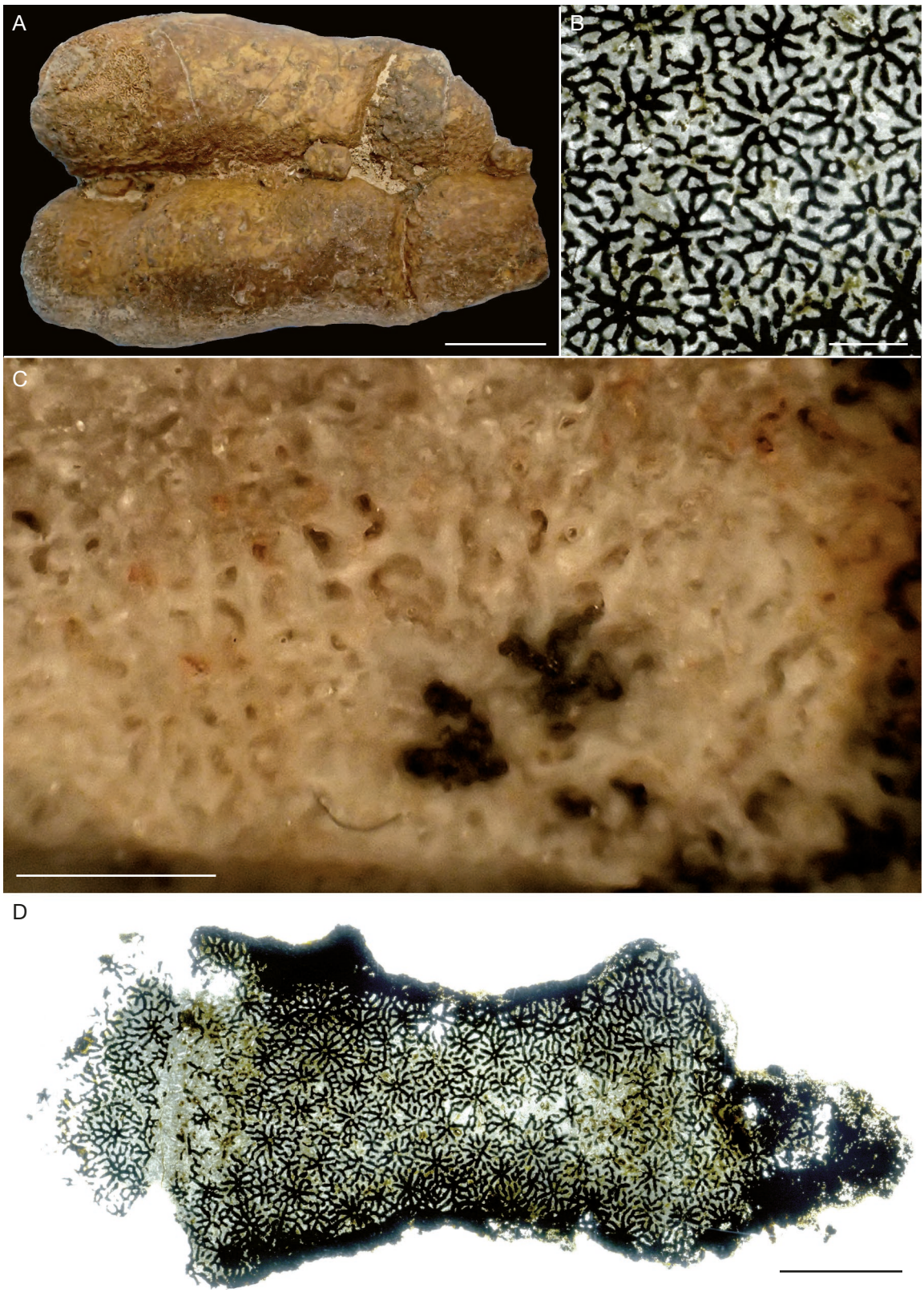

FIG. 5. — *Astraeomorpha confusa* (Winkler, 1861): **A**, distal view of the specimen CPUN AM16165-1; **B**, detail in transverse thin section of some calices of the specimen CPUN AM16165-1; **C**, detail in longitudinal natural section of the pennular ornamentation of septa of the specimen CPUN AM16165-1; **D**, thin section transverse to the calices and longitudinal superficial to one of the branches of the specimen CPUN AM16165-1. Scale bars: A, 1 cm; B, C, 1 mm; D, 4 mm.

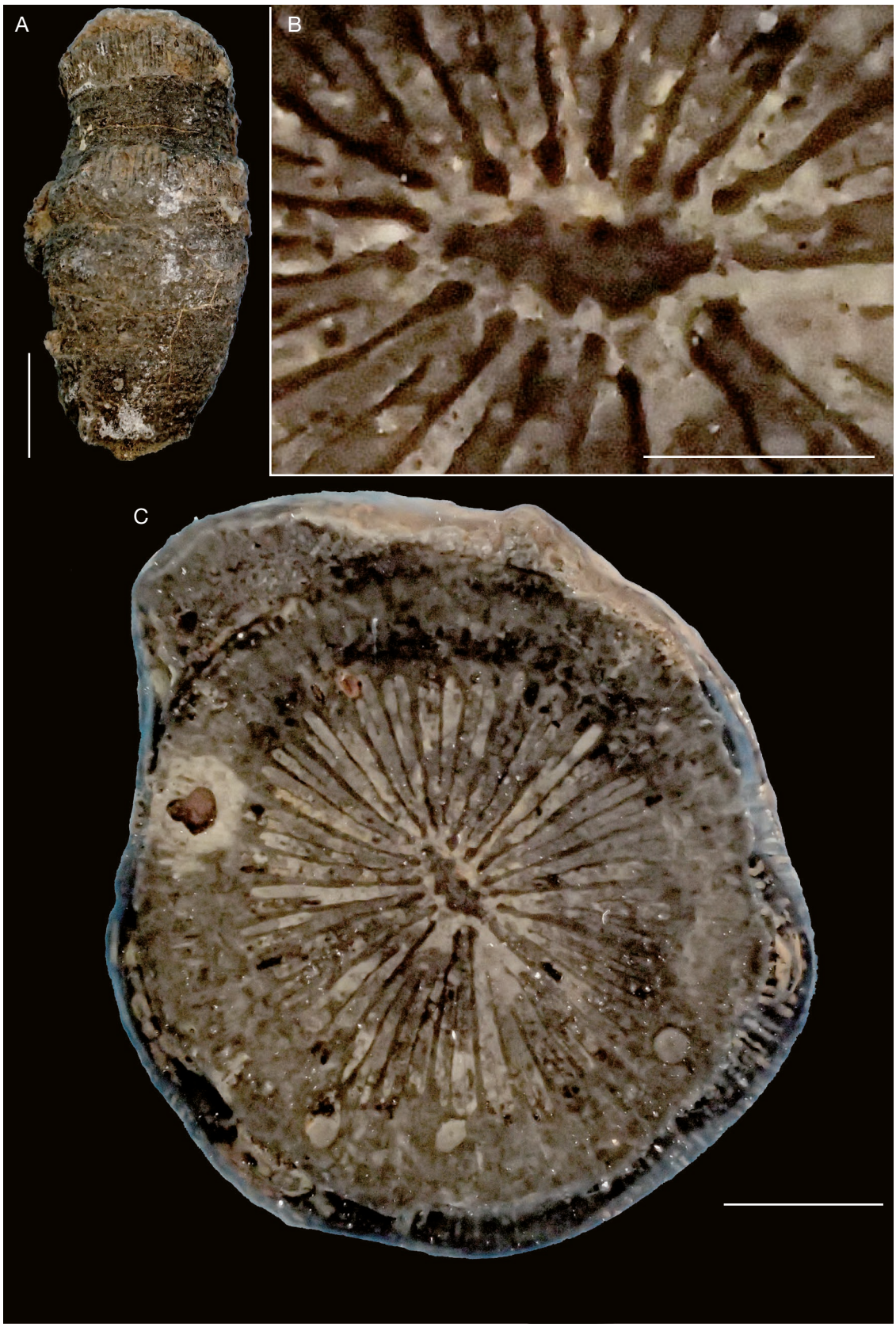

FIG. 6. — *Axosmilia amellagouensis* n. sp.: **A**, lateral view of the specimen CPUN AM16164bis2; **B**, detail of the axial structure of the specimen CPUN AM16164bis2; **C**, transverse section in the specimen CPUN AM16164bis2. Scale bars: A, 1 cm; B, 2 mm; C, 4 mm.

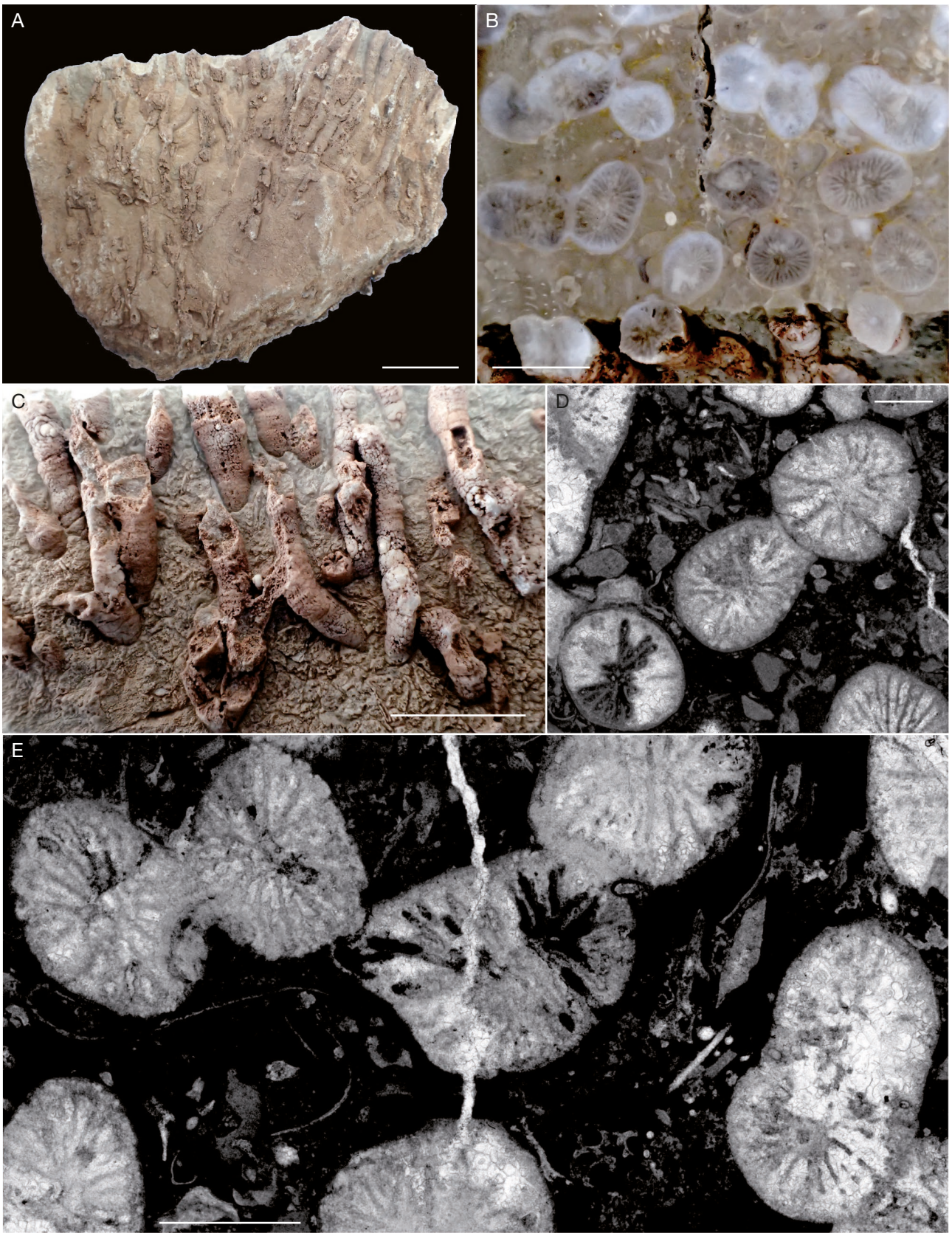

FIG. 7. — *Apocladophyllia guigouensis* n. sp.: **A**, lateral view of the specimen CPUN MA0704E5-4; **B**, transverse polished section of the specimen CPUN MA0704E5-4; **C**, detail in lateral view of apophyses in the specimen CPUN MA0704E5-4; **D**, transverse thin section of the specimen CPUN MA0704E5-4; **E**, transverse thin section of the specimen CPUN MA0704E5-4. Scale bars: A, 2 cm; B, 4 mm; C, D, 1 cm; E, 2 mm.

tion of *Araiophyllum* in connection to Comoseridae or to Haplaraeidae (Roniewicz & Morycowa 1993) remains for us an open question.

Genus *Araiophyllum* Cuif, 1975

TYPE SPECIES. — *Araiophyllum triasicum* Cuif, 1975 (Cuif 1975: 126) by monotypy.

Araiophyllum liasicum Beauvais, 1986 (Fig. 8)

Araiophyllum liasicum Beauvais, 1986: 55, pl. 12, fig. 3. — Vasseur 2018: 124-125, fig. 3.8.

TYPE MATERIAL. — Holotype MNHN.F.A32023 (Beauvais 1986: 55, pl. 12, fig. 3).

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Jebel Bou Dahar, High Atlas of Morocco.

STUDIED SAMPLE. — Holotype: MNHN.F.A32023.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Jebel Bou Dahar (Morocco).

DESCRIPTION (modified after Beauvais 1986)
Phaceloid colony with subcylindrical corallites multiplying by fissiparous intracalicular budding. The external part of the corallites is covered by an epitheca *s.l.* that reveals some regularly granulated costae. The calicular plateau has been observed on a very few corallites because of a very poor preservation but it shows the characteristic aspect described by Cuif (1975) for the genus: a hemispherical shape corresponding to a particular orientation of trabecular axes. Radial elements are totally porous, maybe a few less than in Upper Jurassic microsolenids. However, pores appear more abundant in the axial zone than in the periphery in transverse section because of the orientation of trabecular axes. Moniliform distal edge. Pennulae are numerous. Synapticulae abundant. Endotheca not observed. Weak, parietal papillose columella.

Calicular diameter: 4 to 12 mm – Number of septa: 92 to 120 – Septal density: 12 per 2 mm – Trabecular density: 4 to 5 per 1 mm.

SIMILARITIES AND DIFFERENCES
This species appears very close to the genus *Dermoseris* Koby, 1887 that shows as *Araiophyllum* subhemispheric calices. *Araiophyllum liasicum* differs from *A. triasicum* by the bigger size of the corallites, closer to the dimensions of the Upper Jurassic genus *Dermoseris*.

The more significant difference between the two genera would be the different microstructure of pennulae between *Araiophyllum* and *Dermoseris*: despite the low number of observations, it seems the latter shows regular granulations on the curved edges of pennulae and a more regular alternating disposition (see Cuif 1975).

Genus *Eocomoseris* Melnikova, Roniewicz & Loeser, 1993

TYPE SPECIES. — *Eocomoseris gurumdyensis* (*nom. nov. pro Eocomoseris ramosa* Melnikova, Roniewicz & Loeser, 1993, *non* Frech 1890: 5, pl. I: 1-3).

REMARK
Roniewicz (2011) introduced *Eocomoseris gurumdyensis* as a new species name to replace *E. ramosa* Melnikova, 1993, a junior secondary homonym of *Spongiomorpha* (*Heptastylopsis*) *ramosa* Frech, 1890, assigned to *Eocomoseris* in the same publication (we emit a doubt about this decision, according to the fact that calices seem very poorly defined in the original figure).

Eocomoseris minima (Beauvais, 1986), n. comb. (Fig. 9)

Actinastraea minima Beauvais, 1986: 31, pl. 2, fig. 6 and pl. 6, fig. 6; 1982: 1964, pl. 1, fig. 3, *nomen nudum*.

Eocomoseris ramosa Melnikova, Roniewicz & Loeser, 1993: 5, pl. I, fig. 1-3. — Roniewicz 2011: 424, fig. 7F

?*Actinastraea minima* – Stanley & Beauvais 1994: 42, fig.6a-c.

Eocomoseris gurumdyensis Roniewicz, 2011: 422.

TYPE MATERIAL. — Holotype: MNHN.F.R11620 (Beauvais 1986: 31, pl. 2, fig. 6 and pl. 6, fig. 6.).

TYPE HORIZON. — Domerian (Upper Pliensbachian).

TYPE LOCALITY. — Jebel Bou Dahar, Morocco.

STUDIED SAMPLES. — Nine specimens: holotype, MNHN.F.R11620; paratypes, MNHN.F.A32016, MNHN.F.A32009.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Domerian of Jebel Bou Dahar (Morocco).

REMARK
The specimen described by Beauvais (1982) was published as a *nomen nudum*. In this paper dedicated to Canadian corals, the author considered a holotype from Menchikoff collections (Domerian of Morocco). Moreover, the Canadian specimen shows significant differences with the Moroccan holotype: no porosity of septa and well delimited corallites.

DESCRIPTION
Thamnasterioid, ramose colony with small calices. Radial elements are short, pennular, perforate septa of which trabecular structure appears as a few dots at the distal edge. A styliform, monotrabecular columella appear at the axis of some calices.

Calicular diameter: approximately 1 mm – Number of septa: approximately 17.

REMARK
Even though we did not formally observed a pennular structure of septa (the samples are poorly preserved), we propose a generic reattribution to *Eocomoseris*. A longitudinal thin section or polished section would be desirable to compare the

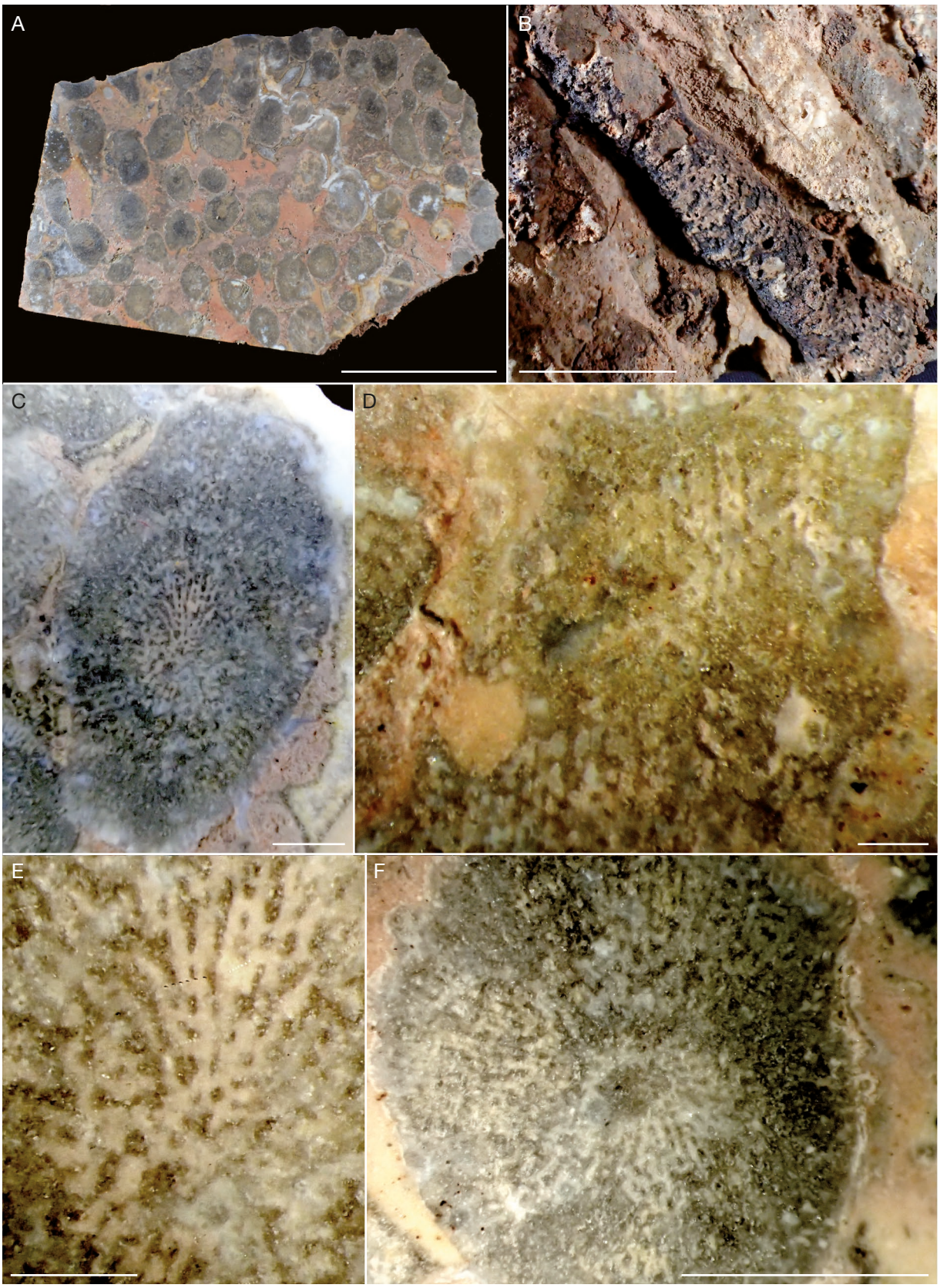

Fig. 8. — *Araiophyllum liasicum* Beauvais, 1986: **A**, transverse section in the holotype MNHN.F.A32023; **B**, lateral view of a corallite of the holotype MNHN.F.A32023; **C**, transverse section of a corallite of the holotype MNHN.F.A32023 (skeleton in dark); **D**, longitudinal section of a corallite of the holotype MNHN.F.A32023; **E**, detail in transverse section of the axial part of one corallite of the holotype MNHN.F.A32023; **F**, transverse section of one corallite of the holotype MNHN.F.A32023 (skeleton in dark). Scale bars: A, 4 cm; B, 1 cm; C, 2 mm; D, E, 1 mm; F, 5 mm.

FIG. 9. — *Eocomoseris minima* (Beauvais, 1986), n. comb.: **A**, holotype MNHN.F.R11620; **B**, detail of one paratype from the batch MNHN.F.A32015; **C**, paratypes from the batch MNHN.F.A32015; **D**, detail of one paratype from the batch MNHN.F.A32015; **E**, enlargement of D. Scale bars: A, B, C, 1 cm; D, E, 2 mm.

septal structure with those of *E. gurumdyensis* but the silicified nature of the type material of *E. minima* (Beauvais, 1986), n. comb. leaves little hope. After such a verification *E. minima* n. comb. could become a senior synonym of *E. gurumdyensis* Roniewicz, 2011.

SIMILARITIES AND DIFFERENCES
Differs from *E. lamellata* Melnikova, 1993 by the diameters of the calices and the number of septa and from the other species attributed to the genus by more distinct calices.

Genus *Trocharea* Etallon *in* Thurmann & Etallon, 1864

SPECIES ORIGINALLY INCLUDED. — *Trocharea actiniformis* Etallon *in* Thurmann & Etallon, 1864.

TYPE SPECIES. — *Trocharea actiniformis* Etallon *in* Thurmann & Etallon, 1864 (Thurmann & Etallon 1864: 411, pl. 58, fig. 4), by monotypy.

REMARKS
The nature of the relationship between *Trocharea* and *Trochoplegma* Gregory, 1900 is a question which is not completely resolved. One important reason is that the type material of *Trocharaea* (*T. actiniformis* Etallon, 1864) is lost. For *Trochoplegma* the type material is housed in Calcutta and has not been revised but we have some ideas of the genus on the basis of topotypes studied by Beauvais (1978) or by Pandey & Fürsich (1993). Alloiteau (1957) and Fischer (1969) remarked that *Trochoplegma* differs from *Trocharea* by its tendency of compactness in septa of first order. They very probably did not see the type material or even topotypes and we cannot confirm their criteria. On the basis of topotypes of *Trochoplegma tenuilamellosa* Gregory, 1900, the type species of the genus, Beauvais (1978) distinguished the genera with help of two characters: the wall and the epitheca. In *Trochoplegma* the wall would be absent and the epitheca present, when in *Trocharea* the wall would be a synapticulotheca and the epitheca would be absent. We are not certain to be able to differentiate the two character states especially when the notion of pennular envelope (Gill 1967) was not taken into account. Pandey & Fürsich (1993) maintained the distinction between the genera *Trochoplegma* and *Trocharea* underlining the tendency to become colonial in *Trochoplegma*. In fact they maintained the two genera because the species are quite distinct in the Bathonian of Kachchh. We are not certain of the independence of these genera and we note that several german authors have put the type species of *Trochoplegma* or other species of the same genus within the genus *Trocharea* (see Geyer 1955; Flügel 1966; Nose 1995; Nose & Leinfelder 1997). The smaller size of trabeculae in *Trochoplegma*, the slightly dipping outward meniana, the exsert character of septa, the tendency toward intracalicular budding, the wavy aspect of septa in distal view are other possible criteria but it seems that all these characters do not always vary together in the same direction (mosaic variation) and could correspond to a variation at the scale of species.

Chomatoseris Thomas, 1935 is free living and shows a downward growth, *Trochoplegmopsis* Roniewicz, 1976 has subcompact septa and has a papillose columella.

Trocharea cf. *cupuloides* Fischer, 1969
(Fig. 10)

Trocharea cupuloides Fischer, 1969: 58, pl. 6, fig. 4-6.

Trocharea sp. 1 – Vasseur 2018: 357-358, fig. 3.101.

TYPE MATERIAL. — Holotype: MNHN.F.R50397; paratype: MNHN.F.R50396.

TYPE HORIZON. — Bathonian.

TYPE LOCALITY. — Rumigny, Ardennes, France.

STUDIED SAMPLES. — Two specimens: CPUN AM16132-3, CPUN AM16178-3.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou (High Atlas of Morocco).

DESCRIPTION
Solitary discoid coral, circular in outline, fixed to its substratum (bivalve shell in this case) by its lower face, which morphology seems to have been governed by physical constraints sustained by the organism: in longitudinal radial section, one side is more elevated and laterally packed than the opposite one. Septa pennular, perforate, straight, free or joined with continuous horizontal meniana on lateral faces. Distal edge ornamented with small regular teeth. Axial zone with a restricted fossa and probably trabecular projections of septa in depth. The lower face of the corallum is layered by an epitheca *s.l.* of unknown nature. Endotheca made of rare dissepiments in depth. Synapticulae abundant. No bilateral nor hexameral symmetry observed.

Calicular diameter: 19.3 mm – Septal density: 16 for 5 mm – Estimated number of septa > 136.

Trocharea sp. 1
(Fig. 11)

Trocharea sp. 2 – Vasseur 2018: 359-360, fig. 3.102.

STUDIED SAMPLES. — Two specimens: CPUN AM16160-6, CPUN AM16178-5.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou (High Atlas of Morocco).

DESCRIPTION
Solitary fungiform coral, circular in outline, fixed to its substratum by a lower face reduced in diameter forming a peduncle. Septa pennular, perforate, straight, free or joined with discontinuous meniana on lateral faces. Distal edge ornamented with small regular teeth. Axial zone with a restricted fossa and probably trabecular projections of septa in depth. The lower face of the corallum is covered by an epitheca *s.l.* of unknown nature. Endotheca made of rare dissepiments in

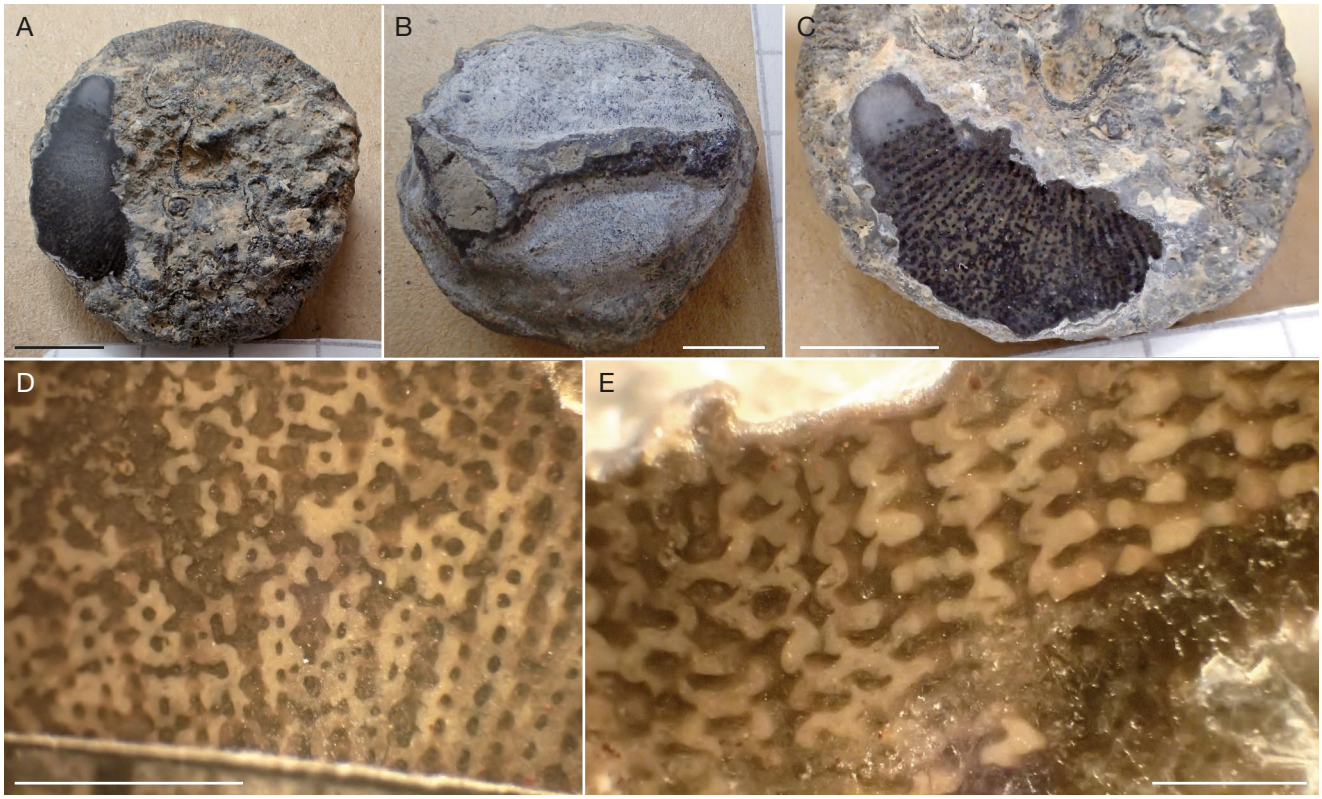

Fig. 10. — *Trocharea* cf. *cupuloides* Fischer, 1969: **A**, upper face of the specimen CPUN AM16178-3; **B**: lower face of the specimen CPUN AM16178-3; **C**, detail of polished section on the surface of the specimen CPUN AM16178-3; **D**, detail of the pennular septal structure in transverse polished section of the specimen CPUN AM16178-3; **E**, detail of the pennular septal structure in longitudinal polished section of the specimen CPUN AM16178-3. Scale bars: A, B, C, 5 mm; D, 2 mm; E, 1 mm.

depth. Synapticulae abundant. No bilateral nor hexameral symmetry observed.

Calicular diameter: 20.1 mm – Septal density: 14 to 15 par 5 mm – Number of septa (extrapolated from ¼): 160.

Similarities and differences

Differs from *Trocharea cupuloides* Fischer, 1969 by its fungiform, pedunculate shape.

Trocharea sp. 2
(Fig. 12)

Trocharea sp. 3 – Vasseur 2018: 361-362, fig. 3.103.

Studied sample. — CPUN CDAm10.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

Description

Subcylindrical solitary coral, subcircular and slightly bilobate in outline. Septa pennular, perforate, straight, free or joined with discontinuous meniana on lateral faces. Distal edge ornamented with small regular trabecular teeth. Axial zone with a restricted fossa and maybe trabecular projections of septa in depth. The corallum is wrapped into an epitheca *s.l.* of unknown nature. Endotheca made of rare dissepiments. Synapticulae present. No bilateral nor hexameral symmetry observed.

Calicular diameter: 12 mm – Number of septa: approximately 96 – Septal density: 8 per 2 mm.

Similarities and differences

Trocharea sp. 2 differs from *T. cupuloides* Fischer, 1969 and *T.* sp. 1 by its smaller dimensions and its higher septal density.

Trocharea tenuilamellosa (Gregory, 1900)
(Fig. 13)

Trochoplegma tenuilamellosa Gregory, 1900: 180, pl. 23, fig. 3-10, pl. II, fig. 8. — Koby 1904: 125, pl. 25, fig. 17-18, pl. 26, fig. 1-2. — Alloiteau 1957: 338. — Beauvais 1978: 61. — Pandey & Fürsich 1993: 29, pl. 8, fig. 11-16. — Pandey *et al.* 2000: 22, pl. 5, fig. 2. — Pandey & Fürsich 2003: 112, pl. 29, fig. 4-5.

Dimorpharaea tenuilamellosa – Bendukidze 1949: 113, text fig. 15. — Bendukidze 1982: 98.

Trocharea tenuilamellosa – Geyer 1955: 355; Flügel 1966: 67, pl. 17, fig. 3-4.

Trocharaea tenuilamellosa – Beauvais L. *in* Manivit 1987: table B 15.

Trochoplegma sp. 1 – Vasseur 2018: 368-369, fig. 3.106.

Fig. 11. — *Trocharea* sp. 1: **A**, distal view of the specimen CPUN AM16160-6 before cutting; **B**, lateral view of the specimen CPUN AM16160-6; **C**, detail in transverse section of the septal apparatus of the specimen CPUN AM16160-6; **D**, detail in distal-peripheric view of pennular septal organisation of the specimen CPUN AM16160-6; **E**, axial longitudinal section in sample CPUN AM16160-6 (skeleton corresponds to light parts). Scale bars: A, 5 mm; B, E, 4 mm; C, 2 mm; D, 0.5 mm.

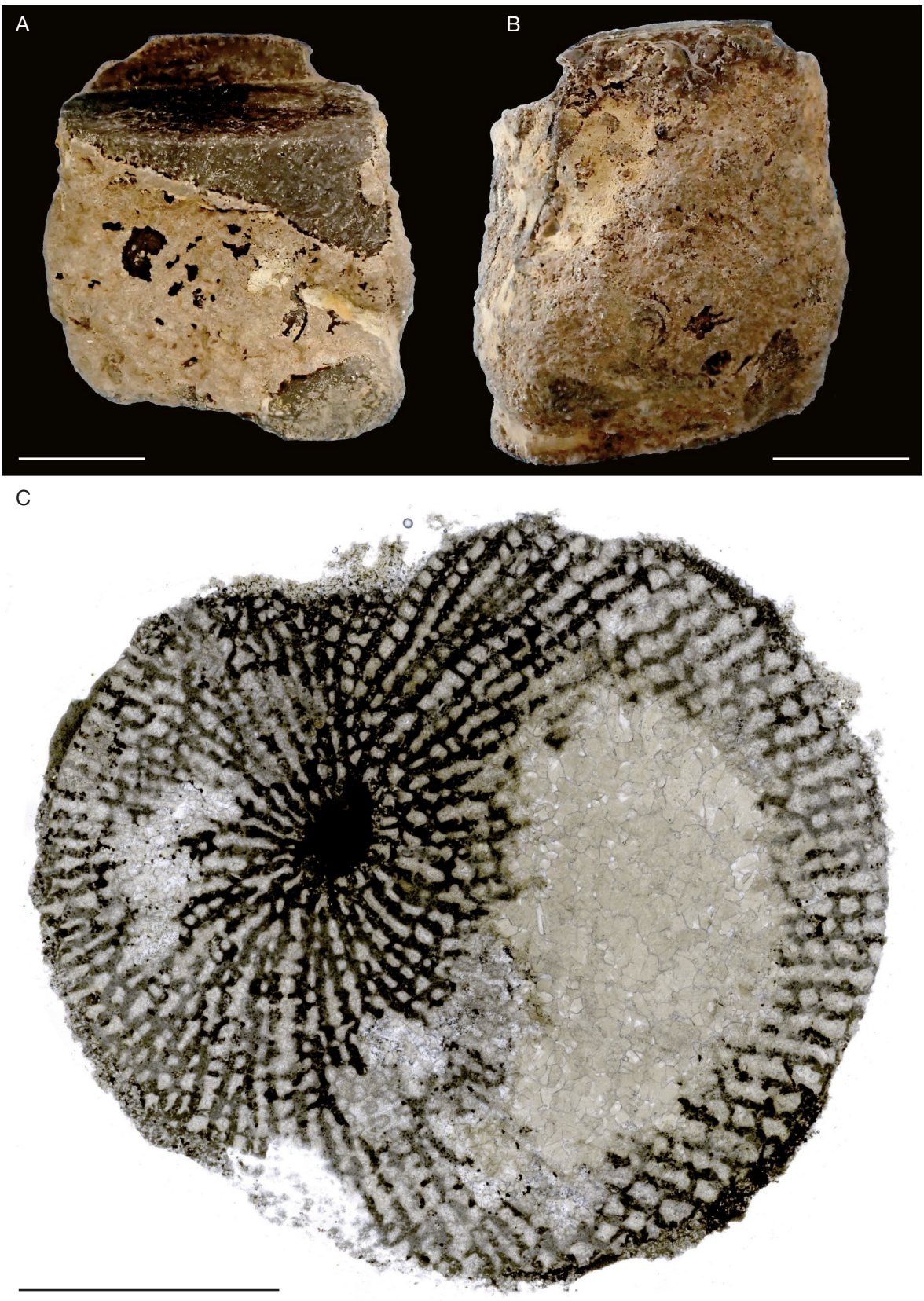

FIG. 12. — *Trocharea* sp. 2: **A**, lateral view of the specimen CPUN CDAm10; **B**, lateral view of the specimen CPUN CDAm10; **C**, transverse thin section of the specimen CPUN CDAm10. Scale bars: A, B, 5 mm; C, 4 mm.

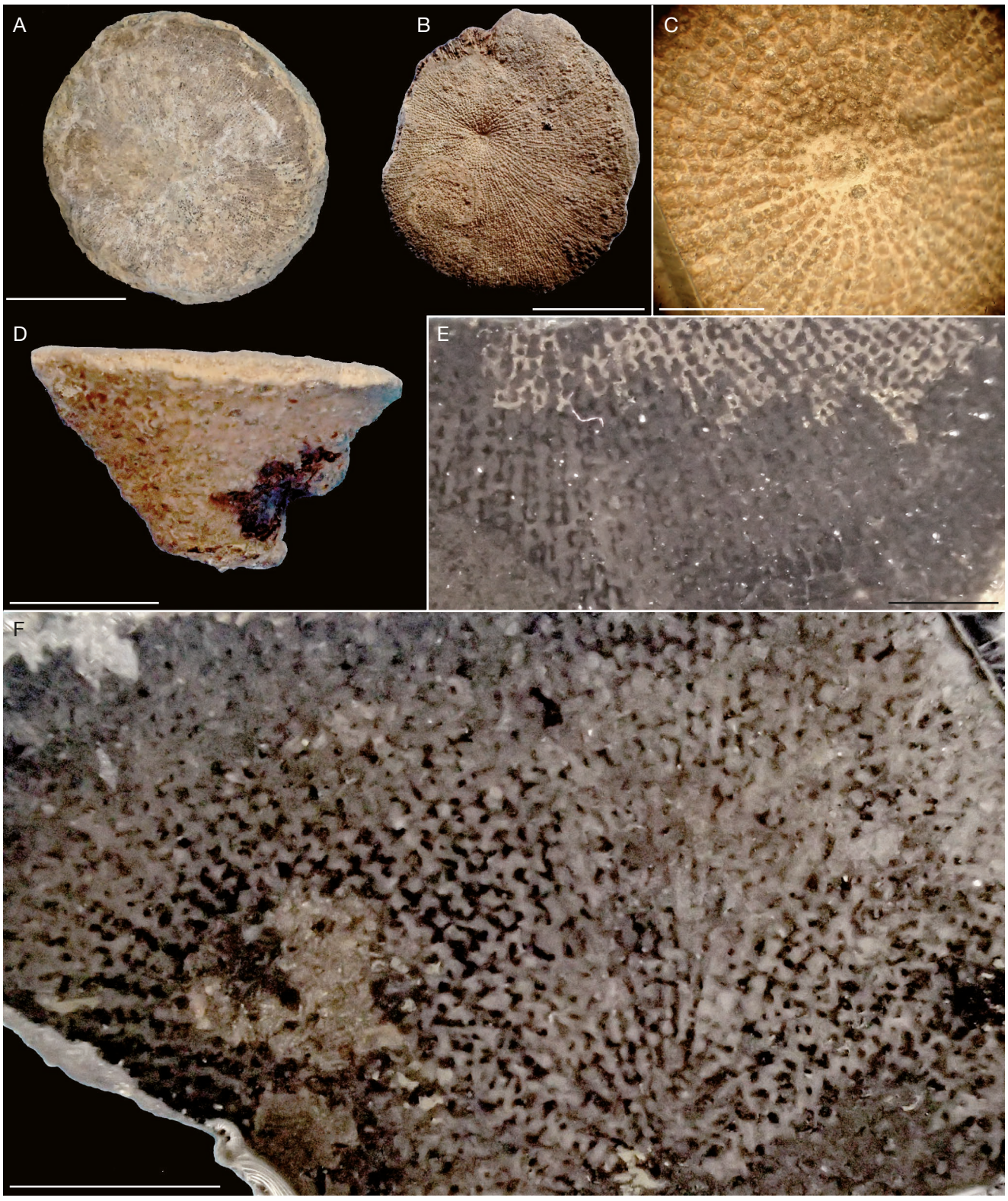

Fig. 13. — *Trocharea tenuilamellosa* (Gregory, 1900): **A**, distal view of the specimen CPUN 2303A4(2)-3 before section; **B**, distal view of the specimen CPUN AM16164-4; **C**, detail distal view of the calice in the specimen CPUN AM16164-4; **D**, lateral view of the specimen CPUN AM16164-4; **E**, polished transverse surface of the specimen CPUN 2303A4(2)-3 (skeleton in halftone, skeletal void in light in the upper part, in dark in the lower part); **F**, longitudinal polished section of the specimen CPUN 2303A4(2)-3 that does not cross the calicular center (skeleton in light). Scale bars: A, B, D, 1 cm; C, E, 2 mm; F, 3 mm.

TYPE MATERIAL. — Syntypes housed in Geological Survey of Calcutta.

TYPE HORIZON. — Bathonian (Upper Putchum beds).

TYPE LOCALITY. — North West Jumara and South Drang (India).

STUDIED SAMPLES. — Two specimens: CPUN 2303A4(2)-3, CPUN AM16164-4.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou (High Atlas of Morocco). Bathonian of India Saudi Arabia, Callovian of Jordan, Aalenian-Bajocian and Bathonian-Callovian of Iran, Late Jurassic of Portugal, Oxfordian of Georgia.

DESCRIPTION

Solitary, fungiform corallum with circular, flat or slightly convex calicular surface showing a small axial fossa. Radial elements are straight, porous septa with typically microsolenid pennular structures. A weak columella of unknown nature appears in depth. Endotheca made of rare, thin vesicular dissepiments. Synapticulae present. A thick, concentrically wrinkled holotheca covers the base of the colony.

Calicular diameter: 24 to 26 mm – Number of septa: > 300 – Septal density: 9 per 2 mm.

Family CORYPHYLLIIDAE Beauvais, 1981

Genus *Coryphyllia* Cuif, 1975

urn:lsid:zoobank.org:act:7619E39C-198D-4715-9898-99D36A9C9C31

TYPE SPECIES. — *Coryphyllia regularis* Cuif, 1975 (Cuif 1975: 380, text-fig. 37, 38), by monotypy.

Coryphyllia bicuneiformis n. sp.
(Fig. 14)

urn:lsid:zoobank.org:act:602A63AE-18E5-4E44-89D2-7754DE3EC605

Coryphyllia sp. 2 – Vasseur 2018: 154-155, fig. 3.20.

TYPE MATERIAL. — Holotype: CPUN CDAm4; paratypes: CPUN AM16162-1, CPUN AM16184-3, CPUN AM16188-12, CPUN CDAm3,15, CPUN MA0504E7-12.

STUDIED SAMPLES. — Seven specimens: CPUN AM16162-1, CPUN AM16184-3, CPUN AM16188-12, CPUN CDAm3, CDAm4, CDAm15, CPUN MA0504E7-12.

ETYMOLOGY. — Refers to the strongly bicuneiform aspect of major septa.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Amellagou, High Atlas of Morocco.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou and Koudiat Ech Chehem (Morocco).

DESCRIPTION

Solitary coral cylindrical to conical, elliptical in outline. Radial elements are straight or curved, free, compact, bicuneiform costosepta with often rhopaloid inner edges. The septal apparatus is quite regular, organized in 3 distinct size orders. Lateral faces are smooth or finely granulated and there are some vestiges of a wavy mid-septal line. Endotheca made of numerous vesicular dissepiments distributed in all the interseptal space. No columella but a constricted, elongated fossa that defines a bilateral symmetry superimposed to the radial arrangement. No epitheca observed, possibly eroded.

Calicular diameter: 9 to 41 mm – Number of septa: 44 to 70 – Septal density: 3-4 per 2 mm.

SIMILARITIES AND DIFFERENCES

Differs from *Coryphyllia regularis* by the apparent lack of epitheca, a reduced average diameter, more bicuneiform septa and a more elongated calice defining a stronger bilateral symmetry.

Coryphyllia capillaria n. sp. described below shows higher values of septal densities and number of septa and also a septal apparatus made of less bicuneiform septa in which it is more difficult to distinguish the different size orders of septa.

Coryphyllia capillaria n. sp.
(Fig. 15)

urn:lsid:zoobank.org:act:F1891D54-805C-4A00-BCCE-C7585E5119CA

Coryphyllia sp. 1 – Vasseur 2018: 152-153, fig. 3.19.

TYPE MATERIAL. — Holotype: CPUN PFPyr7-2; paratypes: CPUN 2303A1-2, CPUN 2303A8-1, CPUN AM16183-4, CPUN CDAm7, CPUN MA0504E7-13, CPUN MA0504E7-17, CPUN MA0704E3-10, CPUN MA0704E3-12.

STUDIED SAMPLES. — Nine specimens: CPUN 2303A1-2, CPUN 2303A8-1, CPUN AM16183-4, CPUN CDAm7, CPUN MA0504E7-13, CPUN MA0504E7-17, CPUN MA0704E3-10, CPUN MA0704E3-12, CPUN PFPyr7-2.

ETYMOLOGY. — Refers to the very thin and long septa of high orders.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Estivère pass, French Pyrenees.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian from France and Middle and High Atlas of Morocco.

DESCRIPTION

Solitary coral cylindrical to conical, circular to slightly elliptical in outline. Radial elements are straight or curved, free, compact, costosepta with first cycle septa often bicuneiform with rhopaloid inner edge that alternate with septa of higher cycles that can be very thin. The septal apparatus is organized in 3 or 4 distinct size orders, sometimes difficult to distinguish. Lateral faces are smooth or finely granulated and there are some vestiges of a wavy mid-septal line. Endotheca made of numerous vesicular dissepiments distributed in all the interseptal space on which some lonsdaleoid septa can appear. No columella but a constricted, elongated fossa that defines a bilateral symmetry superimposed to the radial arrangement. An often eroded epicostal epitheca *s.l.* covers the external parts of the corallum.

