

COLONIAL CORALS FROM THE EARLY APTIAN SILICICLASTIC *Montlivaltia* MARLS OF JUMILLA (MURCIA, SPAIN)

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ABSTRACT

Three species of colonial scleractinian corals are reported from Early Aptian sandy marls of the so-called *Montlivaltia* marls from a section exposed on the SE flank of the Sierra de Sopalmo, south of Jumilla in Murcia, Spain. While solitary corals of the genus *Montlivaltia* are extremely common in the marls, colonial corals are rare. The three colonial coral species presented here (*Cryptocoenia* sp. n. aff. *C. pygmaea*, *Holocystis elegans*, and *Columnocoenia aragonensis*) are all common Early Cretaceous species. They range in age from the late Barremian to early Albian with the exception of *Columnocoenia aragonensis*, which ranges from the Valanginian to Cenomanian. Their geographical distribution is large and all species were found in the central Tethys as well as in the Caribbean province. All species were previously found in siliciclastic environments and while *Holocystis elegans* occurs primarily in such facies, the other two species occur in pure carbonates as well.

Key words: Corals, Scleractinia, Cretaceous, Aptian, Jumilla, Murcia, Spain.

RESUMEN

Se reporta la presencia de tres especies de corales coloniales en las margas arenosas denominada margas de *Montlivaltia* del Aptiense inferior de una sección expuesta en la vertiente suroeste de la sierra de Sopalmo en el sur de Jumilla (Murcia, España). Los corales solitarios del género *Montlivaltia* son extremadamente abundantes en las margas, mientras que los corales coloniales son escasos. Las tres especies de corales coloniales (*Cryptocoenia* sp. n. aff. *C. pygmaea*, *Holocystis elegans*, y *Columnocoenia aragonensis*) son especies comunes del Cretácico Inferior. Sus rangos son del Barremiense superior hasta el Albiense inferior, a excepción de *Columnocoenia aragonensis* que existió desde el Valaginiense hasta el Cenomaniense. La distribución paleogeográfica de las tres especies es grande; vivieron en el Tethys central y en la provincia del Caribe. Las tres especies fueron anteriormente encontradas en ambientes siliciclásticos. *Holocystis elegans* es una especie que se registra predominantemente en ambientes siliciclásticos, mientras que las otras dos especies también son comunes en niveles carbonatos puros.

Palabras clave: Corales, Scleractinia, Cretácico, Aptiense, Jumilla, Murcia, España.

INTRODUCTION

Environments with fine to medium coarse siliciclastic sediments imply a high rate of turbidity and soft bottoms. They are not normally colonised by zooxanthellate shal-

low marine colonial corals because the high turbidity reduces the light reaching the sea floor and sediment may cover or even bury the corals. Solitary corals, with their comparably larger soft bodies, are generally better adapted to such facies as they are better prepared to remove sedi-

ments from their body (for details and examples see Stafford-Smith & Ormond, 1992; for considerations in the fossil record Sanders & Baron-Szabo, 2005). The small fauna presented here shows, however, that colonial corals at least tried to invade such unfavourable environments. The three colonial corals in this study were found among hundreds of solitary corals, and were apparently unaffected by the high sedimentation rate.

STUDY AREA AND MATERIAL

The study material comes exclusively from the Sierra de Sopalmo area near Jumilla (Murcia, Spain; Fig. 1). This small mountain range forms part of the larger Betic Range (Arias *et al.*, 1993) and is tectonically influenced by the Prebetic Domain. The section exposed at the SE flank of the Sopalmo anticline ranges in age from the Aptian to the Campanian with a hiatus from the Turonian to Santonian (Arias *et al.*, 1993; Vilas *et al.*, 1998). It is composed primarily of marine clastic and carbon-

ate sediments. Its second unit consists of a partly sandy marl intercalated with some banks of calcarenites, which corresponds to an outer shelf position in relatively deep water. Informally, these marls are called Margas con Montlivaltiidae (Montlivaltiidae marls) or *Montlivaltia* beds because of the high number of solitary corals of the genus *Montlivaltia* Lamouroux, 1821 weathering out from the marls. Due to the presence of the orbitolinid foraminifer *Palorbitolina lenticularis* (Blumenbach, 1805) it is assigned to the Early Aptian.

The marls contain a full marine fauna composed of three species of *Montlivaltia* (*M. multiformis* Toulou, 1889, *M. sp. 1*, *M. sp. 2*; Morycowa *et al.*, 2001), some gastropods, bivalves (among others *Trigonia sp.*, *Plicatula sp.*, oysters, rudists), cephalopods, brachiopods (terebratulids and rhynchonellids), echinoids (*Discoides sp.* and Salenidae), isolated asteroid plates, crinoids (*Decameros sp.*) and a fauna of benthic and planktonic foraminifers. Whereas the solitary corals of the genus *Montlivaltia* are very common, all other elements of the macro fauna are rare, except for the brachiopods.