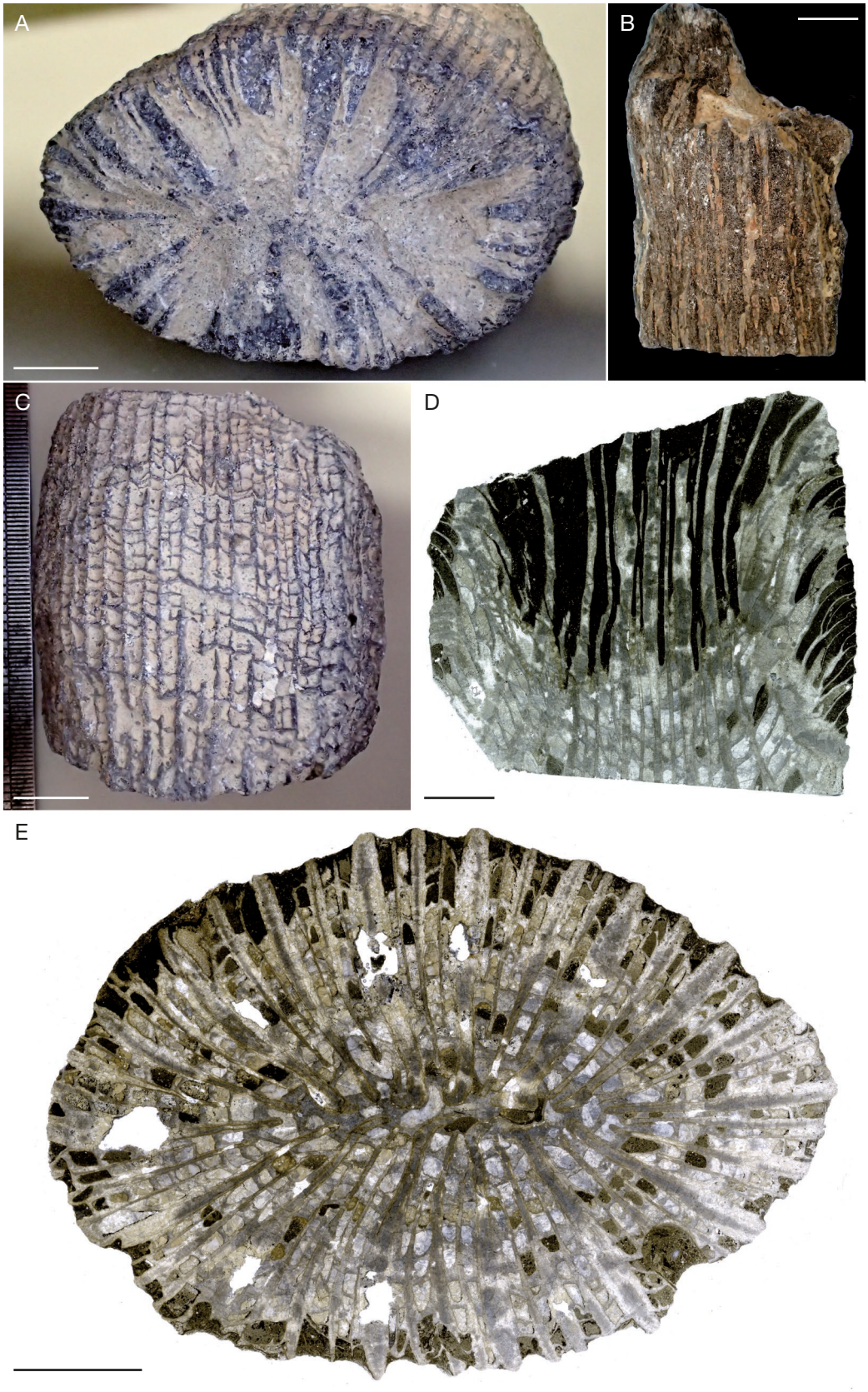

FIG. 14. — *Coryphyllia bicuneiformis* n. sp.: **A**, distal view of the specimen CPUN CDAm4; **B**, lateral view of the specimen CPUN AM16162-1; **C**, lateral view of the specimen CPUN CDAm4; **D**, longitudinal thin section of the specimen CPUN CDAm4; **E**, transverse thin section of the specimen CPUN CDAm4. Scale bars: A, D, E, 5 mm; B, 1 cm; C, 6 mm.

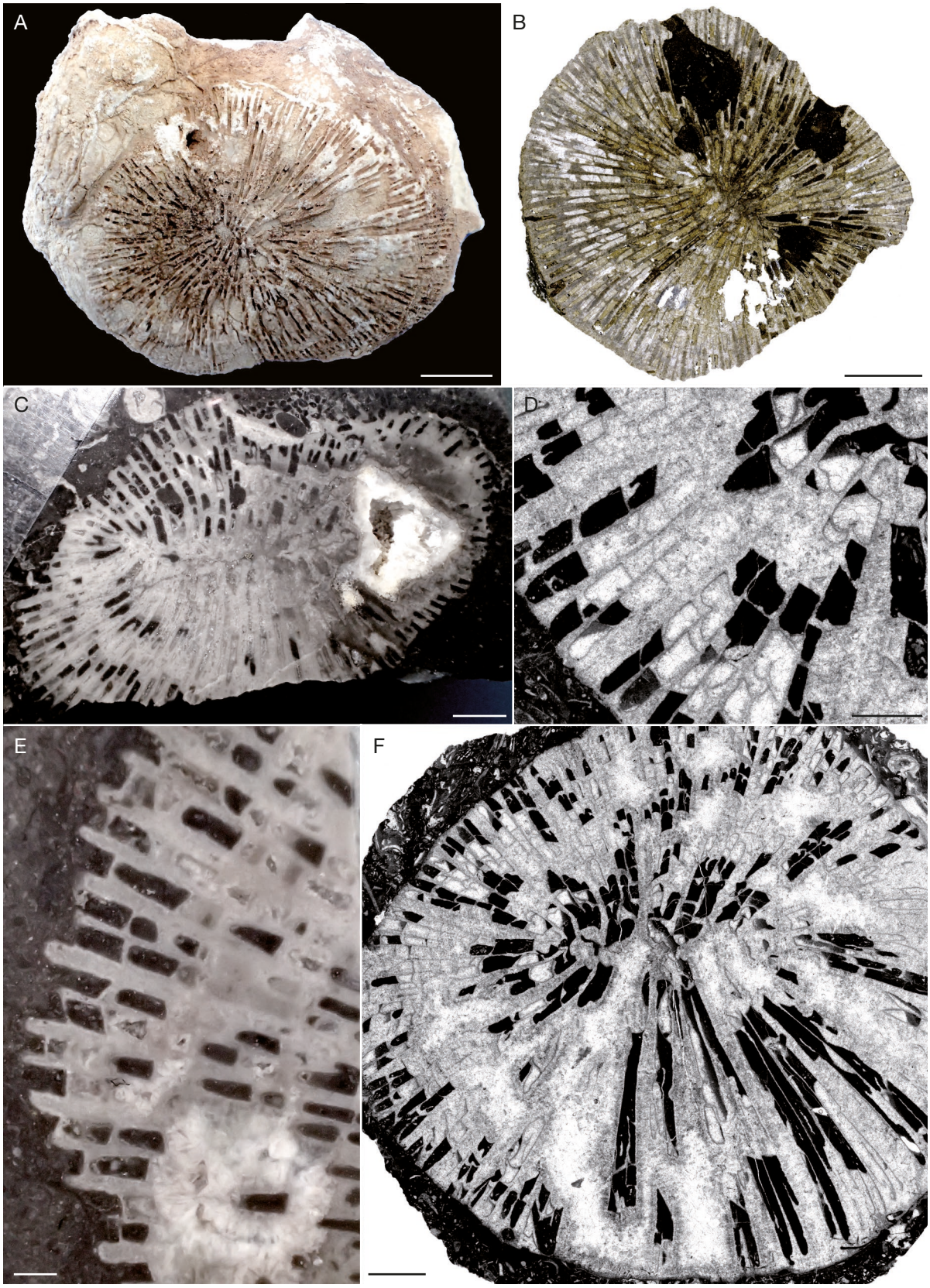

FIG. 15. — *Coryphyllia capillaria* n. sp.: **A**, distal view of the specimen CPUN MA0504E7-13; **B**, transverse thin section of the specimen CPUN CDAm7; **C**, transverse polished section of the specimen CPUN 2303A1-2; **D**, detail in transverse thin section of the septal apparatus of the specimen CPUN PFPyr7-2; **E**, longitudinal polished section of the specimen CPUN 2303A1-2; **F**, transverse thin section of the specimen CPUN PFPyr7-2. Scale bars: A, 1 cm ; B, C, F, 4 mm; D, 2 mm; E, 1 mm.

Calicular diameter: 20 to 53 mm – Number of septa: 110 to 140 – Septal density: 6 to 12 per 5 mm.

SIMILARITIES AND DIFFERENCES
Differs from *Coryphyllia regularis* by higher values of septal densities and number of septa and also by a septal apparatus made of less bicuneiform septa in which it is more difficult to distinguish the different size orders of septa.

Coryphyllia regularis Cuif, 1975
(Fig. 16)

Coryphyllia regularis Cuif, 1975: 380, fig. 37a, b, c and fig. 38. — Ramovš & Turnšek 1984: 175, pl. 4, fig. 1. — Turnšek & Buser 1989: 84, pl. 3. — Turnšek & Senowbari-Daryan 1994: 481, pl. 3, fig. 5. — Vasseur 2018: 150-151, fig. 3.18.

TYPE MATERIAL. — Holotype: MNHN.F.A31946 (Cuif 1975: 380, fig. 37a, b, c and fig. 38).

STUDIED SAMPLES. — Seven specimens: CPUN 2303A6-1, CPUN AM16182-3, CPUN AM16B236-1, CPUN MA0504E6-6, CPUN MA0504E7-13, CPUN MA0504E7-14, CPUNMA0904E10.

TYPE HORIZON. — Triassic.

TYPE LOCALITY. — Anatolia, Turkey (municipality unknown).

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Triassic from Turkey (Lycian Taurus), Pliensbachian from Morocco (Amellagou, Guigou Plateau).

DESCRIPTION
Solitary coral cylindrical to conical, circular to slightly elliptical in outline. Radial elements are straight or curved, free, compact, bicuneiform costosepta with often rhopaloid inner edges. The septal apparatus is regular, organized in 3 or 4 distinct size orders. Lateral faces are smooth or finely granulated and there are some vestiges of a wavy mid-septal line. Endotheca made of numerous vesicular dissepiments distributed in all the interseptal space on which some lonsdaleoid septa can appear. No columella but a constricted, elongated fossa that defines a bilateral symmetry superimposed to the radial arrangement. An epicostal epitheca *s.l.* covers the external parts of the corallum.

Calicular diameter: 22 to 57 mm – Number of septa: 51 to 90? – Septal density: 3 to 5 per 5 mm.

Coryphyllia subregularis Beauvais, 1986
(Fig. 17)

Coryphyllia subregularis Beauvais, 1986: 23, pl. 4, fig. 3. — Vasseur 2018: 156-157, pl. 3.21.

? *Stylophyllopsis mojsvari* – Frech 1890: 52, pl. 10, fig. 7-8, non fig. 9-14.

TYPE MATERIAL. — Holotype: MNHN.F.R11609 (Beauvais 1986: 23, pl. 4, fig. 3).

TYPE HORIZON. — Domerian (*Fuciniceras cornacaldense* horizon).

TYPE LOCALITY. — Jebel el Kounif (Bou-Arfa Range), Morocco.

STUDIED SAMPLES. — Two specimens: holotype, MNHN.F.R11609; CPUNMA0504E9-1.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Jebel El Kounif and Koudiat Ech Chehem (Morocco).

DESCRIPTION
Solitary, subcylindrical coral with rounded calicular edges. Radial elements are probably costosepta (costal part has not been clearly observed). They are straight, thin, slightly bicuneiform, with smooth distal edge and sometimes rhopaloid or joined inner edge for the first size orders of septa. The lateral ornamentation is absent or very thin and has not been observed. Ghosts of a mid-septal line seem to appear among the diagenetic figures. No columella but a constricted, elongated fossa that defines a bilateral symmetry. Endotheca made of large vesicular dissepiments distributed in all the interseptal space. Parathecal incomplete wall. No epitheca observed.

Calicular diameter: 45 to 52 mm – Number of septa: approximately 80 according to Beauvais (1986) – Septal density: 3 to 5 per 2 mm.

SIMILARITIES AND DIFFERENCES
Differs from *Coryphyllia regularis* Cuif, 1975 by a less regular septal apparatus, endotheca made of larger and less numerous dissepiments and the apparent lack of epicostal epitheca that is thin and easily eroded in *C. regularis*.

Family DELTOCYATHIIDAE
Kitahara, Cairns, Stolarski & Miller, 2012

Genus *Fungiaphyllia* Melnikova & Roniewicz, 2017

urn:lsid:zoobank.org:act:2E40EB88-F733-4BC0-9E66-84FDC9C7D13E

TYPE SPECIES. — *Fungiaphyllia communis* Melnikova & Roniewicz, 2017, by monotypy.

SPECIES ORIGINALLY INCLUDED. — *Fungiaphyllia communis* Melnikova & Roniewicz, 2017 (Melnikova & Roniewicz 2017: 141, fig. 8A-C).

REMARKS
Differs from the Micrabaciidae by the lack of costae alternating with septa and a less defined hexameral symmetry. The microstructure has not been observed.

Fungiaphyllia praecursor n. sp.
(Fig. 18)

urn:lsid:zoobank.org:act:65F1F175-9191-46B3-BE67-C3DFFDA08305

TYPE MATERIAL. — Holotype CPUN Gu0905E4-1; paratypes: CPUN Gu0905E4-2 to 21 (20 samples).

STUDIED SAMPLES. — CPUN Gu0905E4-1, CPUN Gu0905E4-2 to Gu0905E4-21 (21 samples).

ETYMOLOGY. — The species name refers to the fact that this coral is a pioneer as living in such deep environment.

Fig. 16. — *Coryphyllia regularis* Cuif, 1975: **A**, distal view of the specimen CPUN MA0504E6-6; **B**, distal view of the specimen CPUN AM16182-3; **C**, distal view of the specimen CPUN MA0904E10; **D**, lateral peripheral view of the specimen CPUN MA0504E6-6 (detail); **E**, detail in transverse section of the specimen CPUN MA0504E7-14; **F**, detail in transverse section of the specimen CPUN MA0504E7-14. Scale bars: A, B, 1 cm ; C-F, 5 mm.

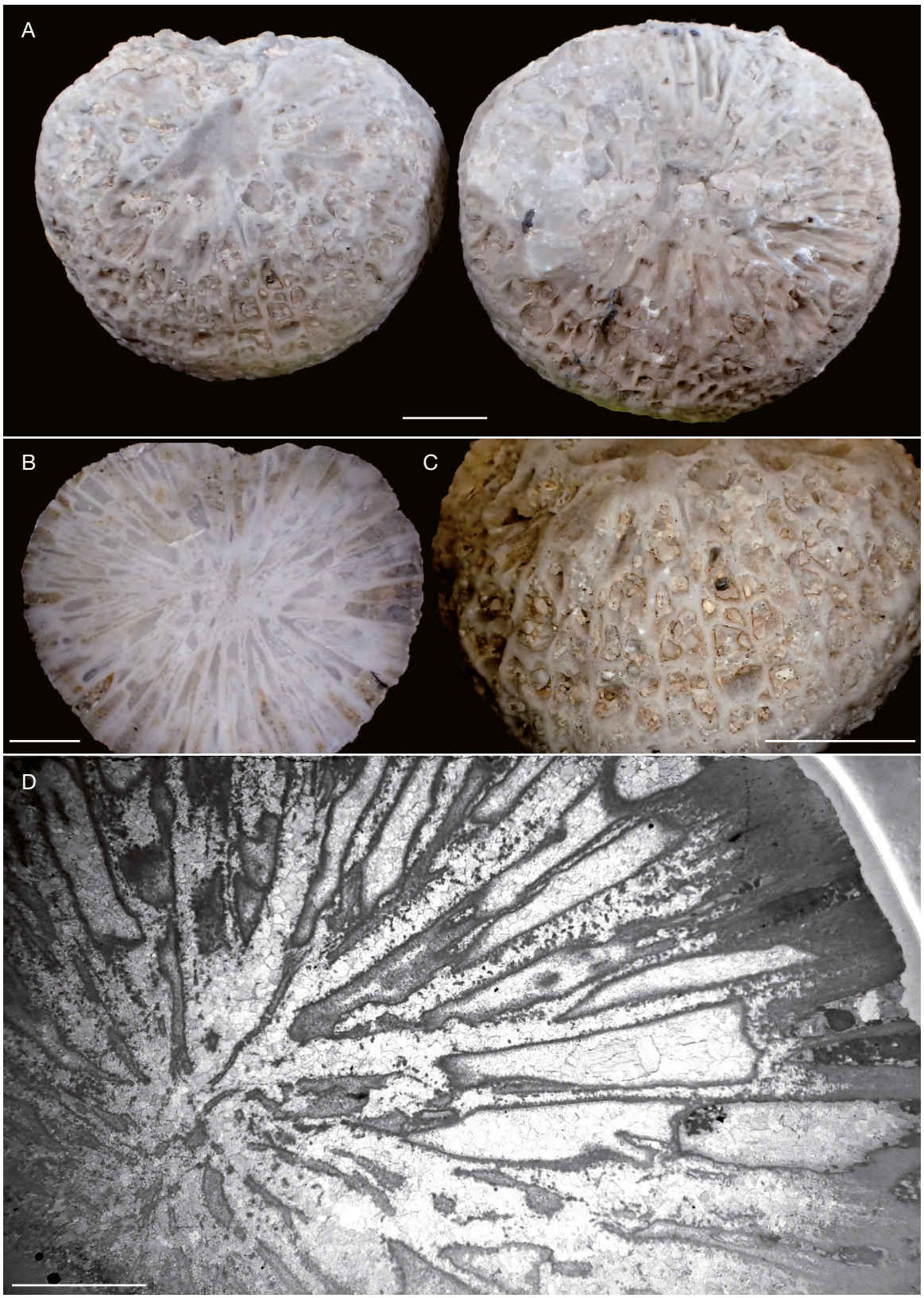

FIG. 17. — *Coryphyllia subregularis* Beauvais, 1986: **A**, distal and proximal views of the holotype MNHN.F.R11609; **B**, transverse polished section of the holotype MNHN.F.R11609; **C**, lateral view of the holotype MNHN.F.R11609; **D**, transverse thin section of the holotype MNHN.F.R11609. Scale bars: A, B, C, 1 cm; D, 4 mm.

Type horizon. — Upper Pliensbachian (Margaritatus zone).

Type locality. — Guigou plateau, Middle Atlas of Morocco, 33°27'32"N, 4°56'38"W.

Geographic and stratigraphic ranges. — Pliensbachian (Margaritatus zone) of Middle Atlas (Morocco).

Description

Solitary, discoid to subhemispheric corallite. Subcompact, straight or curved costo-septa often contratingent, giving to the septal apparatus a typical branching aspect. Lateral faces with irregular granules sometimes flattened and protruding or looking like small sharp spines. Distal edge with sharp-edged teeth made by the projection of trabeculae. A relatively regular hexameral symmetry can be deciphered, especially with the external part of radial elements. No columella observed. Endotheca made of very rare and thin vesicular dissepiments. Synapticulae present. Wall not observed.

Calicular diameter: 10 to 20 mm – Number of septa: 106 to 152 – Septal density: 4 - 6 for 2 mm.

Similarities and differences

F. praecursor n. sp. differs from *F. rotunda* n.sp. and *F. communis* by its long first-orders costae that exceed the periphery of the calice, a very rare endotheca and a more distal living environment.

Fungiaphyllia rotunda n. sp.
(Fig. 19)

urn:lsid:zoobank.org:act:8458DCF1-86C1-47B5-BD41-575B07A62857

Funginella? sp. 1 – Vasseur 2018: 199-200, fig. 3.39.

Type material. — Holotype: CPUN AM16162-9; paratypes: CPUN DA3105E2-1, DA3105E2-2, DA3105E2-3, DA3105E2-4, DA3105E2-5, DA3105E2-7, CPUN AM16124; CPUN AM16179-1.

Studied samples. — Nine specimens: CPUN DA3105E2-1, DA3105E2-2, DA3105E2-3, DA3105E2-4, DA3105E2-5, DA3105E2-7, CPUN AM16124, CPUN AM16162-9, CPUN AM16179-1.

Etymology. — Refers to the perfectly round shape of the skeleton in transverse section, without costae.

Type horizon. — Upper Pliensbachian.

Type locality. — Amellagou, High Atlas of Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Dades Valley and Amellagou (High Atlas of Morocco).

Description

Solitary, discoid to subhemispheric corallite. Subcompact, straight or curved septa often contratingent, giving to the septal apparatus a typical branching aspect. Lateral faces with irregular granules sometimes flattened and protruding or looking like small sharp spines. Distal edge with sharp-edged teeth made by the projection of trabeculae. No columella observed. Endotheca made of thin vesicular dissepiments. Granules of neighbouring septa sometimes joining in synapticulae. The wall seems synapticulothecal.

Calicular diameter: 4 to 20 mm – Number of septa: 64 to 120 – Septal density: 13 to 20 for 5 mm.

Similarities and differences

Fungiaphyllia praecursor n. sp. differs from *F. rotunda* n. sp. by its long first-orders costae that exceed the periphery of the calice, a very rare endotheca and a more distal living environment. *Fungiaphyllia communis* seems to have a lower septal density in comparison with *F. rotunda* n. sp. but more samples could reveal an intraspecific variability meaning a synonymy between the two species.

Family Dermosmiliidae Koby, 1889

Genus *Calamophylliopsis* Alloiteau, 1952

Type species. — *Calamophyllia flabellata* de Fromentel, 1861, by monotypy.

Remark

The generic assignation depends on the badly established interconnections with the genus *Rhabdophyllia* Milne Edwards & Haime, 1851 that differs from *Calamophylliopsis* by the lack of epitheca. The variability of this character is not well established and we maintain here the genus *Calamophylliopsis* for our specimens with epitheca, awaiting a study of variability.

Calamophylliopsis phaceloida (Beauvais, 1986)
(Fig. 20)

Rhabdophyllia? *phaceloida* Beauvais, 1986: 43, pl. 8, fig. 6; pl. 10, fig. 1 and pl. 11, fig. 3.

Calamophylliopsis phaceloida – Vasseur 2018: 140-141, fig. 3.14.

Type material. — Holotype: MNHN.F.R11627 (Beauvais 1986: 43, pl. 8, fig. 6; pl. 10, fig. 1.

Type horizon. — Upper Carixian (Pliensbachian).

Type locality. — Jebel Tekerma, Morocco.

Studied samples. — 22 specimens: Holotype, MNHN.F.R11627; MNHN.F.A32006, CPUN MA0504E5-1, MA0504E5-2, MA0504E7, MA0704E2-1, MA0704E3-4, MA0704E3-5, MA0704E3-6, MA0704E3-7, MA0704E3-8, MA0704E3-9, MA0704E4-3, MA0704E4-4, MA0704E4-5, MA0704E4-6, MA0704E4-7, MA0704E4-8, MA0704E4-9, MA0704E5-2,3.

Geographic and stratigraphic ranges. — Pliensbachian of Jebel Tekerma - Massaoua, Koudiat Ech Chehem (both in Middle Atlas of Morocco).

Description

Phaceloid colony with subcylindrical corallites often distorted by intracalicular budding. Radial elements are subcompact, straight or curved, free septa often in zigzag. We observe a wavy mid-septal line that impact septal morphology of young septa when they are not yet thickened by stereome deposits. The septal trabeculae dissociate from the distal and sometimes inner edges and in some calices project in the axis of the corallite, forming a papillose columella. Endotheca made of dissepiments that seem sometimes

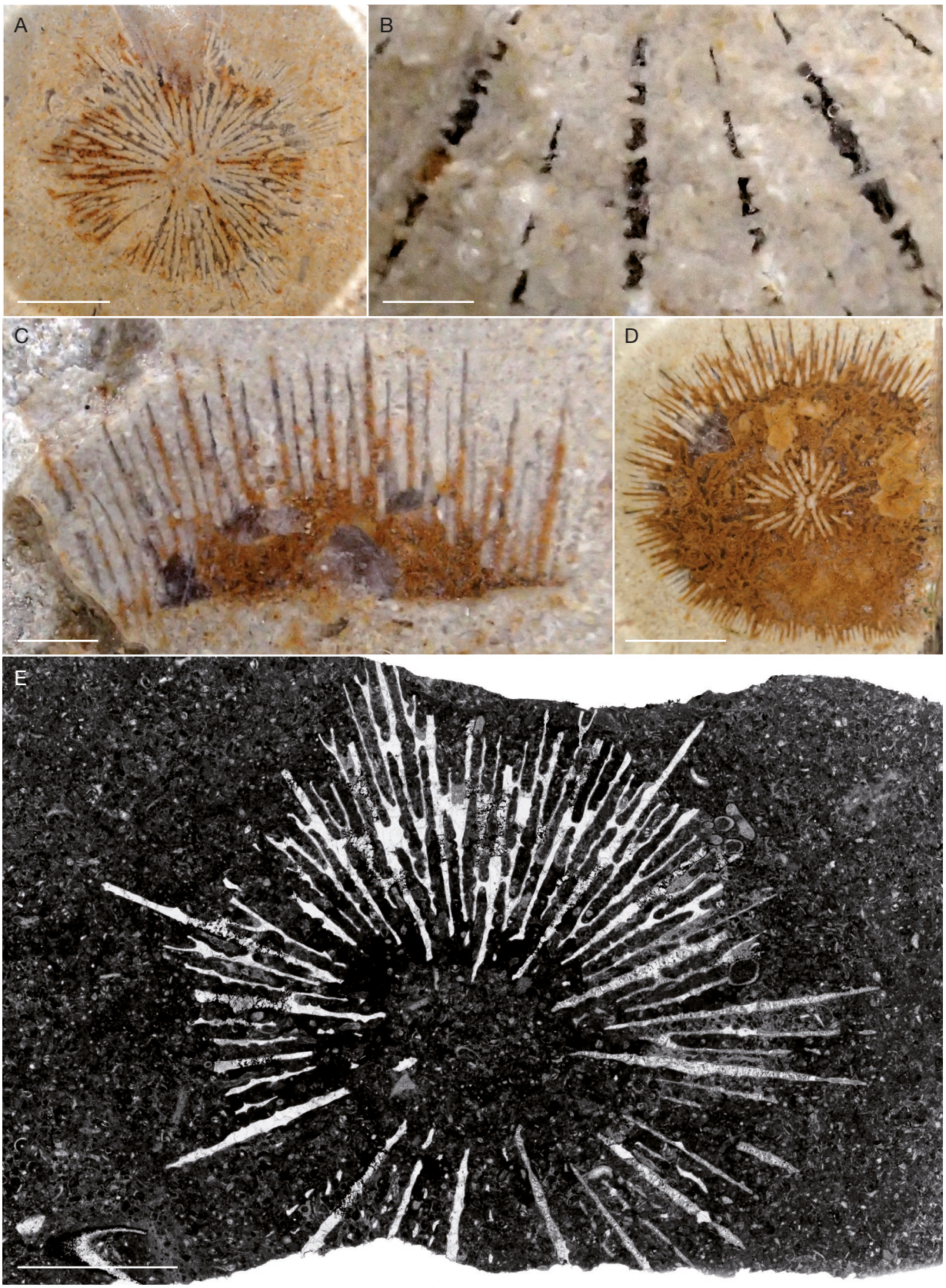

Fig. 18. — *Fungiaphyllia praecursor* n. sp.: **A**, transverse polished section in the holotype CPUN Gu0905E4-1; **B**, distal view of septa showing the granules in sample CPUN Gu0905E4-2; **C**, longitudinal polished section in sample CPUN Gu0905E4-3; **D**, transverse polished section in sample CPUN Gu0905E4-4; **E**, transverse thin section in sample CPUN Gu0905E4-5. Scale bars: A, D, 5 mm; B, 1 mm; C, 2 mm; E, 4 mm.

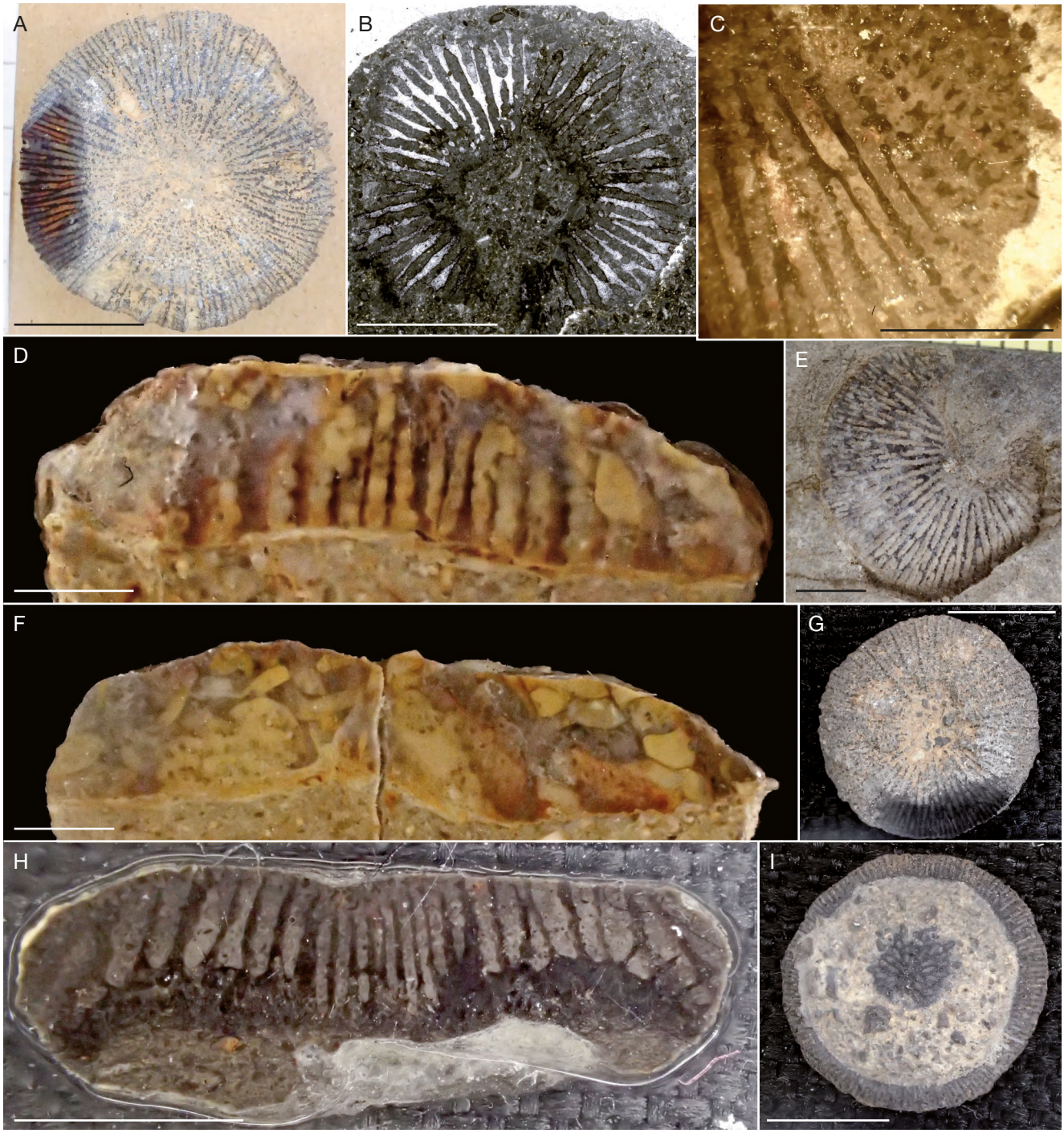

Fig. 19. — *Fungiaphyllia rotunda* n. sp.: **A**, distal view of the specimen CPUN AM16162-9; **B**: transverse thin section in the specimen CPUN DA3105E2-1 (skeleton in light); **C**, detail in transverse section of the specimen CPUN AM16179-1; **D**, longitudinal section of the specimen CPUN DA3105E2-2; **E**, specimen pictured in the field (N31.5682106, W5.8937588); **F**, longitudinal radial section of the specimen CPUN DA3105E2-2; **G**, distal view of the specimen CPUN AM16124-3; **H**, longitudinal section in the specimen CPUN AM16179-1; **I**, proximal view of the specimen CPUN AM16124-3. Scale bars: A, 1 cm; B, 4 mm; C, D, F, 2 mm; E, 3 mm; G, H, I, 5 mm.

tabular and sometimes vesicular. No synapticulae observed. Epitheca *s.l.* present.

Calicular diameter: 3 to 14 mm – Number of septa: 24 to 95 – Septal density: 3 to 8 for 2 mm.

Similarities and differences

Differs from the genus *Phacelophyllia* Beauvais, 1986 by the lack of pennular ornamentation and a weaker papillose columella sometimes even absent.

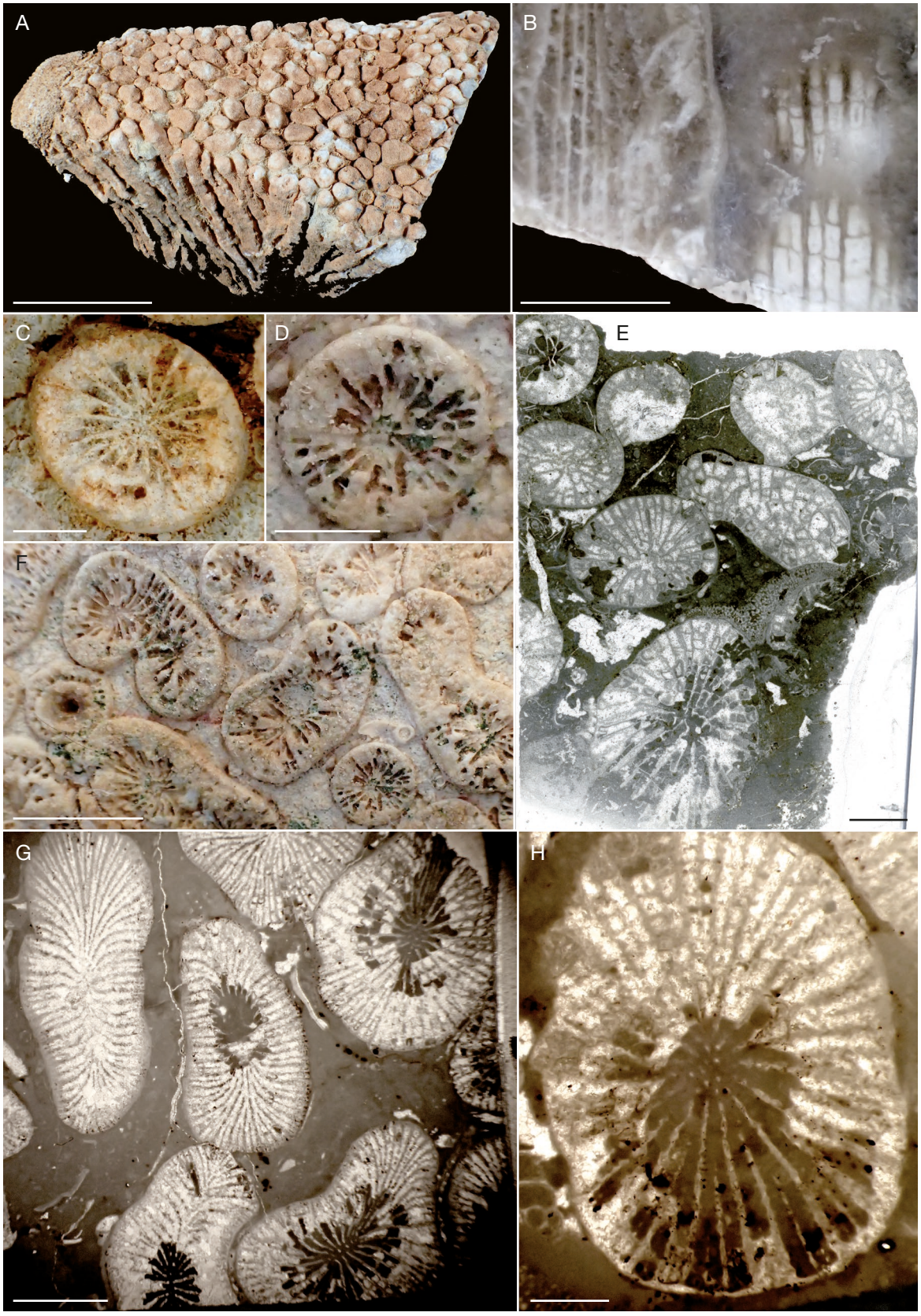

FIG. 20. — *Calamophylliopsis phaceloida* (Beauvais, 1986): **A**, distal view of the holotype MNHN.F.R11627; **B**, longitudinal section in the specimen CPUN MA0504E5-1; **C**, Distal view of one calice of the holotype MNHN.F.R11627; **D**, distal view of one calice of the specimen CPUN MA0504E7; **E**, transverse thin section in the specimen CPUN MA0504E5-1; **F**, Distal view of the specimen CPUN MA0504E7; **G**, transverse thin section in the holotype MNHN.F.R11627; **H**, transverse thin section in one corallum of the holotype MNHN.F.R11627. Scale bars: A, 5 cm; B, 5 mm; C, D, 2 mm; E, G, 4 mm; F, 6 mm; H, 1 mm.

Remarks

Beauvais (1986) attributed doubtfully this taxon to the genus *Rhabdophyllia* Milne Edwards & Haime, 1851 because of the apparent lack of epitheca and synapticulae. However, a deeper investigation of the type material (badly preserved) revealed some vestiges of epitheca in some parts of the specimen. In addition, the taxon described here has no costae and an abundant endotheca, contrary to the type species of the genus *Rhabdophyllia phillipsi* Milne Edwards & Haime, 1851.

The specimens described here strongly vary in the dimensions of their calices and septal densities. As all the intermediates have been observed, we are not able to discriminate them into different species and must assign these variations to an important intraspecific variability.

Genus *Phacelophyllia* Beauvais, 1986

Species originally included. — *Phacelophyllia termieri* Beauvais, 1986.

Type species. — *Phacelophyllia termieri* Beauvais, 1986 (Beauvais 1986: 39 pl. 7, fig. 2 and text-fig. 27), by original designation.

Remarks

We chose to merge under the genus *Phacelophyllia* coral species that were classified by Beauvais (1986) under the genus *Thecactinastraea* Beauvais, 1986 and the species *Myriophyllum fasciatum* Beauvais, 1986 (Brame *et al.* 2019).

Phacelophyllia? sp.
(Fig. 21)

Phacelophyllia? sp. 1 – Vasseur 2018: 282-283, fig. 3.72.

Studied sample. — CPUN MA0704E8-4.

Geographic and stratigraphic ranges. — Pliensbachian of Koudiat Ech Chehem (Guigou plateau, Middle Atlas of Morocco).

Description

Phaceloid colony with close, subcylindrical and subparallel corallites multiplying by intracalicular budding with a low angle of bifurcation. Radial elements are subcompact, straight or curved, free septa with trabecular architecture. Lateral faces hold pennulae with edges curved inward. The distal edge of septa hold teeth due to trabeculae dissociation. The projection of the trabeculae in the axis of the corallite often produces a papillose columella. Endotheca made of numerous vesicular dissepiments. No synapticulae observed. Some vestiges of an epitheca *s.l.* seem to wrap a few corallites, but the preservation of the specimen does not allow a clear confirmation, this is the reason why we merge it with doubt under the genus *Phacelophyllia*.

Similarities and differences

This specimen is attributed to the genus *Phacelophyllia* provided that an epitheca effectively exists in it. It differs from *P. fasciculata* (Beauvais, 1986) by its free septa and from *P.termieri* Beauvais, 1986 because of its smaller calices.

Calicular diameter: 2 to 8 mm – Distance between calices centers: 3 to 9 mm – Number of septa: approximately 75 – Septal density: 7 for 2 mm.

Genus *Proleptophyllia* Alloiteau, 1952

urn:lsid:zoobank.org:act:5F74DE73-1C4D-43D2-AE64-D1ADCACF2C06

Omphalophylliopsis Beauvais, 1986: 38.

Species originally included. — Only the type species *Montlivaltia granulum* Fromentel & Ferry, 1866.

Type species. — *Montlivaltia granulum* Fromentel & Ferry, 1866 (Fromentel & Ferry 1866: 136, pl. 24 fig. 2), by monotypy.

Remark

The genus *Omphalophylliopsis* Beauvais, 1986 is based on one single, badly preserved specimen that differs from *Proleptophyllia multiradiata* Beauvais, 1986 described herein only by the general aspect of the corallum, more elevated. That is the reason why we decided to group *Omphalophylliopsis* Beauvais, 1986 and *Proleptophyllia* Alloiteau, 1952.

Proleptophyllia Alloiteau, 1952 differs from *Epistreptophyllum* Milaschewitsch, 1876 by its septal structure with more developed and regular pennular ornamentation and a deep axial fossa that sometimes shows a weak papillose columella in depth, made by trabecular projections.

Proleptophyllia calix n. sp.
(Fig. 22)

urn:lsid:zoobank.org:act:16F8AE10-40AB-4315-99A0-591CD18F4A31

Proleptophyllia sp. 3 – Vasseur 2018: 312-313, fig. 3.83.

Type material. — Holotype: CPUN AM16162-4; paratype: CPUN CDAm12.

Studied samples. — Four specimens: CPUN CDAm12, CPUN AM16162-4, lot CPUN AM16179-3.

Etymology. — From the latin name *calix*, that designates a bowl; refers to the bowl-like shape of the corallum with a very deep and large fossa.

Type horizon. — Pliensbachian.

Type locality. — Amellagou, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

Description

Solitary, bowl shaped corallum with rounded calicular edges. Lower face is covered by an epitheca *s.l.* and seems to be pedunculate. The calice is subcircular in outline, strongly infundibuliform, with a large fossa in the axial zone in which septa

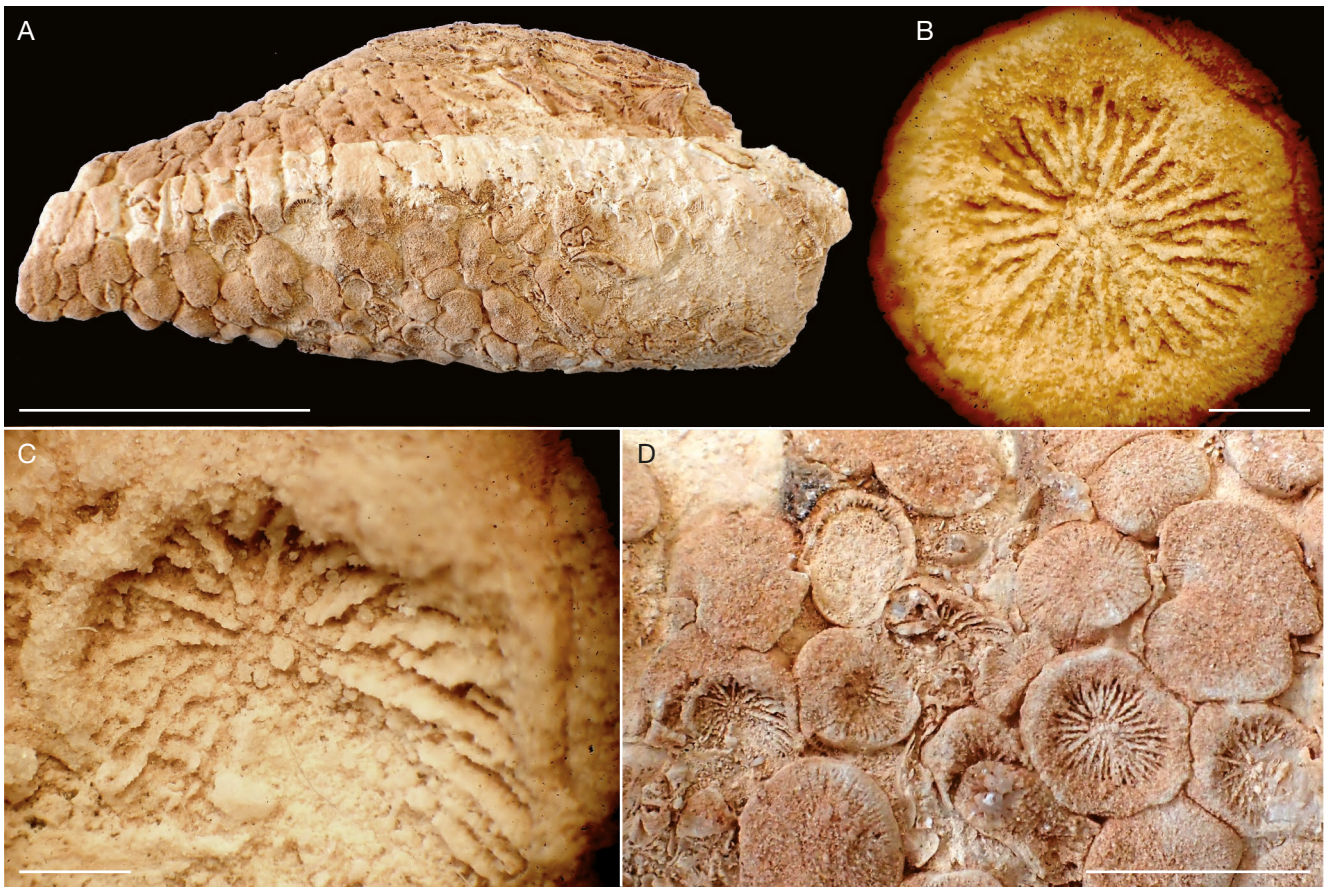

Fig. 21. — *Phacellophyllia*? sp.: **A**, Oblique distal view of specimen CPUN MA0704E8-4; **B**, detail in distal view of one calice of specimen CPUN MA0704E8-4; **C**, detail in distal view of one calice of specimen CPUN MA0704E8-4; **D**, distal view of specimen CPUN MA0704E8-4. Scale bars: A, 5 cm; B, 2 mm; C, 1 mm; D, 1 cm.

plunge. Radial elements are exsert, straight, subcompact, free or joined costosepta of which perforate distal ornamentation reveals a pennular growth pattern with meniana subsequently embedded by stereome deposits. These deposits sometimes also unit two or three neighbouring septa, making difficult the appreciation of the number and density of septa in the specimen. Distal edge with regular round teeth. Trabeculae are externally subvertical and tend to lie down in the internal part of septa, but do not produce a papillose columella. No wall observed. Synapticulae present and possibly dissepiments too.

Calicular diameter: 20 to 25 mm – Number of septa: approximately 128 – Septal density: 5 to 7 per 2 mm.

Similarities and differences

This species differs from the other *Proleptophyllia* by the bowl shaped aspect of the corallum and the axial fossa very large and deep.

Proleptophyllia granulum (Fromentel & Ferry, 1866) (Fig. 23)

Montlivaultia granulum Fromentel & Ferry, 1866: 136, pl. 24, fig. 2.

Montlivaultia arenula Fromentel & Ferry, 1866: 134-135, pl. 23, fig.4, 4a-b.

Proleptophyllia granulum – Alloiteau 1952: 666; 1956: Pal. Univ., NS. n°121; 1957: 113, pl. 8, fig. 10 and fig. 73. — Vasseur 2018: 297-298, fig. 3.78.

Epiphyllum arenula – Alloiteau 1957: 107, pl.5, fig.13.

Cyclophyllopsis cornutiformis Beauvais, 1986: 34, pl. 7, fig. 1, pl. 8, fig. 1 and text-fig. 23.

Proleptophyllia cf. *granulum* – Lathuilière 2011: 542, pl. 3, fig. 11-12.

Type material. — Lectotype: MNHN.F.M03533. ICZN (1999) art. 74.6: designation of a lectotype for stipulation of the existence of a "holotype" by Alloiteau (1956a).

Type horizon. — Pliensbachian.

Type locality. — May-sur-Orne (Calvados, France).

Studied samples. — 22 specimens: lectotype: MNHN.F.M03533; CPUN MAM16, CPUN CDAm5, CPUN AM16177-2, CPUN AM16182-7, CPUN AM16188-24 and population CPUN MA1004E1-G.

Geographic and stratigraphic ranges. — Pliensbachian of May-sur-Orne (Calvados, France), upper Toarcian of Aïn Leuh (Middle Atlas of Morocco).

Description

Turbinate, patellate or subcylindrical solitary coral with calice elliptical to subcircular in outline. Flattened calicular

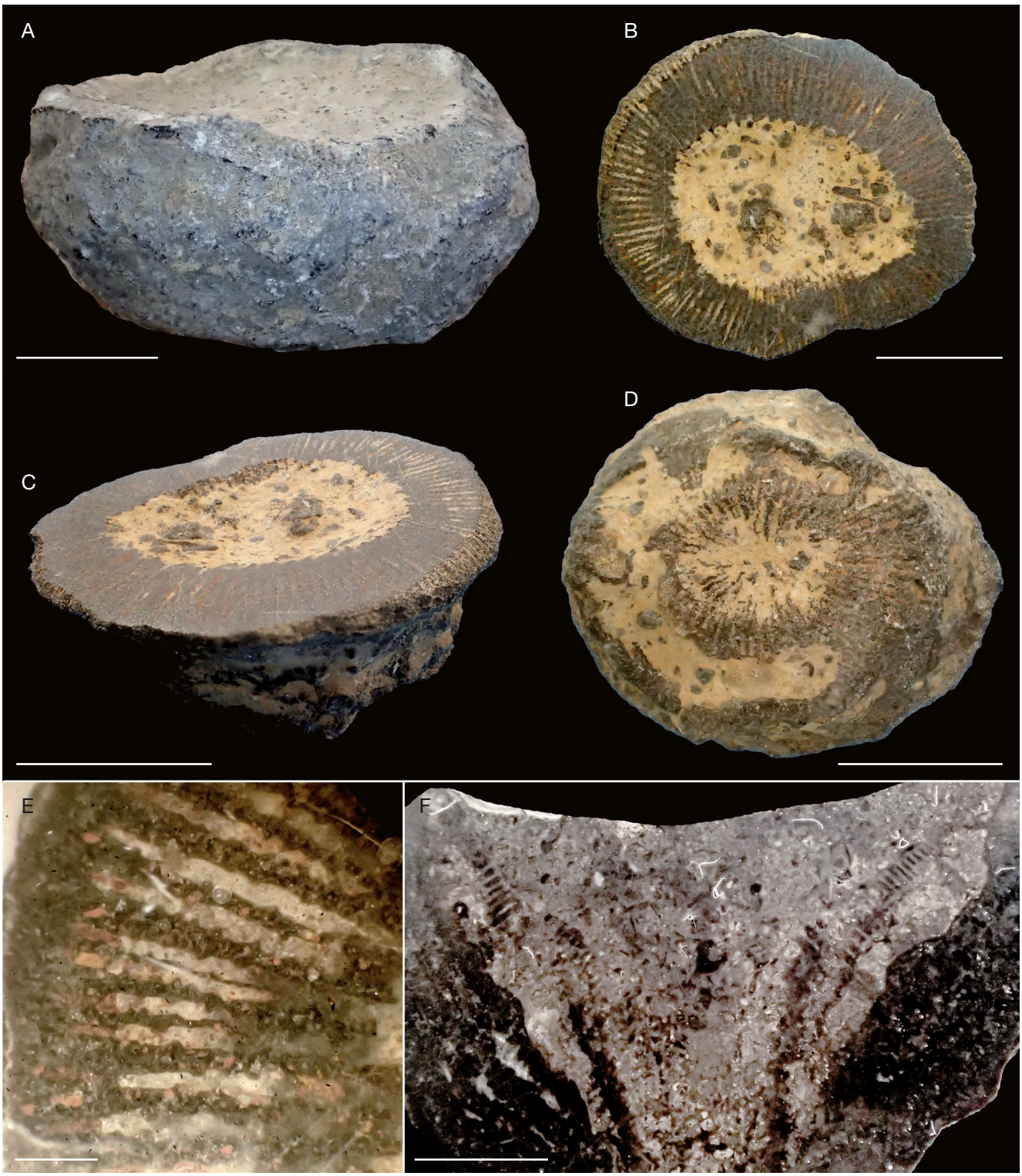

FIG. 22. — *Proleptophyllia calix* n. sp.: **A**, lateral view of the specimen CPUN CDAm12; **B**, distal view of the specimen CPUN AM16162-4 (polished calicular edge); **C**, lateral view of the specimen CPUN AM16162-4 (polished calicular edge); **D**, proximal view of the specimen CPUN AM16162-4 (polished calicular edge); **E**, detail in transverse polished section of the pennular septal structure of the specimen CPUN AM16162-4; **F**, polished longitudinal section of the specimen CPUN CDAm12. Scale bars: A, B, C, D, 1 cm; E, 1 mm; F, 4 mm.

platform, more or less infundibuliform, with a generally deep fossa at the axis. Rejuvenescences are common in the coralla. Radial elements are straight, free or joined, subcompact costosepta with flat granule-like pennulae on lateral faces. Pennulae do not alternate between neighbouring septa and are not arranged in continuous meniana.

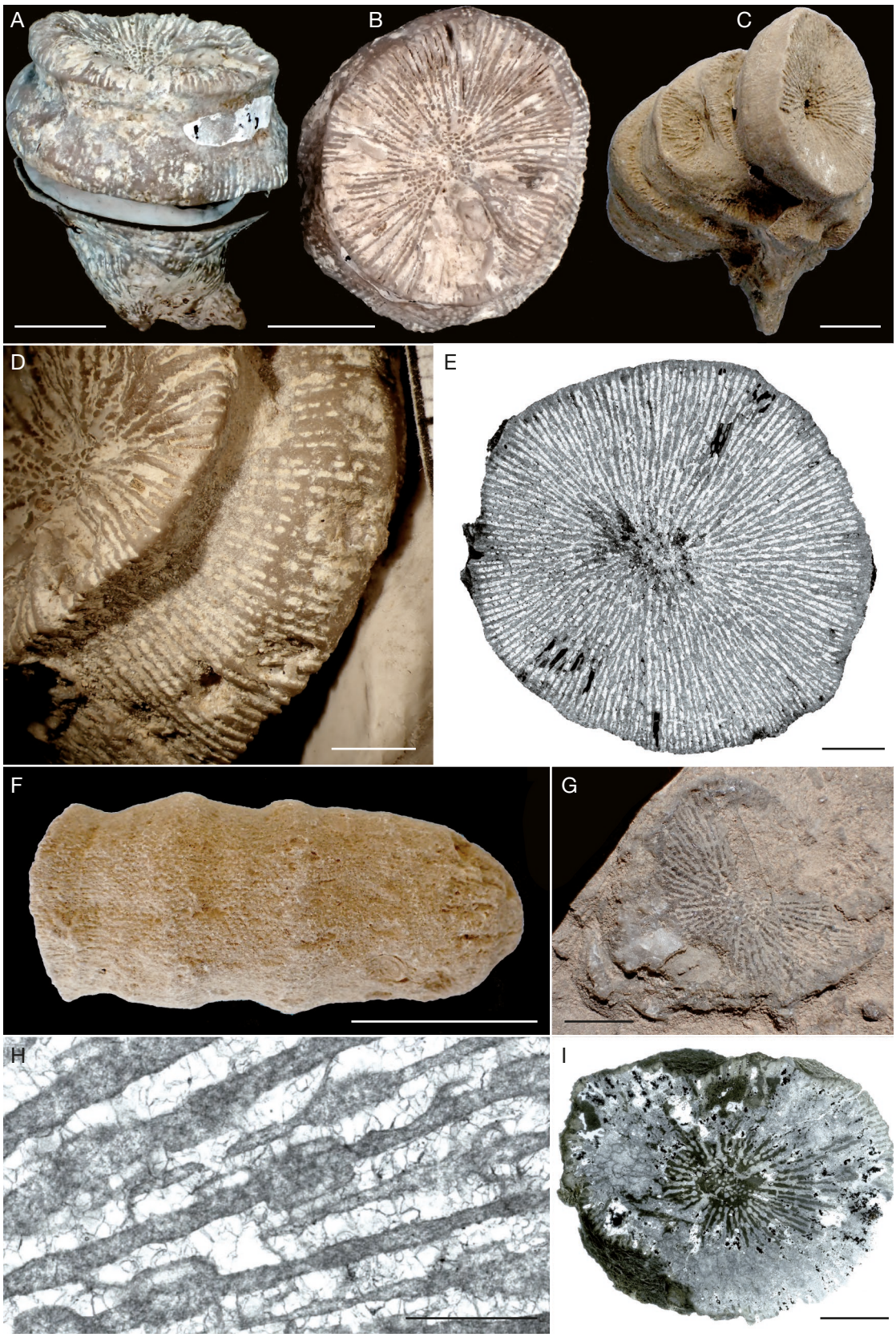

Fig. 23. — *Proleptophyllia granulum* (Fromentel & Ferry, 1866): **A**, lectotype MNHN.F.M03533; **B**, distal view of the lectotype MNHN.F.M03533; **C**, rejuvenescent specimen from the batch CPUN MA1004E1-G; **D**, detail of costoseptal structure in the lectotype MNHN.F.M03533; **E**, transverse thin section of the specimen CPUN CDAm5; **F**, subcylindrical specimen that lost his epitheca from the batch CPUN MA1004E1-G; **G**, specimen pictured in the field (Dades Valley, Morocco); **H**, detail of the pennular septal ornamentation in the specimen CPUN G'3; **I**, transverse thin section of the specimen CPUN AM16182-7. Scale bars: A, B, C, 1 cm; D, E, 4 mm; F, 2 mm; G, I, 5 mm; H, 1 mm.

The distal edge is ornamented of strong teeth. More the teeth are in the axial region bigger and more detached they are. They produce in the center the appearance of a papillose columella in a pit. Numerous thick dissepiments. Synapticulae present. Wall parathecal. A thin epitheca, sometimes totally eroded wraps the coralla. Probable hexameral symmetry.

Calicular diameter: 13 to 29.5 mm – Number of septa: 119 to 182 – Septal density: 4 to 6 for 2 mm.

Similarities and differences

Differs from *P.multiradiata* Beauvais, 1986,which shows a convex calicinal surface with exert septa and a more discoid morphology.

Proleptophyllia magna n. sp.
(Fig. 24)

urn:lsid:zoobank.org:act:F05F8D69-8714-480B-98B7-6878FA27B5ED

Proleptophyllia sp. 1 – Vasseur 2018: 306-307, fig. 3.81.

Type material. — Holotype: CPUN AM16160-1.

Studied sample. — CPUN AM16160-1.

Etymology. — Refers to the huge size of the corallum.

Type horizon. — Pliensbachian.

Type locality. — Amellagou, 31°57'0"N, 5°2'32"W, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

Description

Solitary, discoid corallum. Pedunculate, the flat lower face is covered by a possible epitheca with concentric wrinkles. The calice seems circular to elliptic in outline (it is incomplete), convex, with a slightly elliptic small fossa in the axial zone in which septa plunge. Radial elements are straight, subcompact, free or joined costosepta that are thin and numerous and of which fenestrate distal ornamentation reveals a pennular growth pattern with meniana subsequently embedded by stereome deposits. These deposits sometimes also unit two or three neighbouring septa, making difficult the appreciation of the number and density of septa in the specimen. Distal edge with regular round teeth. Trabeculae are externally subvertical and inclined in the internal part of septa, maybe forming a papillose parietal columella in depth but we did not observe it. No wall observed. Synapticulae present and possibly dissepiments too. Bilateral symmetry appears by the elongation of the fossa and perhaps that of the calice.

Calicular diameter: approximately 64 mm – Septal density: 8 to 10 per 2 mm – Number of septa: > 600 ?

Similarities and differences

Differs from other species of the same genus by the higher size of the calice and the higher number of septa.

Proleptophyllia multiradiata Beauvais, 1986
(Fig. 25)

Proleptophyllia multiradiata Beauvais, 1986: 52, pl. 13, fig. 4, pl. 14, fig. 4, 5. — Vasseur 2018: 300-301, fig. 3.79.

?*Montlivaltia spiculata* Fromentel & Ferry, 1866: 142, pl. 23, fig. 2.

?*Procyclolites spiculata* – Alloiteau 1957: 106, pl. 5, fig. 19.

Proleptophyllia rejuvenescens Beauvais, 1986: 53, pl. 14, fig. 1, texte-fig. 31.

Proleptophyllia subcylindrica Beauvais, 1986: 53, pl. 15, fig. 2.

?*Myriophyllum constrictum* Beauvais, 1986: 36, pl. 8, fig. 2 and txt-fig. 24.

Type material. — Holotype: MNHN.F.R11638 (coll. Menchikoff MD 7), original designation; paratypes: 32 specimens (coll. Menchikoff MD 8 [eight specimens, MNHN.F.A32018], MD 29, MD 34 [22 specimens, MNHN.F.A32013]).

Type horizon. — Domerian (Upper Pliensbachian).

Type locality. — Beni Tadjit (Morocco).

Studied samples. — 22 specimens: MNHN.F.R11638, R11639, MNHN.F.R11640, R11642, R11646, A32013, A32018, A32019, MNHN.F.A32020, A32022, CPUN AM16162-2, CPUN AM16178-4.

Geographic and stratigraphic ranges. — Pliensbachian of Beni Tadjit and Amellagou (Morocco).

Description

Fungiform to discoid solitary corallum subcylindrical in young stages, sometimes showing successive rejuvenescences. Pedunculate, flat lower face is layered by a possible epitheca with concentric wrinkles, which reveals sometimes fine, equal costae, very close and equidistant. The calice is circular to elliptic in outline, sometimes convex, sometimes infundibuliform or flat, with a small circular to elliptic fossa of variable depth in the axial zone in which septa plunge. Radial elements are straight, subcompact, free or joined costosepta of which fenestrate distal ornamentation reveals a pennular growth pattern with meniana subsequently embedded by stereome deposits. These deposits sometimes also unit two or three neighbouring septa, making difficult the appreciation of the number and density of septa in some samples. Distal edge with round teeth quite homogeneous on one septum but with a diameter that varies from one cycle of septa to another. Trabeculae are externally subvertical and tend to lie down in the internal part of septa, forming a papillose parietal columella. No wall observed. Synapticulae present and possibly dissepiments too. Bilateral symmetry appears when the calice is elongated.

Calicular diameter: 9.4 to 35 mm – Number of apparent septa: 80 to 240 – Corallite height without rejuvenescense: 9 to 11 mm – Septal density: 8 to 20 for 5 mm – Trabecular density: 5 to 11 for 2 mm.

Similarities and differences

As *P. rejuvenescens* and *P. multiradiata*, erected and distinguished by Beauvais (1986), come from the same locality

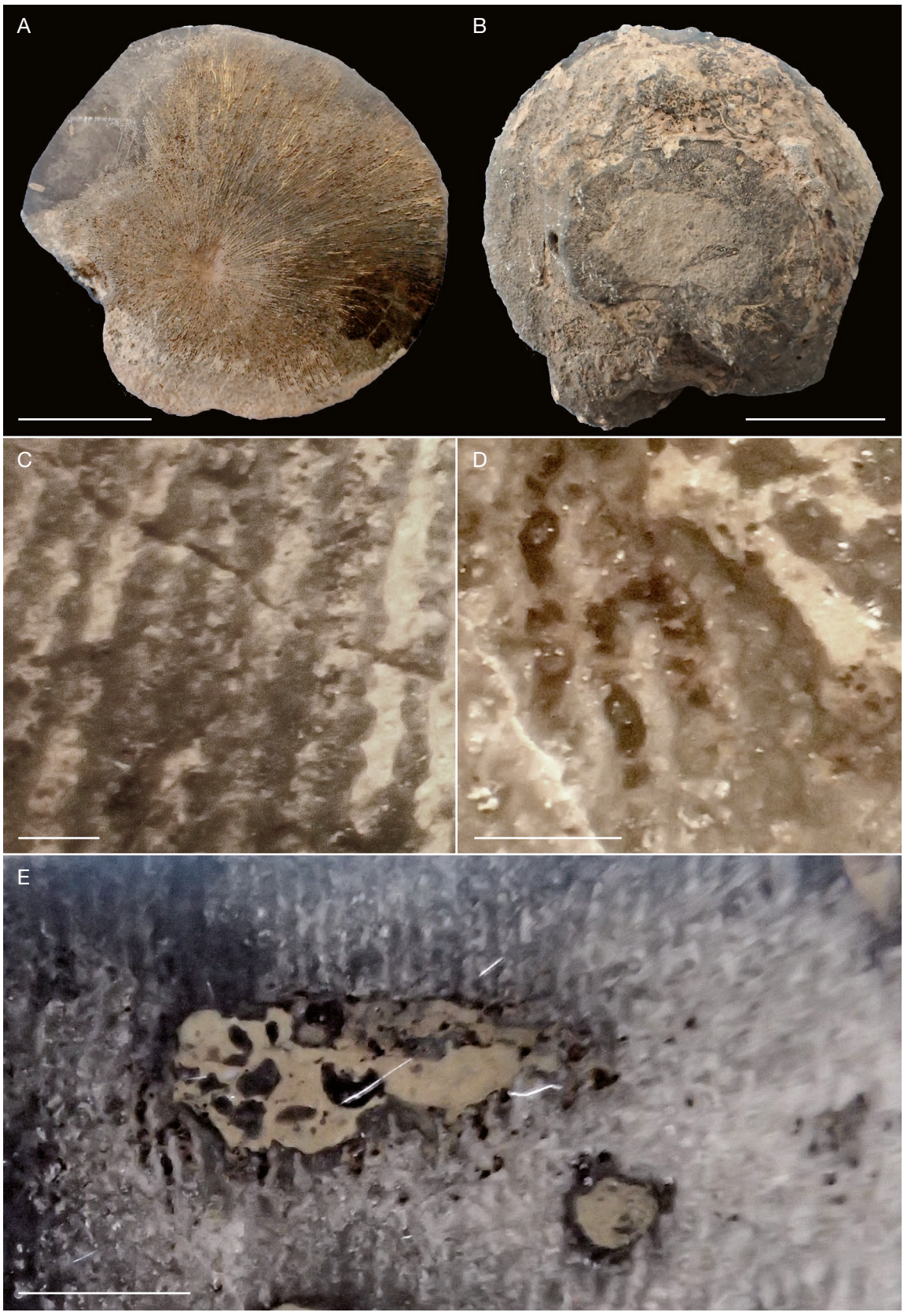

FIG. 24. — *Proleptophyllia magna* n. sp.: **A**, distal view of the specimen CPUN AM16160-1; **B**, proximal view of the specimen CPUN AM16160-1; **C**, pennular septal structure of the specimen CPUN AM16160-1 in distal view (skeleton in dark); **D**, pennular septal structure of the specimen CPUN AM16160-1 in polished longitudinal section; **E**, longitudinal polished section of the specimen CPUN AM16160-1. Scale bars: A, B, 2 cm; C, D, 0.5 mm; E, 2 mm.

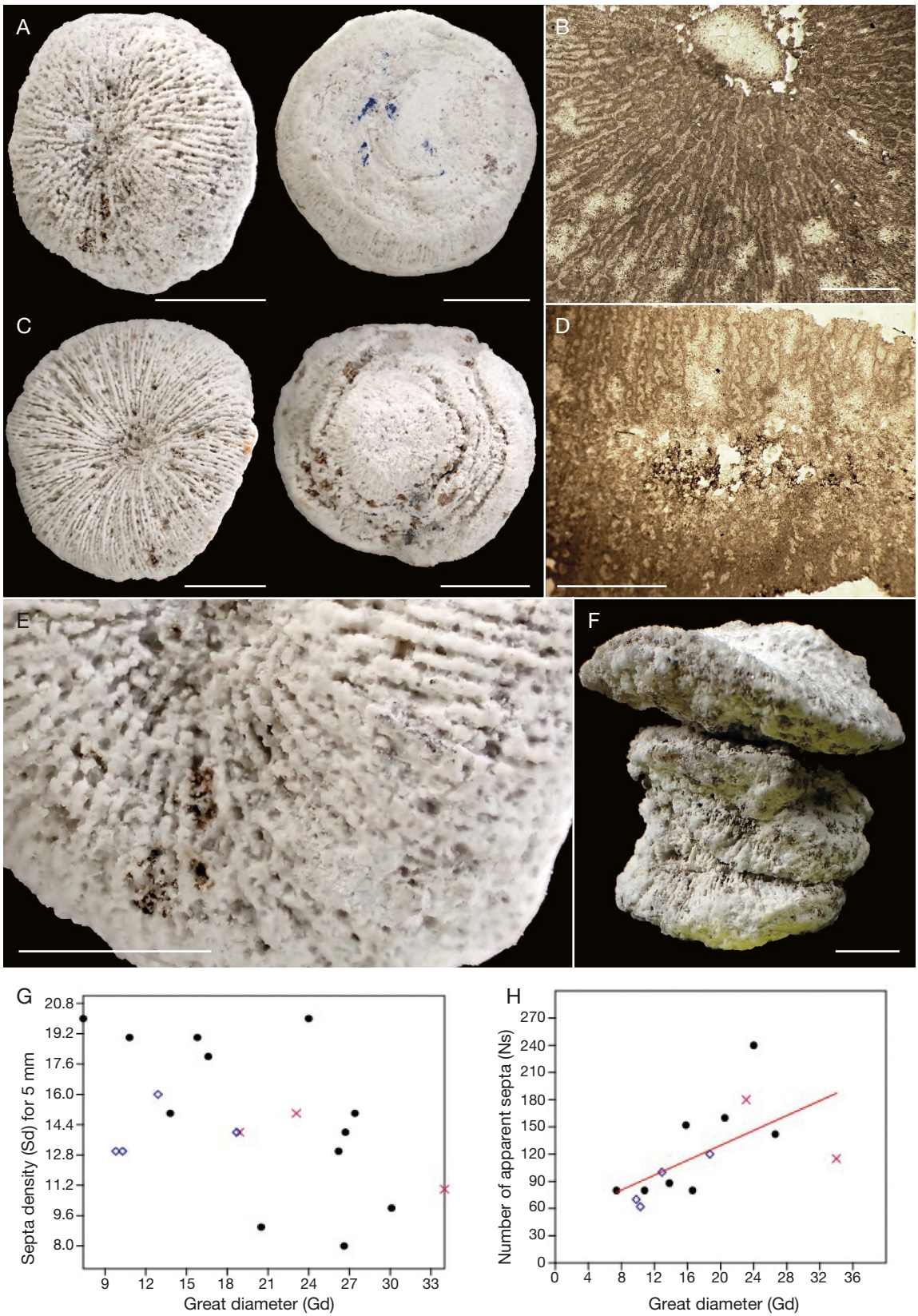

Fig. 25. — *Proleptophyllia multiradiata* Beauvais, 1986: **A**, upper and lower faces of one of the specimens MNHN.F.A32020 (batch). Scale: 1 cm and 5 **B**, detail in transverse thin section of the septal structure of *P. multiradiata* (coll. MNHN); **C**, upper and lower faces of one sample of *P. multiradiata* (Coll. MNHN); **D**, detail in longitudinal thin section of the septal structure of *P. multiradiata* (coll. MNHN); **E**, detail of the distally fenestrate pennular structure of septa; **F**, rejuvenescent specimen MNHN.F.R11642; **G**, graph presenting septal density as a function of the great diameter (Gd) of calices. The different symbols represent the different nominal species created by L. Beauvais (1986): **black dots**, *Proleptophyllia multiradiata*; **red cross**, *P. rejuvenescens* Beauvais, 1986; **blue rhombs**, *P. subcylindrica*; **H**, graph presenting the apparent number of septa as a function of the great diameter (**Gd**) of calices. Symbols have the same meaning as in Fig. 25G. Scale bars: A, 1 cm and 5 mm; B, 1.5 mm; C, 1 cm; D, 2 mm; E, 1 mm; F, 5 mm.

and differ only by the fact that *P. rejuvenescens* shows rejuvenescences, they are interpreted here as a case of intraspecific variability due to ontogenetical contingencies. On the other hand, important rates of morphologic variability in shapes and dimensions have been measured among *P. multiradiata* Beauvais, 1986, *P. rejuvenescens* Beauvais, 1986 and *P. subcylindrica* Beauvais, 1986. As statistical analysis did not distinguish them, we merged these three species under one single species (see figures 47.G, H). A synonymy with *Montlivaltia spiculata* Fromentel & Ferry, 1866 and *Procyclolites spiculata* Alloiteau, 1957 is suspected but cannot be comfirmed regarding to the type material of these taxa.

Proleptophyllia punctulum (Fromentel & Ferry, 1866), n. comb. (Fig. 26)

Montlivaltia punctulum Fromentel & Ferry, 1866: 124, pl. 34, fig. 3.

Procyclolites? *punctulum* – Alloiteau 1957: 107, pl. 5, fig. 11.

Proleptophyllia punctulum – Vasseur 2018: 304-305, fig. 3.80.

Type material. — Holotype: MNHN.F.M03502, by monotypy.

Type horizon. — Pliensbachian.

Type locality. — May-sur-Orne (Calvados, France).

Studied sample. — Holotype MNHN.F.M03502.

Geographic and stratigraphic ranges. — Pliensbachian of May-sur-Orne, Calvados, France.

Description

Solitary, conical coral, strongly infundibuliform with sharp calicular edges, circular in outline. Radial elements are subcompact, straight, free septa with distal edge ornamented with regular small trabecular teeth. Lateral faces hold pennulae with pennular rims curved upward. Radial symmetry. No columella or maybe a weak parietal papillose one in depth. Endotheca and synapticulae not observed. Peripheral wall of undefined nature. An epitheca *s.l.* wraps the corallum.

Calicular diameter: 22 mm – Number of septa: approximately 216 – Septal density: 7 per 2 mm – Trabecular density 6 per 2 mm.

Similarities and differences

This specimen is distinct among the species of the genus *Proleptophyllia* because of its very specific shape and the regularity of its septal apparatus.

Proleptophyllia subphaceloida n. sp. (Fig. 27)

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Proleptophyllia sp. 2 – Vasseur 2018: 309-310, fig. 3.82.

Type material. — Holotype CPUN AM16180-2.

Studied sample. — CPUN AM16180-2.

Etymology. — Refers to the phaceloid form of the corallum.

Type horizon. — Pliensbachian.

Type locality. — Amellagou, 31°57'33"N, 5°2'7"W, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

Remarks

In this case of incipient phaceloid form, the papillose columella is larger and better defined in the clearly phaceloid genus *Phacelophyllia* Beauvais, 1986.

Description

Subphaceloid corallum made of two calices growing from a bigger parent corallite probably by a rejuvenescence process. External face is covered by an epitheca *s.l.* with concentric wrinkles. The calice is subcircular to elliptic in outline, convex, with an elliptic small fossa in the axial zone in which septa plunge. Radial elements are straight, subcompact, free costosepta that are thin and numerous, and of which fenestrate distal ornamentation reveals a pennular growth pattern with meniana subsequently embedded by stereome deposits. Distal edge not observed but probably with homogeneous round teeth due to the architecture of the radial elements. No columella. Wall parathecal. Synapticulae present. Endotheca made of vesicular dissepiments. Bilateral symmetry appears by the elongation of the fossa.

Calicular diameter: 23 to 31 mm – Number of septa: approximately 170 – Septal density: 5 per 2 mm.

Similarities and differences

Very close to *P. granulum* (Fromentel & Ferry, 1866), this taxon differs from the latter by the fact that it is the only known colonial form of *Proleptophyllia*. In addition, its calices are slightly bigger and the fossa seems to be less marked.

Family Epismiliidae? Alloiteau, 1952

Genus *Epismilia*? Fromentel, 1861

Type species. — *Epismilia haimei* Fromentel, 1861 (Fromentel 1861: 105), by monotypy.

Remark

The Epismiliidae differ from the Stylophyllidae by the more horizontal septal projections at the inner edge. This character is however less pronounced than in the type specimen of the type species of the genus *Epismilia* from Upper Jurassic.

Fig. 26. — *Proleptophyllia punctulum* (Fromentel & Ferry, 1866), n. comb.: **A**, holotype MNHN.F.M03502; **B**, lateral view of the holotype MNHN.F.M03502; **C**, distal view of the holotype MNHN.F.M03502; **D**, detail of the pennular ornamentation of septa of the holotype MNHN.F.M03502. Scale bars: A, B, 1 cm; C, 5 mm; D, 1 mm.

Epismilia? sp.
(Fig. 28)

pars Cyclophyllopsis cornutiformis Beauvais, 1986 in collection.

Epismilia? sp. 1 – Vasseur 2018: 192-193, fig. 3.36.

Studied samples. — Three specimens (MNHN.F.A32015) found among the *Cyclophyllopsis cornutiformis* paratypes arbitrarily numbered 1, 2 and 3 for the needs of this description (collections MNHN).

Geographic and stratigraphic ranges. — Pliensbachian of Jebel Bou Dahar (Morocco).

Description

Solitary, cylindro-conical corallum subcircular to elliptic (quite distorted) in outline. Radial elements are straight, free septa or costosepta made of septal spines projecting at the inner edge of septa, providing a spiky aspect characteristic of the genus. Lateral faces are smooth. No real columella observed but an elongated fossa that defines a

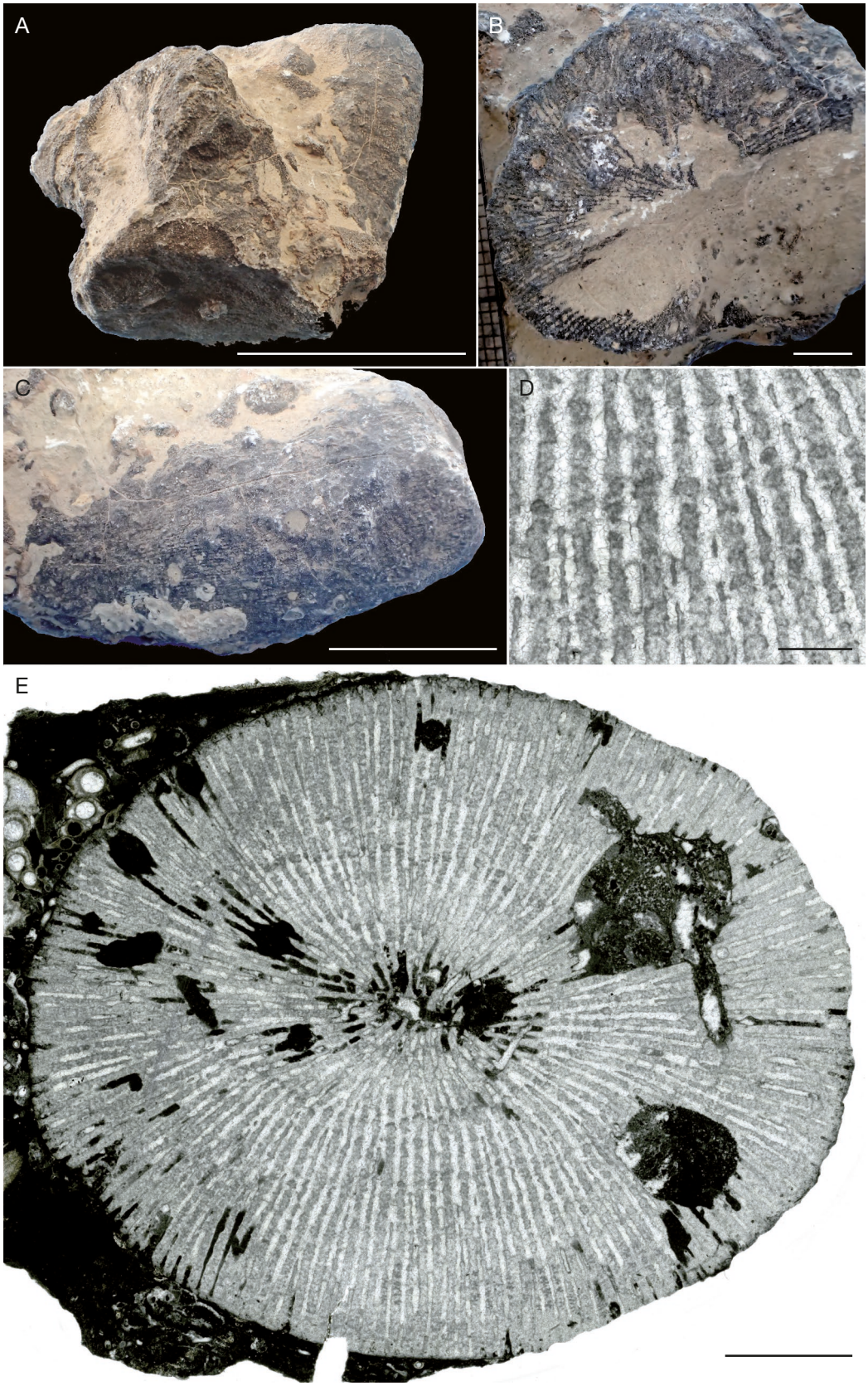

Fig. 27. — *Proleptophyllia subphaceloida* n. sp.: **A**, proximal-lateral view of the specimen CPUN AM16180-2; **B**, detail of one of the calices of the specimen CPUN AM16180-2; **C**, lateral view of one of the corallites of the specimen CPUN AM16180-2; **D**, detail in transverse thin section of the septal structure of the specimen CPUN AM16180-2; **E**, transverse distal thin section of one corallite of the specimen CPUN AM16180-2. Scale bars: A, 3 cm; B, 5 mm; C, 2 cm; D, 1 mm; E, 4 mm.

bilateral symmetry. Septal projections may produce a deep parietal papillose columella. Endotheca not observed. No synapticulae. Wall probably parathecal or septothecal. An epitheca *s.l.* wraps the corallite.

Calicular diameter: 7 to 17 mm – Number of septa: approximately 70 to 132 – Septal density: 5 to 8 per 2 mm – trabecular density: 5 to 7 per 2 mm.

Remark

Many species assigned to *Episimilia* fit with our specimens with regards to their number of septa and diameter. However many of them are not documented enough in terms of septal structure and ornamentation. This genus for which many species have been created obviously needs a revision. This is the reason why we have chosen the open nomenclature in the present case.

Family Hispaniastraeidae Boivin, Vasseur, Lathuilière, Lazăr, Durlet, Martindale, El Hmidi & Martini, 2019

Hispaniastraeidae Boivin, Vasseur, Lathuilière, Lazăr, Durlet, Martindale, El Hmidi & Martini, 2019: 7.

Genus *Hispaniastraea* Turnšek & Geyer, 1975

Species originally included. — *H. murciana* and *H. ramosa.*

Type species. — *Hispaniastraea murciana* Turnšek & Geyer, *in* Turnšek, Seyfried & Geyer, 1975 (Turnšek *et al.* 1975: 22, pl. 20-21), by original designation.

Hispaniastraea murciana Turnšek & Geyer, 1975 (Fig. 29)

Hispaniastraea murciana Turnšek & Geyer *in* Turnšek, Seyfried & Geyer, 1975: 138, pl. 20, figs. 1-2, pl. 21,figs. 1-2. — Vasseur 2018: 216-217, fig. 3.46. — Boivin *et al.* 2019: fig. 4-5 *cum syn*.

Chaetetes (*Pseudoseptifer*) *murciana* – Beauvais 1980: 30, pl. 3, fig. 2.

Type material. — Holotype: colony no. 33 (original designation); Turnšek *et al.* 1975: 22, pl. 20-21, from collection Seyfried reposited in Departamento de Paleontología of the University of Granada (UG), Spain.

Type horizon. — Upper Sinemurian-Lower Pliensbachian, Lower Jurassic.

Type locality. — Zarcilla de Ramos (Province of Murcia, Spain).

Studied samples. — Seven specimens: MNHN.F.LB5374, CPUN DA0106E2-4, CPUN 2303A1-6, CPUN AM16160-2, CPUN DA2905E1-2, CPUN DA2905E2-2, CPUNDA3105E3-1.

Geographic and stratigraphic ranges. — Sinemurian of Murcia (Spain) and Languedoc (France), Pliensbachian of Calabria (Italy) and Pliensbachian to Lower Toarcian (pre-TOAE) of High Atlas and Middle Atlas of Morocco.

Description (in collaboration with S. Boivin)

Cerioid massive, lamellar or ramose colony. Subcircular to polygonal corallites sometimes strongly distorted, particularly in the middle of the branches. The septal apparatus is characterized by one major septum that dominates in width and thickness. It is straight or curved, compact, ornamented only by periodic auriculae along its inner edge. The auriculae are subcircular in transverse section (they fill up to ¾ of the lumen surface) and reveal a horizontally elongated rhombic shape or a platelike shape with rims turned upward in longitudinal section perpendicular to the mid-septal plan. The inner edge of the major septum is thus enlarged at each auricula and narrower and rounded between successive auriculae, conferring to the lumen a characteristic horseshoe shape. Minor septa are short, compact, rounded or sharp and generally restricted within the wall that makes them sometimes undistinguishable. The inner edge of septa is covered of granules that alternate with the auriculae of the major septum. In some parts of the colonies where geometrical constraints of construction are weak, all the major septa of the neighbouring corallites are oriented in the same direction. Thin, concave (in distal view) tabulae can sometimes be observed. Microstructure not preserved. Two different modes of budding coexist in the colonies: extracalicular budding and intracalicular septal budding. Many heterogeneously distributed intercalicular canals have been observed. These canals are restricted to some parts of the colonies and their origin is still unknown. The hypothesis of an association between non-corals organisms is considered.

Great diameter of the lumen: 0.46 to 1.95 mm – Small diameter of the lumen: 0.14 to 1.44 mm – Thickness of the wall: 0.09 to 0.84 mm – Distance between calices centers: 0.49 to 2.10 mm – Length of major septa: 0.11 to 0.99 mm – Thickness of major septa: 0.05 to 0.57 mm – Number of apparent septa: 1 to 12.

Remarks

This taxon is morphologically close to a chaetetid sponge group that belongs to the sug-genus *Chaetetes* (*Pseudoseptifer*) Fischer, 1970 but differs from the latter by the presence of auriculae on the major septum, intercalicular canals and a serrated aspect of the wall due to abortive septa (see Boivin *et al.* 2019).

Hispaniastraea ousriorum Boivin, Vasseur, Lathuilière, Lazăr, Durlet, Martindale, El Hmidi & Martini, 2019 (Fig. 30)

Hispaniastraea ousriorum Boivin, Vasseur, Lathuilière, Lazăr, Durlet, Martindale, El Hmidi & Martini, 2019: 10, fig. 7-8.

Hispaniastraea sp. 1 – Vasseur 2018: 219-220, fig. 3.47.

Type material. — Holotype no. SB367 (Collections of the Direction of Geology, Ministère de l'Énergie, des Mines et du Développement durable – Département de l'Énergie et des Mines, Rabat, Morocco).

Type horizon. — Upper Pliensbachian, Lower Jurassic.

Type locality. — Koudiat Ech Chehem, Guigou Plateau, Middle Atlas Mountains, Morroco.

Studied samples. — Three specimens: CPUN AM16160-3, CPUN AM16188-5, CPUN CDAm1.

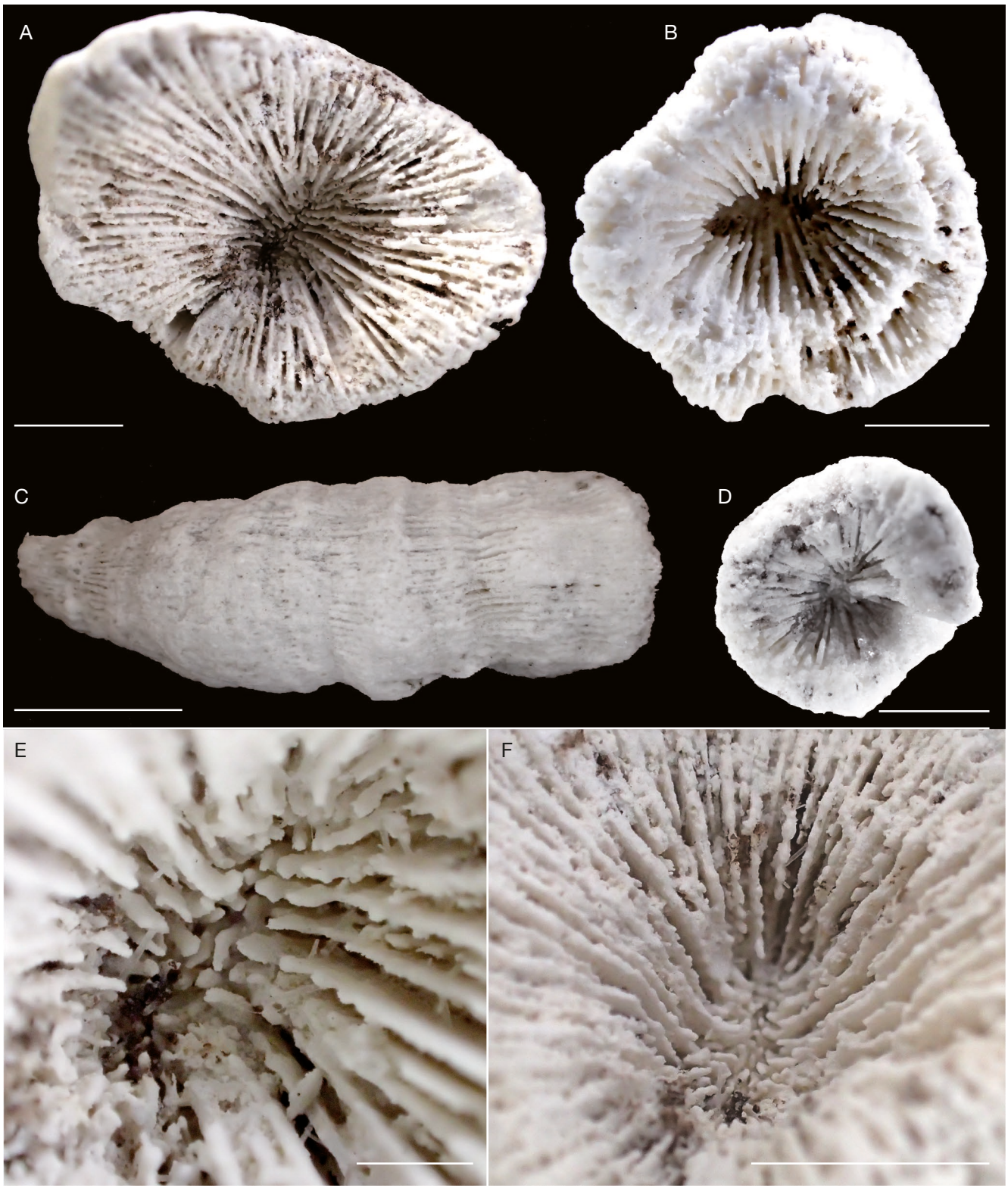

Fig. 28. — *Episimilia*? sp.: **A**, distal view of the specimen 1 from the batch MNHN.F.A32015; **B**, distal view of the specimen 2 from the batch MNHN.F.A32015; **C**, longitudinal view of the specimen 3 from the batch MNHN.F.A32015; **D**, distal view of the specimen 3 from the batch MNHN.F.A32015; **E**, detail of the axial fossa of the specimen 1 from the batch MNHN.F.A32015; **F**, detail of the axial fossa of the specimen 1 from the batch MNHN.F.A32015. Scale bars: A, D, F, 5 mm; B, 4 mm; C, 1 cm; E, 1 mm.

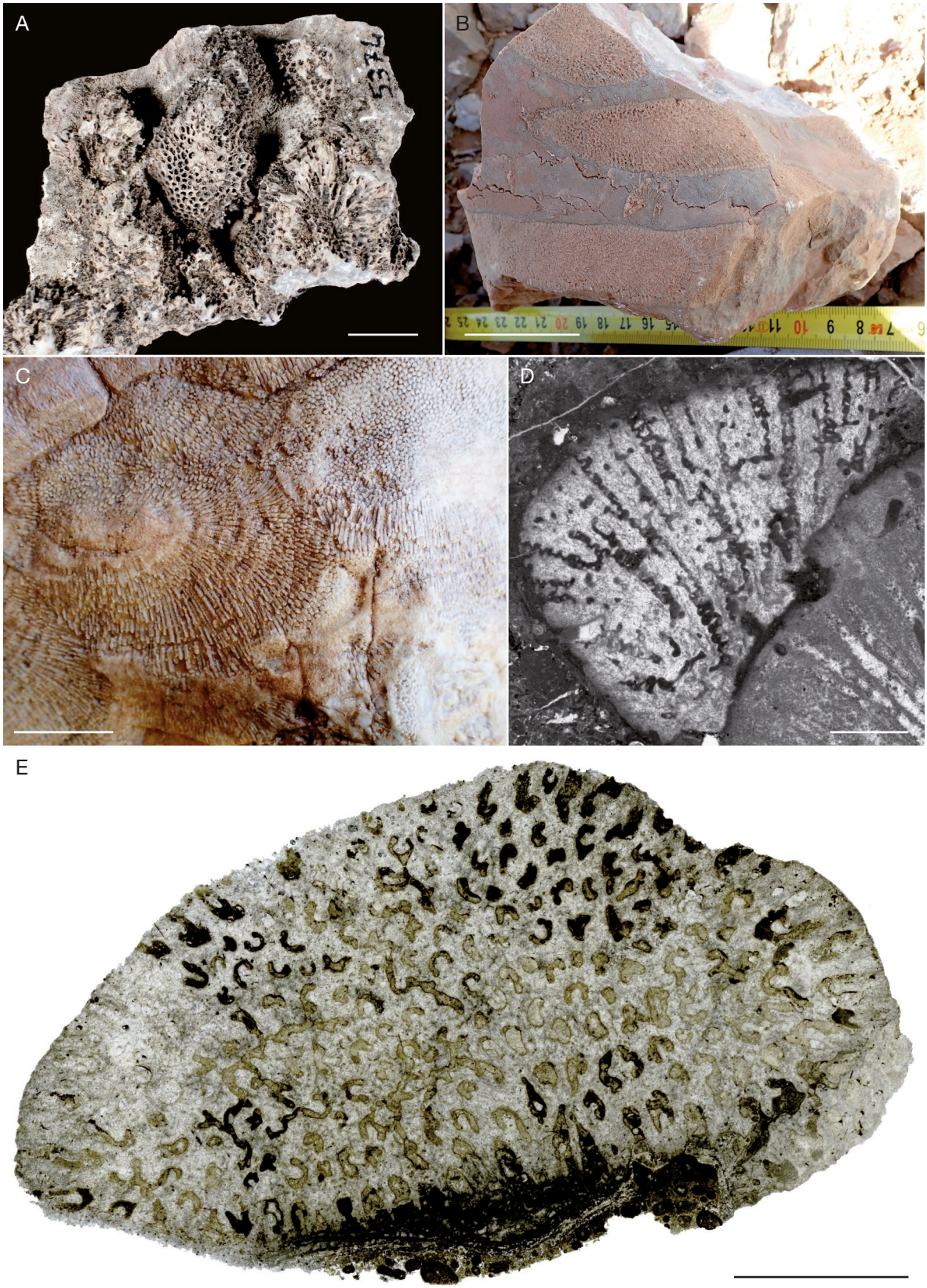

Fig. 29. — *Hispaniastraea murciana* Turnšek & Geyer, 1975: **A**, distal view of the specimen MNHN.F.LB5374; **B**, ramose specimen pictured in the field (Dades Valley, Morocco, 31°33'43"N, 5°54'13"W); **C**, massive specimen pictured in the field (Vallone del Gardo, Calabria, Italy, 39°27'51"N, 16°47'26"E); **D**, longitudinal thin section of the specimen CPUN DA2905E1-2; **E**, transverse thin section of the specimen CPUN AM16160-2. Scale bars: A, 1 cm; B, 4 cm; C, 2 cm; D, 2 mm; E, 5 mm.

Geographic and stratigraphic ranges. — Upper Pliensbachian of Middle and High Atlas of Morocco.

Description (in collaboration with S. Boivin)
Cerioid massive, lamellar or ramose colony. Subcircular to polygonal corallites. The septal apparatus is composed of a major septum, one to four well-developed septa (S1) and a few minor septa (S2). Major septum is highly dominant in length and thickness, straight, compact, ornamented by auriculae on the inner margin of septum. Ordinary, S1 septa also bear auriculae. Auriculae occur in periodic intervals, and are sub-circular in transverse section. In longitudinal section (perpendicular to the septum plan), auriculae are shaped like a horizontally elongated lozenge or a spoon. Inner margin of S1 is strongly enlarged at the level of the auriculae and rounded between the auriculae. Minor septa very short, compact, rounded, and mostly not discernible in the wall. Inner margins of the minor septa with sharp granules that alternate with auriculae. Thin, concave (in distal view) tabulae can be linked to auriculae. Vestiges of microstructure have been observed: straight axes parallel to the wall or divergent with an angle of 10 to 20° appear in longitudinal section. In transverse section we observed black spots in the middle of the wall surrounding the calices. Many heterogeneously distributed intercalicular canals have been observed. These canals are restricted to some parts of the colonies. One single corallite can be connected to until four canals, and sometimes two corallites can be connected by two different canals. Their origin is still unknown. The hypothesis of an association between *Hispaniastraea* and non-corals organisms is considered.

Great diameter of the lumen: 0.47 to 0.89 mm – Small diameter of the lumen: 0.35 to 0.78 mm – Thickness of the wall: 0.09 to 0.72mm – Distance between calices centers: 0.27 to 1.18 mm – Length of major septa: 0.14 to 0.36 mm – Thickness of major septa: 0.03 to 0.21 mm – Number of apparent septa: 3 to 8.

Similarities and differences
This species differs from *Hispaniastraea murciana* Turnšek & Geyer, 1975 by the presence of 1 to 3 S1 septa (there is always one single major septum in *H. murciana*), and smaller auriculae (the inner space is shared by the auriculae of the different S1 septa).

Family *incertae sedis*
Genus indet.

Gen. et sp. indet.
(Fig. 31)

Nov. gen. 2 sp. 1 – Vasseur 2018: 265-266, fig. 3.65.

Studied samples. — Two specimens: CPUN DA2905E3, CPUN DA3105E1.

Geographic and stratigraphic ranges. — Pliensbachian of Dades Valley (High Atlas of Morocco).