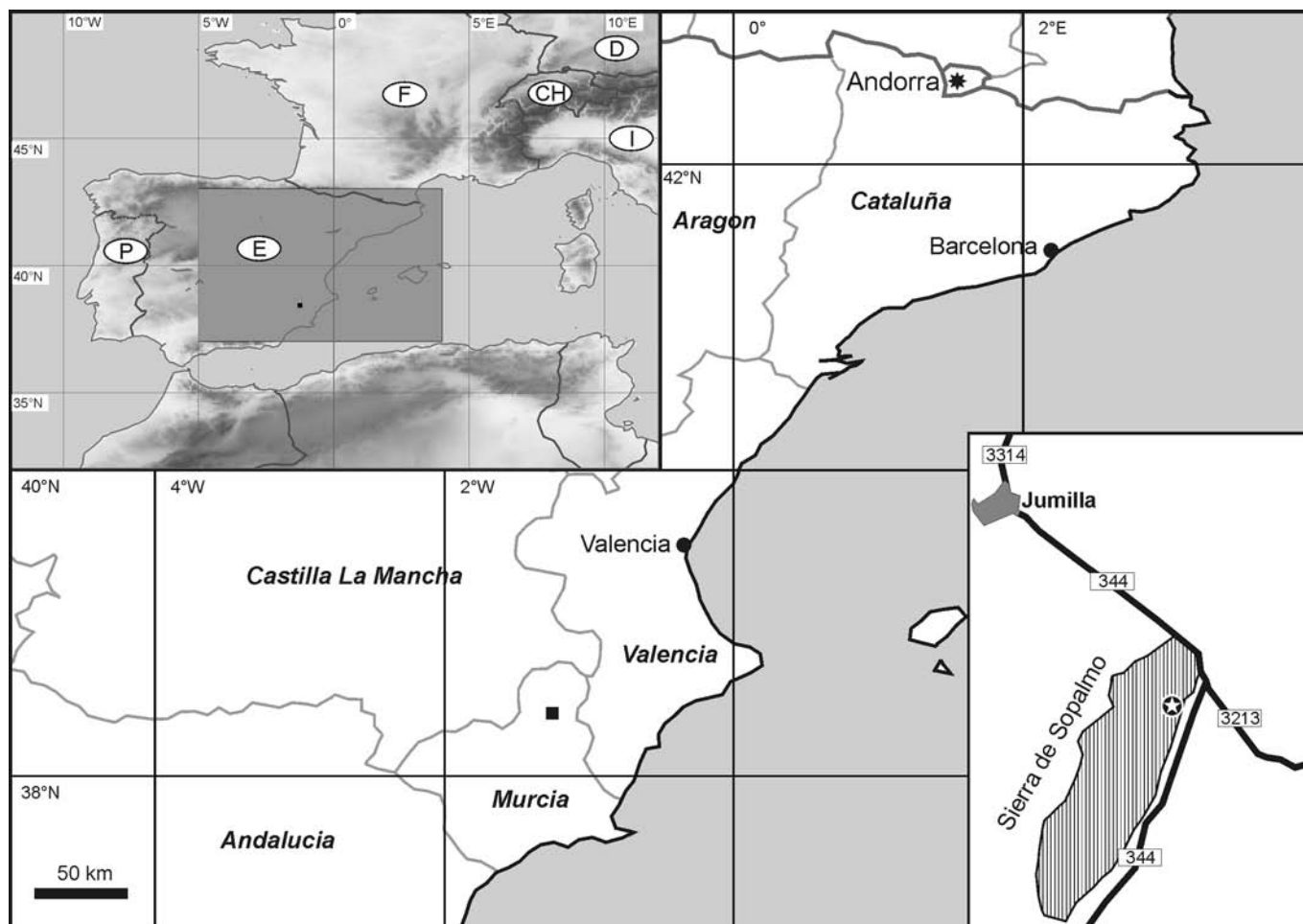


Figure 1. Study area. Sample location marked with ☆.

The colonial corals presented here are all isolated finds. Due to the inclined outcrop area and the high rate of erosion, horizontal sampling of macrofossils is almost impossible. Attached sediment identifies the samples clearly as being derived from the *Montlivaltia* beds; one colonial coral is even attached to a *Montlivaltia* coral. Colonial corals are extremely rare in this area and the samples presented here were found during three years of continuous search in the outcrop area by the second author.

The three coral samples were collected by the second author and were transferred to the collection of the Museo Geológico del Seminario de Barcelona, Spain (MGSB). Thin sections were obtained from two specimens. One specimen was too small for this type of study.

DESCRIPTION OF MATERIAL

The following institutional abbreviations are used:

ERNO, Universidad Nacional Autónoma de México, Instituto de Geología, Estación Regional del Noroeste, Hermosillo, Mexico;

GPIB, Geologisch-Paläontologisches Institut Bremen, Germany;

IRScNB, Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium;

MB, Museum für Naturkunde der Humboldt-Universität, Berlin, Germany

MHNG, Muséum d'histoire naturelle de la Ville de Genève, Switzerland;

PU, Museo di Geologia e Paleontologia dell' Università di Torino, Italy;

SLD, H. Löser Collection, Dresden, Germany (being transferred to the Bayerische Staatssammlungen München, Germany)

ZSH, Zumsteinhaus (H. Scholz Collection), Kempten, Germany

The following abbreviations are used to describe the dimensions of the corals: c, calicular diameter; ccd, distance of calicular centres; s, number of septa; sc, number of costae

The following abbreviations are used in the synonymy lists: v = the author has seen the material belonging to this citation; * = first publication. A year in italic typesetting indicates that the citation was provided without description and illustration.