Description
Phaceloid colony with extracalicular budding. Radial elements are straight, free or joining, apparently subcompact (even though badly preserved) with lateral faces holding pennulae or mi-pennulae. A columella seems to occur at the axis of the corallites but it cannot be confirmed because of the bad preservation. Synapticulae present. No wall and no endotheca but again they have possibly disappeared during the fossilization process.

Calicular diameter: 2 to 8 mm – Distance between calices centers: 3 to 8 mm – Number of septa: approximately 50 to 90 – Septal density: 10 to 13 for 2 mm.

Similarities and differences
Resembles the species *Craspedophyllia ramosa* Roniewicz, Stanley, Da Costa Monteiro & Grant-Mackie, 2005 from Triassic but it would be necessary to confirm the presence of a styliform columella and an epitheca to merge this taxon under the Triassic species.

Genus *Neorylstonia* Vasseur, Boivin, Lathuilière, Lazar, Durlet, Martindale, Bodin & Elhmidi, 2019,
nomen novum pro Mesophyllum Beauvais, 1986
non Schlüter, 1889

Originally included species. — *Mesophyllum pseudocolumellatum* Beauvais, 1986.

Type species. — *Mesophyllum pseudocolumellatum* Beauvais, 1986 (Beauvais 1986: 20), by original designation.

Neorylstonia pseudocolumellata (Beauvais, 1986)
(Fig. 32)

Type material. — Holotype: MNHN.F.R11604 (original designation), Beauvais 1986: 20, pl. 4, fig. 1a-1b; paratypes figured in Beauvais 1986: pl. 4, fig. 1c, d and e.

Type horizon. — Pliensbachian.

Type locality. — Beni Tadjit, Morocco.

Mesophyllum pseudocolumellatum Beauvais, 1986: 20, pl. 4, fig. 1a-1b.

Neorylstonia pseudocolumellata – Vasseur 2018: 259-260, fig. 3.63; Vasseur *et al.* 2019: 9 -17, fig. 2- 6, 13.6.

Studied samples. — 91 specimens described in Vasseur *et al.* (2019) (collections MNHN and CPUN).

Geographic and stratigraphic range. — Sinemurian of Amellagou (Jebel Serdrar, High Atlas) and Pliensbachian of Amellagou, Dades Valley, Koudiat Ech Chehem and Taililout (High and Middle Atlas) in Morocco; Pliensbachian of Italy (Caloveto, Calabria).

Description
Solitary coral. Corallum ceratoid, straight or curved. The calice is subcircular in outline. Costosepta straight or slightly curved (possibly post-mortem distortion), free, compact, occasionally rhopaloid. Some first-order septa (S1) rarely reach the axial

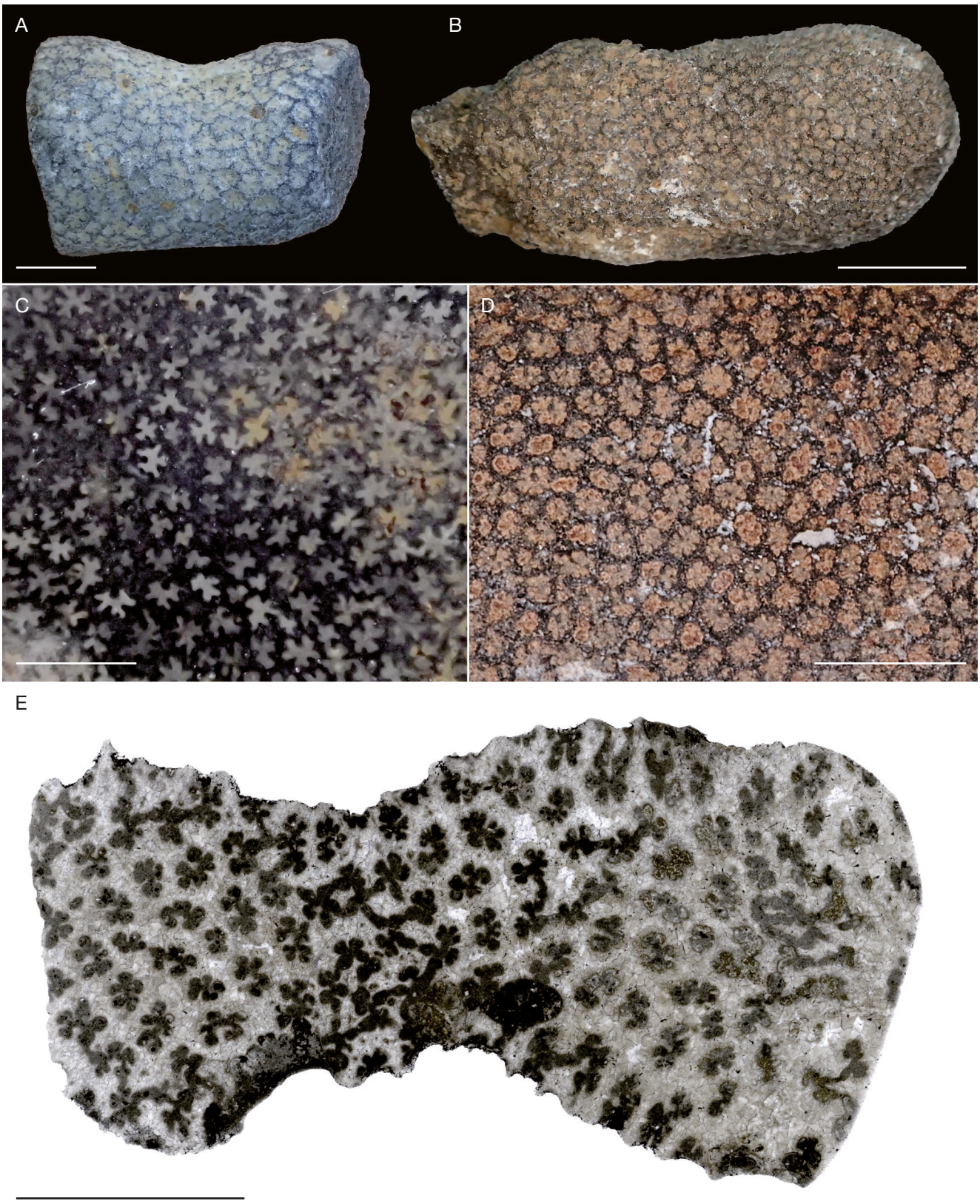

FIG. 30. — *Hispaniastraea ousriorum* Boivin, Vasseur, Lathuilière, Lazăr, Durlet, Martindale, El Hmidi & Martini, 2019: **A**, specimen CPUN CDAm1; **B**, specimen CPUN AM16188-5; **C**, transverse polished section of the specimen CPUN AM16160-3; **D**, distal view of the calicular surface of the specimen CPUN AM16188-5; **E**, transverse thin section of the specimen CPUN CDAm1. Scale bars: A, 5 mm; B, 1 cm; C, 2 mm; D, E, 4 mm.

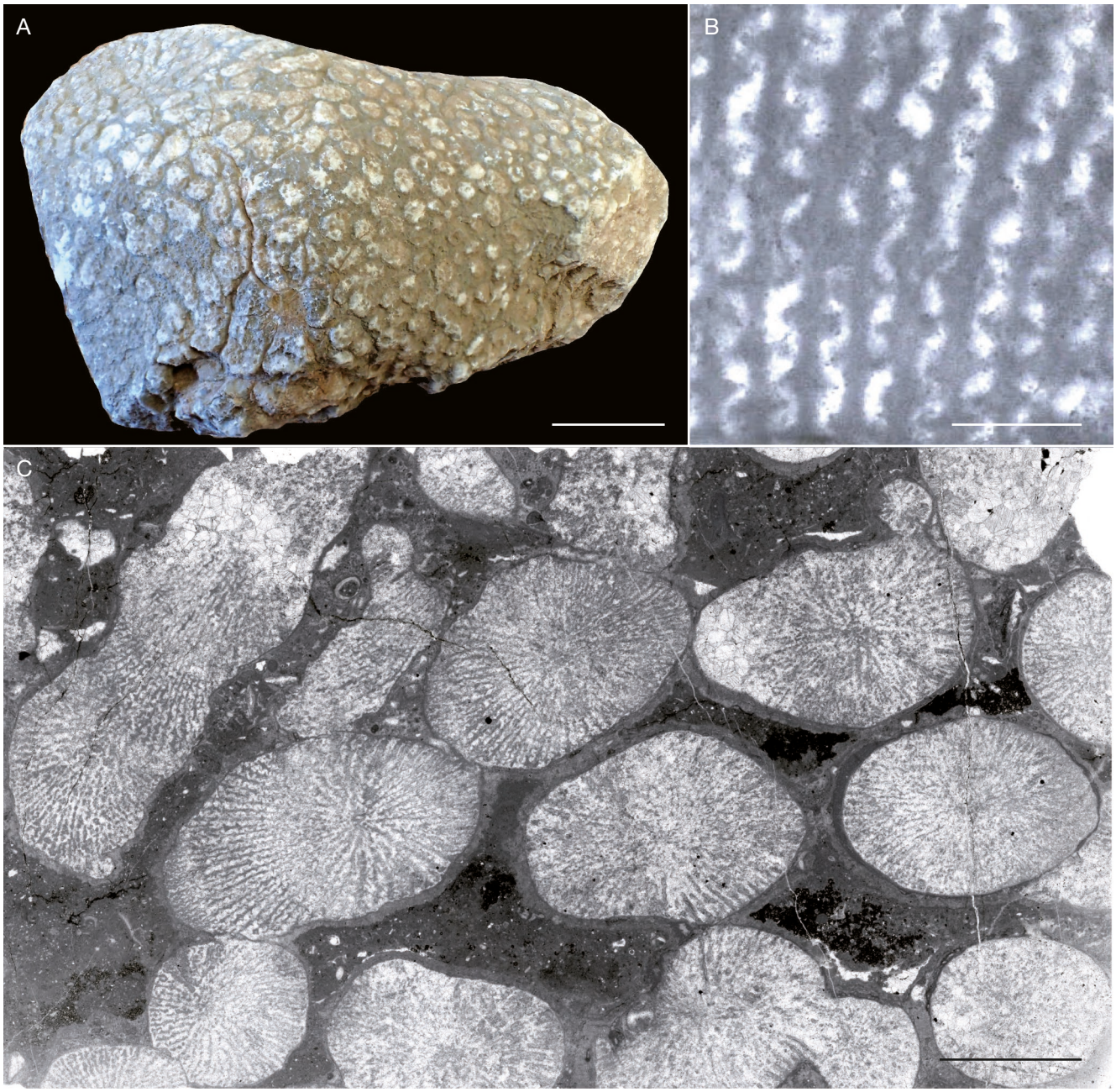

Fig. 31. — Gen. et sp. indet.: **A**, distal view of the specimen CPUN DA3105E1; **B**, detail in longitudinal thin section of pennular structures of septa in the specimen CPUN DA3105E1; **C**, transverse thin section in the specimen CPUN DA3105E1. Scale bars: A, 3 cm; B, 0.5 mm; C, 4 mm.

structure but in most cases the inner edge abruptly dips in the fossa. Lateral faces and distal edge are smooth. No pali. Radial elements are commonly arranged in three distinct size orders with different length and width in transverse sections but S1 and S2 are occasionally indistinct because of similar sizes. In contrast, some other samples show clearly four distinguishable size orders of septa. In the latter case, the first and second size orders geometrically correspond to a subdivision of the S1. Lastly, the S3 are sometimes missing. On the basis of the described arrangement of septal length and thicknesses a very classical model of septal insertion can be proposed, namely 96 septa distributed in five ontogenetical cycles according to 6+6+12+24+48 septa. This model of septal insertion is statistically grounded by univariate statistical analysis in which the number 96 shows a well-marked mode (Vasseur *et al.* 2019). Ghosts of septal structures can sometimes be observed in thin sections. They consist in transverse section of a darker axial zone within the septum, a brighter zigzag line or some dark spots in a line considered as remains of "centers of calcification" or centers of rapid accretion (Stolarski 2003). Growth lines in "ogive" or "gloves fingers" can be seen in longitudinal sections, resulting from the deposition of different successive layers of stereome thickening the septa (thickening deposits of Stolarski 2003). Axial structure present, in the form of

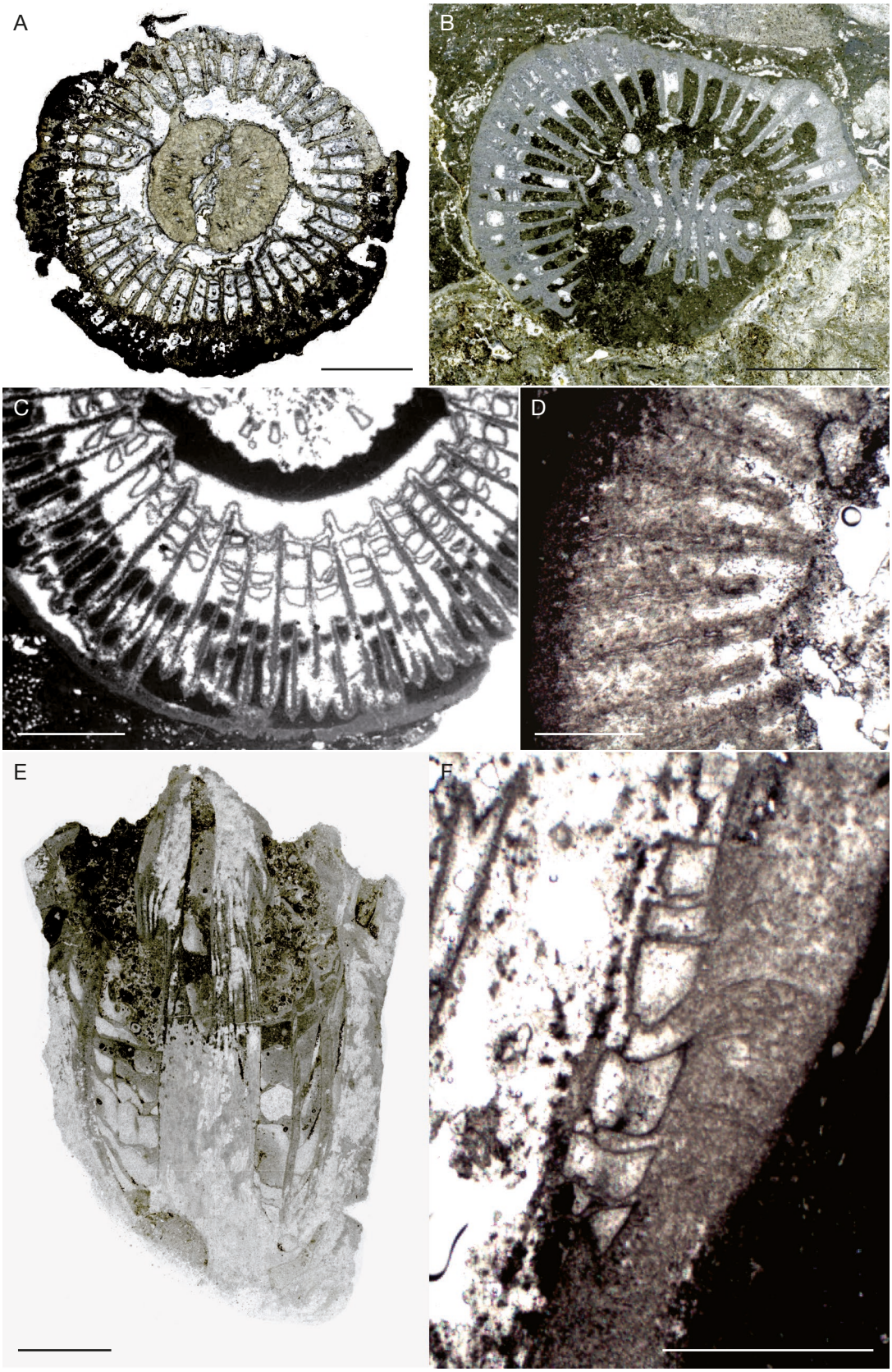

FIG. 32. — *Neorylstonia pseudocolumellata* (Beauvais, 1986): **A**: transverse section of the specimen CPUN AM16164, showing a type 2 pseudocolumella with visible pseudocolumellar septa; **B**: transverse section of the specimen CPUN AM175 showing a type 1 pseudocolumella; **C**: transverse section in the specimen CPUN DA2905E1.1 showing the true epitheca surrounding the septal apparatus and the stereome deposits on septa; **D**: detail of the ghosts of septal structure in transverse section (specimen CPUN 2110A2) and the stereome deposits in "ogives" or "glove fingers"; **E**: longitudinal section of the specimen MNHN.F.A57331-2 showing the endothecal organization in tabular dissepiments and the axial porosity of the pseudocolumella; **F**, detail of the parathecal wall in continuity with the tabular dissepiments (longitudinal section of the specimen CPUN 2110A2). Scale bars: A, B, E, F, 5 mm; C, 4 mm; D, 2 mm.

a Rugose-like calicular boss made of septa and endotheca. According to Milne Edwards & Haime (1848: 78) and later Berkowski & Weyer (2012) it corresponds to the definition of a pseudocolumella. This pseudocolumella presents different morphologies during the polyp life, giving the fossils a very characteristic aspect in transverse section. It is made of 16 to 26 septa not organized in a strict radial symmetry, more often 21 to 22, organized even in two crescents separated by an axial cavity (type 2) or in the form of a star with opposite septa linked in the calicular axial zone (type 1). Between these two extreme morphologies are some transition states.

In the main cases, hexameral symmetry can be established. The superimposed bilateral symmetry is evidenced by the spatial organization of the axial structure. Endotheca abundant, made of tabular dissepiments regularly arranged in the axial zone. Parathecal wall. Paratheca is continuous with the dissepiments. Synapticulae absent. A true epitheca with growth striae and wrinkles encloses the corallite.

Calicular diameter: 9 to 29 mm – Number of septa: 41 to 104 (mostly 96) – Septal density: 5 to 10 S1 + S2 for 5 mm.

SIMILARITIES AND DIFFERENCES

This taxon is the single case of post-paleozoic coral with a pseudocolumella *sensu* Berkowski & Weyer (2012) referenced up until now.

Genus *Pseudodiplocoenia* Alloiteau, 1958

SPECIES ORIGINALLY INCLUDED. — *P. lazarivensis* Alloiteau, 1958.

TYPE SPECIES. — *P. lazarivensis* Alloiteau, 1958, by monotypy.

Pseudodiplocoenia cf. ***soltanensis*** Beauvais, 1966 (Fig. 33)

cf. *Pseudodiplocoenia soltanensis* Beauvais, 1966: 19 or 131, pl. 1, fig. 7.

Pseudodiplocoenia sp. 1 – Vasseur 2018: 317-318, fig. 3.85.

TYPE MATERIAL. — Holotype MNHN.F.R10776.

TYPE HORIZON. — Probably Callovian.

TYPE LOCALITY. — Tunisia, between Tazerdunet and Ksar Kredima.

Studied samples. — Five specimens: CPUN MA0504E7-8, CPUN MA0704E3-3, CPUN MA0704E4-2, CPUN MA0704E3-11, CPUNMA0904E9-2.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Koudiat Ech Chehem (Guigou plateau, Morocco), Callovian? of Tunisia.

DESCRIPTION

Cerioid colony with polygonal calices multiplying by extracalicular budding. Radial elements are subcompact, free or joined, slightly wavy septa. The S1 septa are generally linked to a porous parietal columella and they sometimes look cuneiform. The wall is probably septothecal, tectiform in distal parts and producing in section a characteristic zigzag line between the calices. Endotheca made of sparse vesicular dissepiments. No synapticulae.

Calicular diameter: 2.5 to 6.1 mm – Distance between calices centers: 3 to 7 mm – Number of septa: approximately 26 – Septal density: 5 to 6 per 2 mm.

SIMILARITIES AND DIFFERENCES

Differs from *Kompsasteria* Roniewicz, 1989, *Rhaetiastrea* Roniewicz, 1974, *Septastraeopsis* Alloiteau, 1953 and *Sakalavastraea* Alloiteau, 1958 by its extracalicinal mode of budding (and also by its parietal porous columella in comparison to the first two genera cited above).

REMARKS

The present material is referred to *P. soltanensis* with a cf due to the highest values of diameter that are not mentioned in the initial description of the species. We observed also a tendency to produce a small depression in the center of the axial structure in some calices (Fig. 51E). This character cannot be observed in the holotype due to its poor preservation.

Genus *Spongiocoenia* n. gen.

urn:lsid:zoobank.org:act:41CED0DF-4AD3-4F29-BBFA-55A99C480CA3

TYPE SPECIES. — *Coccophyllum liasicum* Turnšek & Geyer *in* Turnšek, Seyfried & Geyer, 1975.

DIAGNOSIS. — Colonial massive or ramose colony with calices separated by a porous coenosteum. Spine-like, smooth septa. Columella and endotheca absent. Synapticulothecal wall. Extracalicular budding.

ETYMOLOGY. — Refers to the spongious nature of the coenosteum. Turnšek & Geyer (in Turnšek *et al.* 1975) placed their species within the genus *Coccophyllum* Reuss, 1865, family Stylophyllidae Frech 1890 (in fact they attribute erroneously the family to Volz 1896). *Coccophyllum* is a cerioid genus and we cannot place the present genus within the family Stylophyllidae with the capacity to produce such a spongious coenosteum, which recalls more non-scleractinian corals like *Plagiosolenacis* Alloiteau, 1957 and *Paleomillepora* Gabilly & Lafuste, 1957. Turnšek *et al.* (1975) noticed the proximity with Helioporid octocorallians.

Spongiocoenia liasica (Turnšek & Geyer, 1975), n. comb. (Fig. 34)

Coccophyllum liasicum Turnšek & Geyer in Turnšek, Seyfried & Geyer,1975: 21, taf. 19.

pars Plagiosolenacis laffittei – Alloiteau 1957: 386, non pl. 12, fig. 2-3, MNHN.F.J08981 (some of the paratypes).

Nov. gen. 1 sp. 1 – Vasseur 2018: 263-264, fig. 3.64.

TYPE MATERIAL. — *Coccophyllum liasicum*, no. 55 from collection Seyfried housed in Departamento de Paleontología of the University of Granada (UG), Spain.

STUDIED SAMPLES. — Seven specimens: CPUN DA2905E1-5, CPUN DA3105E2-8, CPUN DA3105E3-3, CPUN AM16178-2, CPUN AM16178-11, CPUN AM16188-7, CPUNAM16188-31.

TYPE HORIZON. — Upper Sinemurian- Lower Pliensbachian.

TYPE LOCALITY. — Zarcilla de Ramos (Murcia, Spain).

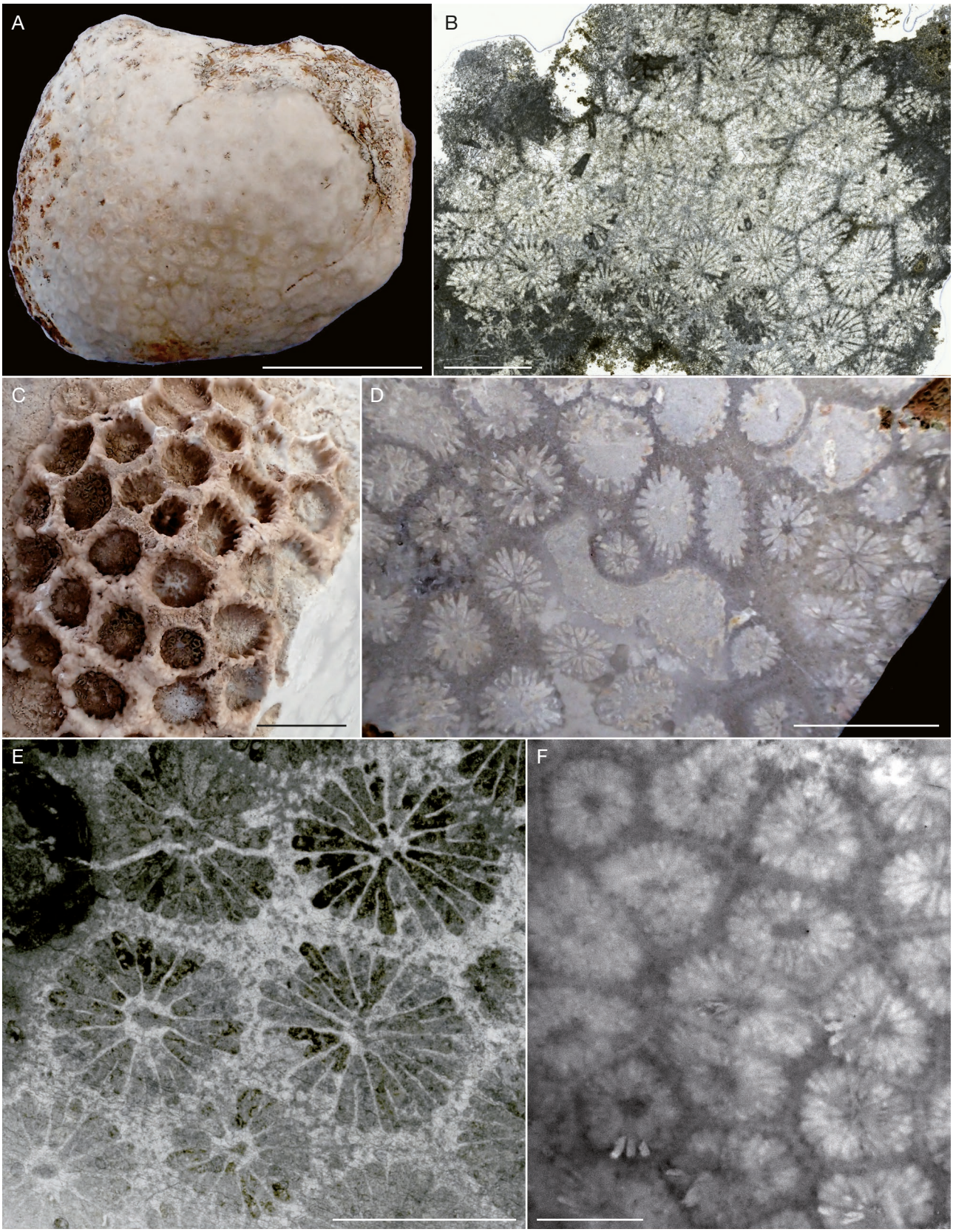

FIG. 33. — *Pseudodiplocoenia* cf. *soltanensis* Beauvais, 1966: **A**, distal view of the specimen CPUN MA0904E9-2; **B**, transverse thin section of the specimen CPUN MA0704E4-2; **C**, distal view of the specimen CPUN MA0704E3-3; **D**, polished transverse section in the specimen CPUN MA0704E3-3; **E**, transverse thin section of the specimen CPUN MA0704E3-3; **F**, transverse polished section in the specimen CPUN MA0904E9-2 with a bright line separating the walls of the different calices. Scale bars: A, 3 cm; B, C, 5 mm; D, 6 mm; E, 3 mm; F, 4 mm.

Geographic and stratigraphic ranges. — Pliensbachian and lower Toarcian (pre-TOAE, Polymorphum zone) of Dades Valley-Jebel Toksine and Pliensbachian of Amellagou (High Atlas of Morocco).

Description

Small massive plocoid colony (8 to 30 mm) with well calibrated circular calices separated by a wide porous coenosteum. The free, straight and smooth septa sometimes look like small spines on the inner edge of the calice. During their growth, calices tend to modify their trajectory, giving a wavy aspect to the lumen in longitudinal sections. No columella nor endotheca. Wall porous, synapticulothecal. The budding seems to be extracalicular.

Calicular diameter: 0.4 to 1 mm – Distance between calices centers: 1.5 to 3 mm – Number of septa: 6 to 8.

Similarities and differences

Differs from *Plagiosolenacis laffittei* Alloiteau, 1957 and *Paleomillepora liasica* Gabilly & Lafuste, 1957 by the presence of well-developed septa. Differs also from *Etallonasteria* Roniewicz, 1987 and *Alveopora* Blainville, 1830 by its smaller and more spaced calices and by the total lack of endothecal structures. In addition, the species under the genus *Alveopora* generally present a well-developed columella and teeth along the inner edges of septa.

Family Latomeandridae Alloiteau, 1952

Genus *Dimorphastrea* d'Orbigny, 1850

Species originally included. — *Dimorphastrea grandiflora* d'Orbigny, 1850, *D. crassisepta* d'Orbigny, 1850, *D. alternata* d'Orbigny, 1850, *D. bellula* d'Orbigny, 1850, *D. excavata* d'Orbigny, 1850.

Type species. — *Dimorphastrea grandiflora* d'Orbigny, 1850 (d'Orbigny 1850: vol. 2, p. 93), designation by Gregory (1900).

Dimorphastrea? *menchikoffi* (Beauvais, 1986) (Fig. 35)

Dimorphastraea [sic] *menchikoffi* Beauvais, 1986: 51, pl. 13, fig. 3. — Vasseur 2018: 168-169, fig. 3.26.

Type material. — Holotype: MNHN.F.R11641, Beauvais 1986: 51, pl. 13, fig. 3.

Type horizon. — Domerian.

Type locality. — Beni Tadjit, Morocco.

Studied sample. — Holotype MNHN.F.R11641.

Geographic and stratigraphic ranges. — Pliensbachian of Beni Tadjit (Morocco).

Description

Small, fungiform thamnasterioid colony fixed by a peduncle. Calices are concentrically arranged, suggesting a circumoral mode of gemmation. Radial elements are pennular, straight or flexuous biseptal blades that are subcompact or porous (a thin section would be necessary to conclude about this question). The projections of dissociated septal trabeculae at the axis of the corallite produce a papillose columella. Endotheca not observed but it would be rare according to Beauvais 1986. Synapticulae probably present. No wall separating the calices. A concentrically wrinkled holotheca covers the base of the colony.

Calicular diameter: approximately 2 to 4 mm – Distance between calices centers: 2 to 4 mm – Number of septa: 23 to 38 – Septal density: 6 to 7 per 2 mm.

Remarks

We maintain with doubt this specimen within the genus *Dimorphastrea* d'Orbigny, 1850 (and not *Dimorphastraea* Fromentel, 1857 as it was described in Beauvais [1986]) because the specimen preparation does not allow to confirm that septa are compact. A thin section would be necessary to verify that this taxon does not belong to *Dimorpharaea* Fromentel, 1861.

Family Margarophylliidae Cuif, 1977

Genus *Margarosmilia* Volz, 1896

urn:lsid:zoobank.org:act:0A33D175-C6C5-4B6E-863A-289520ADDDF6

Species originally included. — *Margarosmilia zieteni* (Klipstein, 1843), *M. confluens* (Münster, 1841) as a variation of *M. zieteni*, *M. richtofeni* Volz, 1896, *M. hintzei* Volz, 1896, *M. septanectens* (Loretz, 1875).

Type species. — *Montlivaltia confluens* Münster, 1841 by subsequent designation of Diener (1921).
In assumed infraction with the international code of zoological nomenclature, Cuif (1975) invoked in consistence with usage that preference should be accorded to *M. zieteni* and he designated a "type specimen" (no. 4462). Despite of this unsatisfactory nomenclatural situation, and as a necessity, we rely on the descriptions of Cuif (1975) for the genus *Margarosmilia*.

Margarosmilia dividenda n. sp. (Fig. 36)

urn:lsid:zoobank.org:act:37CC44E3-55EF-4487-82C3-90E35002B5DA

Type material. — Holotype CPUN Gu1105E2-1.

Studied sample. — CPUN Gu1105E2-1.

Etymology. — Refers to the phacelo-thamnasterioid aspect of the colony.

Type horizon. — Upper Pliensbachian (Margaritatus ammonite zone).

Type locality. — Guigou plateau, 33°27'45"N, 4°56'43"W, Middle Atlas of Morocco.

Geographic and stratigraphic ranges. — Upper Pliensbachian of Guigou Plateau (Middle Atlas of Morocco).

Description

Phacelo-thamnasterioid colony with rounded calices irregular in size and shape. Growth by intracalicular budding. Radial

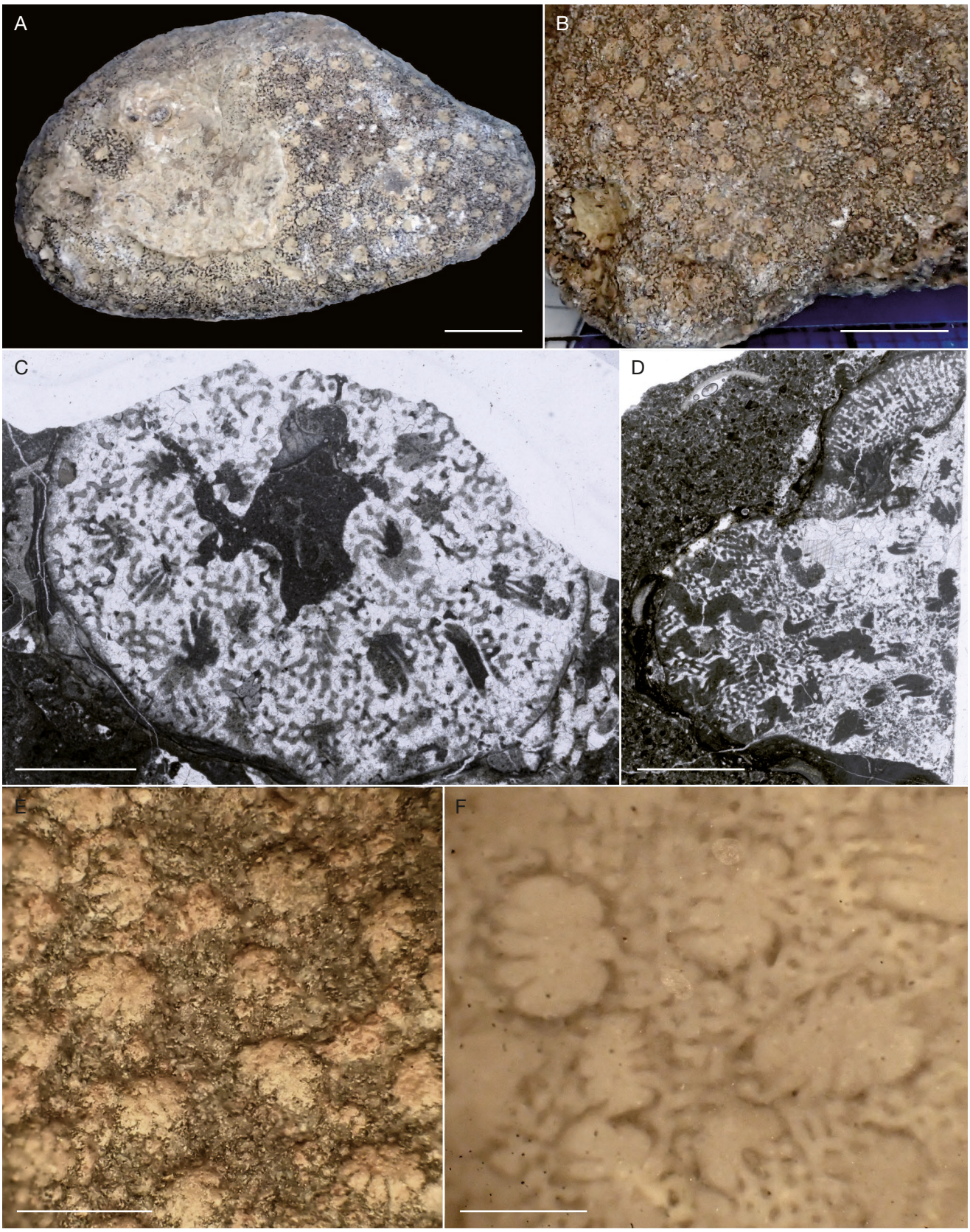

FIG. 34. — *Spongiocoenia liasica* (Turnšek & Geyer, 1975), n. comb.: **A**, distal view of the specimen CPUN AM16178-2; **B**, distal view of the specimen CPUN AM16188-31; **C**, transverse thin section in the specimen CPUN DA3105E3-2; **D**, longitudinal thin section in the specimen CPUN DA3105E3-3; **E**, detail in distal view of the specimen CPUN AM16188-7; **F**, detail in longitudinal thin section of the specimen CPUN DA3105E3-3. Scale bars: A, D, 4 mm; B, 5 mm; C, 2 mm; E, 1 mm; F, 0.5 mm.

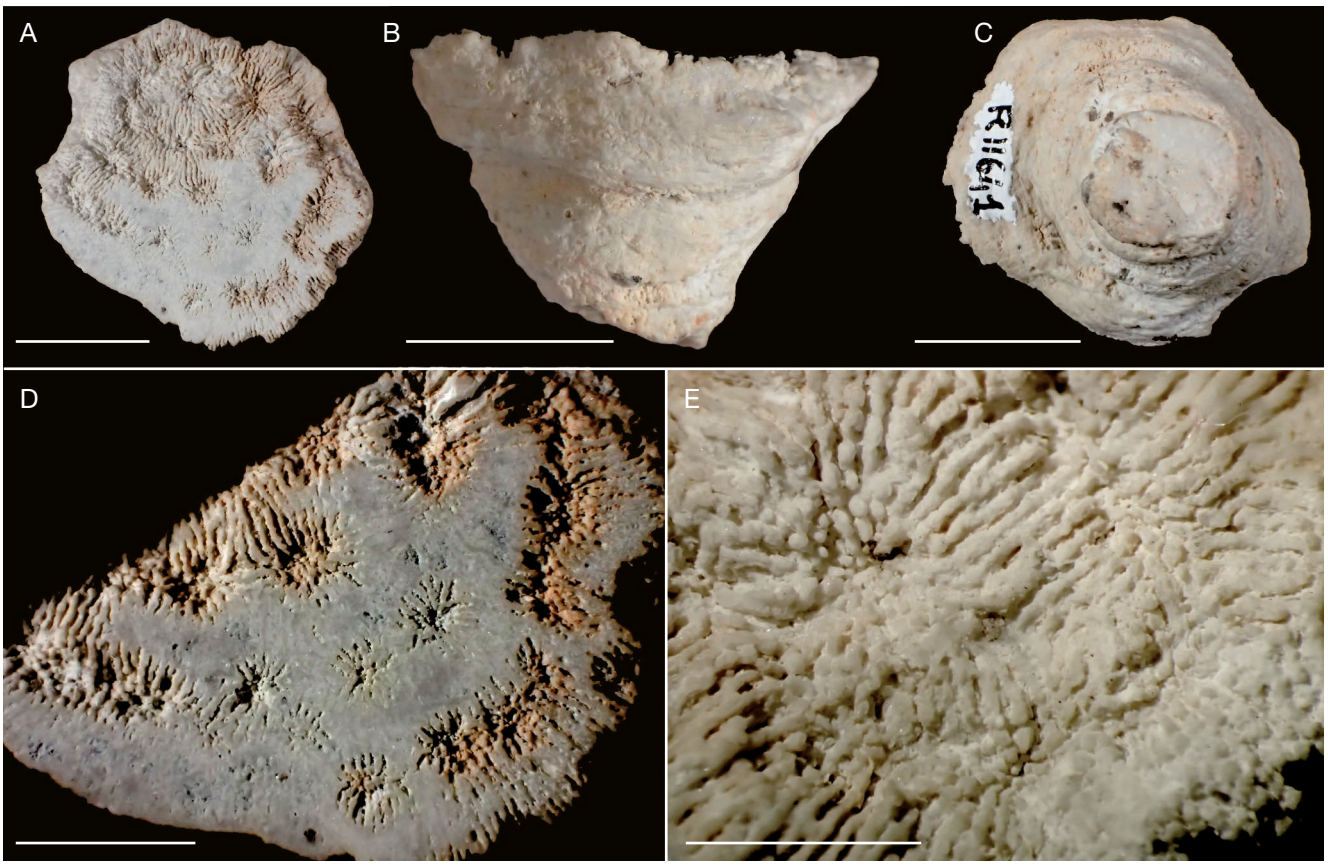

Fig. 35. — *Dimorphastrea*? *menchikoffi* (Beauvais, 1986): **A**, distal view of the specimen MNHN.F.R11641; **B**, lateral view of the specimen MNHN.F.R11641; **C**, proximal view of the specimen MNHN.F.R11641; **D**, detail in distal view of the specimen MNHN.F.R11641; **E**, detail in distal view of the specimen MNHN.F.R11641. Scale bars: A, 4 mm; B, C, D, 1 cm; D, 5 mm; E, 3 mm.

elements are compact, free or more often joined septa that are laterally sharply granulated. Trabecular microstructure. The inner edge of major septa sometimes join together in the axis of the calice. Endotheca made of thin vesicular dissepiments. Synapticulae not observed. An epitheca *s.l.* wraps the corallites.

Calicular diameter: 5 to 17 mm – Number of septa: 84 to 123 – Septal density: 5 for 2 mm – Trabecular density: approximately 4 per 1 mm.

Similarities and differences

This taxon differs from all the other species in the genus by the phacelo-thamnasterioid aspect of the colony.

Margarosmilia? *gemminata* Beauvais, 1986 (Fig. 37)

Margarosmilia? *gemminata* Beauvais, 1986: 27, pl. 6, fig. 3, and txt-fig. 17-18.

Margarosmilia? *gemminata* – Vasseur 2018: 234-235, fig. 3.53.

Type material. — Holotype: MNHN.F.R11617, Beauvais 1986: 28, pl. 6, fig. 3 and txt-fig. 17-18.

Type horizon. — Domerian (Upper Pliensbachian).

Type locality. — Beni Tadjit (Bou Dahar), Morocco.

Studied sample. — Holotype MNHN.F.R11617.

Geographic and stratigraphic ranges. — Pliensbachian of Jebel Bou Dahar (Morocco).

Description (modified after Beauvais 1986)

Subdendroid corallum in the form of a cylinder holding three short branches that seem to have grown by parricidal intracalicular budding. One single corallite is well developed, the two others are abortive. The bigger corallite is subcylindrical as the parent-corallite and hold a deep infundibuliform calice with sharp calicular edges. The parent-corallite is covered by a thick wrinkled epitheca *s.l.*, which is not the case for the offspring-corallites. The calicular fossa is small, deep, slightly elongated. Radial elements are compact, free, straight costosepta with a fusiform elongated shape in transverse section. The distal edge is smooth or finely granulated and the lateral faces hold thin granulae. No columella. Wall probably present, of undefined nature.

Calicular diameter: 9 to 26 mm – Number of septa: approximately 102 for the bigger of the 3 rejuvenescent calices – Septal density: 5 per 2 mm.

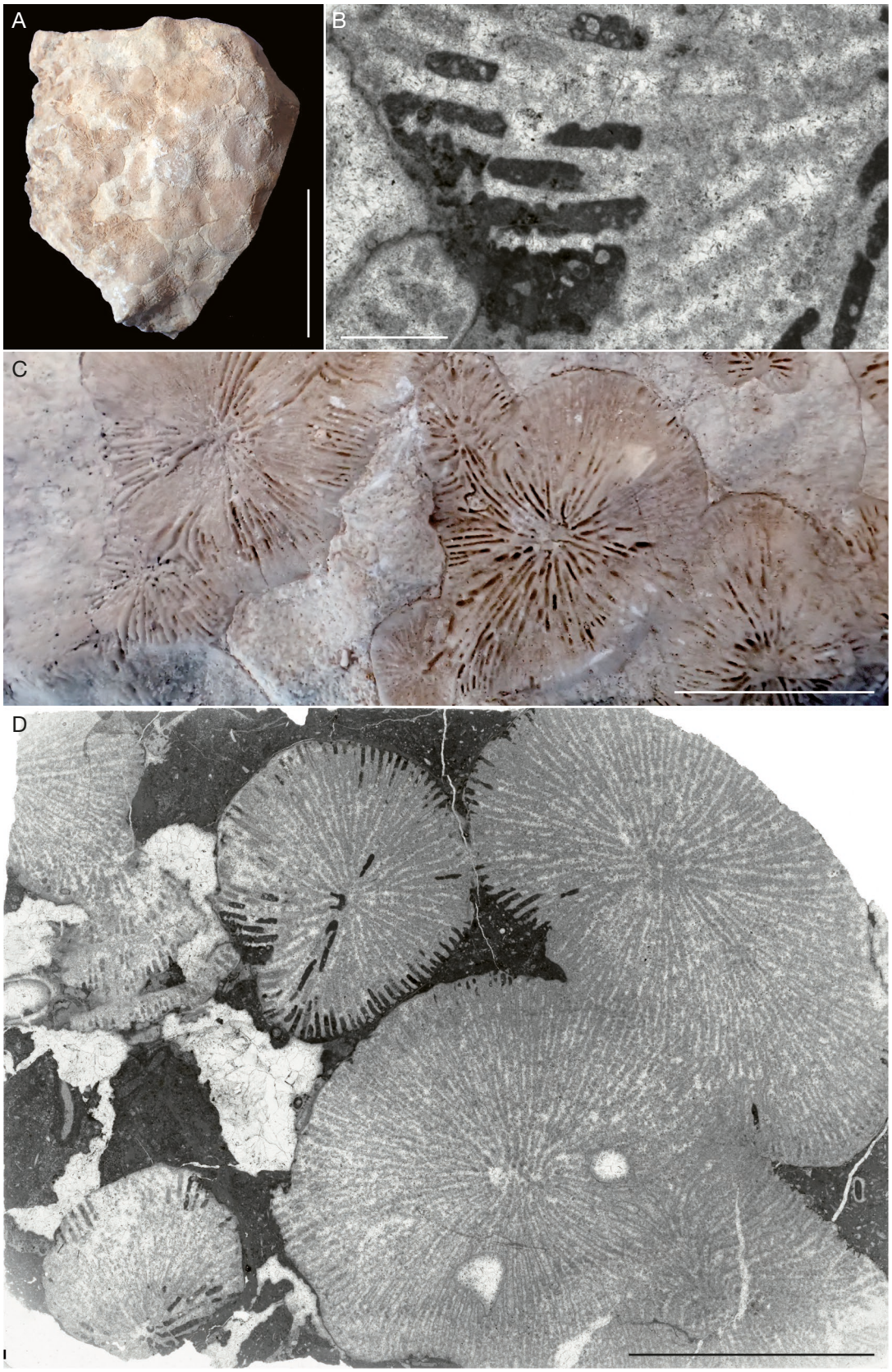

FIG. 36. — *Margarosmilia dividenda* n. sp.: **A**, distal view of specimen CPUN Gu1105E2-1; **B**, detail of septal ornamentation in specimen CPUN Gu1105E2-1 (transverse thin section); **C**, detail in distal view of the specimen CPUN Gu1105E2-1; **D**, transverse thin section in specimen CPUN Gu1105E2-1. Scale bars: A, 5 cm; B, C, D, 1 cm.

Remark

We keep this species with doubt under the genus *Margarosmilia*, given that polished or thin sections would be necessary to exclude the possibility of a reallocation to the genus *Coryphyllia* Cuif, 1975 into the family of the Coryphylliidae.

Margarosmilia? sp.
(Fig. 38)

Margarosmilia? sp. 1 – Vasseur 2018: 236-237, fig. 3.54.

Studied samples. — Two specimens: CPUN DA2905E1-2, CPUN DA2905E2-1.

Geographic and stratigraphic ranges. — Pliensbachian of Dades Valley (High Atlas of Morocco).

Description

Phaceloid colony with huge subcircular calices often distorted by intracalicular budding. Radial elements are free, straight or curved, compact costosepta except in the most inner part of septa where septal trabeculae dissociate sometimes in the close elongated fossa but never produce a real columella. Lateral faces of septa hold pennula-like granules that alternate from one side to the other of one single septum, in accordance with the description of the genus *Margarosmilia* in Cuif (1975). A wavy mid-septal line seems to appear even if the poor preservation of the specimens does not allow a clear confirmation. Endotheca made of quite abundant thin vesicular dissepiments. Synapticulae not observed. An epicostal epitheca *s.l.* wraps the corallites.

Calicular diameter: 12 to 23 mm – Distance between calices centers: 25 to 40 mm – Septal density: 4 to 6 per 2 mm.

Remarks

We place with doubt these specimens under the genus *Margarosmilia* because the poor preservation of the specimens does not allow to confirm the presence of a mid-septal line (even if some ghosts of these structures seem to exist) and because of the subcompact nature of the very inner edge of septa; however, this last character appears for us compatible with the structure described in Cuif (1975).

Family Protoheterastraeidae Cuif, 1977

Genus *Paravolzeia*
Roniewicz, Stanley, Da Costa Monteiro & Grant-Mackie, 2005

urn:lsid:zoobank.org:act:F174FB5D-A955-4F17-9296-52F278414112

Species originally included. — *Paravolzeia alpina* Roniewicz, Stanley, Da Costa Monteiro & Grant-Mackie, 2005, *Paravolzeia timorica* Roniewicz, Stanley, Da Costa Monteiro & Grant-Mackie, 2005.

Type species. — *Paravolzeia alpina* Roniewicz, Stanley, Da Costa Monteiro & Grant-Mackie, 2005 (Roniewicz *et al.* 2005: 293, fig. 44D, G), by original designation.

Paravolzeia calabrensis n. sp.
(Fig. 39)

urn:lsid:zoobank.org:act:EB9258DD-F0B3-4A1E-9368-ED7AC8C35F1C

Paravolzeia sp. 1 – Vasseur 2018: 275-276, fig. 3.69.

Type material. — Holotype: CPUN Ca0211E1-1; paratypes: CPUN Ca0111E3-18, CPUN Ca0211E1-2, CPUN Ca0211E2-1, CPUN Ca0211E2-6.

Studied samples. — Five specimens: CPUN Ca0111E3-18, CPUN Ca0211E1-1, CPUN Ca0211E1-2, CPUN Ca0211E2-1, CPUNCa0211E2-6.

Etymology. — The samples have been collected in Calabria.

Type horizon. — Pliensbachian.

Type locality. — Vallone del Gardo, 39°27'54"N, 16°47'28"E, Calabria, Italy.

Geographic and stratigraphic ranges. — Pliensbachian of Vallone del Gardo (Calabria, Italy).

Description

Phaceloid corallum multiplying by fissiparous intracalicular budding. Radial elements are free or joined, compact costosepta in zigzag, organized in 2 distinct size orders. Lateral faces hold sharp granules that sometimes look like pennulae because of their curvature. No columella but the joined septa produce sometimes a weak parietal columella. Endotheca made of tabular dissepiments. Wall probably parathecal. Epitheca *s.l.* present.

Calicular diameter: 2 to 4 mm – Number of septa: 32 to 39 – Septal density: 4 to 6 per 1 mm.

Family Reimaniphylliidae Melnikova, 1975

Genus *Distichophyllia* Cuif, 1975

urn:lsid:zoobank.org:act:9AFC2812-4FBF-4D3B-B7C7-70E2CF443C07

Type species. — *Montlivaltia norica* Frech, 1890: 39: pl. 3, fig. 8, 9, pl. 10, fig. 1-5, pl. 18, fig. 17, by original designation.

Remark

The genus differs from *Coryphyllia* Cuif, 1975 by a midseptal line in zigzag, thick fibrous and laminar stereome deposits on lateral faces and the lack of lonsdaleoid septa.

Distichophyllia norica (Frech, 1890)
(Fig. 40)

Montlivaltia norica Frech, 1890: 39-40, pl. 3, fig. 9, pl. 10, figs 1-5, pl. 13, figs 1-7, pl. 18, fig. 17.

Montlivaltia cupuliformis Reuss, 1854: 74, 102, pl. 6 fig. 16-17.

Distichophyllia norica – Roniewicz 1989: 39, pl. 6, fig. 2-4 (*cum syn.*).

Distichophyllia sp. 2 – Vasseur 2018: 178-179, fig. 3.30.

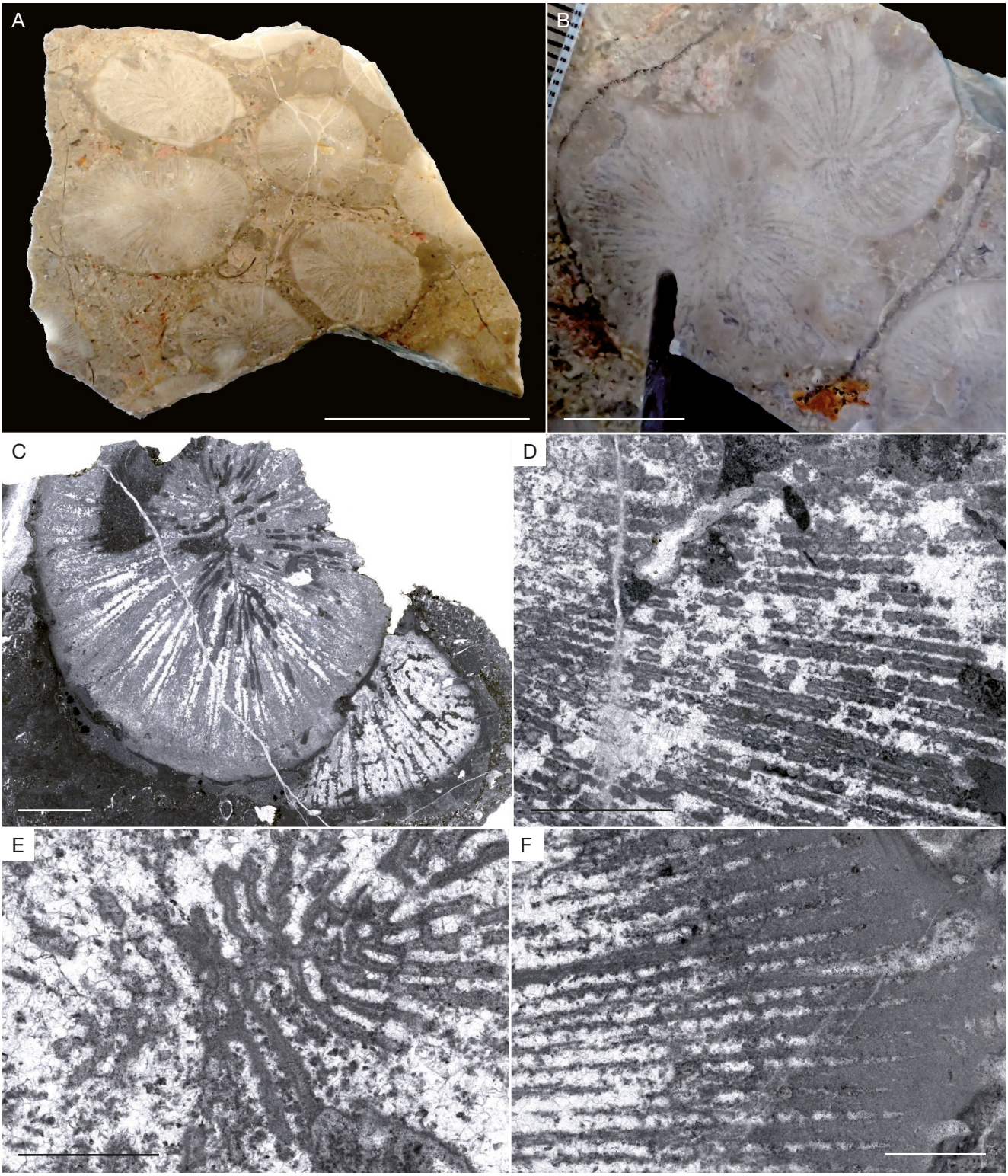

Fig. 37. — *Margarosmilia*? sp.: **A**, lateral view of the specimen MNHN.F.R11617; **B**, distal view of the specimen MNHN.F.R11617; **C**, lateral view of the major calice, corallum specimen MNHN.F.R11617; **D**, distal view of the major calice of the specimen MNHN.F.R11617; **E**, detail of the septal ornamentation of the major calice of the specimen MNHN.F.R11617. Scale bars: A, B, 1 cm; C, 2 mm; D, 4 mm; E, 1 mm.

Type material. — Syntypes BSP AS X II 46, 48, Reuss 1854: 74, 102, pl. 6, fig. 16-17.

Type horizon. — Zlambach beds, Triassic.

Type locality. — Grosser Zlambach graben.

Studied samples. — Two specimens: CPUN 2303A1-3, CPUN AM16188-15.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

Fig. 38. — *Margarosmilia*? *gemminata* Beauvais, 1986: **A**, distal view of the polished specimen CPUN DA2905E2-1; **B**, transverse polished section of two separating calices on the specimen CPUN DA2905E2-1; **C**, transverse thin section of the specimen CPUN DA2905E1-2. Note the *Hispaniastraea* colony attached at the right lower side; **D**, detail in transverse oblique thin section of the septal structure of the specimen CPUN DA2905E2-1; **E**, detail in transverse thin section of the axial part of one corallite of the specimen CPUN DA2905E2-1 (skeleton in bright at the center); **F**, detail in transverse thin section of the septal structure of the specimen CPUN DA2905E2-1. Scale bars: A, 5 cm; B, 1 cm; C, D, 4 mm; E, F, 2 mm.

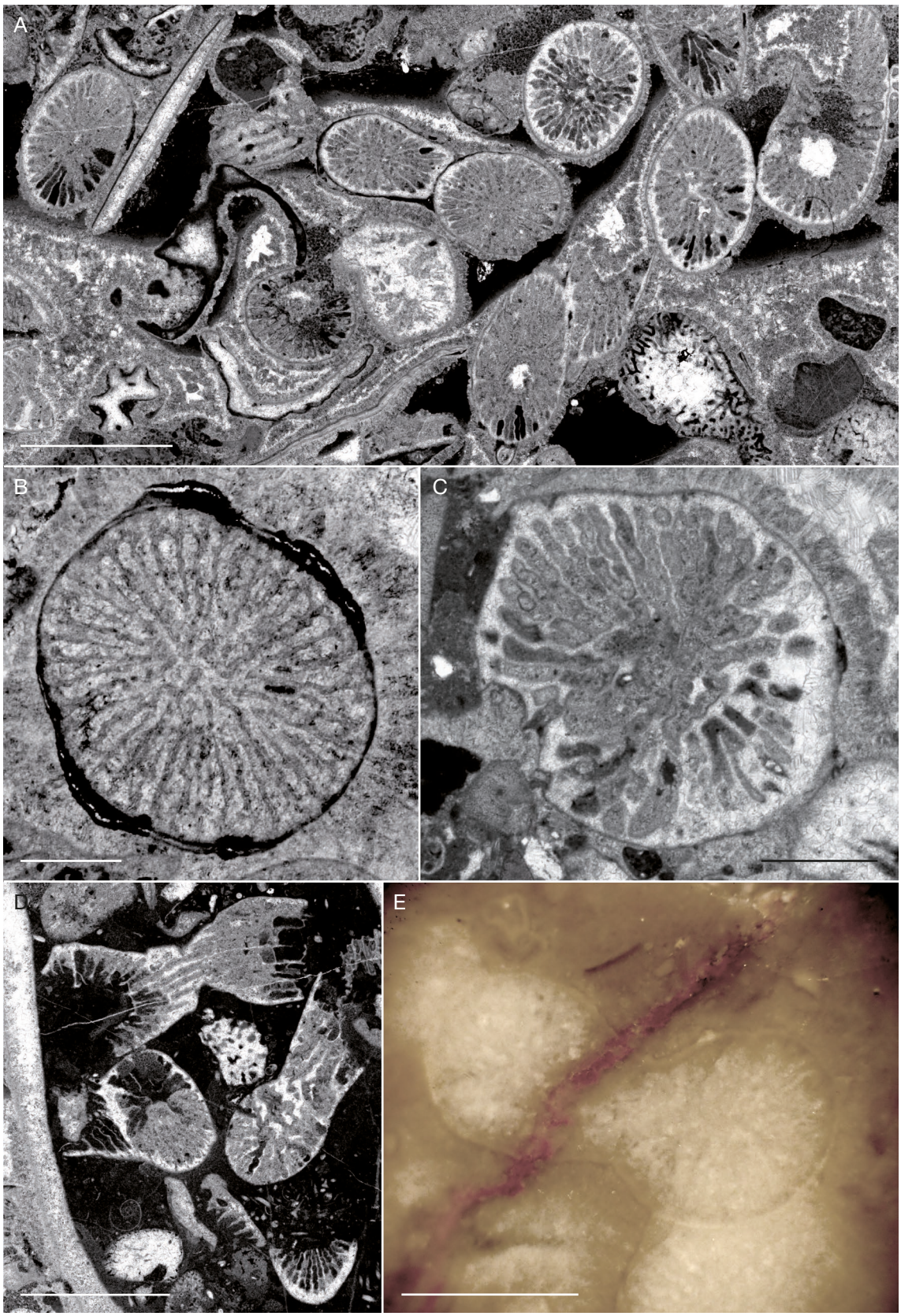

FIG. 39. — *Paravolzeia calabrensis* n. sp.: **A**, transverse thin section of the specimen CPUN Ca0211E2-1; **B**, transverse thin section of the specimen CPUN Ca0211E1-1; **C**, transverse thin section of the specimen CPUN Ca0111E3-18; **D**, transverse thin section of the specimen CPUN Ca0211E2-1; **E**, polished transverse section in the specimen CPUN Ca0211E2-6. Scale bars: A, D, E, 2 mm; B, C, 1 mm.

Description
Solitary, conical corallum, elliptical in outline. Radial elements are slightly bicuneiform costosepta for the first order, thin for the last ones, often in zigzag and organized in 3 or 4 size orders following a relatively strict hexameral symmetry. Septa are compact, free, ornamented with strong granules sometimes angular on lateral faces and seem to have a more or less wavy zigzag midseptal line that the poor preservation does not allow to confirm. No columella but an axial fossa elongated that defines a bilateral symmetry. Endotheca made of peripheral vesicular dissepiments. Wall parathecal. An epicostal epitheca *s.l.* seems to cover the external parts of the corallum.

Calicular diameter: 26 to 28 mm – Distance between calice centers: 55 to 70 mm – Septal density: 2 to 3 per 2 mm.

Similarities and differences
The present species has no equivalent among Triassic *Distichophyllia* in terms of number of septa and hierarchy of septal thickness. It differs from the other *Distichophyllia* described herein by the big size and the particular shape of the lateral granules of septa. In addition, this species differs from *Distichophyllia pauciseptata* n. sp. by a higher number of septa, a pronounced bilateral symmetry, a less defined hexameral symmetry and also less bicuneiform septa. The endotheca seems less abundant and costal parts are smaller. These characters make this species close to *Distichophyllia* cf. *norica* described thereafter.

The synonymy with *M. cupuliformis* is not certain that is why we prefer to keep the name *norica* to describe this species despite the anteriority of *M. cupuliformis*.

Distichophyllia cf. ***norica*** (Frech, 1890)
(Fig. 41)

Montlivaltia norica Frech, 1890: 39-40, pl. 3, fig. 9, pl. 10, figs 1-5, pl. 13, figs 1-7, pl. 18, fig. 17.

Montlivaltia cupuliformis – Reuss 1854: 74, 102, pl. 6, fig. 16-17.

Distichophyllia norica – Roniewicz 1989: 39, pl.6, fig.2-4 (*cum syn.*).

Distichophyllia sp. 2 – Vasseur 2018: 178-179, fig. 3.30.

Type material. — Syntypes BSP AS X II 46, 48, Reuss 1854: 74, 102, pl. 6, fig. 16-17.

Type horizon. — Zlambach beds, Triassic.

Type locality. — Grosser Zlambach graben.
Studied samples. — Two specimens: CPUN 2310A2, AM16174-1.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

Description
Solitary, probably conical corallum, elliptical in outline. Radial elements are costosepta slightly bicuneiform for the first orders, thin for the last ones, often in zigzag and organized in 3 or 4 size orders following a relatively strict hexameral symmetry. Septa are compact, free, ornamented with granules sometimes attenuated by stereomal layer deposits on lateral faces and have a more or less wavy zigzag midseptal line. No columella but an axial fossa elongated that defines a bilateral symmetry. Endotheca made of many peripheral vesicular dissepiments. Wall parathecal. An epicostal epitheca *s.l.* seems to cover the external parts of the corallum.

Calicular diameter: 19.9 × 25.9 – 20.5 × 24 – 17.4 × 23.8 mm – Number of septa: approximately 60 to 70 – Septal density: 2 to 3 per 2 mm – Ratio great calicular diameter (D) / length of fossa (f) (in distal part of the corallum) = approximately 2.5.

Similarities and differences
This species differs from *Distichophyllia pauciseptata* n. sp. by a higher number of septa, a more pronounced bilateral symmetry and less bicuneiform first-order septa. The present species is distinguished from the typical *D. norica* by the high elongation of the fossa in distal part and also of the calice in the bilateral plan and also a strong hierarchy in thickness among the size orders of septa. The size of granules is also very low in the present form. The ratio D / f seems significant in the present state of our sampling but *D. norica* seems so variable that we renounced to the creation of a new species.

The synonymy with *M. cupuliformis* is not certain that is why we prefer to keep the name of *norica* to describe this species despite the anteriority of *M. cupuliformis*.

Distichophyllia pauciseptata n. sp.
(Fig. 42)

urn:lsid:zoobank.org:act:09CE1D0D-E0FA-473B-A598-9ED47CECA2E4

Distichophyllia sp. 1 – Vasseur 2018: 176-177, fig. 3.29.

Type material. — Holotype: CPUN AM16179-4; paratypes: CPUN 2703A3-4, CPUN CDAm2.

Studied samples. — Three specimens: CPUN 2703A3-4, CPUN AM16179-4, CPUN CDAm2.

Etymology. — Refers to the low number of septa among the specimens of this species.

Type horizon. — Upper Pliensbachian.

Type locality. — Amellagou, 31°57’25”N, 5°2’11”W, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian from Amellagou (High Atlas, Morocco).

Description
Solitary, conical corallum, subcircular to elliptical with varying apical angle. Radial elements are bicuneiform costosepta for the first order, thin for the last ones, often in zigzag and organized in 3 or 4 size orders following a relatively strict hexameral symmetry. Septa are compact, free, ornamented with granules sometimes attenuated by stereome layers on lateral faces. No columella but an axial fossa sometimes elongated defining a bilateral symmetry. Endotheca made of vesicular

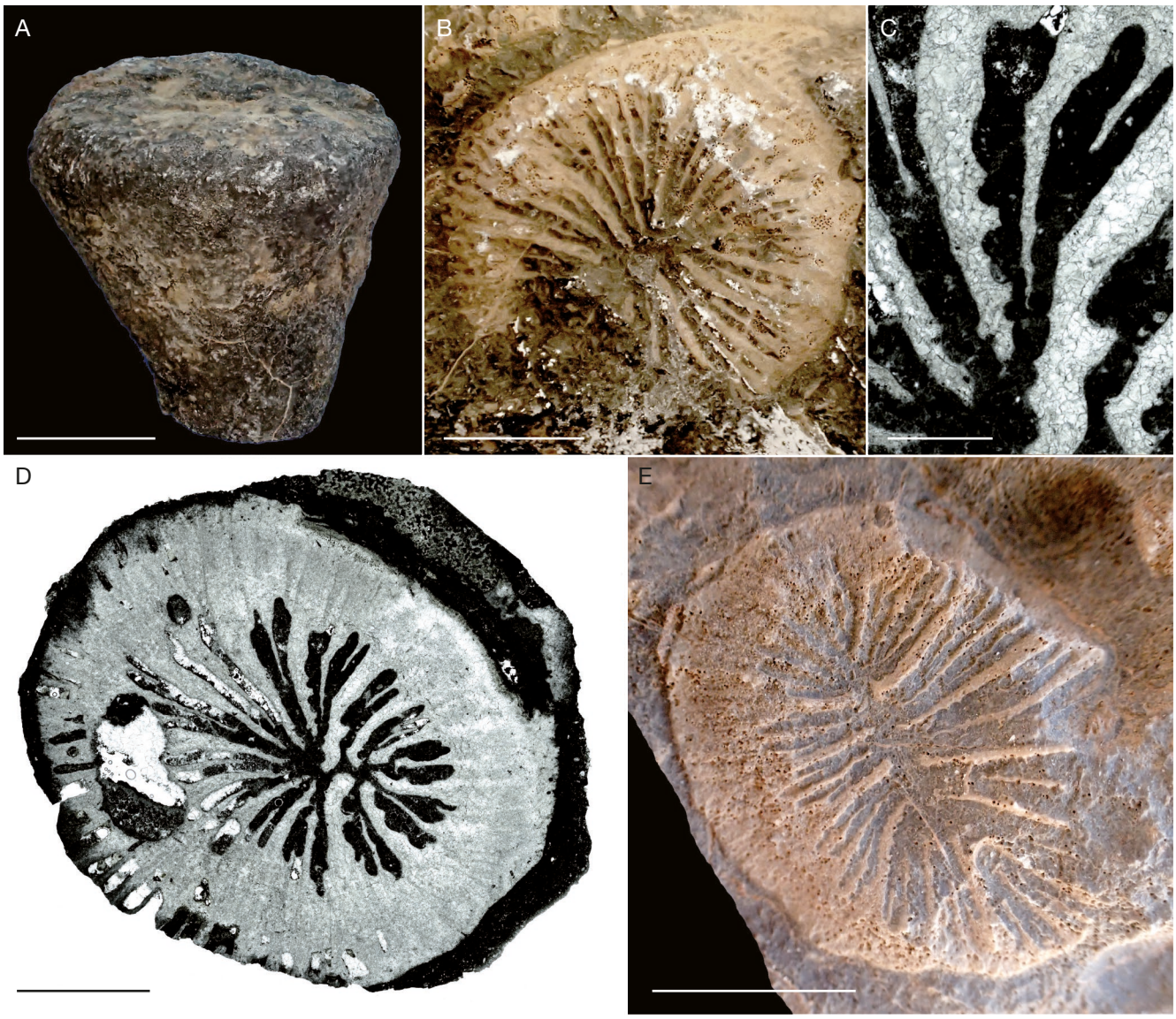

Fig. 40. — *Distichophyllia norica* (Frech, 1890): **A**, distal view of the specimen CPUN AM16174-1; **B**, transverse thin section of the specimen CPUN 2310A2; **C**, detail in transverse thin section of the septal structure of the specimen CPUN 2310A2; **D**, detail in transverse thin section of the mid-septal lines (bright) of the specimen CPUN AM16174-1. Scale bar: A, 5 mm; B, 4 mm; C, 1 mm; D, 2 mm.

dissepiments. Wall parathecal, incomplete. An epicostal epitheca *s.l.* covers the external parts of the corallum.

Calicular diameter: 18.5 to 26 mm – Number of septa: 45 to 50 – Septal density: 2 to 3 per 2 mm.

Remark

The present species has no equivalent among Triassic *Distichophyllia* in terms of number of septa and hierarchy of septal thickness.

Distichophyllia? sp.
(Fig. 43)

Distichophyllia sp. 4? – Vasseur 2018: 182-183, fig. 3.32.

Studied samples. — Three specimens: CPUN AM16177-5, CPUN AM16177-9, CPUNAML8-1.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou and Dades Valley (High Atlas of Morocco).

Description

Solitary, probably conical corallum, subcircular. Radial elements are bicuneiform costosepta for the first orders, thin for the last ones, often in zigzag and organized in 3 size orders following a relatively strict hexameral symmetry. Septa are compact, free, ornamented with granules sometimes attenuated by stereome layer deposits on lateral faces. No columella but an axial fossa sometimes elongated that thus defines a bilateral symmetry. Endotheca probably made of peripheral dissepiments but not observed. Wall probably

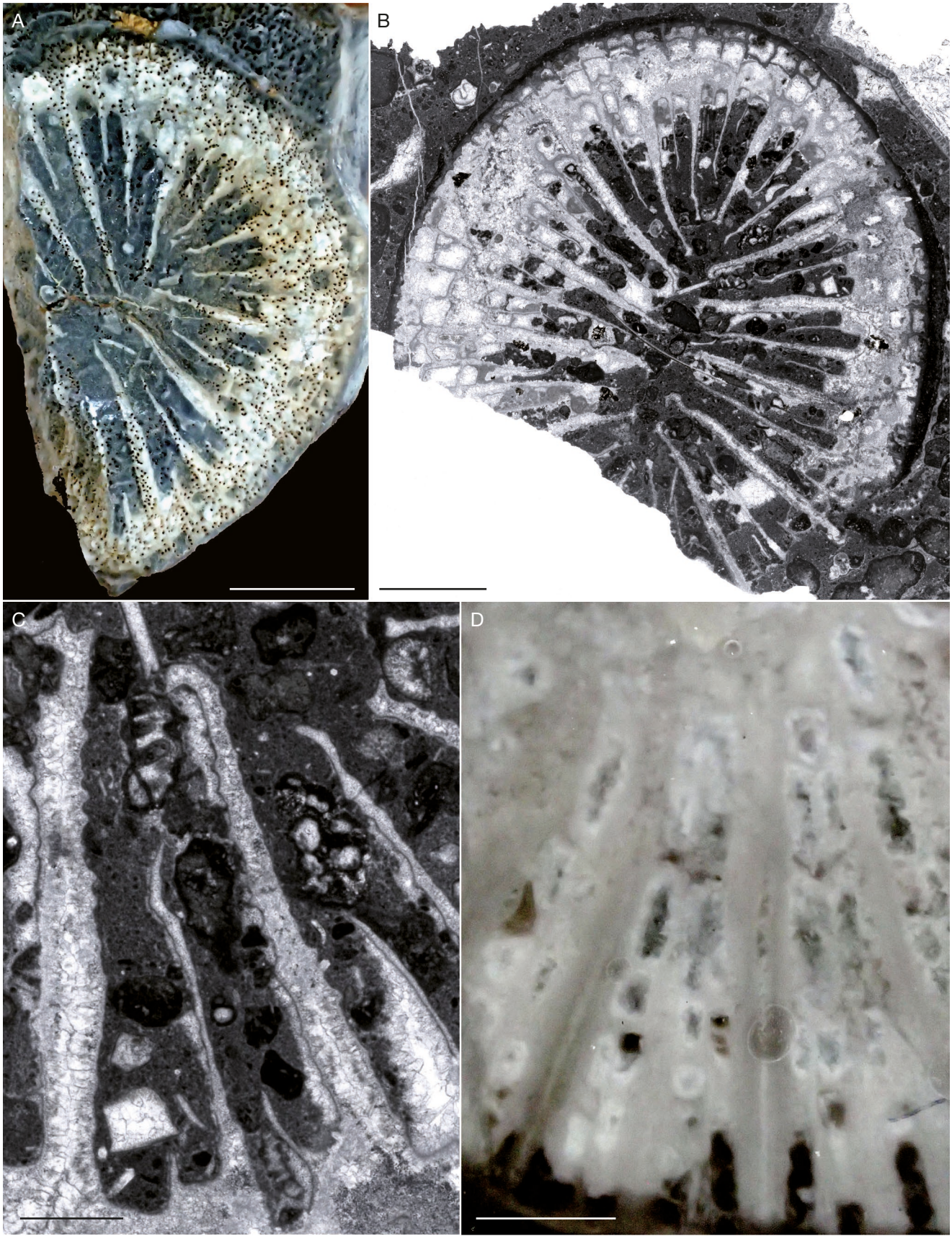

Fig. 41. — *Distichophyllia* cf. *norica* (Frech, 1890): **A**, lateral view of the specimen CPUN 2303A1-3; **B**, distal view of the specimen CPUN AM16188-15, **C**, detail in transverse thin section of the specimen CPUN 2303A1-3; **D**, transverse thin section of the specimen CPUN 2303A1-3; **E**, specimen pictured in the field (Amellagou, Maroc). Scale bars: A, B, E, 1 cm; C, 1 mm; D, 4 mm.

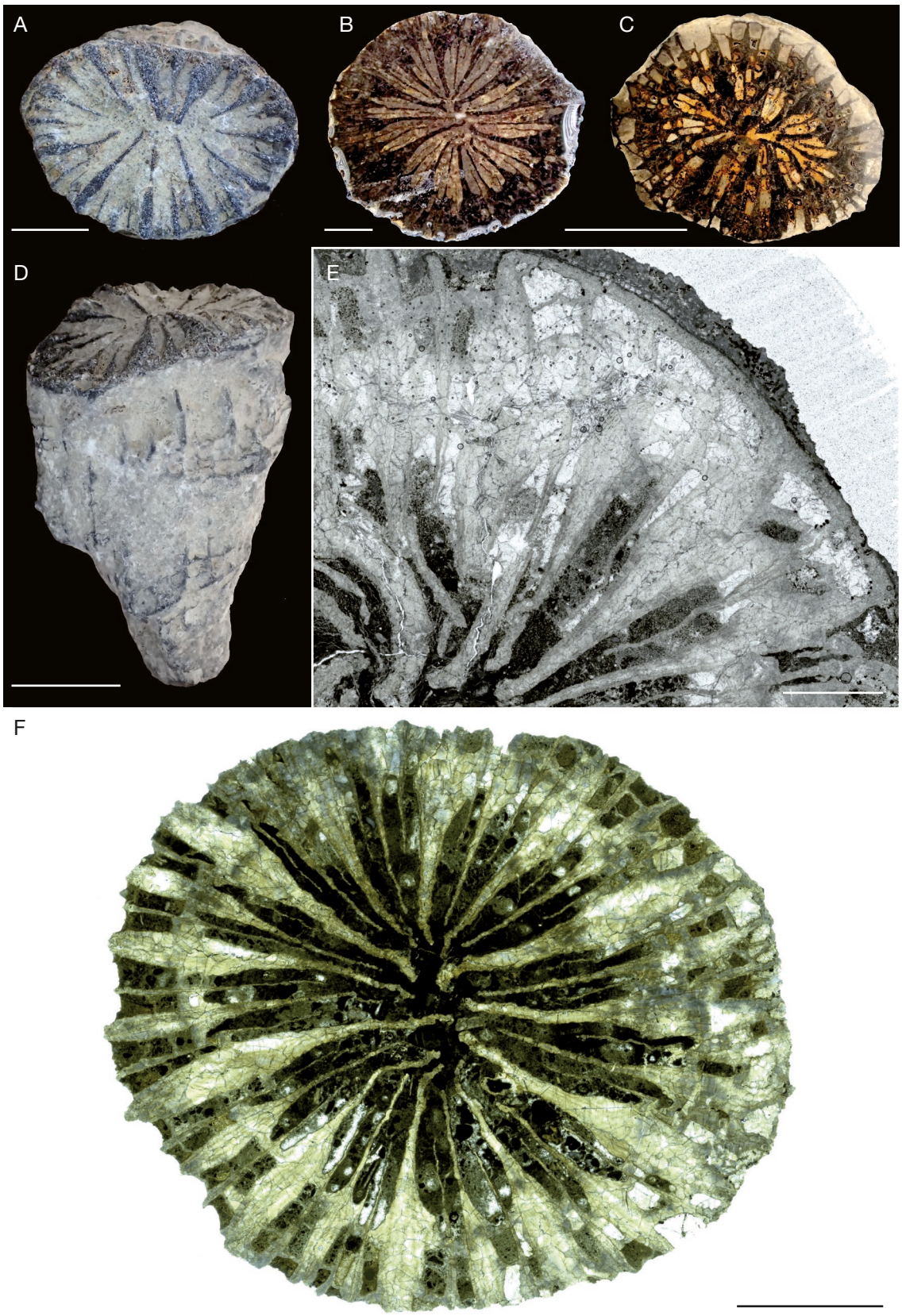

FIG. 42. — *Distichophyllia pauciseptata* n. sp.: **A**, distal view of the specimen CPUN CDAm2; **B**, transverse section in the specimen CPUN AM16179-4; **C**, transverse polished section in the specimen CDAm2; **D**, lateral view of the specimen CPUN CDAm2 before section; **E**, detail in transverse thin section of the septal structure of the specimen CPUN 2703A3-4; **F**, transverse thin section of the specimen CPUN AM16179-4. Scale bars: A, 5 mm; B, F, 4 mm; C, D, 1 cm; E, 2 mm.

parathecal. An epicostal epitheca *s.l.* seems to cover the external parts of the corallum.

Calicular diameter: 15 to 17.8 mm – Number of septa: approximately 30 - 35 – Septal density: 3 per 2 mm.

SIMILARITIES AND DIFFERENCES

Differs from previously reported species of *Distichophyllia* by a more circular shape in transverse section, smaller diameter and number of septa, a thick and better defined wall. This could be a young stage of any of them.

Genus *Retiophyllia sensu* Roniewicz (1989)

urn:lsid:zoobank.org:act:E67AD5BE-A907-4333-BE06-D1163E160A16

TYPE SPECIES. — *Thecosmilia fenestrata* Reuss, 1854, designated by Frech (1890: 10, pl.2, fig. 12).

REMARK

The genus is attributed to the Reimaniphylliidae rather than the Coryphylliidae on the basis of the dimensions of the structural units associated with the mid-septal zigzag line according to the table of Roniewicz & Stanley (2009: 469).

Retiophyllia zizensis n. sp.
(Fig. 44)

urn:lsid:zoobank.org:act:3D62AE51-03F4-401D-9F68-BA85BF71F78B

Retiophyllia sp. 1 – Vasseur 2018: 320-321, fig. 3.86.

Retiophyllia sp. – Brame *et al.* 2019: fig. 7C-D.

TYPE MATERIAL. — Holotype: CPUN DA2705E1; paratypes: CPUN DA2705E2, CPUN DA2705E7, CPUN DA2805E7.

TYPE HORIZON. — Upper Pliensbachian.

TYPE LOCALITY. — Bin El Ouidane, 32°4'1"N, 4°22'57"W, Ziz valley of Morocco.

STUDIED SAMPLES. — Four specimens: CPUN DA2705E1, CPUN DA2705E2, CPUN DA2705E7, CPUNDA2805E7.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Ziz valley – Bin El Ouidane (High Atlas of Morocco).

DESCRIPTION

Phaceloid coral with subcylindrical corallites growing by extracalicular parietal increase similar to those described for *Placophyllia* by Beauvais (1976). Costosepta compact, free or linked by their inner edge (first size-order of septa), straight or wavy, structured in three or four distinct size-orders. S1 and most of the S2 are characterized by a bicuneiform transverse section and lateral faces showing rare small and irregular granules. Their inner edge is sometimes clearly rhopaloid. Mid-septal line in zigzag can be guessed. The fifth order septa are generally straight and thin with smooth lateral faces although some S3 show a thickening in their external part suggesting a transition between septal shape of lower and upper orders. Parathecal wall absent or sparse and incomplete. A true epitheca encloses the corallite. Endotheca is well developed, made of thin vesicular dissepiments in periphery backing onto the inner side of the epitheca, and thin and regular tabular dissepiments dipping into the center of the corallite. No columella, nor synapticulae.

Calicular diameter: 4 to 10 mm – Distance between calices centers: 6 to 10 mm – Number of septa: 32 to 48 – Septal density: 5 for 2 mm.

SIMILARITIES AND DIFFERENCES

Differs from the Triassic species by its smaller number of septa, an extracalicular parietal growth mode, an irregular and sparse septal ornamentation, a distance between calices generally greater and the lack of continuous septothecal wall. This taxon also differs from *R. ahraboutensis* Beauvais, 1986 by the lack of continuous septothecal wall and also by longer S1 septa that fill more extensively the axial space.

Family STYLINIDAE d'Orbigny, 1851

Genus *Stylosmilia* Milne Edwards & Haime, 1848

SPECIES ORIGINALLY INCLUDED. — *Stylosmilia michelini* Milne Edwards & Haime, 1848.

TYPE SPECIES. — *Stylosmilia michelini* Milne Edwards & Haime, 1848, by monotypy.

"***Stylosmilia***" ***dresnayi*** Beauvais, 1986
(Fig. 45)

Stylosmilia dresnayi Beauvais, 1986: 41, pl. 8, fig. 3.

Stylosmilia? *dresnayi* – Vasseur 2018: 338-339, fig. 3.93.

TYPE MATERIAL. — Holotype: MNHN.F.R11623, Beauvais 1986: 41, pl. 8, fig. 3.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Jebel Bou Dahar, Morocco.

STUDIED SAMPLES. — Two specimens: holotype MNHN.F.R11623; CPUN Gu1005E2.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Jebel Bou Dahar and Guigou Plateau, Morocco.

DESCRIPTION

Phaceloid colony with cylindrical corallites multiplying by extracalicular budding. Radial elements are wavy, compact costosepta apparently free and organized in two distinct size-orders. External lateral faces of the corallites are ornamented with vertical striation made by the naked costae. Styliform columella according to Beauvais (1986) but that does not appear clearly in the sample. Endotheca made of

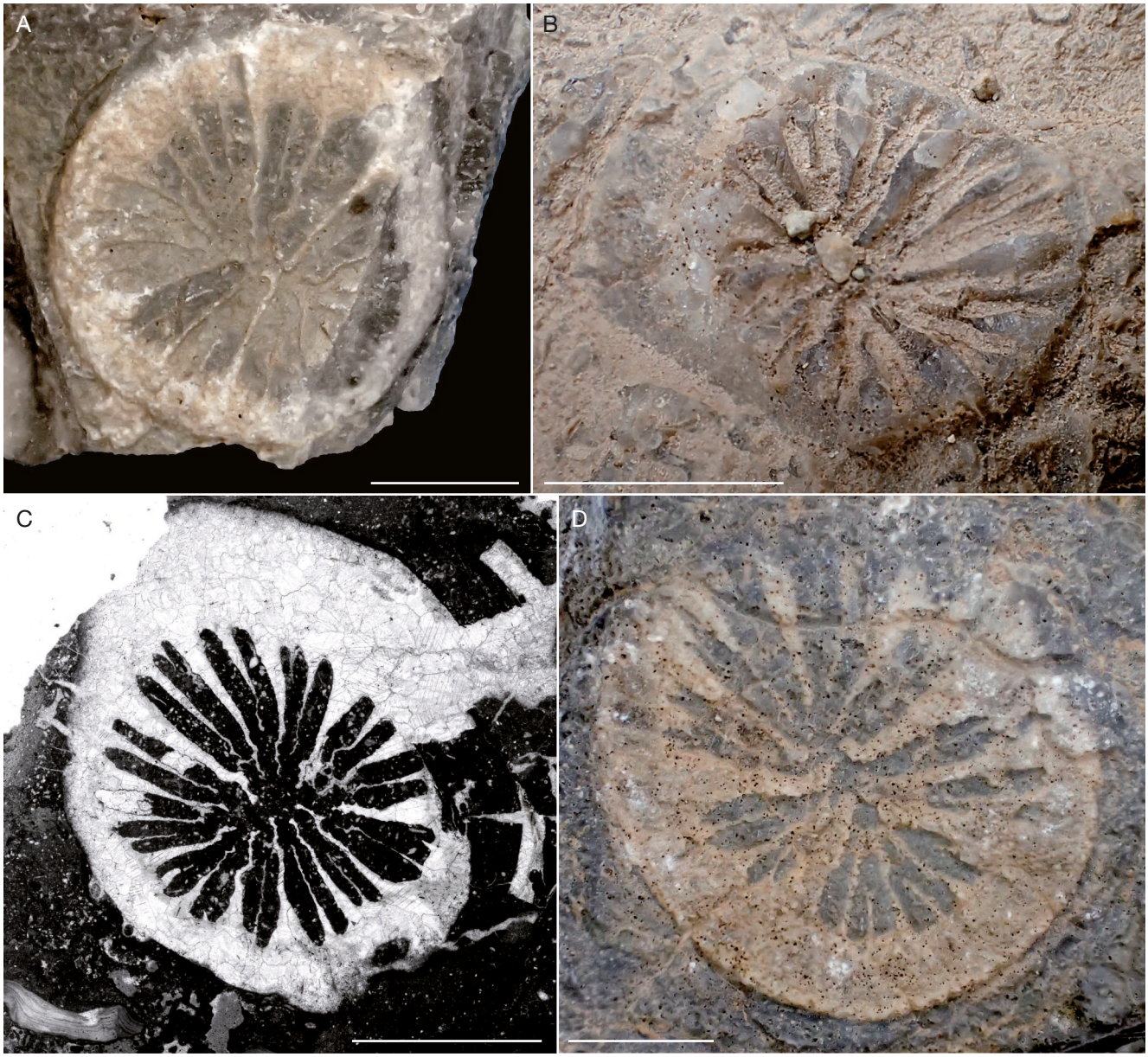

Fig. 43. — *Distichophyllia*? sp.: **A**, distal view of the specimen CPUN AM16177-5; **B**, specimen pictured in the field (Dades Valley, Morocco); **C**, transverse thin section of the specimen CPUN AML8-1; **D**, distal view of the specimen CPUN AM16177-9. Scale bars: A, 6 mm; B, C, D, 4 mm.

rare dissepiments and tabulae that periodically divide the lumen vertically. Wall present, probably septothecal. No synapticulae observed.

Calicular diameter: 1.5 to 2.5 mm – Number of septa: 32 to 36 – Septal density: 3 to 4 for 0.5 mm.

Similarities and differences

Differs from the other taxa of the genus *Stylosmilia* Milne Edwards, 1848 by the lack of auriculae. With the doubt concerning the presence of a styliform columella we choose to maintain the species under the genus *Stylosmilia* (with quotation marks) even if the genus *Proaplophyllia* Roniewicz, 1976 would be more appropriate in case of lack of columella.

Family Stylophyllidae Frech, 1890

Genus *Epismiliopsis* Alloiteau, 1952

urn:lsid:zoobank.org:act:628C7E4F-B6C9-4B5D-8EEE-F254CB035D42

Type species. — *Epismilia liasica* Fromentel & Ferry, 1865 (Fromentel & Ferry 1865: 53, pl. 15, fig. 3), by monotypy.

Remark

Although the genus is very close to *Stylophyllopsis* Frech, 1890, it seems to differ by a well-defined bilateral symmetry marked by the elongated fossa and the curvature of lateral septa, and by a less apparent stylophyllid microstructure (detached septal

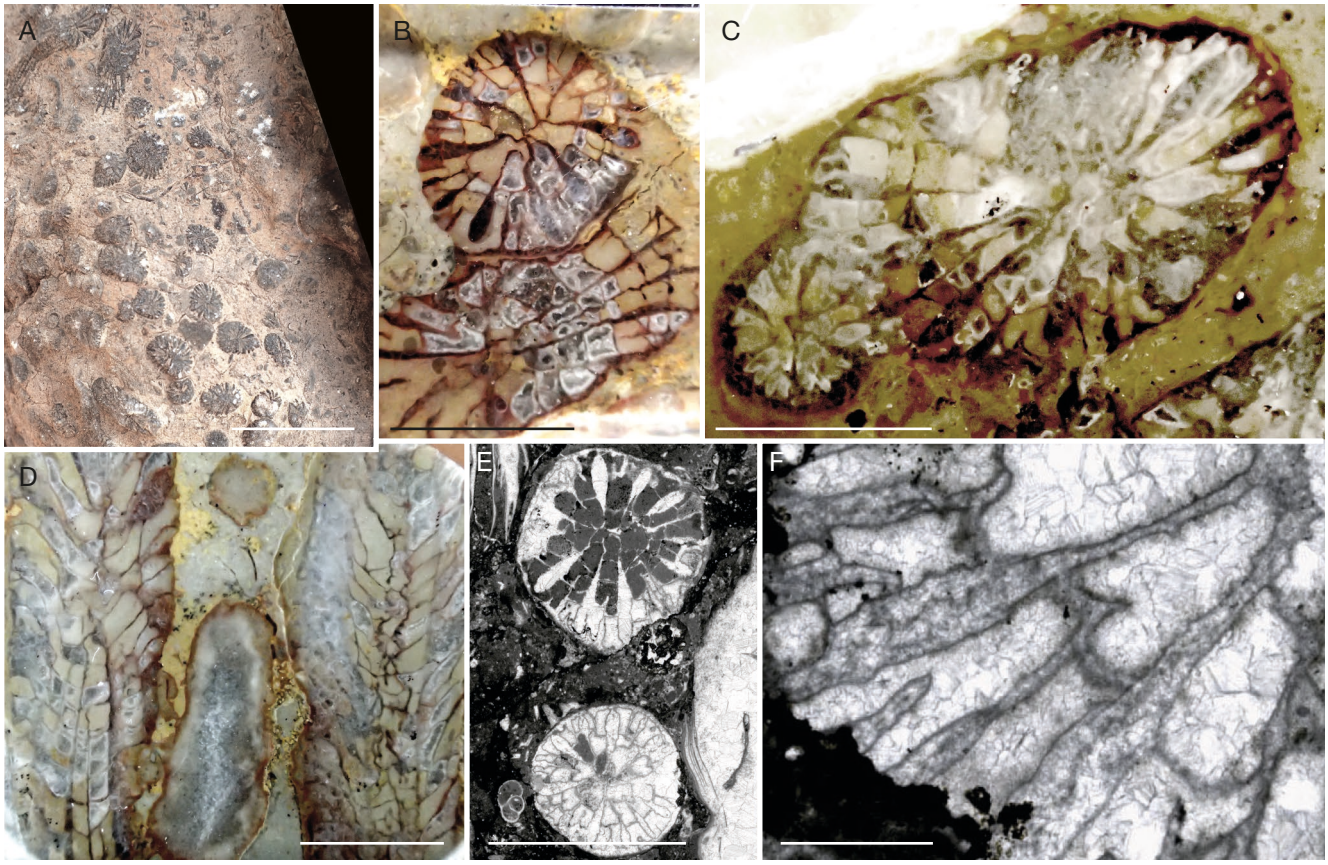

Fig. 44. — *Retiophyllia zizensis* n. sp: **A**, Specimen pictured in the field (Bin El Ouidane, Morocco, N32°067180 - W4°382511); **B**, transverse section in the specimen CPUN DA2705E1; **C**, detail of extracalicular budding in the specimen CPUN DA2705E1; **D**, longitudinal section the specimen CPUN DA2705E1; **E**, transverse thin section in the specimen CPUN DA2705E7-1; **F**, detail in transverse section showing zig-zag mid-septal line in the specimen CPUN DA2805E7.Scale bars: A, 2 cm; B, C, D, 5 mm; E, 6 mm; F, 1 mm.

spines are sometimes absent) giving sometimes an appearance close to *Coryphyllia* Cuif, 1975 to some species of the genus (the microstructure allows the differentiation of the two groups).

Epismiliopsis liasicus (Fromentel & Ferry, 1865) (Fig. 46)

Epismilia liasica Fromentel & Ferry, 1865: 53, pl. 15, fig. 3.

Epismiliopsis liasicus – Alloiteau 1952: 605; 1957: 93, txt-fig. 46. — Vasseur 2018: 194-195, fig. 3.37.

Epismiliopsis liasica – Beauvais 1986: 18.

Type material. — Holotype: MNHN.F.M03740, Fromentel & Ferry 1865: 53, pl. 15, fig. 3.

Type horizon. — Pliensbachian.

Type locality. — May-sur-Orne, France.

Studied sample. — Holotype MNHN.F.M03740.

Geographic and stratigraphic ranges. — Pliensbachian of May-sur-Orne (Calvados, France).

Description

Solitary trochoid slightly arched corallum. Subcircular calice. Moderately deep calicular platform. Radial elements compact, free, joining only in depth at the center, exsert, slightly bicuneiform to attenuated, generally straight costosepta, with lateral S1 curved. Distal edge festooned, lateral faces smooth. Distal inner edge with large well detached teeth. Radial hexameral symmetry. Bilateral symmetry marked by the elongated fossa and the curvature of lateral S1. Endotheca made of extended tabular dissepiments climbing along the wall. No synapticule. An epicostal epitheca *s.l.* covers the external part of the corallum.

Calicular diameter: 24.6 mm – Number of septa: approximately 82 – Septal density: 3 per 2 mm.

Epismiliopsis paraeudesi n. sp. (Fig. 47)

urn:lsid:zoobank.org:act:125EE1E6-0C2D-43D5-9C26-4204D1037453

Epismiliopsis sp. – Beauvais 1986: 18, pl. 2, fig. 5.

Epismiliopsis sp. 1 – Vasseur 2018: 196-197, fig. 3.38.

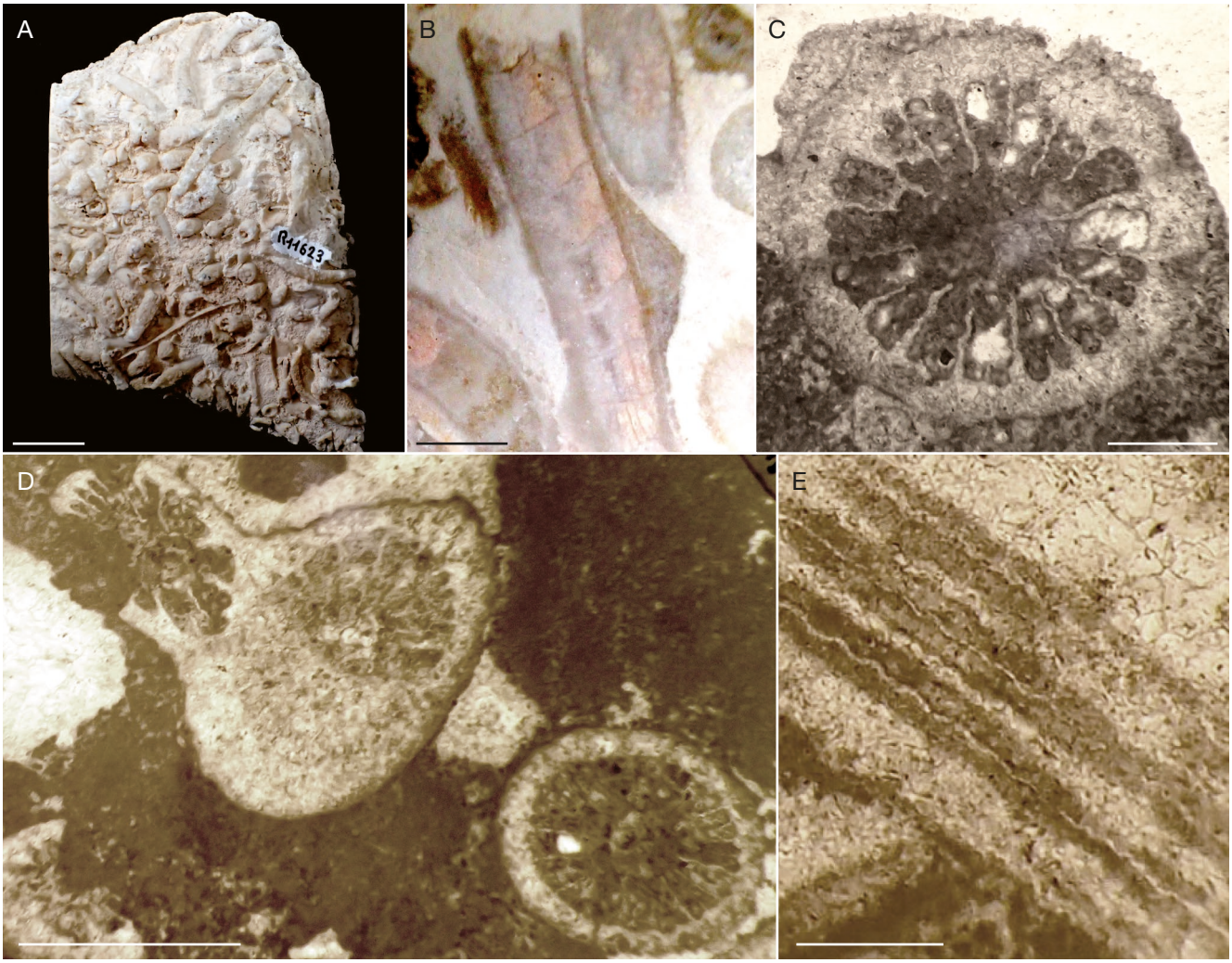

Fig. 45. — "*Stylosmilia*" *dresnayi* Beauvais, 1986: **A**, distal view of the holotype MNHN.F.R11623; **B**, polished longitudinal section in one corallum of the holotype MNHN.F.R11623; **C**, transverse thin section in one corallum of the holotype MNHN.F.R11623; **D**, transverse thin section in the holotype MNHN.F.R11623; **E**, oblique thin section of septa in a corallum of the holotype MNHN.F.R11623. Scale bars: A, 1 mm; B, D, 2 mm; C, E, 0.5 mm.

Type material. — Holotype: MNHN.F.R11596; paratypes: CPUN 2703A3-5, CPUN 2303A6-2, CPUN AM16188-11.

Studied samples. — Six specimens: MNHN.F.R11596, CPUN 2303A6-2, CPUN 2703A1-4, CPUN 2703A3-5, CPUN AM16179-5, CPUN AM16188-2, CPUN AM16188-11.

Etymology. — Refers to our doubt concerning a possibility for the single specimen of *E. eudesi* to be a young stage of this taxon.

Type horizon. — Pliensbachian.

Type locality. — Beni Tadjit, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Beni Tadjit and Amellagou (Morocco).

Description

Solitary cylindroconical corallum sometimes showing piled up enlarged rings corresponding to starts and stops alternation in growth. Elliptical calice with flattened calicular platform showing a slightly deepened axial fossa. Radial elements compact, free, joining only in depth at the center, exsert, slightly bicuneiform to attenuated, generally straight costosepta, with lateral S1 curved. Distal edge festooned, lateral faces smooth. Distal inner edge with large well detached teeth. Radial hexameral symmetry. Bilateral symmetry marked by the elongated fossa and the curvature of lateral S1. Endotheca made of extended tabular dissepiments climbing along the wall. No synapticule. An epicostal epitheca *s.l.* covers the external part of the corallum.

Calicular diameter: 20 to 40 mm – Number of septa: approximately 60 to 70 – Septal density: 2-3 per 2 mm.

Similarities and differences

Differs from *Epismiliopsis liasicus* (Fromentel & Ferry, 1865) by the absence of detached septal spines at the inner edge of septa, an elliptical calice and a lower number of radial elements. It differs also from *E. eudesi* (Fromentel & Ferry, 1865) by its higher diameter and number of septa. However we cannot exclude that the holotype of *E. eudesi* (the only specimen known) could be a young stage of the same species.

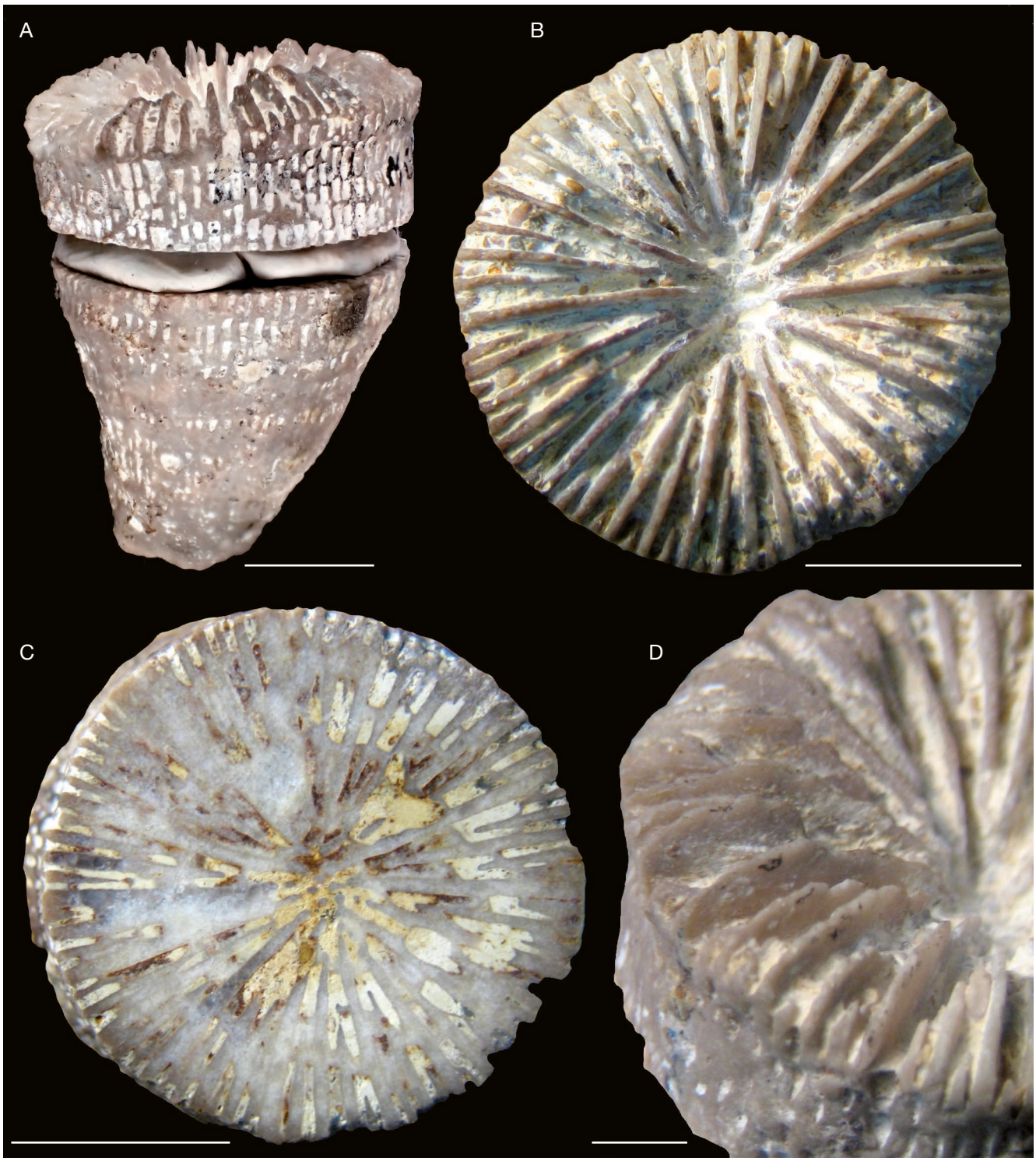

Fig. 46. — *Episimiliopsis liasicus*. **A**, lateral view of the holotype MNHN.F.M03740; **B**, distal view of the holotype MNHN.F.M03740; **C**, transverse polished section of the holotype MNHN.F.M03740; **D**, lateral distal view of the holotype MNHN.F.M03740. Scale bars: A, B, C, 1 cm; D, 3 mm.

Genus *Gillismilia* Lathuilière, Charbonnier & Pacaud, 2017

Type species. — *Palaeocyathus fromenteli* Alloiteau, 1956 (Alloiteau 1956a: Pal univ. n°86, fig. 1-2), by original designation.

Gillismilia fromenteli (Alloiteau, 1956) (Fig. 48)

Palaeocyathus fromenteli Alloiteau, 1956: Pal univ. n°86, fig.1-2.

Gillismilia fromenteli – Lathuilière *et al.* 2017: 141, pl. 1, fig. 6-8.

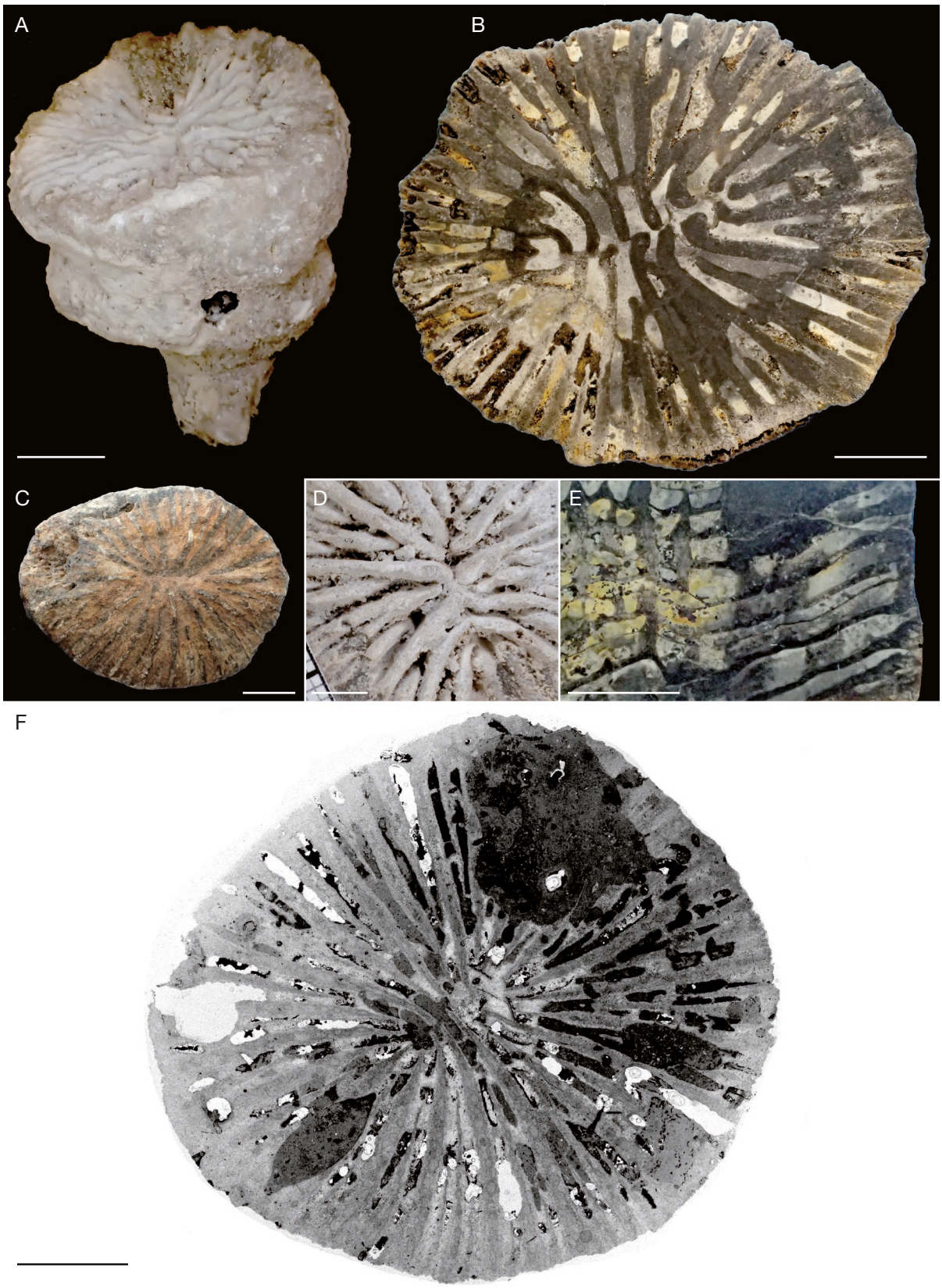

FIG. 47. — *Epismiliopsis paraeudesi* n. sp.: **A**, slightly oblique lateral view of the specimen MNHN.F.R11596; **B**, transverse polished section of the specimen CPUN 2703A3-5; **C**, distal view of the specimen CPUN 2303A6-2; **D**, detail in distal view of the axial fossa of the specimen MNHN.F.R11596; **E**, polished longitudinal axial section (following the elongated fossa) of the specimen CPUN 2703A3-5; **F**, transverse polished section of the specimen CPUN AM16188-11. Scale bars: A, C, 1 cm; B, E, 5 mm; D, F, 4 mm.

Gillismilia fromenteli – Vasseur 2018: 212-213, fig. 3.44.

TYPE MATERIAL. — Holotype: MNHN.F.M03524, Alloiteau 1956a: Pal univ. n°86, fig. 1-2.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — May-sur-Orne, France.

STUDIED SAMPLE. — Holotype MNHN.F.M03524.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of May sur Orne (Calvados; France).

DESCRIPTION

Solitary discoid corallum. Epitheca weakly folded covering a little more than half of the basal face. Calice circular in outline. Radial elements are prominent, compact, straight costo-septa. Distal edge ornamented by some regular wide festoons corresponding to the variations in thickness. No pali but some detached columns. Hexameral symmetry easy to decipher especially with the external part of radial elements. Endotheca not observed. Columella formed by teeth fused to inner edges of S1 septa; other cycles show free septa. Wall parathecal or septothecal.

Calicular diameter: 21.8 mm – Number of septa: approximately 50.

SIMILARITIES AND DIFFERENCES

The external prominence of septa and general morphology distinguishes *Gillismilia* from other Liassic stylophyllids.

Genus *Phacelostylophyllum* Melnikova, 1972

urn:lsid:zoobank.org:act:540AF60F-BAF0-4DB9-9FE0-6A9AD494F951

SPECIES ORIGINALLY INCLUDED. — ?*Phacelostylophyllum pontebbanae* (Volz, 1896), *P. romerloana* (Volz, 1896), "*P. caespitosa*" (Frech, 1890), *P. pygmaeum* (Frech, 1890) *P. zitteli* (Frech, 1890), *P. karauldyndalaensis* (Melnikova, 1972).

TYPE SPECIES. — *Stylophyllopsis zitteli* Frech, 1890 (Frech 1890: 49, pl. 13, fig. 9-15, 17-24), original designation by Melnikova (1972: 59; p. 198 in the translated version of the *Paleontological Journal*).

REMARKS

The genus differs from solitary *Stylophyllopsis* Frech, 1890 by its generally phaceloid growth form which can transform into a subcerioid one. For a long time, the transition between solitary to phaceloid and subcerioid forms have been observed in the group *Sylophyllopsis* – *Phacelostylophyllum.* According to the aim of the study (taxonomic description or phylogenetic interpretation) several nomenclatural positions can be adopted. For instance Roniewicz & Michalík (1998) classify the phaceloid forms within the genus *Stylophyllopsis* that has the nomenclatural anteriority. We prefer to adopt the spectral nomenclature (see Lathuilière 1996) and the use of a morphogenus: *Phacelostylophyllum* mg.

Phacelostylophyllum mg. ***arbustulum*** n. sp.
(Fig. 49)

urn:lsid:zoobank.org:act:329A0F5D-31AE-41EA-9475-2E4641789CDE

Phacelostylophyllum sp. 2 – Vasseur 2018: 289-290, fig. 3.75.

TYPE MATERIAL. — Holotype: CPUN PFPyr13; paratype: CPUN PFPyr9.

STUDIED SAMPLES. — Two specimens: CPUN PFPyr9, PFPyr13.

ETYMOLOGY. — Refers to the true bushing aspect of this very developed phaceloid form.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Estivère pass and surrounding areas (Pyrenees, France).

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of the Estivère pass and surrounding areas (Pyrenees, France).

DESCRIPTION

Phaceloid colony with cylindrical corallites multiplying by extratentacular lateral budding. Radial elements are subcompact, free, straight or wavy septa, organized in 2 distinct size orders. Microstructure typically stylophyllid: septa are made of septal spines linked together by thickening deposits and generally dissociated at the distal and inner edges. Septa show a rhopaloid aspect in transverse section when a septal spine occur in its very inner part. The dissociation of the septal spines along the inner edge sometimes produces a papillose columella. Endotheca made of tabular and vesicular dissepiments. Wall present, apparently parathecal. An epitheca *s.l.* seems to wrap the corallites.

Calicular diameter: 3 to 7 mm – Number of septa: 28 to 45 – Septal density: 4 to 5 for 2 mm.

SIMILARITIES AND DIFFERENCES

Differs from *Phacelostylophyllum martini* (Fromentel, 1860) by the reduced size of the calices and the mode of budding. The new species has dimensions overlapping with *P. irregularis* (Duncan, 1867). However the Hettangian species of Duncan has a very weak colonial development and a different mode of budding. From other species of the genus, *P. arbustulum* n. sp. is distinctive by its bushlike shape and by low values of diameter for such a number of septa (30-45). *Phacelostylophyllum romerloana* (Volz, 1896) and *P. pygmaeum* (Frech, 1890) have much less septa.

Phacelostylophyllum mg. ***martini*** (Fromentel, 1860)
(Fig. 50)

Thecosmilia martini Fromentel *in* Martin, 1860: 92, pl. 8, fig. 8-9. — Fromentel 1861: 142. — Dumortier 1864: 173, pl. 29, fig. 9-10. — Terquem & Piette 1865: 127, pl. 17, fig. 1-3. — Duncan 1868: 45, pl. 12, fig. 1-2. — Tomes 1878: 186. — Koby 1884b: 164, pl. 54, fig. 5; 1894: 16, pl. 4, fig. 3. — Joly 1936: 170.

Phacelostylophyllum sp. 1 – Vasseur 2018: 286-287, fig. 3.74.

TYPE MATERIAL. — Syntype MHNG GEPI 036077.

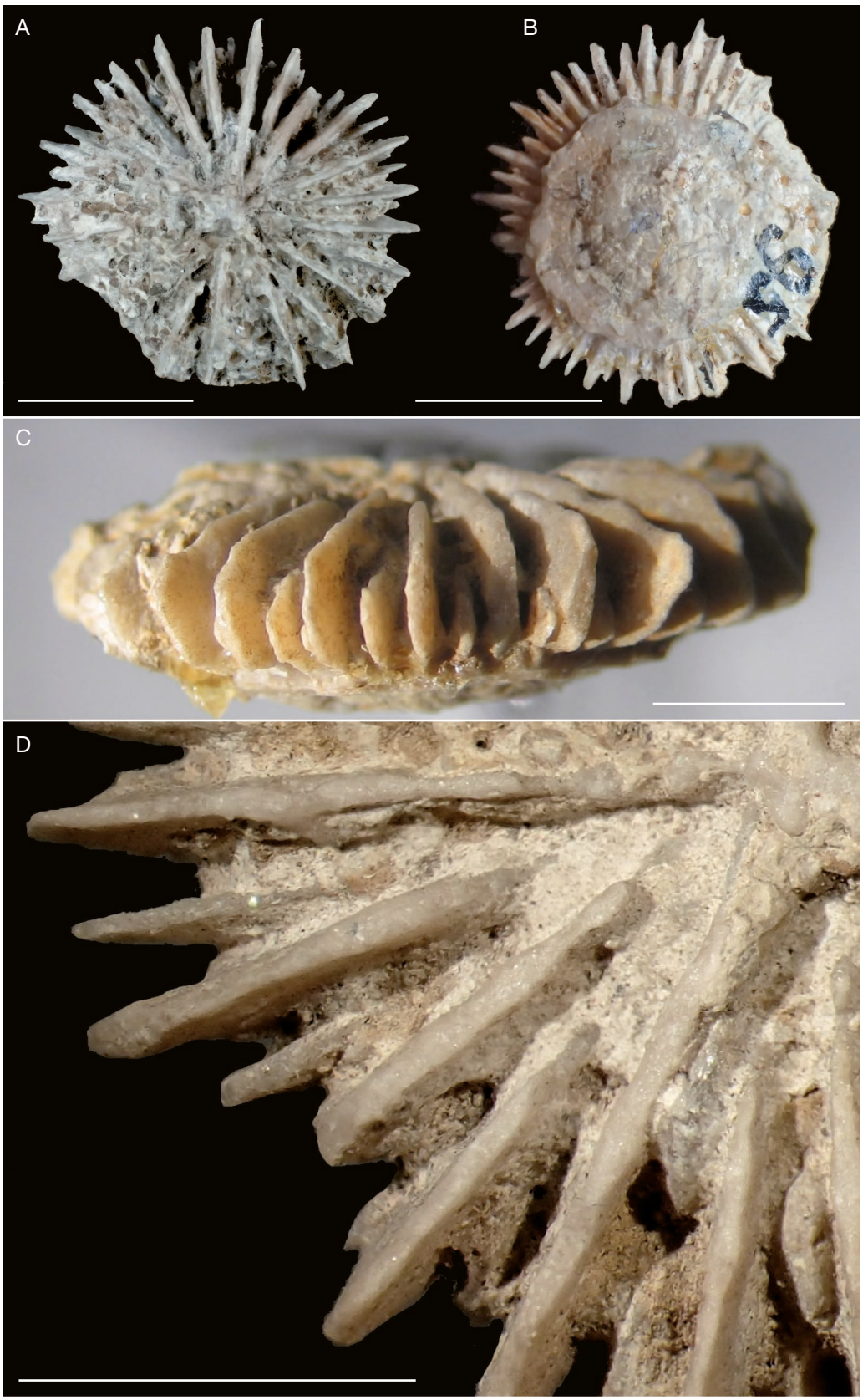

FIG. 48. — *Gillismilia fromenteli* (Alloiteau, 1956): **A**, distal view of the holotype MNHN.F.M03524; **B**, proximal view of the holotype MNHN.F.M03524; **C**, lateral view of the holotype MNHN.F.M03524; **D**, detail of the septal apparatus of the holotype MNHN.F.M03524. Scale bars: A, B, 1 cm; C, D, 5 mm.

TYPE HORIZON. — Sinemurian.

TYPE LOCALITY. — Semur en Auxois (France, historical stratotype of Sinemurian).

STUDIED SAMPLES. — Three specimens: CPUN PFPyr7, PFPyr10, PFPyr12 from French Pyrenees.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Lower Lias of France, Belgium and Great Britain. Pliensbachian of the Estivère pass and surrounding areas (Pyrenees, France). Cited also from Lower Lias of Northern Scotland (Hallam 1959; Morton & Hudson 1995; Gretz *et al.* 2013).

DESCRIPTION

Phaceloid colony with cylindrical corallites multiplying by intratentacular budding. Radial elements are subcompact, free, straight or wavy septa, organized in 3 or 4 distinct size orders. Microstructure typically stylophyllid: septa are made of septal spines linked together by sclerenchyme deposits and generally dissociated at the distal and inner edges. Septa show a rhopaloid aspect in transverse section when a septal spine occurs in its very inner part. The dissociation of the septal spines along the inner edge sometimes produces a weak papillose columella. Endotheca abundant, made of tabular and vesicular dissepiments mostly concentrated in the periphery of the corallites. Wall present, apparently parathecal. An epitheca *s.l.* seems to wrap the corallites.

Calicular diameter: 10 to 18.3 mm – Number of septa: 39 to 54 – Septal density: 3 for 2 mm.

REMARK

The initial description of the species by Fromentel (*in* Martin 1860) mentioned 80 septa. The observation of photos of the type material housed in Geneva demonstrates a much lower value (around 50-60) compatible with the present material.

SIMILARITIES AND DIFFERENCES

Differs from *Phacelostylophyllum arbustulum* n. sp. by the larger size of the calices and the mode of budding.

Dimensions of *P. martini* are partly overlapping with those of *P. medium* Roniewicz, 1974. However the morphology of *P. medium* is not a fully developed phaceloid growth form. Additionnally, there is a stratigraphic gap of two stages between the two species.

Dimensions of *P. caespitosum* (Reuss, 1864) are not very far from those of our specimens. However, again, the species is Triassic and with a poor astogenic (= colonial) development. According to the figures in Frech (1890), the septa do not show a detachment of septal spines at their inner edges.

Phacelostylophyllum dentatum (Duncan, 1867) dimensions range within the dimensions of our specimens of *P. martini* (Fromentel, 1860) but the colonial development is stopped after a very low number of corallites and the distal edge of septa in *P. dentatum* (Duncan, 1867) is characterized by an extensive development of septal spines even far from the inner edge. *Phacelostylophyllum dentatum* is Hettangian.

Phacelostylophyllum michelini (Terquem & Piette, 1865) seems very close in terms of dimensions and is a really a fully developed phaceloid colony. From the original drawing, we do not observe septal spines at the inner edge. *P. michelini* (Terquem & Piette, 1865) is known from the Lower Liassic.

Phacelostylophyllum robustum (Roniewicz, 1974) has dimensions partially overlapping with *P. martini* (Fromentel, 1865). However, this Triassic species has very thick tabuloid dissepiments that produce a thick wall.

Phacelostylophyllum peruviana (Wells, 1953) has a tendency toward the ceroid structure that we never observed in our samples.

All other species have significantly different dimensions: *P. rugosum* (Laube, 1865), *P. romerloana* (Volz, 1896), *P. pygmaeum* (Frech, 1889), *P. affinis* (Duncan, 1867), *P.* sp. *in* Roniewicz, 1974, *P. karauldyndalaensis* Melnikova, 1972). *Phacelostylophyllum pontebbanae* (Volz, 1896) was reclassified in a new genus *Pontebbastraea* (in Roniewicz & Michalík: 152) and *P. chocolatensis* (Wells, 1953) is not a stylophyllid according to Morsch (1995).

Genus *Podosmilia* n. gen.

urn:lsid:zoobank.org:act:919531A8-F816-4648-81FA-620BA459D843

TYPE SPECIES. — *Podosmilia horologium* n. sp.

DIAGNOSIS. — Solitary coral with regular hexameral septal arrangement modified in depth by the superimposition of a bilateral symmetry: the inner edges of septa appear podoid in depth in transverse section and two opposed first-order septa are longer than the four others. The orientation of the podoid tips creates a characteristic pattern. The septal microstructure looks stylophyllid but no septal detachment has been observed at the inner edge. No columella. Endotheca made of vesicular dissepiments. No synapticulae. Wall parathecal. An epitheca *s.l.* wraps the corallum.

ETYMOLOGY. — From greek ποδός (podós), refers to the foot-like aspect of septal inner edge in depth.

Podosmilia horologium n. gen., n. sp.
(Fig. 51)

urn:lsid:zoobank.org:act:9698B647-E3F3-493E-AFB9-33F7DFE0F9AB

Archaeosmilia? sp. 1 – Beauvais 1986: 13, pl. 1, fig. 1, pl. 15, fig. 4 and txt-fig. 5.

Epismiliopsis sp. – Beauvais 1986: 18, pl. 2, fig. 5c, 5d.

Nov. gen. 3 sp. 1 – Vasseur 2018: 267-268, fig. 3.66.

TYPE MATERIAL. — Holotype no. AM16177-3.

STUDIED SAMPLES. — 16 specimens: CPUN 1703A2-1, 2210E2, 2303A1-1, 2303A1-9, AM16160-4, AM16177-3, MA0504E7-15, PFPyr6-2, PFPyr6-3, PFPyr6-4, PFPyr6-5, PFPyr6-6, PFPyr6-12, PFPyr6-13, PFPyr6-14, PFPyr6-15 (collections CPUN), MNHN.F.R11597.

ETYMOLOGY. — From latin, *horologium* (clock) refers to the very regular hexameral symmetry of the septal apparatus at the distal edge of the corallum suggesting a time clock.

TYPE HORIZON. — Pliensbachian.

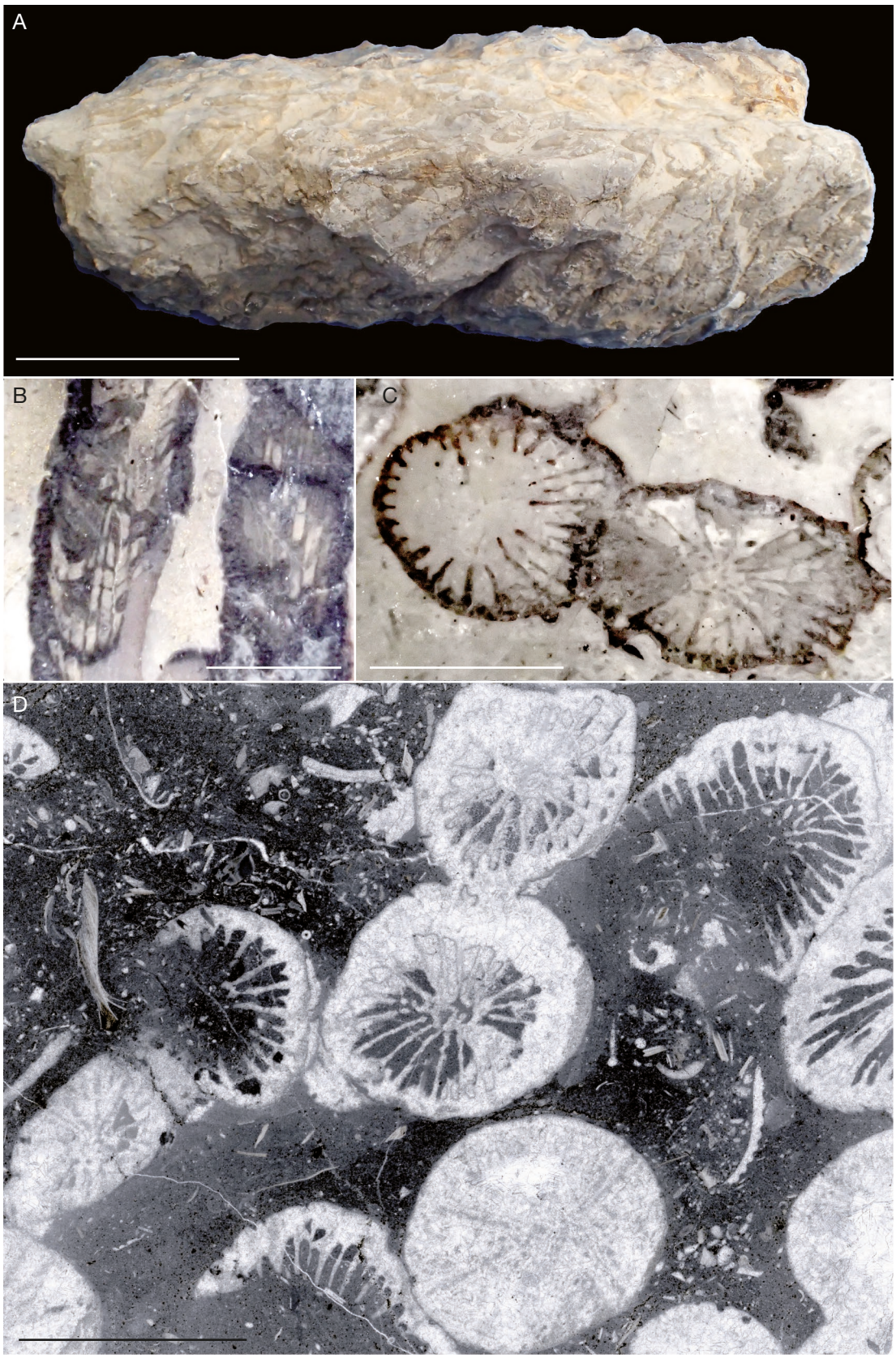

FIG. 49. — *Phacelostylophyllum* mg. *arbustulum* n. sp.: **A**, distal view of specimen CPUN PFPyr13; **B**, longitudinal oblique section of two corallites of the specimen CPUN PFPyr13; **C**, transverse section of two corallites of the specimen CPUN PFPyr13; **D**, transverse thin section in specimen CPUN PFPyr13. Scale bars: A, 5 cm; B, C, D, 5 mm.

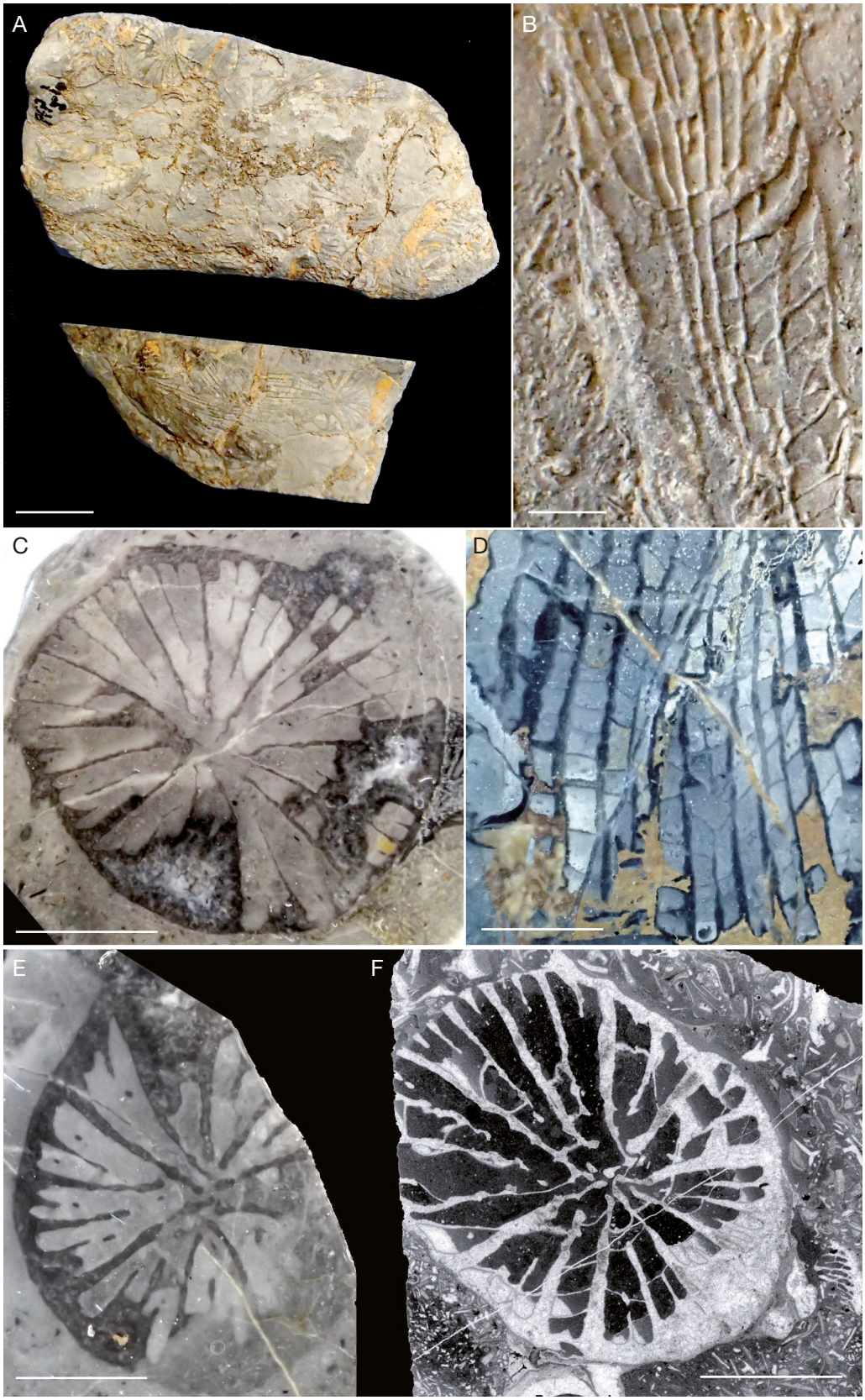

Fig. 50. — *Phacelostylophyllum* mg. *martini* (Fromentel, 1860): **A**, Distal view of specimen CPUN PFPyr10; **B**, natural worn longitudinal section of a corallum on specimen CPUN PFPyr7; **C**, transverse polished section in one corallum of specimen CPUN PFPyr7; **D**, longitudinal polished section in one corallum of specimen CPUN PFPyr10; **E**, transverse polished section in one corallum of specimen CPUN PFPyr7; **F**, transverse thin section in one corallum of specimen CPUN PFPyr7. Scale bars: A, 2 cm; B, D, F, 5 mm; C, 6 mm; E, 4 mm.

TYPE LOCALITY. — Amellagou, 31°57'21"N, 5°2'16"W, Morocco.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Morocco (Beni Tadjit, Koudiat Ech Chehem and Amellagou) and Pyrenees (close to the Estivère pass).

DESCRIPTION
Solitary, conical corallum, circular to elliptical in outline. Septal apparatus very regular in most of the specimens, made of free, compact, straight septa organized in 4 or 5 size orders corresponding to the successive ontogenic cycles of a strictly hexameral development. A superimposed bilateral symmetry appears in depth. In fact, S1 and S2 septa produce podoid bulges at their inner edges and 4 S1 come close to the axis of the elongated lumen, which reveals a bilateral symmetry defined in transverse section by the prolongation of the 2 other S1. The orientation of the podoid tips of the S1 and S2 septa follow this bilateral symmetry, producing a very characteristic pattern. No columella. Endotheca made of rare vesicular dissepiments. Synapticulae absent. Wall parathecal. An epitheca *s.l.* wrap the corallum.

Calicular diameter: 11 to 35 mm – Number of septa: 64 (6 × 8) to 96 (6 × 16).

REMARKS
We include under this taxon the specimen MNHN.F.R11597 identified and figured in Beauvais 1986 as *Epismiliopsis* sp.

Genus *Protostylophyllum* Roniewicz & Michalík, 2002

SPECIES ORIGINALLY INCLUDED. — *Protostylophyllum praenuntians* (Volz, 1896), *P. bortepense* (Melnikova, 1972).

TYPE SPECIES. — *Stylophyllum polyacanthum* Reuss, 1854 by monotypy.

Protostylophyllum praenuntians (Volz 1896) (Fig. 52)

Stylophyllum praenuntians Volz, 1896: 87, pl. XI, fig. 1-4 (*non* Cuif 1973: 254, fig. 22b, c).

Protostylophyllum praenuntians – Roniewicz & Michalík 2002: 156, fig. 5.3a-e, 5.4a-b. — Vasseur 2018: 315-316, fig. 3.84.

TYPE MATERIAL. — Holotype: MGUWr 71sz, Volz 1896: 87, pl. XI, fig. 1-4.

TYPE HORIZON. — Carnian, Late Triassic.

TYPE LOCALITY. — Valparola, Southern Alps.

STUDIED SAMPLES. — Two specimens: CPUN AM16164bis4, CPUN 2303A5-1.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou (High Atlas of Morocco), Trias (Carnian) of San Cassiano (Italia) and western Carpathian (Slovakia).

DESCRIPTION
Solitary, subcylindrical coral, subcircular in outline. Radial elements are free, straight, subcompact septa with a typically stylophyllid structure. Some septal elements dissociate at the inner edge to produce the columella. In fact, a strong spongy-papillose columella appears in depth, filling the whole axial space. The inner edge of septa is widen in transverse section and these bulges hold sharp lateral granules. This unusual organization for corals has not been described on the holotype. The septal apparatus is very regular and reveals an almost perfect hexameral symmetry with 4 or 5 distinct size orders of septa. The width of septa vary periodically from the periphery to the inner edge, which probably indicates a quite slack frame made of septal spines. The septal apparatus progressively retreats peripherally in the distal part of the corallum that shows no columella. Endotheca made of thin tabular or vesicular dissepiments. No synapticulae. An epitheca *s.l.* wraps the corallite. Wall probably parathecal.

Calicular diameter: 12.5 to 26 mm – Number of septa: 83 to 103 – Septal density: 3 to 4 per 2 mm.

Genus *Rodinosmilia* Beauvais, 1986

SPECIES ORIGINALLY INCLUDED. — Only the type species.

TYPE SPECIES. — *Rodinosmilia elegantula* Beauvais, 1986, by original designation.

REMARK
Attributed by Beauvais (1986) to the sub-family Pachycoeniinae M. Beauvais, 1977, considered after as synonym of Heterocoeniidae Oppenheim, 1930 that are described as colonial except *Hexasmiliopsis* Löser, 2008. The genus was moved by Stolarski (1996) into his new family Gardineriidae, revision that is not recognized by Fedorowski (1997) nor by Löser (2008). The smooth lateral faces of septa and the septal spines detachments at the inner edge incite us to reattribute this genus to the Stylophyllidae.

Rodinosmilia elegantula Beauvais, 1986 (Fig. 53)

Rodinosmilia elegantula Beauvais, 1986: 22, pl. 4, fig. 2 and text-fig. 11-12. — Vasseur 2018: 322-323, fig. 3.87.

TYPE MATERIAL. — Holotype MNHN.F.R11608, by original designation.

TYPE HORIZON. — Domerian (Upper Pliensbachian).

TYPE LOCALITY. — Bou Dahar, Beni Tadjit (Morocco).

STUDIED SAMPLES. — Seven specimens: holotype MNHN.F.R11608; CPUN AM16132-2, CPUN AM16178-12, CPUN AM16179-14, CPUN AM16188-1, CPUN AM16188-16, CPUN AM16188-30.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Amellagou and Bou Dahar (Beni Tadjit) in High Atlas of Morocco; Pliensbachian of Caloveto (Calabria, Italy).

DESCRIPTION
Solitary coral, ceratoid to subcylindrical, straight or slightly curved. Septa free, compact, usually straight although a

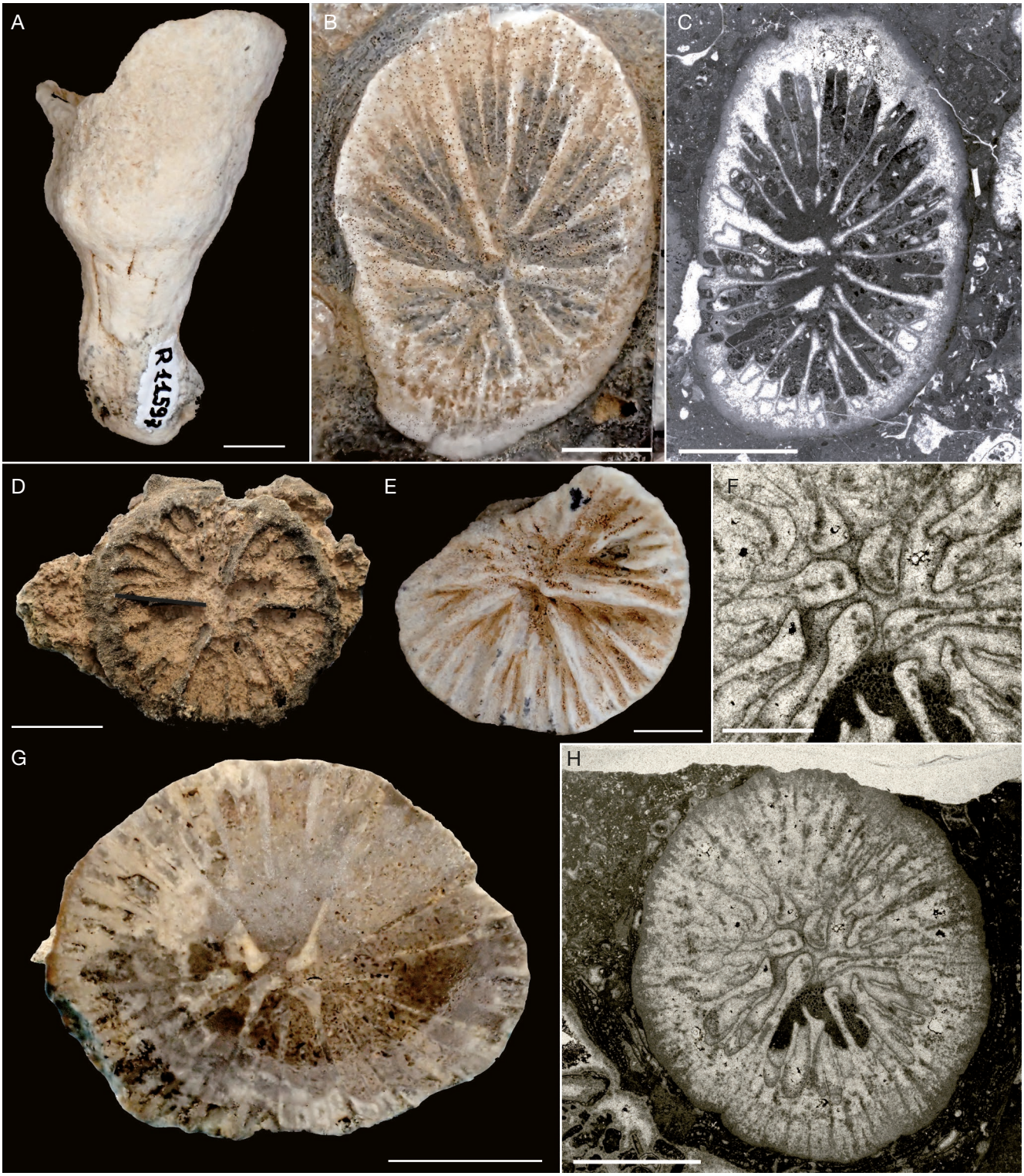

Fig. 51. — *Podosmilia horologium* n. gen., n. sp.: **A**, lateral view of the specimen MNHN.F.R11597; **B**, distal view in natural section of the specimen CPUN AM16177-3; **C**, transverse thin section of the specimen CPUN 2210E2; **D**, distal view of the specimen CPUN 2703A7; **E**, distal view of the specimen MNHN.F.R11597; **F**, detail in transverse thin section of the characteristic pattern produced by the septal bulges in depth (specimen CPUN AM16177-3); **G**, deep transverse section in sample CPUN PFPyr6-2; **H**, deep transverse thin section in sample CPUN AM16177-3. Scale bars: A, B, C, E, H, 5 mm; D, G, 1 cm; F, 2 mm.

few curved septa can be locally observed in some samples. The lumen of the calice is divided in equal lobes by the six main septa, conferring at the lumen a typical flower-like shape in transverse section characterized by a radial six-folded symmetry. Lateral faces of septa are smooth or finely granulated. The six first-order septa (S1) present

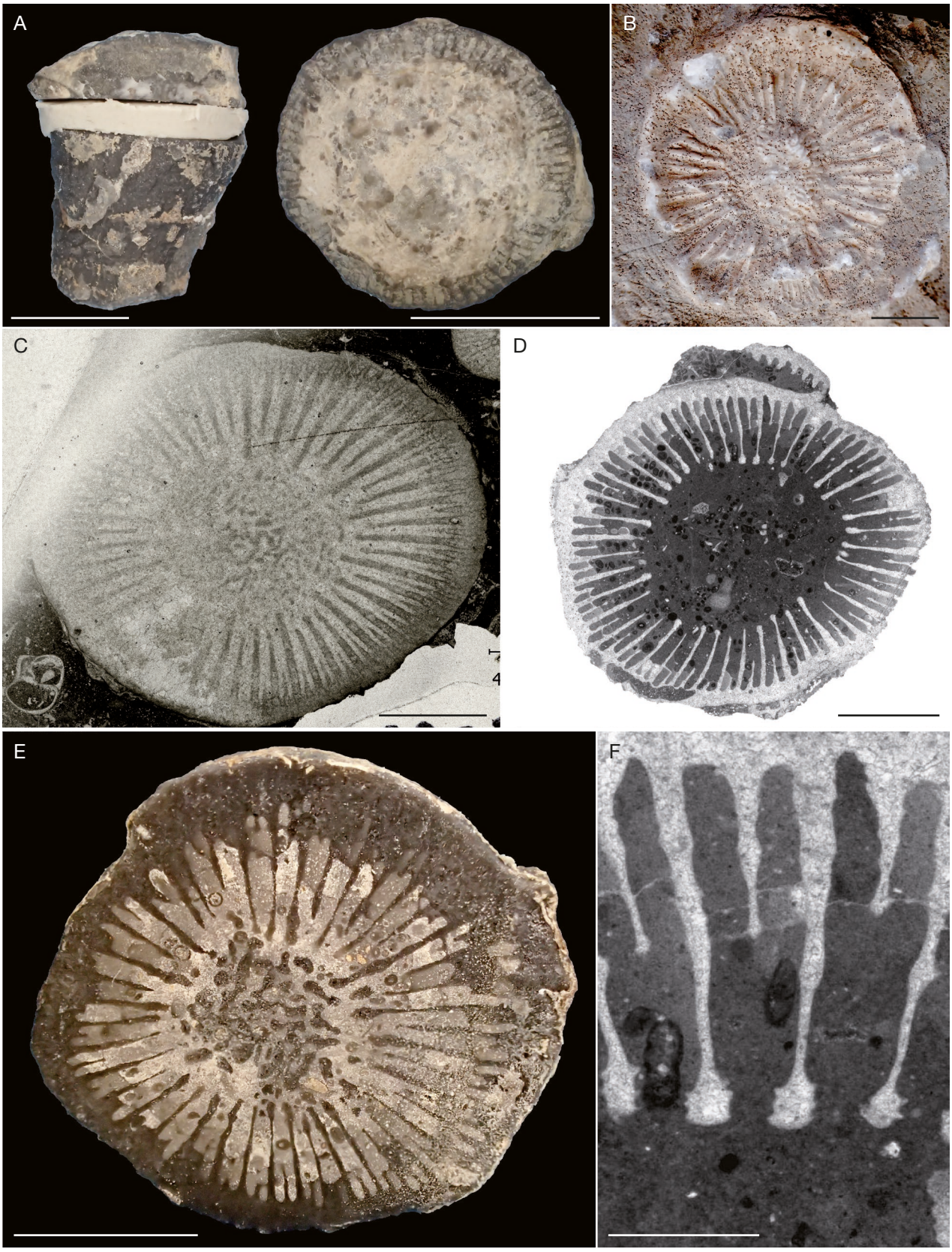

FIG. 52. — *Protostylophyllum praenuntians* (Volz, 1896): **A**, lateral view of the sectioned specimen CPUN AM16164bis4; **B**, distal view of the sectioned specimen CPUN AM16164bis4; **C**, specimen pictured in the field (Amellagou, High Atlas of Morocco); **D**, transverse thin section of the specimen CPUN 2303A5-1; **E**, proximal transverse thin section of the specimen CPUN AM16164bis4; **F**, deep transverse section of the specimen CPUN AM16164bis4; **G**, detail in transverse thin section of the septal ornamentation of the specimen CPUN AM16164bis4. Scale bars: A, B, 1 cm; C, D, 5 mm; E, 4 mm; F, 6 mm; G, 1 mm.

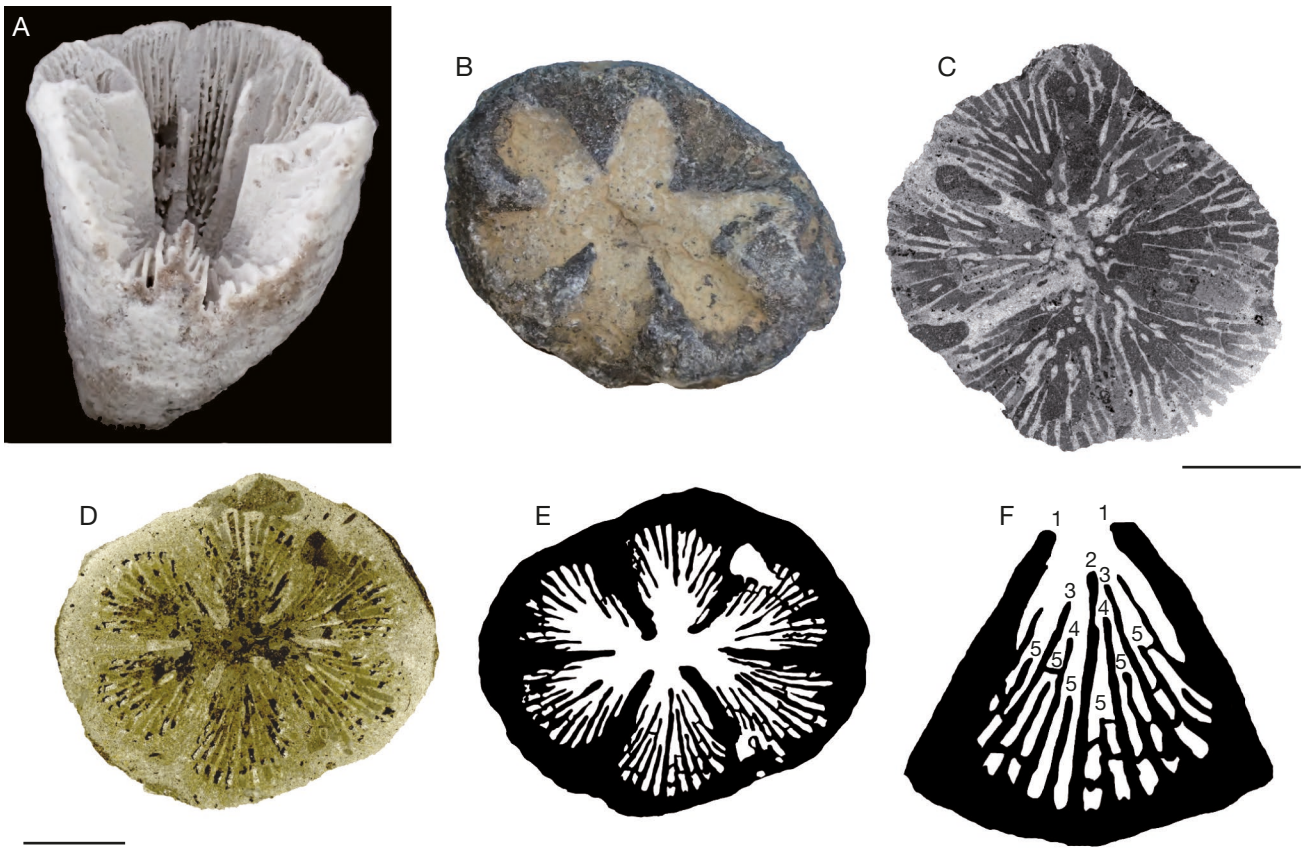

Fig. 53. — *Rodinosmilia elegantula*. **A**, perspective view of the holotype MNHN.F.R11608; **B**, distal view of the specimen CPUN AM16188-1; **C**, transverse section of the specimen CPUN AM16188-30; **D**, transverse section of the specimen CPUN AM16188-1; **E**, drawing of septal apparatus of the specimen CPUN AM16188-1; **F**, detail of a single system in sample CPUN AM16188-1 septal apparatus. The different numbers correspond to the different size orders of septa that can be distinguished. Scale bars: A, 1 cm; B, D, 5 mm; C, 4 mm.

smooth distal and inner edges whereas the septa of higher orders show wide spines regularly arranged and oriented downward along their inner edge and each of these septa is bevelled in the higher part of the calice, making their distal and inner edge in continuity, and disappearing in the very distal views. Four geometrical orders can be distinguished (S2, S3, S4 and S5) among the septa growing into the lobes formed by the S1 with the particularity for the ones closest to the S1 to grow directly on the lateral faces of these S1. Endotheca is present in the form of rare and irregularly distributed dissepiments. Synapticulae absent. The wall seems to be parathecal.

Calicular diameter: 8.2 to 19.1 mm – Number of septa: 82 to 97 (129 by extrapolation) – Septal density: 10 to 12 for 5 mm.

Similarities and differences

In comparison to Cretaceous genera *Tiarasmilia* Wells, 1932 and *Hexasmilia* Fromentel, 1870, apophysal septa are not developed toward internal edge of septa.

Genus *Stylophyllopsis* Frech, 1890

urn:lsid:zoobank.org:act:2F851F57-84C5-429D-AE7B-B75287E6D3E7

Species originally included. — *Stylophyllopsis polyactis* Frech, 1890, *S. zitteli* Frech, 1890, *S. lindstroemi* Frech, 1890, *S. caespitosa* Frech, 1890, *S. rudis* Emmrich, 1853.

Type species. — *Stylophyllopsis polyactis* Frech, 1890 (Frech 1890: 48, pl. 12, fig. 3, pl. 5, fig. 17-23), subsequent designation by Diener (1921).

Stylophyllopsis bovista n. sp.
(Fig. 54)

urn:lsid:zoobank.org:act:E549905B-386B-450D-8A0E-DF06722AB4A6

Stylophyllopsis sp. 1 – Vasseur 2018: 328-329, fig. 3.89.

Type material. — Holotype: CPUN PFPyr6-7; paratypes: CPUN PFPyr 6-8, PFPyr 6-9, PFPyr 6-10, PFPyr 6-11, PFPyr 6-16.

Studied samples. — Six specimens: CPUN PFPyr 6-7, PFPyr 6-8, PFPyr 6-9, PFPyr 6-10, PFPyr 6-11, PFPyr 6-16.

Etymology. — The species name refers to the similarity of shape with most of the mushrooms of the genus *Bovista*.

Type horizon. — Pliensbachian.

Type locality. — Estivère pass and surrounding areas (Pyrenees, France).

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of the Estivère pass and surrounding areas (Pyrenees, France).

DESCRIPTION

Solitary, discoid to fungiform corallum (the diameter exceed the height of the corallum) showing a circular adhesion scar on its lower face. Radial elements are subcompact, straight, free costosepta with stylophyllid septal structure that produce periodical fluctuations in width of septa in transverse section and sometimes project in the axial space at the inner edge. Endotheca made of rare peripheral dissepiments. No synapticulae observed. A concentrically wrinkled epitheca *s.l.* covers the external part of the corallum.

Calicular diameter: 20 to 33 mm – Number of septa: 60 to 70 – Septal density: 4 to 5 per 5 mm.

SIMILARITIES AND DIFFERENCES

This species differs from the other Triassic and Liassic ones of the genus by its ratio between number of septa and diameter and/or by its very specific shape, wider than high.

Stylophyllopsis fritillus (Fromentel & Ferry, 1866) (Fig. 55)

Montlivaltia fritillus Fromentel & Ferry, 1866: 143, pl. 24, fig. 1, 1a.

Montlivaltia laxa Fromentel & Ferry, 1867: 151, pl. 35, fig. 3.

Plesiophyllum laxa – Alloiteau 1952: 605, fig. 51; 1957: 112, pl. 5, fig. 10, fig. 70.

Axosmilia fritillus – Alloiteau 1952: 642, fig. 98.

Axosmiliopsis fritillus – Alloiteau 1957: 113, pl. 5, fig. 18, fig. 72.

Plesiophyllum ferry [sic] Alloiteau, 1957: 112, fig. 71.

Plesiophyllum fritillus – Vasseur 2018: 292-293, fig. 3.76.

TYPE MATERIAL. — Holotype MNHN.F.M03502, Fromentel & Ferry 1866: 143, pl. 24, fig. 1a.

ETYMOLOGY. — In latin *fritillus* designates a cylindro-conical cup used for dice roll. It is a name and not an adjective. This is the reason why we do not make an agreement between *fritillus* and the neutral gender of the genus name in the new combination.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — May-sur-Orne, France.

STUDIED SAMPLES. — Three specimens: holotype MNHN.F.M03502; MNHN.F.M03520, CPUN AM16179-6.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of May-sur-Orne (Calvados, France).

DESCRIPTION

Solitary subcylindrical coral. Calice subcircular with moderately large and deep, eccentric fossa. Radial elements are slightly exsert, compact, free, straight, slightly curved or even bent (costo-?) septa. Septa show regular variation of their thickness from the center to the periphery. Distal edge poorly ornamented by some regular wide festoons corresponding to the variations in thickness. Lateral faces show the subvertical orientation of these thicker and thinner bands. Hexameral symmetry not very regular. Bilateral symmetry visible with curvature of septa and eccentricity. Endotheca with tabuloid thick dissepiments. Wall of unknown nature but peripheral in position. Epitheca *s.l.* present.

Calicular diameter: 14 to 20 mm – Number of septa: approximately 30 to 40? – Septal density: 2 per 2 mm.

REMARK

Small rows of granules evoked in the fig. 70 of Alloiteau (1957) were not seen and the angle of thick and thin bands with vertical is obviously exaggerated.

Stylophyllopsis veracolumella n. sp. (Fig. 56)

urn:lsid:zoobank.org:act:63B1ABD4-42E4-442F-80FD-4DE250ADF4B4

Stylophyllopsis sp. 2 – Vasseur 2018: 330-331, fig. 3.90.

TYPE MATERIAL. — Holotype MHNLM 2019.4.1

STUDIED SAMPLES. — 13 specimens: holotype MHNLM 2019.4.1, batch 1279 from private collections of Marc Chesnier (collection MC).

ETYMOLOGY. — The species name refers to the presence of a true papillose columella in the axis of the corallite.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — Brûlon (Sarthe; France).

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Brûlon (Sarthe; France).

DESCRIPTION

Solitary, cylindroconical corallum. Radial elements are slightly exsert, straight, free or joined costosepta with stylophyllid structure that produce regular variations in width of septa from the periphery to the inner edge. The distal edge is festooned and the inner edge shows dissociated septal spines that project in the lumen and produce a well expressed papillose parietal columella. Radial symmetry. Endotheca dissepimental. No synapticulae. Wall of unknown nature. A wrinkled epicostal epitheca *s.l.* wraps the corallum.

Calicular diameter: 16 to 18 mm – Number of septa: approximately 62 – Septal density: 3 - 4 per 2 mm.

SIMILARITIES AND DIFFERENCES

This taxon differs from *S. rugosa* (Duncan, 1868), *S. mucronata* (Duncan, 1868) and *S. murchisoniae* (Duncan, 1867) by the presence of a true papillose columella and from the other species of the genus by its morphometric characters.

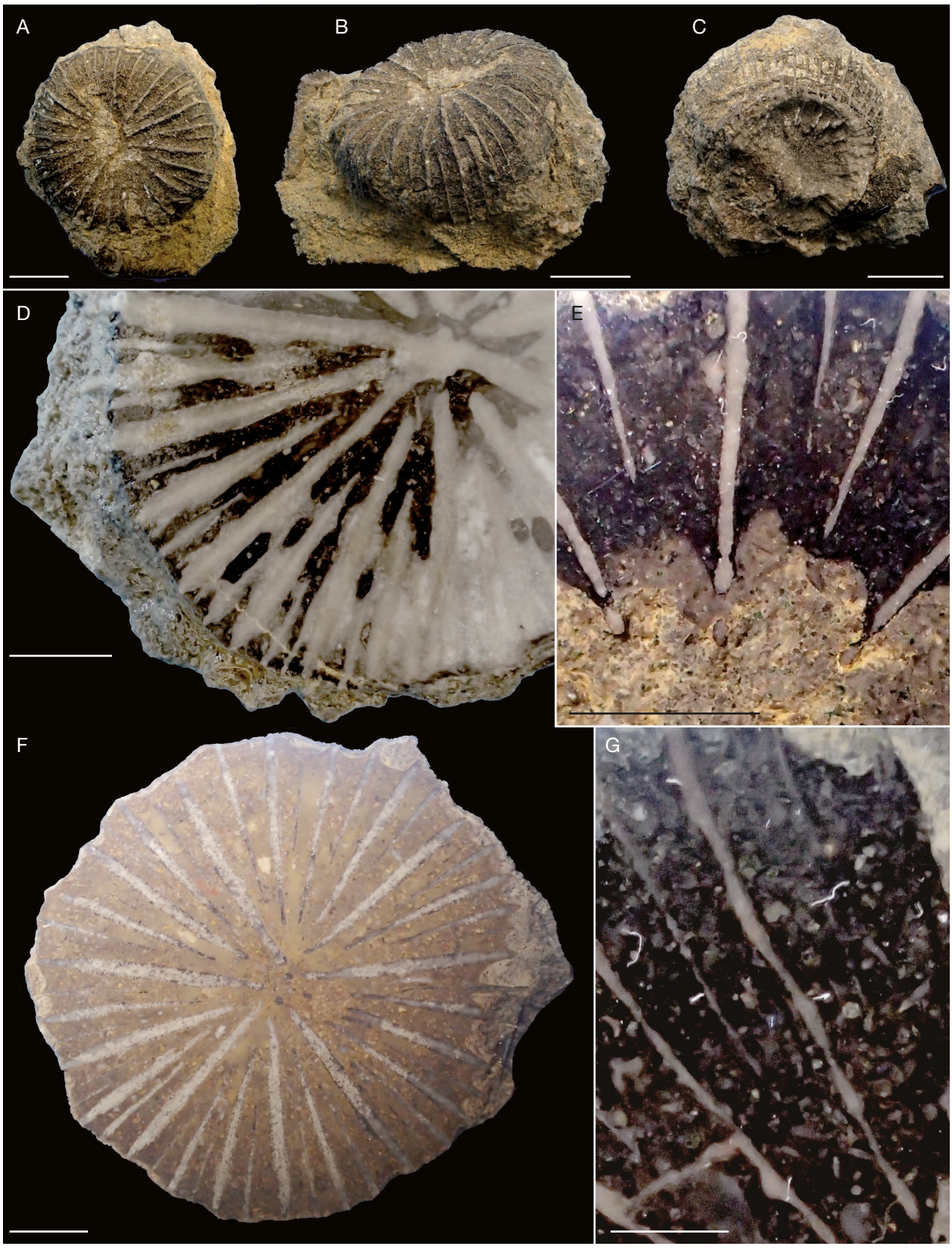

FIG. 54. — *Stylophyllopsis bovista* n. sp.: **A**, distal view of the specimen CPUN PFPyr6-7; **B**, lateral view of the specimen CPUN PFPyr6-7; **C**, proximal view of the specimen CPUN PFPyr6-7; **D**, transverse proximal polished section of the specimen CPUN PFPyr6-8; **E**, transverse distal polished section of the specimen CPUN PFPyr6-8 (detail of septal structure); **F**, transverse polished section of the specimen CPUN PFPyr6-10; **G**, transverse polished section of the specimen CPUN PFPyr6-11 (detail of septal structure). Scale bars: A, B, C, 1 cm; D, E, F, 5 mm; G, 2 mm.

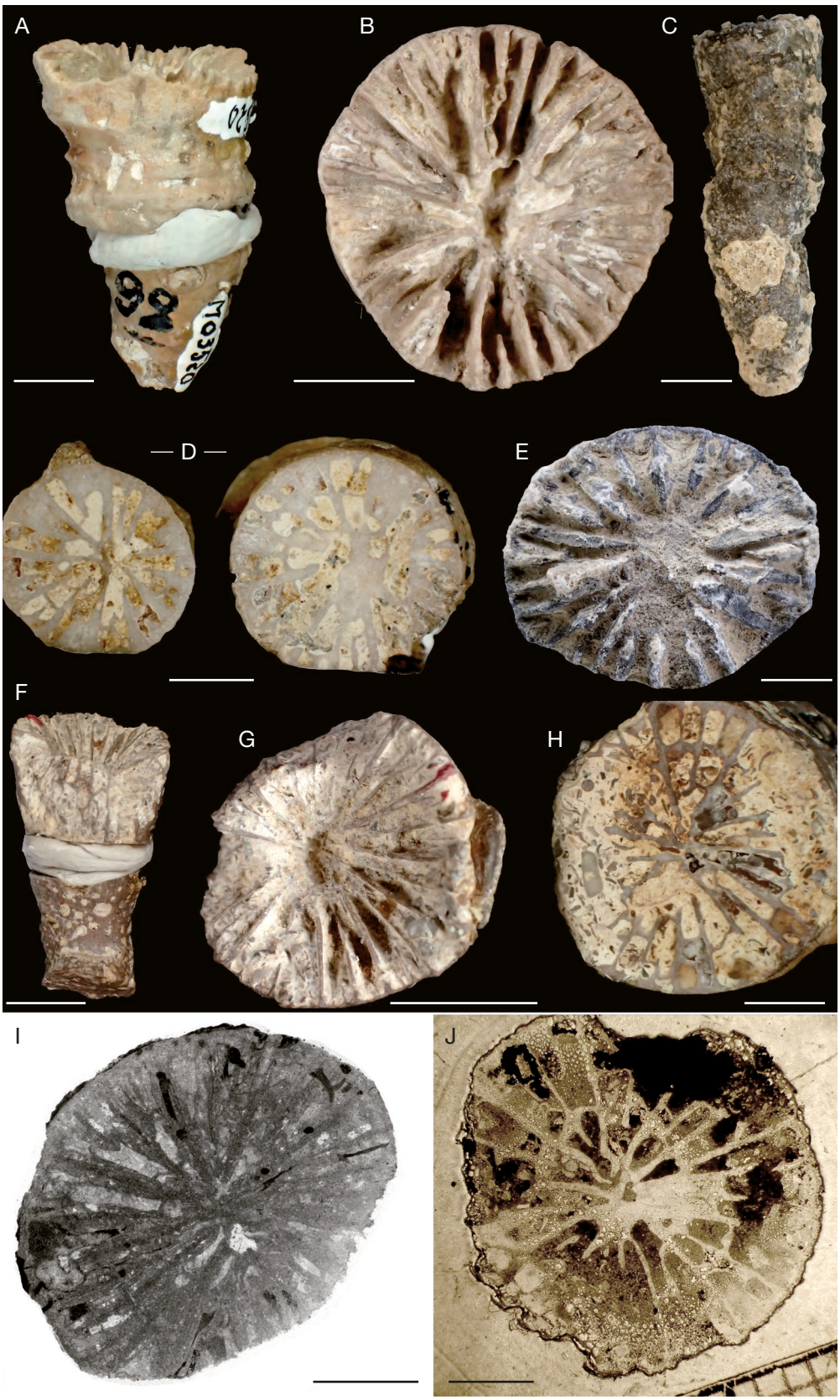

Fig. 55. — *Stylophyllopsis fritillus* (Fromentel & Ferry, 1866): **A**, lateral view of the specimen MNHN.F.M03520; **B**, distal view of the specimen MNHN.F.M03520; **C**, lateral view of the specimen CPUN AM16179-6; **D**, polished sections of the specimen MNHN.F.M03520; **E**, distal view of the specimen CPUN AM16179-6; **F**, lateral view of the holotype MNHN.F.M03502; **G**, distal view of the holotype MNHN.F.M03502; **H**, polished transverse section of the holotype MNHN.F.M03502; **I**, transverse thin section of the specimen CPUN AM16179-6; **J**, printing of the holotype MNHN.F.M03502 (transverse section). Scale bars: A, B, 5 mm; C, F, G, 1 cm; D, E, H, I, 4 mm; J, 3 mm.

Stylophyllopsis vetusum (Beauvais, 1986) (Fig. 57)

Epistreptophyllum vetusum Beauvais, 1986: 56, pl. 15, fig. 6 et 7.

Stylophyllopsis vetusum – Vasseur 2018: 332-333, fig. 3.91.

Studied sample. — Holotype MNHN.F.R11648.

Geographic and stratigraphic ranges. — Pliensbachian of Jebel Bou Dahar (Morocco).

Description

Subcylindrical corallum, elliptical in outline, with convex calicular plateau showing a slightly depressed fossa. Radial elements are subcompact, straight or slightly curved, free or joined costosepta with a stylophyllid structure. We did not observed the pennulae described by Beauvais (1986). Septal spines in the frame of septa project at the inner edge in the axial space and produce a weak parietal papillose columella. Radial symmetry and bilateral symmetry following the calicular elongation. Endotheca made of numerous dissepiments. Synapticulae not observed. Epitheca *s.l.* present.

Calicular diameter: 17 to 20 mm – Number of septa: approximately 120 – Septal density: 4 to 7 per 2 mm.

Remark

The original material described in Beauvais (1986) consists in a heterogeneous batch. The holotype belongs to the Stylophyllidae because of its septal structure. One of the paratypes (within the batch MNHN.F.A32021) seems to be a *Proleptophyllia*. None of the specimens shows the typical characters of the genus *Epistreptophyllum* Milaschewitsch, 1876.

Stylophyllopsis zitteli Frech, 1890 (Fig. 58)

Stylophyllopsis zitteli Frech,1890: 49, pl. 13, fig. 9-15 et 17-24. — Cuif 1973: 243, txt-fig. 15-18. — Roniewicz 1989: 125, pl. 39, fig. 8 and pl. 40, fig. 5-7. — Vasseur 2018: 335-336, fig. 3.92.

Stylophyllopsis zitteli var. *crassisepta* Haas, 1909: 149, pl. 5, fig. 9.

non Oppelismilia zitteli Kristan-Tollmann & Tollmann, 1963: 562, pl. 7, fig. 1 et pl. 8, fig. 2-5.

non Phacelostylophyllum zitteli Melnikova, 1972: 198, txt-fig. 5, pl. 9, fig. 6-7; 1975b: 79, txt-fig. 6, pl. 11, fig. 2-7.

Stylophyllopsis zitelli [*sic*] – Beauvais 1986: 7.

Studied samples. — Two specimens: CPUN 2703A3-3, CPUN AM16179-8.

Geographic and stratigraphic ranges. — Rhaetian of Austria, Pliensbachian of Amellagou (High Atlas of Morocco).

Description

Solitary coral, cylindrical to conical, quite irregular in shape. Radial elements are subcompact costosepta of a well-defined stylophyllid structure in their inner part but showing a wavy mid-septal line in the two peripheral thirds (this character can fit with a stylophyllid structure, see for example Cuif 1972 or Stolarski & Russo 2002). They are large, with detachments of quite rough septal spines at the inner edge and sometimes some stereome layers in depth. The last-order septa are constituted of only one or two septal spines that appear oblong (i.e. subcircular but elongated) in transverse section. No columella observed but the genus is described as having sometimes a papillose columella made of septal spines projected in the axial space. Endotheca made of large vesicular dissepiments with stereomal thickenings, in continuity with enlarged septa. An often eroded epicostal epitheca *s.l.* seems to wrap the corallum.

Calicular diameter: 14 to 26 mm – Number of septa: 43 to 47 – Septal density: 3 to 4 per 2 mm.

Similarities and differences

This species differs from other *Stylophyllopsis* species by its large, weakly numerous septa with mid-septal line in the peripheral part of the corallite transverse section. Dissepiments are large too. The last-order septa are sometimes constituted of only one or two septal spines that appear oblong (i.e. subcircular, elongated) in transverse section.

Genus *Tubulosmilia* n. gen.

urn:lsid:zoobank.org:act:0B6B1523-7696-436C-9EAB-54F854ADBEAD

Type species. — *Tubulosmilia regularis* n. sp.

Diagnosis. — Phaceloid corallum with cylindrical corallites that seems to reproduce by extracalicular budding. Radial elements are free or joined, often wavy septa of fluctuating width with inner edge generally swollen. The first cycles of septa are generally so enlarged that they link together into a ring that more or less completely encloses the lumen and separate it from the interseptal chambers. Endotheca made of tabular dissepiments and wall probably parathecal. An epitheca *s.l.* wraps the corallites.

Etymology. — Refers to the tube-like shape of the corallites.

Tubulosmilia regularis n. gen., n. sp. (Fig. 59)

urn:lsid:zoobank.org:act:62B61ED0-2B66-41C5-9A9E-0C5EC86FA2D0

Nov. gen. 5 sp. 1 – Vasseur 2018: 273-274, fig. 3.68.

Type material. — Holotype CPUN 2303A5-3.

Studied sample. — CPUN 2303A5-3.

Etymology. — The species name refers to the regularity of the septal apparatus and to the fact that this species represents the genus in its features.

Type horizon. — Pliensbachian.

Type locality. — Amellagou, 31°57’29”N, 5°2’20”W, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Amellagou (High Atlas of Morocco).

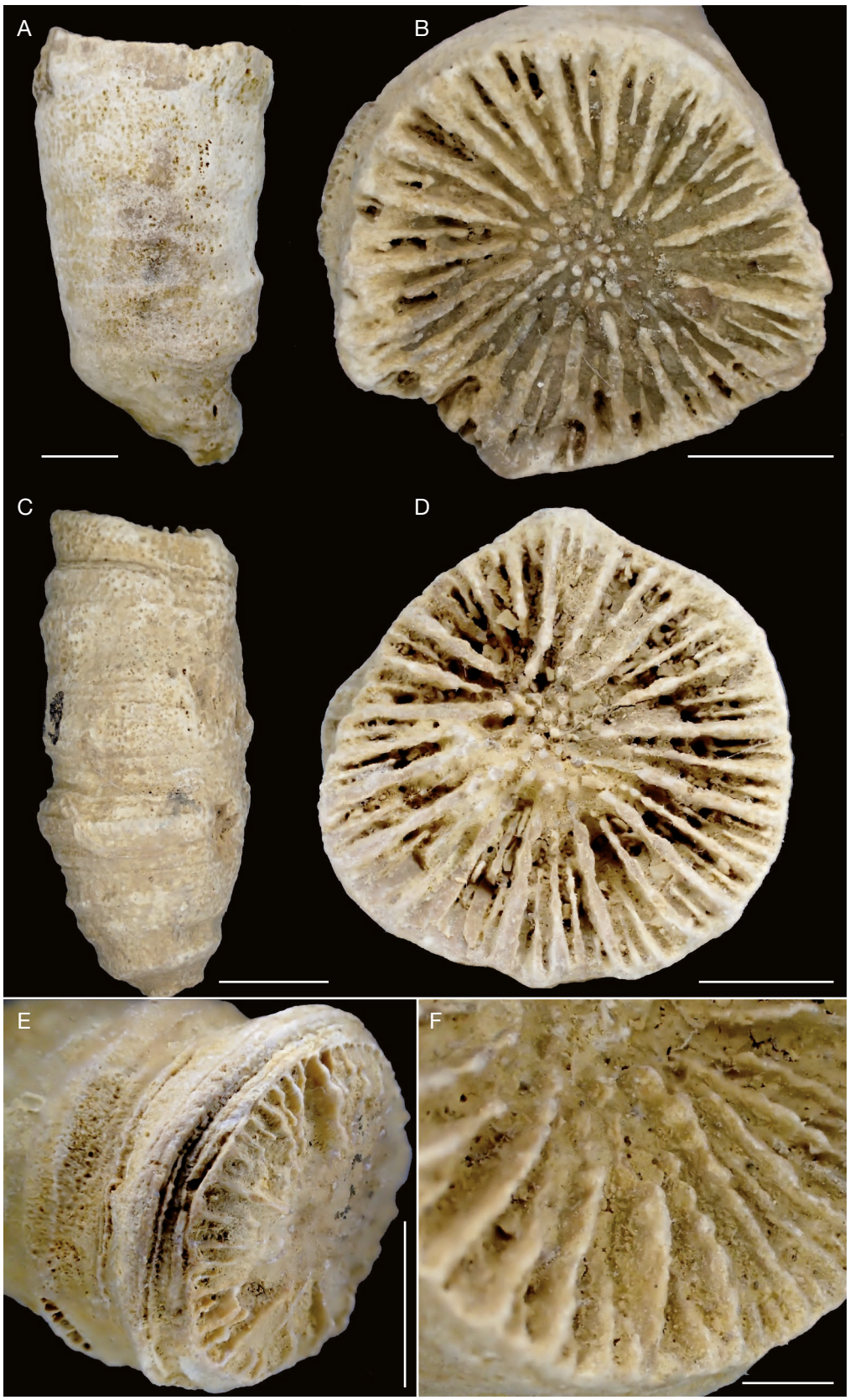

FIG. 56. — *Stylophyllopsis veracolumella* n. sp.: **A**, proximal view of the holotype MHNLM 2019.4.1; **B**, distal view of the previous specimen; **C**, proximal view of one specimen from the batch MC 1279; **D**, distal view of the previous specimen; **E**, distal lateral view of one specimen from the batch MC 1279; **F**, detail in distal view of one specimen from the batch MC 1279. Scale bars: A, B, D, 5 mm; C, E, 1 mm F, 2 mm.

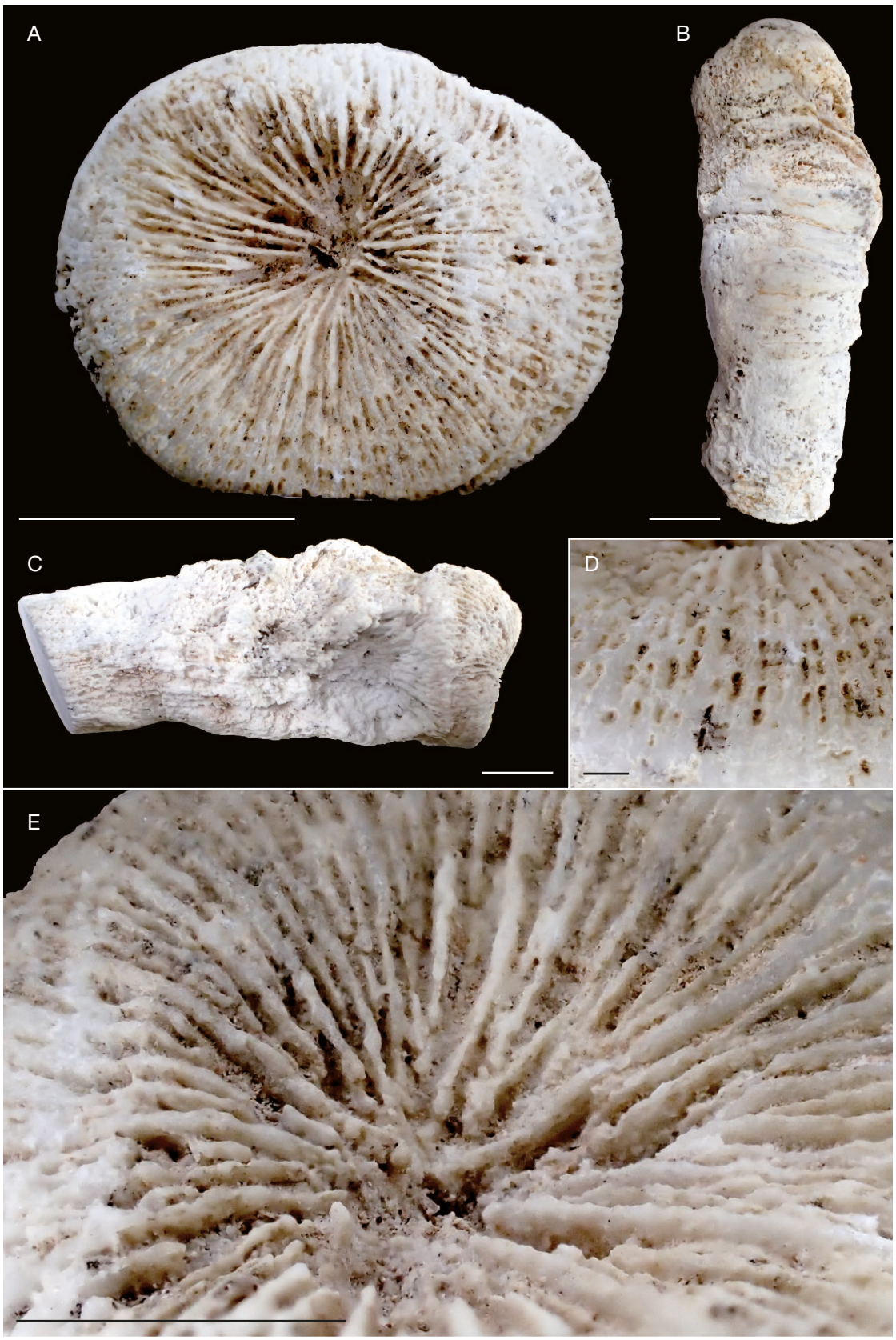

FIG. 57. — *Stylophyllopsis vetusum* (Beauvais, 1986): **A**, distal view of the holotype MNHN.F.R11648; **B**, lateral view of the holotype MNHN.F.R11648; **C**, lateral view of the holotype MNHN.F.R1164; **D**, distal peripheral view of the holotype MNHN.F.R11648; **E**, detail in distal view of the holotype MNHN.F.R11648. Scale bars: A, C, 1 cm; B, E, 5 mm; D, 1 mm.

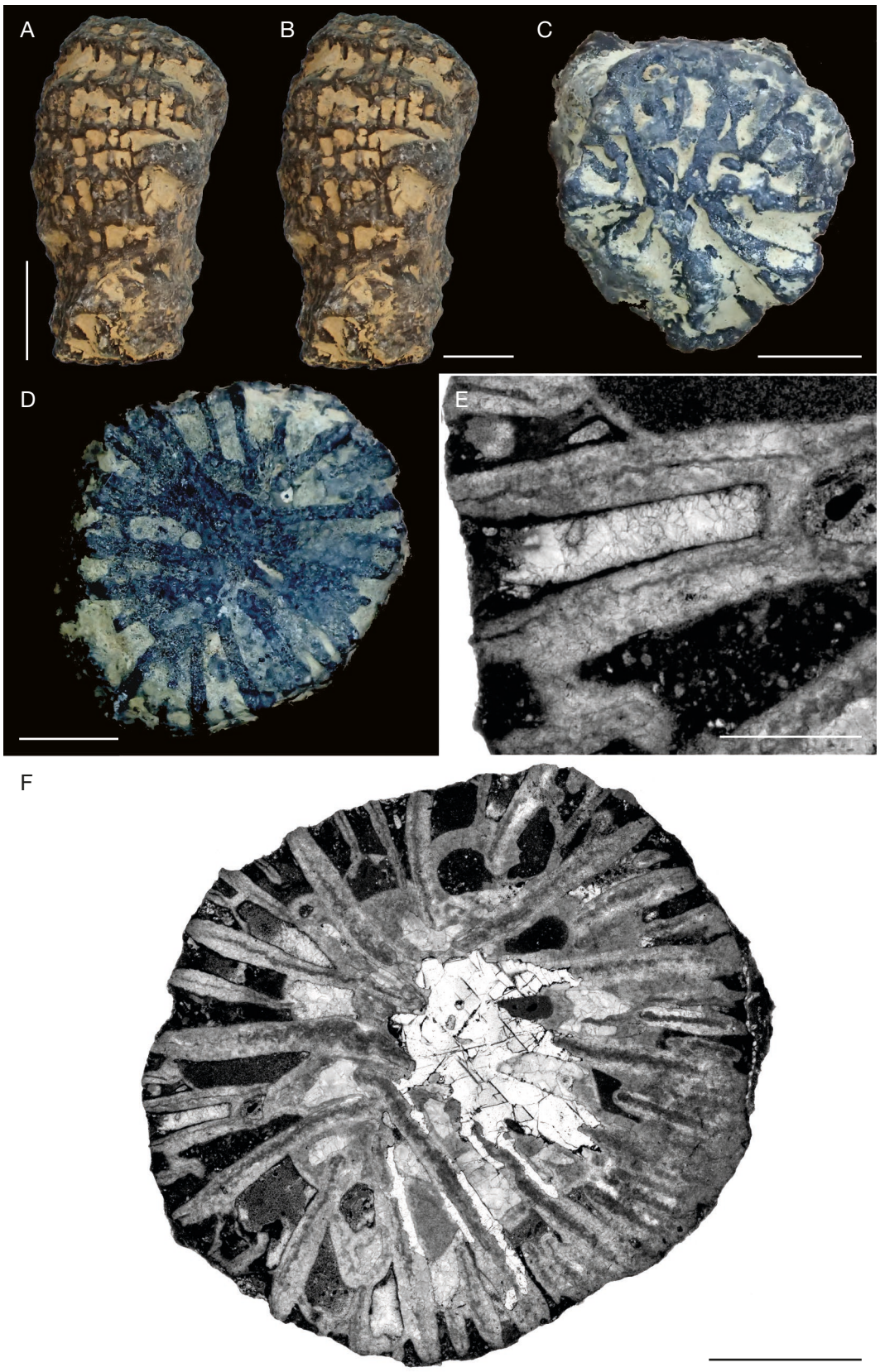

FIG. 58. — *Stylophyllopsis zitteli* Frech, 1890: **A**, lateral view of the specimen CPUN 2703A3-3; **B**, lateral view of the specimen CPUN AM16179-8; **C**, distal view of the specimen CPUN 2703A3-3; **D**, distal view of the specimen CPUN 2703A3-3; **E**, transverse thin section showing wavy mid-septal line in the specimen CPUN 2703A3-3; **F**, transverse thin section of the specimen CPUN 2703A3-3. Scale bars: A, B, 1 cm; C, D, 5 mm; E, 1 mm; F, 4 mm.

Description
Phaceloid corallum with cylindrical corallites that seems to reproduce by extracalicular budding. Radial elements are free or joined, often wavy septa of fluctuating width with inner edge generally swollen. In most of the calices, the first cycles of septa are so enlarged that they link together into a ring that more or less completely encloses the lumen and separate it from the interseptal chambers. There are at least 3 distinct size orders of septa in the septal apparatus. Endotheca made of tabular dissepiments and wall probably parathecal. An epitheca *s.l.* wraps the corallites.

Calicular diameter: 3.3 to 7.3 mm – Distance between calices: 7 to 13 mm – Number of septa: approximately 60 to 70 – Septal density: 8 per 2 mm.

Family Thamnasteriidae Vaughan & Wells, 1943

Genus *Thamnasteria* Lesauvage, 1823

Dactylastrea d'Orbigny, 1849: 9.

Centrastrea d'Orbigny, 1849: 9.

Species originally included. — *Astrea dendroidea* Lamouroux, 1821.

Type species. — *Astrea dendroidea* Lamouroux, 1821 (Lamouroux 1821: 85, pl. 78, fig. 6), by monotypy.

Thamnasteria cf. ***mettensis*** Milne Edwards & Haime, 1851 (Fig. 60)

Thamnasteria mettensis Milne Edwards & Haime, 1851: 141, pl. 30, fig. 3. — Lathuilière 2000b: 161, fig. 13.4, 13.6, 13.9, 18, 19 *cum syn.* — Pandey & Fürsich 2003: 75 pl. 20 fig. 3, pl. 21 fig. 1, 4-6.

Thamnasteria aff. *mettensis* – Pandey & Fürsich 2003: 76, pl. 22, fig. 3.

Thamnasteria sp. 1 – Vasseur 2018: 344-345, fig. 3.96.

Thamnasteria sp. – Brame *et al.* 2019: fig. 7J-K.

Type material. — Syntype lost.

Type horizon. — Bajocian.

Type locality. — Saint Quentin, near Metz (France) and Crickley (Great Britain).

Studied samples. — Two specimens: CPUN DA2705E5-1 and CPUN DA2805E6-1.

Geographic and stratigraphic ranges. — Pliensbachian of Ziz valley (High Atlas of Morocco).

Description
Massive thamnasterioid corallum without epitheca (14 to 38 mm in size). Radial elements are subcompact (upward) to compact (in depth), septa or biseptal sheets sometimes anastomosed and often sinuous. Distal edge with regular small teeth, which diameter decrease from the periphery to the center of the calice. These teeth are often well detached at the distal-inner edge. False pennulae small, in the form of horizontally flattened dentate expansions never turned upward and not alternating or corresponding from a septum to the neighbouring one or from one side to the other of a single septum. Acute granules also present on lateral faces. Styliform columella in depth. Endotheca present, made of numerous dissepiments. Synapticulae abundant, wall absent.

Calicular diameter: 3.5 to 6 mm – Distance between calices: 3.5 to 6 mm – Number of septa: 20 to 30 – Septal density: 6 to 7 for 2 mm.

Remarks
According to Lathuilière (2000b), the dimensions of the present species range within the species *Thamnasteria mettensis*, the only species of the genus for which a population study is available. However they are situated in the upper part of the spectrum with regards to the distance between calices. Moreover we identified the species with a cf. due to the absence of holotheca, an unusual character in the Bajocian *T. mettensis*. Since its creation in 1823 the genus *Thamnasteria* includes 165 nominal species that obviously need a thorough revision. We refer here to *T. mettensis* because it is well known in terms of variability and it is the closest species in terms of stratigraphy. The revision of common Upper Jurassic species (*T. dendroidea* Lamouroux, 1821, *T. gracilis* Goldfuss, 1829 and *T. concinna* Goldfuss, 1826 among others) could lead to a synonymy of *T. mettensis* Milne Edwards & Haime, 1851.

Family Thecosmiliidae Duncan, 1884

Genus *Complexastrea* d'Orbigny, 1849

Platastraea Tomes, 1885: 183.

Species originally included. — *Astrea burgundiae* Leymerie, 1846.

Type species. — *Astrea burgundiae* Leymerie, 1846 (Leymerie 1846: 252, pl. 10, fig. 13), *non* Defrance *in* Blainville 1830).

Remark
In 1849, d'Orbigny created *Complexastrea* with the indication *Astrea burgundiae* Leymerie. In 1850 (d'Orbigny 1850: 35-36, no. 565) d'Orbigny abandoned *Complexastrea* and attributed *Astrea burgundiae* Leymerie to *Confusastrea subburgundiae*. The genus *Complexastrea* is now considered available and valid. The type material has been described and figured in Morsch (1994: 10, pls 1, 2, 3).

Complexastrea cf. ***gregaria*** (M'Coy, 1848) (Fig. 61)

Montlivaultia gregaria M'Coy, 1848: 403.

Thecosmilia gregaria – Milne Edwards & Haime 1851: 135, pl. 28, fig. 1-1a; 1857: 359. — Fromentel 1861: 144. — Duncan 1872: 18, pl. 6, fig. 1-2-3-4. — Tomes 1878: 299. — Meyer 1888: 19, pl. 4, fig. 3-6. — Lang 1917: 93.

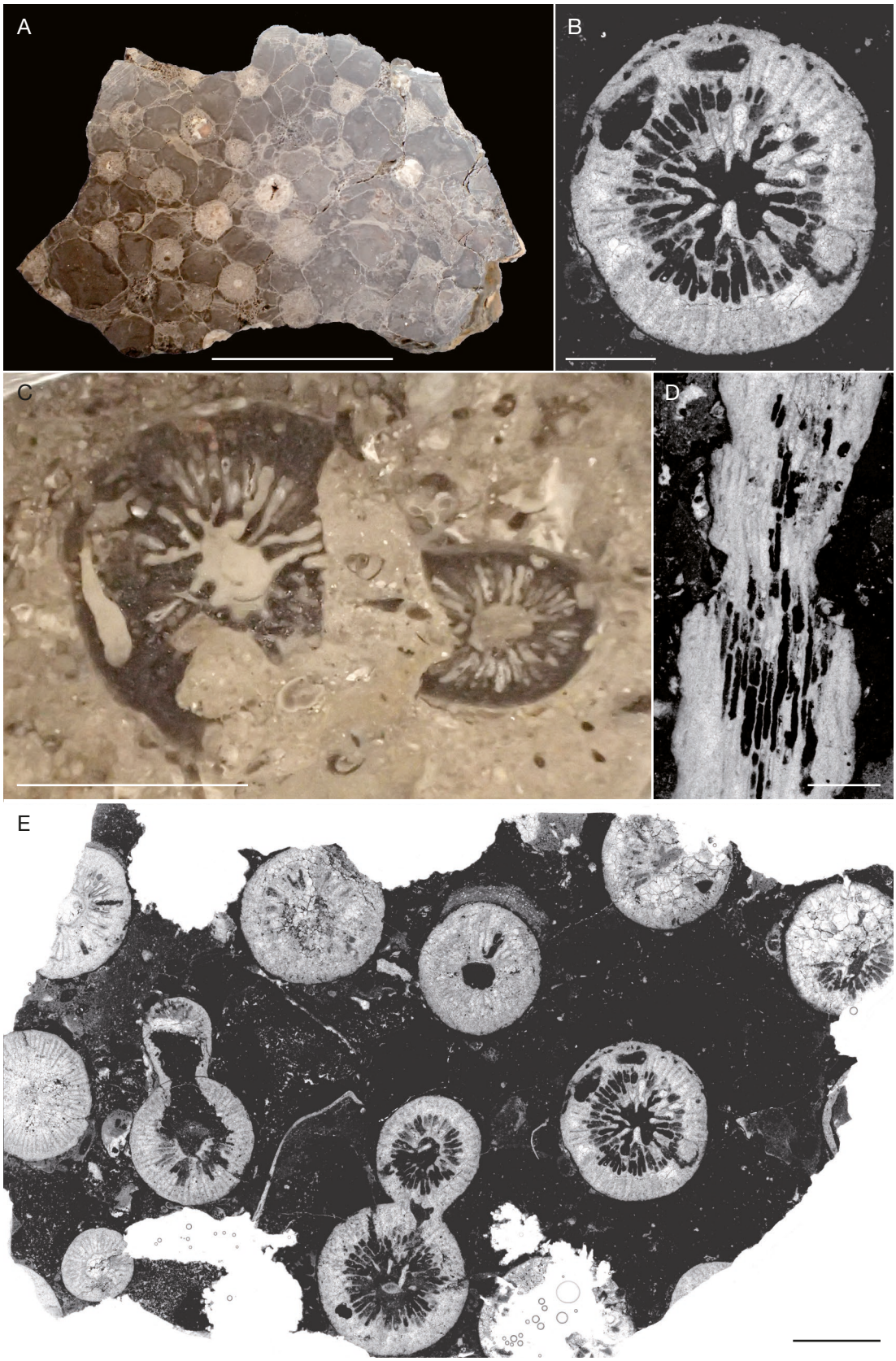

FIG. 59. — *Tubulosmilia regularis* n. gen., n. sp.: **A**, transverse polished section of the specimen CPUN 2303A5-3; **B**, transverse thin section of one calice of the specimen CPUN 2303A5-3; **C**, detail in transverse polished section of two calices of the specimen CPUN 2303A5-3; **D**, longitudinal thin section of one calice of the specimen CPUN 2303A5-3; **E**, transverse thin section of the specimen CPUN 2303A5-3. Scale bars: A, E, 4 mm; B, D, 2 mm; C, 5 mm.

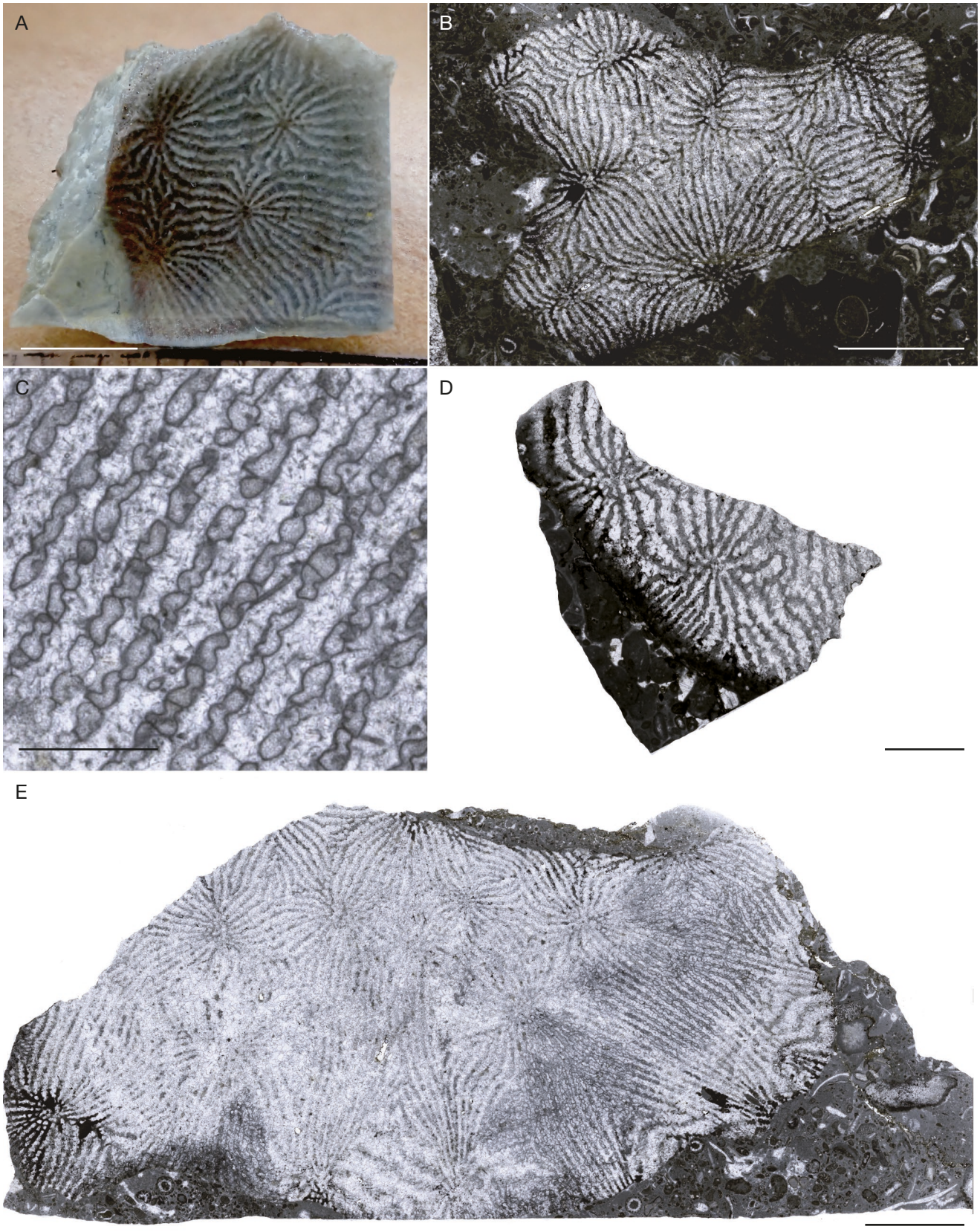

Fig. 60. — *Thamnasteria* cf. *mettensis* Milne Edwards & Haime, 1851: **A**, distal view of the specimen CPUN DA2705E5-1; **B**, transverse thin section of the specimen CPUN DA2805E6-1; **C**, detail of septal structure in transverse section of the specimen CPUN DA2805E6-1; **D**, transverse thin section of the specimen CPUN DA2705E5-1; **E**, transverse thin section of the specimen CPUN DA2805E6-1. Scale bars: A, C, D, 2 mm; B, E, 4 mm.

Chorisastraea gregaria – Tomes 1882: 429; 1886: 445.

Confusastraea gregaria – Beauvais 1974: 20.

Complexastrea sp. 2 – Vasseur 2018: 147-148, fig. 3.17.

TYPE MATERIAL. — Syntypes Sedgwick Museum Cambridge, J 34976-J 34978, J 6116-J 6117.

TYPE LOCALITY. — Inferior Oolite of Dundry, Somerset, England and Cheltenham, Gloucester shire, England.

STUDIED SAMPLES. — Two specimens: CPUN MA0504E2-3, CPUN MA0504E2-4.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of Taililout (Middle Atlas of Morocco).

DESCRIPTION

Cerio-plocoid massive corallum with subcircular corallites often distorted and fluctuating in diameter. Radial elements are compact, free or joining by their inner edge, often curved costosepta. Lateral faces hold granules with typically montlivaltid distribution and shape. No columella. Endotheca abundant, made of vesicular dissepiments. Incomplete wall made with the external twisted edge of septa, no synapticulae. Some remains of what seems to have been a holotheca have been observed.

Calicular diameter: 8 to 23 mm – Distance between calices: 13 to 18 mm – Number of septa: >80 – Septal density: 2 to 4 per 2 mm.

SIMILARITIES AND DIFFERENCES

The Pliensbachian specimens show higher number of septa and septal densities than the Toarcian specimens but the variations of these characters fit with the morphometric variability of *Complexastrea gregaria* (see Lathuilière1996), a species described up until now in Middle Jurassic that shows important intraspecific variability. We maintain a cf. due to the tendency of calices to be smaller than in Middle Jurassic *C. gregaria*.

Genus *Isastrea* Milne Edwards & Haime, 1851

Isastrea Milne Edwards & Haime, 1851: 102.

Andemantastraea Alloiteau, 1951: 48.

Confusastrea d'Orbigny, 1849: 10.

Dermosastraea Beauvais, 1970: 1129.

Mesoseris Ferry, 1870: 206.

Parisastraea Alloiteau, 1958: 51.

SPECIES ORIGINALLY INCLUDED. — 40 species originally referenced, see Lathuilière *et al.* (2017).

TYPE SPECIES. — *Astrea helianthoides* Goldfuss, 1826, subsequent designation by Quenstedt (1856: 704).

REMARK

Junior synonym of *Confusastrea* d'Orbigny, 1849, *Isastrea* is placed under *nomen protectum* in Lathuilière *et al.* (2017) in conformity with the ICZN article 23.9.1.

Isastrea aff. *bernardiana* (d'Orbigny, 1850) (Fig. 62)

Prionastrea bernardiana d'Orbigny, 1850: 293.

Isastrea bernardiana – Lathuilière 1988: 287, pl. 1-4 *cum syn*; 1989: 887, pl. 1, 2; 1996: pl. 73, fig. 11-12; 2000a: 61, fig. 6.5- 6.8. — Pandey & Fürsich 1994: 78, fig. 2; 2003: 53, pl. 12, fig. 1-2, pl. 13, fig. 1; 2006: 54.

Isastrea bernardi – Prinz 1991: 185, pl. 5, fig. 10.

Complexastrea carpathica Morycowa & Mišík, 2005: 424, fig. 6.6-7.

? *Complexastrea* sp. – Morycowa & Mišík 2005: 426, fig. 6.5.

Complexastraeopsis kouteki Morycowa & Mišík, 2005: 426, fig. 6-8.

Isastrea helianthoides Morycowa & Mišík, 2005: 426, fig. 7.6-7.

Isastrea robusta Morycowa & Mišík, 2005: 428, fig. 7.1-5.

Gen. indet. 3 sp. 1 – Vasseur 2018: 207-208, fig. 3.42.

Gen. indet. 4 sp. 1 – Vasseur 2018: 210-211, fig. 3.43.

TYPE MATERIAL. — Lectotype MNHN.F.R53023, subsequent designation following the abusive stipulation of the existence of a holotype by Beauvais (1966) (ICZN 1999: art.74.6.).

TYPE HORIZON. — Bajocian (Dogger).

TYPE LOCALITY. — Langres, France.

STUDIED SAMPLES. — 10 specimens: CPUN AM1603A8-2, CPUN Gu0905E9, CPUN Gu0805E5, CPUN Gu1105E3-1, CPUN Gu1105E3-2, CPUN MA1004E1-5, CPUN MA1004E4-6, CPUN MA1004E4-28, CPUN MA1004E4-31, CPUN MA1004E5-7. Many more have been seen in the field.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Upper Pliensbachian of Guigou Plateau (Middle Atlas of Morocco), Middle/Upper Toarcian of Amellagou (High Atlas of Morocco), Bajocian of France, Belgium, Luxembourg, Switzerland, Slovakia, Romania (unpublished), Morocco, Canada, Northern Chile, India, Iran.

DESCRIPTION

Cerioid massive corallum without holotheca, with subcircular to polygonal calices showing intracalicular budding. Compact, straight or curved, free or joining, subconfluent septa. Lateral faces of septa with sharp granules typically montlivaltid in shape and disposition. Calicular fossa is not elongated and shows sometimes in its center a variable columella often joined by some first order septa. Sometimes the axial space leaves place for trabecular projections of septa that produce a papillose columella-like structure. Endotheca made of vesicular dissepiments. A zigzag wall of variable nature is present. No synapticulae observed or perhaps in the wall.

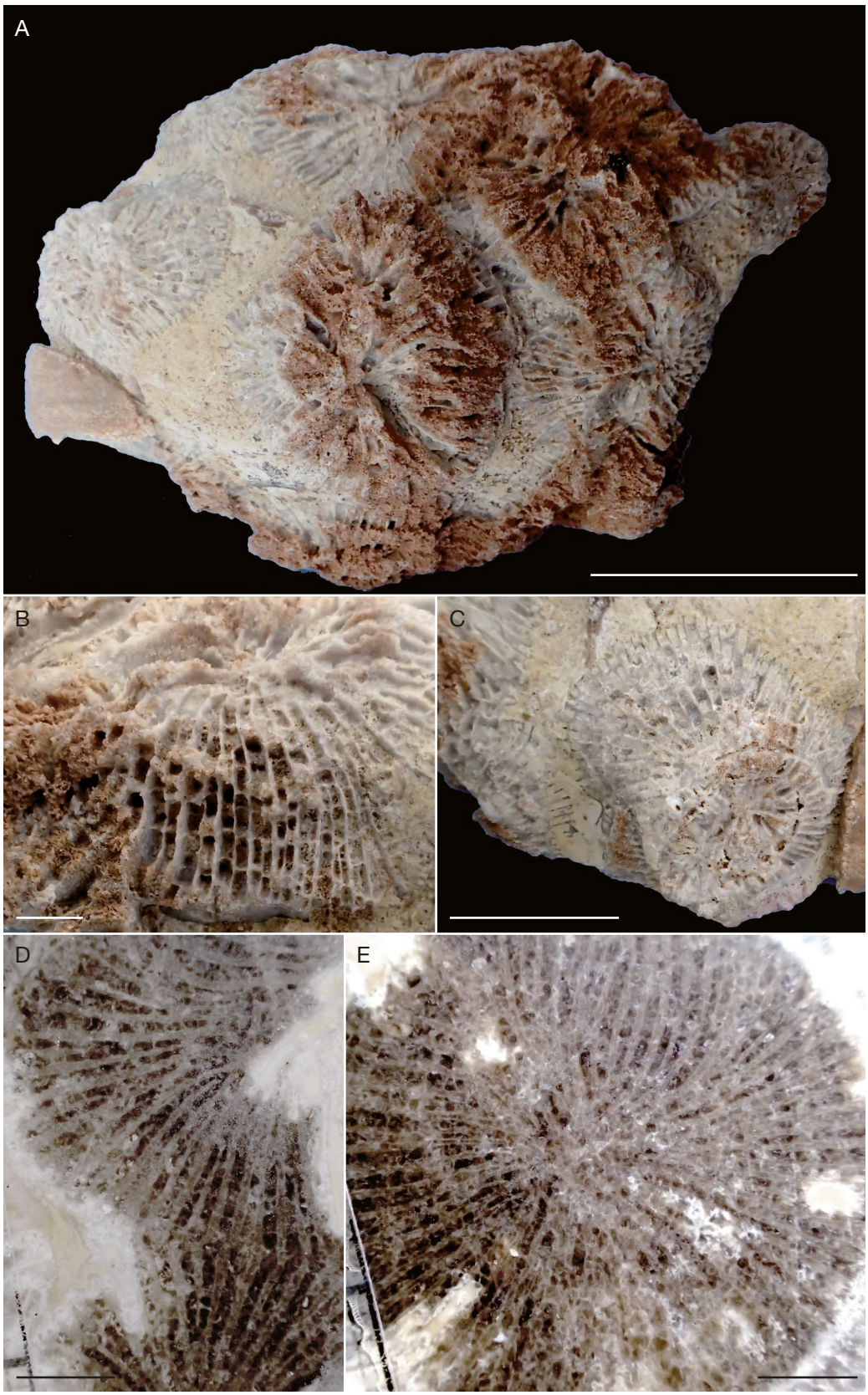

Fig. 61. — *Complexastrea* cf. *gregaria* (M'Coy, 1848): **A**, distal view of the specimen CPUN MA0504E2-3; **B**, lateral view of one corallite of the specimen CPUN MA0504E2-3; **C**, distal view of one calice of the specimen CPUN MA0504E2-3; **D**, transverse polished section of the specimen CPUN MA0504E2-4; **E**, transverse polished section of the specimen CPUN MA0504E2-4. Scale bars: A, 2 cm; B, 2 mm; C, 1 cm; D, E, 4 mm.

Calicular diameter: 1.6 to 9 mm – Distance between calices: 2 to 7 mm – Number of septa: 20 to 49 – Septal density: 4 to 8 per 2 mm.

REMARKS
These Pliensbachian specimens show an important variability of the axial structure.

Genus *Montlivaltia* Lamouroux, 1821

Lasmophyllia d'Orbigny, 1849: 6.

Thecophyllia Milne Edwards & Haime, 1848: 491.

TYPE SPECIES. — *Montlivaltia caryophyllata* Lamouroux, 1821 (Lamouroux 1821: 78, table 79, fig. 8, 9, 10), by monotypy.

Montlivaltia fragilis (Fromentel & Ferry, 1866) (Fig. 63)

Montlivaultia [sic] *fragilis* Fromentel & Ferry, 1866: 139, pl. 24, fig. 4. — Alloiteau 1956b n°119.

Montlivaltia cf. *fragilis* – Beauvais 1986: 225; 1988: 1091.

Proleptophyllia fragilis – Vasseur 2018: 295-296, fig. 3.77.

TYPE MATERIAL. — Lectotype MNHN.F.M03716, Fromentel & Ferry 1866: 139, pl. 24, fig. 4, subsequent designation following the abusive stipulation of the existence of a holotype by Alloiteau (1956b), n°119 (ICZN 1999: art.74.6.).

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — May-sur-Orne, France.

STUDIED SAMPLE. — Lectotype MNHN.F.M03716.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of May-sur-Orne (Calvados, France).

DESCRIPTION
Solitary, subconical corallum. Radial elements are exsert, thin, subcompact, straight costosepta with trabecular, montlivaltid microstructure made of spaced carinae. No columella but a large and quite deep circular fossa. Endotheca made of tabular dissepiments at the periphery. We observed some vestiges of an epicostal epitheca *s.l.* that covered the external part of the corallum.

Calicular diameter: 36 mm – Septal density: 3 to 4 per 2 mm.

SIMILARITIES AND DIFFERENCES
Even if the species is based on one single specimen, it is distinct among species of the genus *Montlivaltia* because of the delicacy of septa and the large space between them and between carinae in one single septum.

Montlivaltia subcaryophyllata Alloiteau, 1957 (Fig. 64)

Montlivaltia subcaryophyllata Alloiteau, 1957: 93, pl. 5, fig. 4. — Vasseur 2018: 257-258, fig. 3.62.

Epismilia? *caryophyllata* Fromentel & Ferry, 1865: 54, pl. 15, fig. 2.

TYPE MATERIAL. — Holotype MNHN.F.M03506 (Fromentel coll.), Fromentel & Ferry 1865: 54, pl. 15, fig. 2.

TYPE HORIZON. — Pliensbachian.

TYPE LOCALITY. — May-sur-Orne, France.

STUDIED SAMPLE. — Holotype MNHN.F.M03506.

GEOGRAPHIC AND STRATIGRAPHIC RANGES. — Pliensbachian of May-sur-Orne (Calvados, France).

DESCRIPTION
Solitary, patellate corallum. Radial elements are exsert costosepta organized in 3 distinct size orders and apparently 5 distinct ontogenetic cycles (6+6+12+24+48 septa). They are straight, free, of montlivaltid structure. Endotheca made of rare peripheral dissepiments. An epitheca *s.l.* wraps the basis of the corallum.

Calicular diameter: 14.4 mm – Number of septa: 96 by extrapolation – Septal density: 5 per 2 mm.

SIMILARITIES AND DIFFERENCES
The differences with *Montlivaltia* sp. described from Moroccan Toarcian (Vasseur 2018) is difficult to confirm because of the great intraspecific variability of the latter species and the uniqueness of the Pliensbachian specimen from Calvados. However, the specimen described herein shows quite higher septal densities and a more regular septal apparatus than the specimens from the Toarcian.

Genus *Prismastrea* n. gen.

urn:lsid:zoobank.org:act:75E819EA-3B57-453E-A116-AE66614AC022

TYPE SPECIES. — *Prismastrea organum* n. sp.

DIAGNOSIS. — Phacelo-cerioid coral with polygonal corallites multiplying by intratentacular budding. Radial elements are subcompact, subconfluent, septa. Lateral faces of septa hold granules organized in carinae, typically montlivaltid in shape and distribution. Distal and inner edges are ornamented with trabecular teeth that sometimes project in the axial zone, producing a parietal papillose columella. No endotheca observed. Wall of unknown nature but precisely delimited and apparently of the same nature as septa. No synapticulae.

ETYMOLOGY. — Refers to the prismatic shape of the corallites.

Prismastrea organum n. gen., n. sp. (Fig. 65)

urn:lsid:zoobank.org:act:42293C7A-7574-4594-BECA-57EB2C34910C

Nov. gen. 4 sp. 1 – Vasseur 2018: 270-271, fig. 3.67.

TYPE MATERIAL. — Holotype no. CPUN MA0704E6-1.

STUDIED SAMPLES. — Four specimens: CPUN MA0704E6-1, MA0704E6-2, MA0704E6-3, MA0704E6-4.

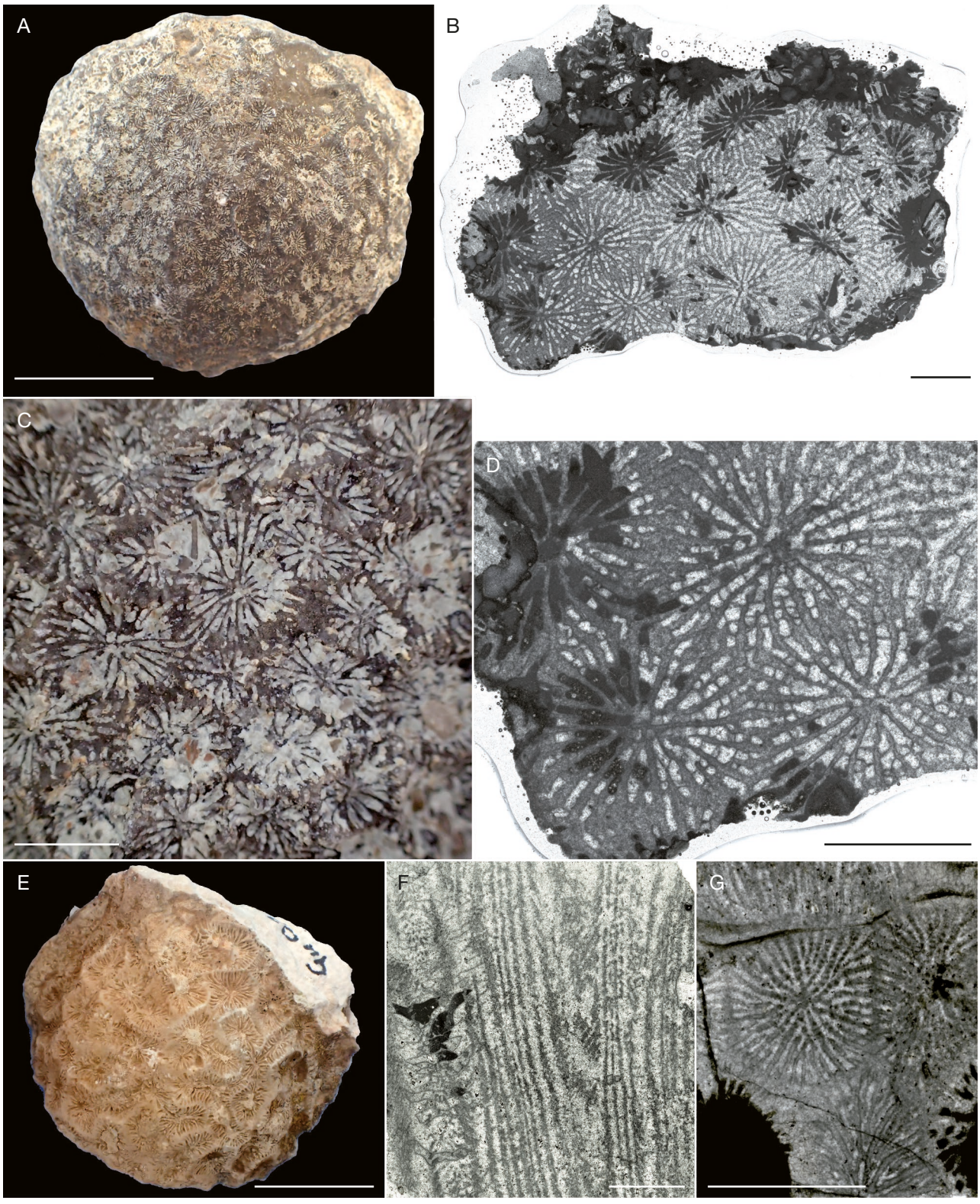

Fig. 62. — *Isastrea* aff. *bernardiana* (d'Orbigny, 1850): **A**, distal view of the specimen AM1603A8-2; **B**, detail in distal view of the specimen Gu1105E3-2; **C**, detail in distal view of the specimen MA1004E1-5; **D**, detail in transverse thin section of calices in the specimen AM1603A8-2;**E**, distal view of the specimen Gu0905E9; **F**, longitudinal thin section in the specimen Gu1105E3-1; **G**, detail in transverse thin section of calices in the specimen MA1004E5-7. Scale bars: A, 4 cm; B, 1 cm; C, 5 mm; D, F, G, 4 mm; E, 2 cm.

Etymology. — From the latin name *organum* (organ), refers to the typical basalt organ-like shape of the lateral faces of colonies.

Type horizon. — Margaritatus zone (Upper Pliensbachian).

Type locality. — Koudiat Ech Chehem (Guigou Plateau), 33°27'10"N, 4°55'22"W, Morocco.

Geographic and stratigraphic ranges. — Pliensbachian of Koudiat Ech Chehem (Guigou plateau, Middle Atlas of Morocco).

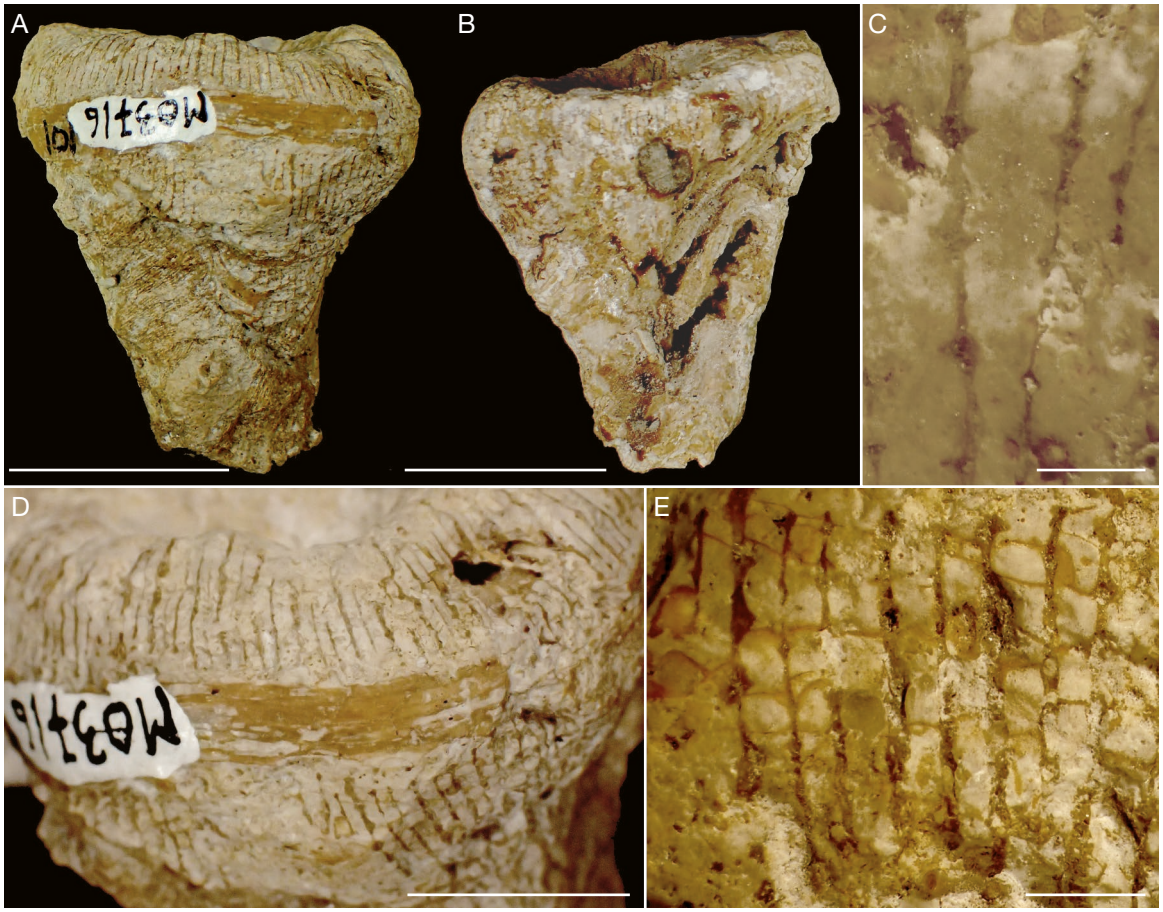

Fig. 63. — *Montlivaltia fragilis* (Fromentel & Ferry, 1866): **A**, lateral view of the holotype MNHN.F.M03716; **B**, lateral view of the holotype MNHN.F.M03716; **C**, detail of the septal pennular ornamentation of the holotype MNHN.F.M03716; **D**, detail in lateral distal peripheral view of the septal apparatus of the holotype MNHN.F.M03716; **E**, detail in lateral peripheral view of the holotype MNHN.F.M03716; Scale bars: A, B, 2 cm; C, 1 mm; D, 1 cm; E, 2 mm.

Description

Massive phacelo-cerioid colony with polygonal corallites multiplying by intratentacular budding. Radial elements are subcompact, subconfluent, straight or slightly curved septa, generally free (sometimes joined). Lateral faces of septa hold granules organized in carinae, typically montlivaltid in shape and distribution. Although, the symmetry and regularity of granules on both sides of the septa sometimes differ from the typical model. Distal and inner edges are ornamented with trabecular teeth that sometimes project in the axial zone, producing a parietal papillose columella. No endotheca observed. Wall of unknown nature but precisely delimited and apparently of the same nature as septa. No synapticulae observed.

Calicular diameter: 2 to 6 mm – Distance between calices centers: 2 to 4 mm – Number of septa: approximately 86 – Septal density: approximately 18 for 2 mm.

Similarities and differences

Differs from *Isastrea* by its continuous and well defined wall, from *Heterastraea* by its montlivaltid septal structure and from *Vallimeandropsis* that is clearly meandroid.

Genus *Vallimeandropsis* Beauvais, 1966

Species originally included. — Only the type species *V. davidsoni* (Milne Edwards & Haime, 1851).

Type species. — *Latomeandra davidsoni* Milne Edwards & Haime, 1851 (Milne Edwards & Haime 1851: 137, pl. 27 fig. 10), by original designation.

Remarks

The genus differs from *Microphyllia* d'Orbigny, 1849 by non-pennular and typical montlivaltid structure of septa.

Vallimeandropsis sp.
(Fig. 66)

Studied sample. — CPUN Gu0805E4.

Geographic and stratigraphic ranges. — Upper Pliensbachian of Guigou Plateau, Middle Atlas of Morocco.

Description

Massive meandroid colony, with subparallel series. Valleys are separated by tectiform collines with no ambulacrum. Intracali-

Fig. 64. — *Montlivaltia subcaryophyllata* Alloiteau, 1957: **A**, distal view of the holotype MNHN.F.M03506; **B**, lateral view of the holotype MNHN.F.M03506; **C**, detail of the montlivaltid structure of one septum in distal view of the holotype MNHN.F.M03506; **D**, detail of the costal part of costosepta of the holotype MNHN.F.M03506. Scale bars: A, B, 5 mm; C, 1 mm; D, 2 mm.

cinal budding. Valley septa connect the different calices within series. Radial elements are straight or curved septa or biseptal sheets, subcompact, often joined, subconfluent or not confluent from one side of a colline to the other. Septal structure corresponds to an irregular montlivaltid model, lateral faces of septa are ornamented with small regular sharp teeth. Distal edge not observed. Trabeculae are externally subvertical and tend to recline in the internal part of septa. Parietal columella seems to exist in depth. Endotheca made of numerous vesicular dissepiments. Synapticulae not observed. Wall of unknown nature.

Distance between calices centers: 5 to 9 mm – Septal density: 3 to 4 for 2 mm.

Similarities and difference

Differs from *V. lineata* (Beauvais, 1986) by a lower septal density. The bad preservation of the only specimen does not allow the erection of a new species.

Family Zardinophyllidae Montanaro-Gallitelli, 1975

Genus *Pachydendron* Cuif, 1975

Type species. — *Pachydendron microthallos* Cuif, 1975 (Cuif 1975: 169, txt-figs 5-7, pl. 14: 1, 2).

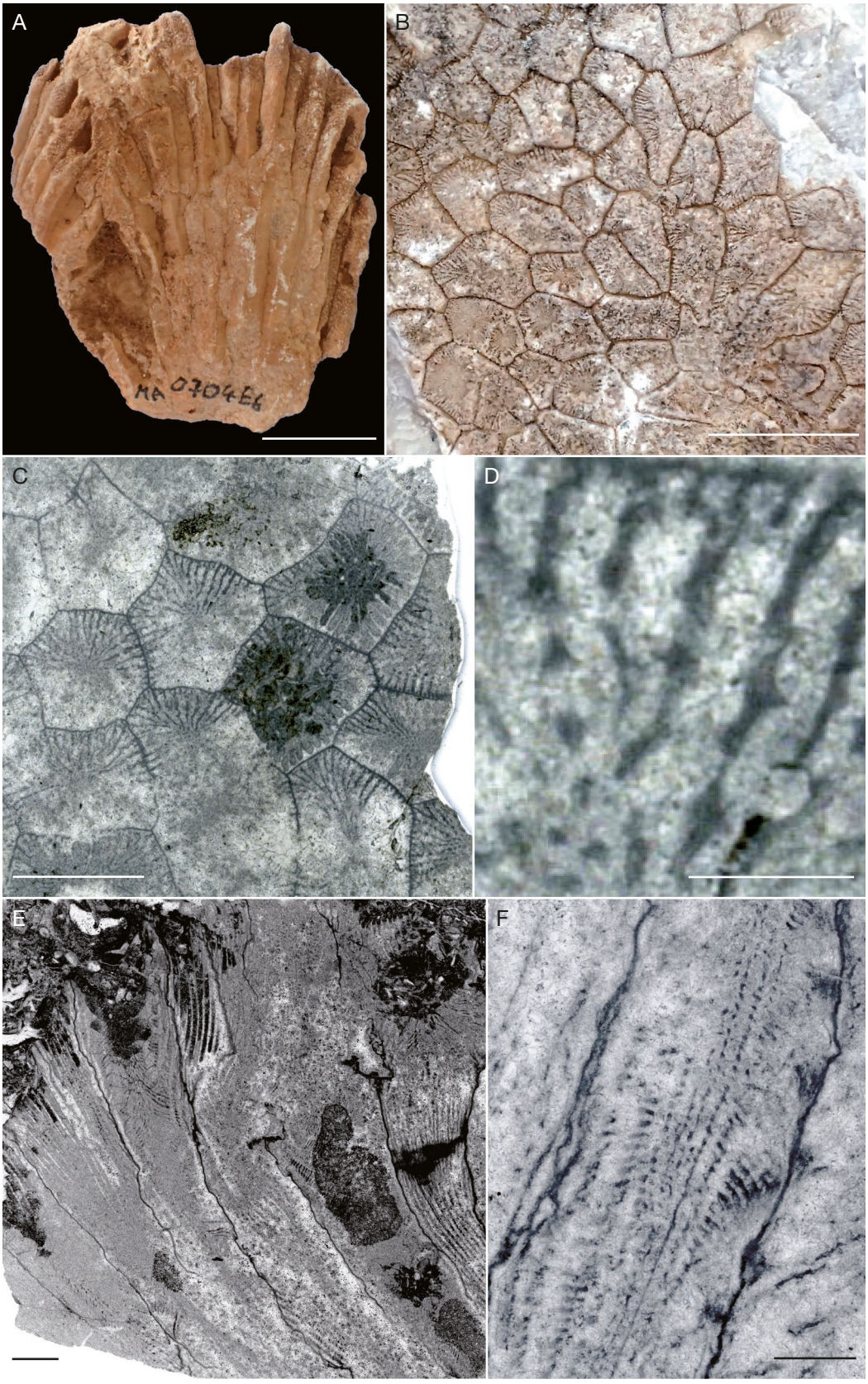

FIG. 65. — *Prismastrea organum* n. gen., n. sp.: **A**, lateral view of specimen CPUN MA0704E6-2; **B**, distal view of specimen CPUN MA0704E6-1; **C**, transverse thin section in specimen CPUN MA0704E6-1; **D**, detail in transverse section of montlivaltid septal microarchitecture in specimen CPUN MA0704E6-1; **E**, longitudinal thin section in the specimen CPUN MA0704E6-1; **E**, longitudinal thin section in the specimen CPUN MA0704E6-3. Scale bars: A, 2 cm; B, 1 cm; C, 4 mm; D, 0.5 mm; E, 2 mm; F, 1 mm.

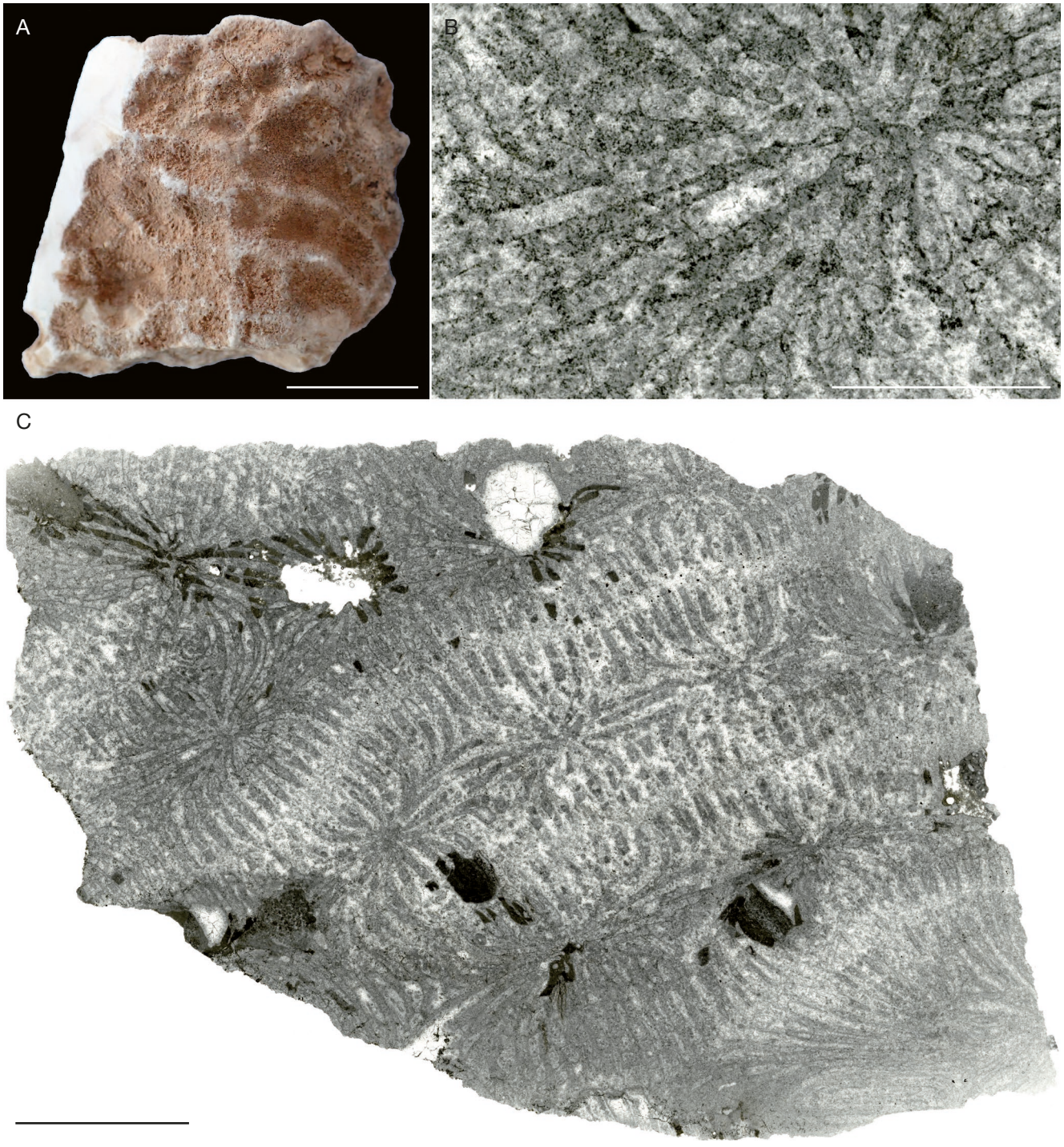

Fig. 66. — *Vallimeandropsis* sp.: **A**, distal view of the specimen CPUN Gu0805E4; **B**, detail in transverse thin section of the specimen CPUN Gu0805E4; **C**, transverse thin section of the specimen CPUN Gu0805E4. Scale bars: A, 2 cm; B, 2 mm; C, 5 mm.

Pachydendron microthallos Cuif, 1975
(Fig. 67)

Pachydendron microthallos Cuif, 1975: 169, txt-figs 5-7, pl. 14: 1, 2. — Melnikova 1986: 88, pl. 20: 3, 4. — Turnšek & Ramovš 1987: 37, pl. 7: 3, 4. — Roniewicz *et al.* 2007: 590, pl. 4: 1. — Roniewicz 2011: 408, fig. 2C, D.

Type material. — Holotype untraced, MNHN.

Type horizon. — *Stikinoceras kerri* zone, Early Norian, Late Triassic.

Type locality. — Alakir Cay (Taurus Mts), Anatolia, Turkey.

Studied sample. — CPUN Gu1105E2-2.

Geographic and stratigraphic ranges. — Triassic of Turkey, Russia, Yugoslavia and Austria, Upper Pliensbachian of Guigou Plateau (Middle Atlas of Morocco). Until now, the species was considered as a valuable marker of the lower Norian (Roniewicz 2011).

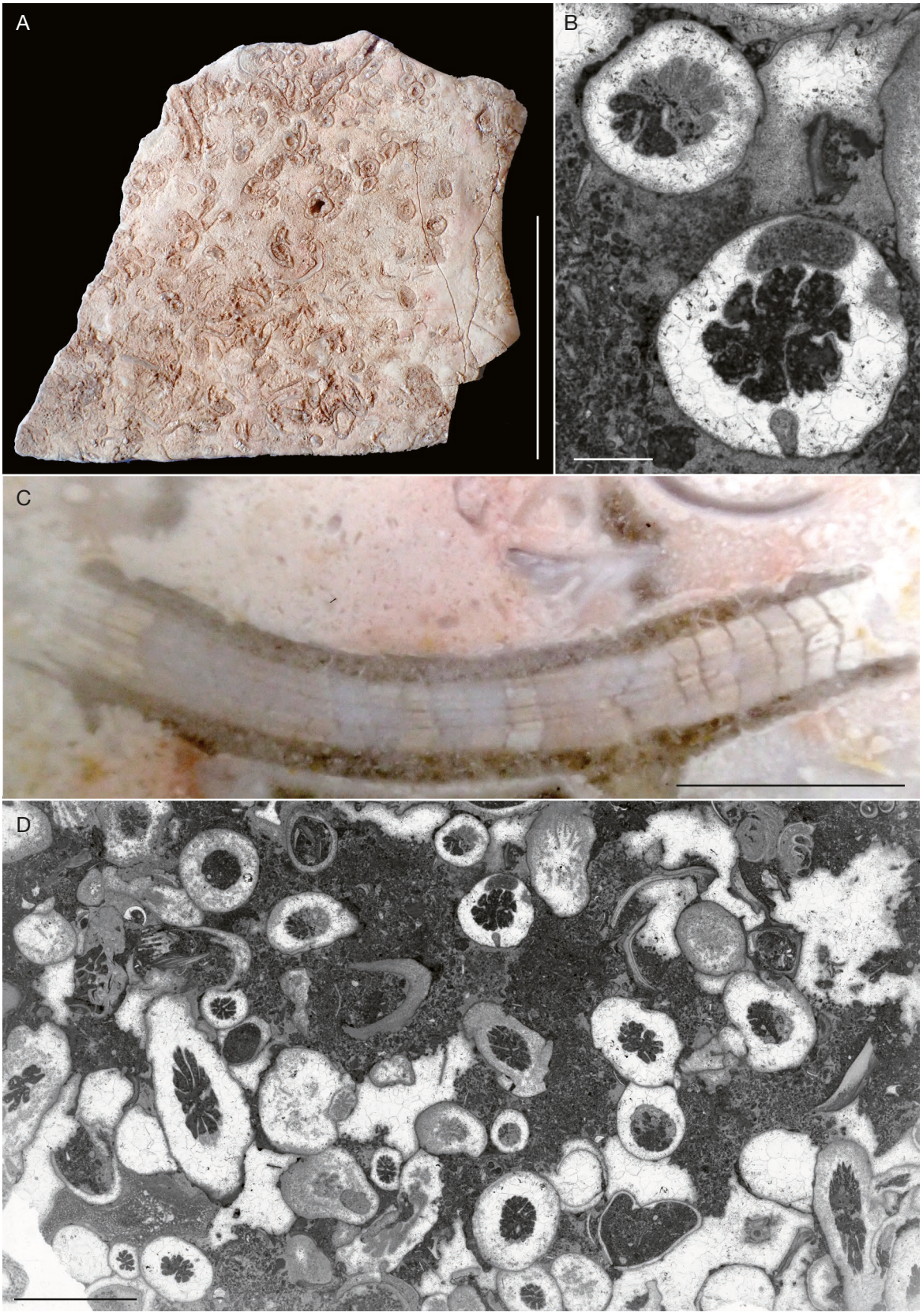

FIG. 67. — *Pachydendron microthallos* Cuif, 1975: **A**, distal view of the specimen CPUN Gu1105E2-2; **B**, detail in transverse thin section of two calices of the specimen CPUN Gu1105E2-2; **C**, longitudinal polished section in the specimen CPUN Gu1105E2-2; **D**, transverse thin section in the specimen CPUN Gu1105E2-2. Scale bars: A, D, 5 mm; B, 1 mm; C, 4 mm.

Description

Phaceloid colony growing by extracalicular lateral budding. Radial elements are thin, compact, free and wavy septa with inner edge often rhopaloid. Septa are organized in three distinct size orders. The first order concerns only one single major septa that is longer and sometimes thicker than the others and define a bilateral symmetry. The third size order consist in very small protosepta. Endotheca made of tabular elements. Wall thick, its nature has not been observed in the Pliensbachian specimen.

Calicular diameter: 1 to 3 mm – Number of septa: 8 to 14.

CONCLUSIONS

The description of Pliensbachian coral faunas reveals an important number of new taxa that did not exist in the literature up until now (17 new species and 3 new genera). They include important proportion of genera that took root in the Triassic or Lower Liassic and a very small proportion of genera that maintained during Dogger or Malm (*Isastrea*, *Montlivaltia* and *Thamnasteria* have their first occurrence during this stage). Despite their low abundance during Pliensbachian, these genera will significantly increase their part in Middle and Upper Jurassic communities. This stage records 7 genera that have never been found in any other stage.

The Pliensbachian is marked by a significant radiation phenomenon with 23 genera occurring during this stage including 11 exclusively solitary taxa and 5 phaceloid ones. For 12 genera the biostratigraphic distribution is extended in this study.

In the field, the Pliensbachian coral assemblages are quantitatively dominated by solitary and phaceloid forms in terms of biomass and diversity. The more integrated forms (i.e. plocoid, cerioid, thamnasterioid and meandroid) are rare and small-sized (colonies of a few centimeters) with exceptions in Middle Atlas and Calabria where bigger highly-integrated forms have been observed.

Pliensbachian assemblages seem to perform moderate photosymbiotic activity, supplemented with a mixotrophic diet.

Several new questions arise from these observations: how to explain particular characters of Pliensbachian coral faunas, especially the occurrence of so many original solitary forms? As many genera described herein were considered extinct during the Triassic-Jurassic biological crisis before this study, when do these genera actually went extinct? What happened to Pliensbachian coral faunas during the Pliensbachian-Toarcian crisis?

Acknowledgements

We are indebted to a number of people who took part in the field work, collection of specimens and work in museums. For our five field missions in Morocco we thank Hamid Haddoumi, Khalid El Mhidi, Christophe Durlet, Mohamed Ousri, Rowan Martindale, Iuliana Lazar, Rossana Martini, Simon Boivin, Stéphane Bodin, Hassan el Arabi, André Charrière, Thomas Saucède, Pierre Pellenard. We are especially thankful to Philippe Fauré who collected corals from the Pyrenees and who waited results for so long. We thank Massimo Santantonio for organizing the unforgettable field work in Calabria with Giulia Innamorati and Simone Fabbi. We thank also Marc Chesnier to leave at our disposal his private collection from western France. We are also indebted to the team of the MNHN especially Sylvain Charbonnier and Jean Michel Pacaud who welcomed us in various occasions to help us with samples of Morocco and Normandy. We would like to express our gratitude to Cyrille Delangle and Terrae Genesis association as well as to John Moine and Alexandre Flammang from Georessources litholamellage platform for the precious help with thin sections. We are also grateful to our reviewers for the judicious and helpful corrections and advices that helped us to improve the quality of this monograph. The MNHN gives access to the collections in the framework of the RECOLNAT national Research Infrastructure.

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