Order SCLERACTINIA Bourne, 1900

Suborder STYLININA Alloiteau, 1952

Family **Cyathophoridae** Vaughan & Wells, 1943

Genus *Cryptocoenia* d'Orbigny, 1850

Cryptocoenia sp. n. aff. *C. pygmaea*
(Volz, 1903)

Fig. 2a, 2b

- v 1976 *Cyathophora miyakoensis* (Eguchi 1936); Turnšek and Buser, p. 11, 38, pl. 1: 3-5.

- 1981 *Cyathophora pygmaea* Volz 1903; Turnšek and Mihajlović, p. 18, pl. 13: 1, 2.
v 1998 *Adelocoenia fontseri* (Bataller 1947); Schöllhorn, p. 74, pl. 18: 7, pl. 27: 2-4.
? 2001 *Pseudocoenia* sp.; Morycowa *et al.*, fig. 4h.
v 2003 *Confusaforma weyeri* Löser, 1987; Baron-Szabo and González León, p. 207, fig. 7B.
v 2008 *Cryptocoenia* aff. *pygmaea* (Volz, 1903); Tomás *et al.*, fig. 14A.

Dimensions: c 0.9 - 1 mm, ccd 1.4 - 1.5 mm, s 6-9, sc 12.

Description: A small but very well preserved specimen that shows no trace of sediment. The attachment area is small. The coral was probably attached to a shell or other small solid object that is no longer preserved. Calices small, round, with a clear coenosteum that is filled with the non-confluent to sub-confluent costae and thin dissepiments. Margins of the calices slightly elevated above the colony surface. Only the first cycle of very short septa is complete. The septa reach between 10 and 20 percent of the calicular diameter. The beginning of a second septal cycle can be traced. The septa are very short and only form ridges. Up to 12 costae were counted. Endotheca is well developed and shows tabulae. Budding extracalicular.

Remarks: The type material of *Cyathophora pygmaea* Volz, 1903 got lost during the Second World War. A study on the coral fauna of the type area (Morycowa, 1971) did not yield material comparable to the description given by Volz (1903). The characteristics of *Cyathophora pygmaea* are only known from the literature. Volz gives a good description: calicular diameter between 0.5 and 0.75 mm, one to two septal cycles. The present material (and the material given in the synonymy list and under occurrences) has slightly larger calicular dimensions and does not fit the dimensions of *C. pygmaea*. Besides the lost type material of *C. pygmaea*, samples of comparable dimensions are also known (syntype PU 18113 of *Polytremacis kilianii* Prever, 1909; material collected by the first author from the Early Albian of Mexico). It is therefore assumed that two species exist, with the present material belonging to a previously undescribed species.

Material: MGSB 73673.

Occurrence: Early Cretaceous of Slovenia (Levpa, Banjska planota). Early Aptian of Serbia (Sopot) and Spain (Valencia, Castellón, Benicasin, La Venta). Early Late Aptian of Spain (Cataluña, Montsec de Rubies, La Cabrua, SLD 6312; Cataluña, Alt Urgell, Senyús). Late Aptian of Spain (Cataluña, Alt Penedès, Can Pascual, SLD 6295). Early Albian of Mexico (Sonora, Arizpe/Cucurpe/Sierra San Jose/Tuape, ERNO L-4488, L-4278, L-4411, L-4428).

Range: Aptian to Early Albian.

Genus *Holocystis* Lonsdale, 1849

Holocystis elegans (Lonsdale, 1849)

Fig. 2c

- 1847 *Astrea* ? *elegans* Fitton, p. 296 [nomen nudum, non *Astrea elegans* Goldfuss, 1826].
- * v 1849 *Cyathophora* ? *elegans* Lonsdale, p. 83, pl. 4, figs 12-15.
- non 1883 *Tetracoenia elegans*; deFromental, p. 520, pl. 139, fig. 1.
- 1927 *Holocystis elegans* (Fitton); Ryder, p. 120, figs 1-9.
- v ? 1964 *Holocystis bukowinensis* Volz, 1903; Morycowa, p. 25, pl. 3, fig. 3, pl. 5, fig. 1.
- v ? 1989 *Holocystis bukowinensis* Volz, 1903; Morycowa, p. 61, pl. 19, fig. 2.
- v non 1998 *Holocystis elegans* (Lonsdale 1849); Schöllhorn, p. 76, figs 36, pl. 18, figs 4-5, pl. 21, figs 1-3, pl. 27, fig. 1.
- v 2003 *Holocystis elegans* (Lonsdale, 1849); Baron-Szabo & González-León, p. 204, figs 6A-B.
- v 2006 *Holocystis elegans* (Lonsdale, 1849); Löser, p. 294, fig. 1e-g [see here for more detailed synonymy].

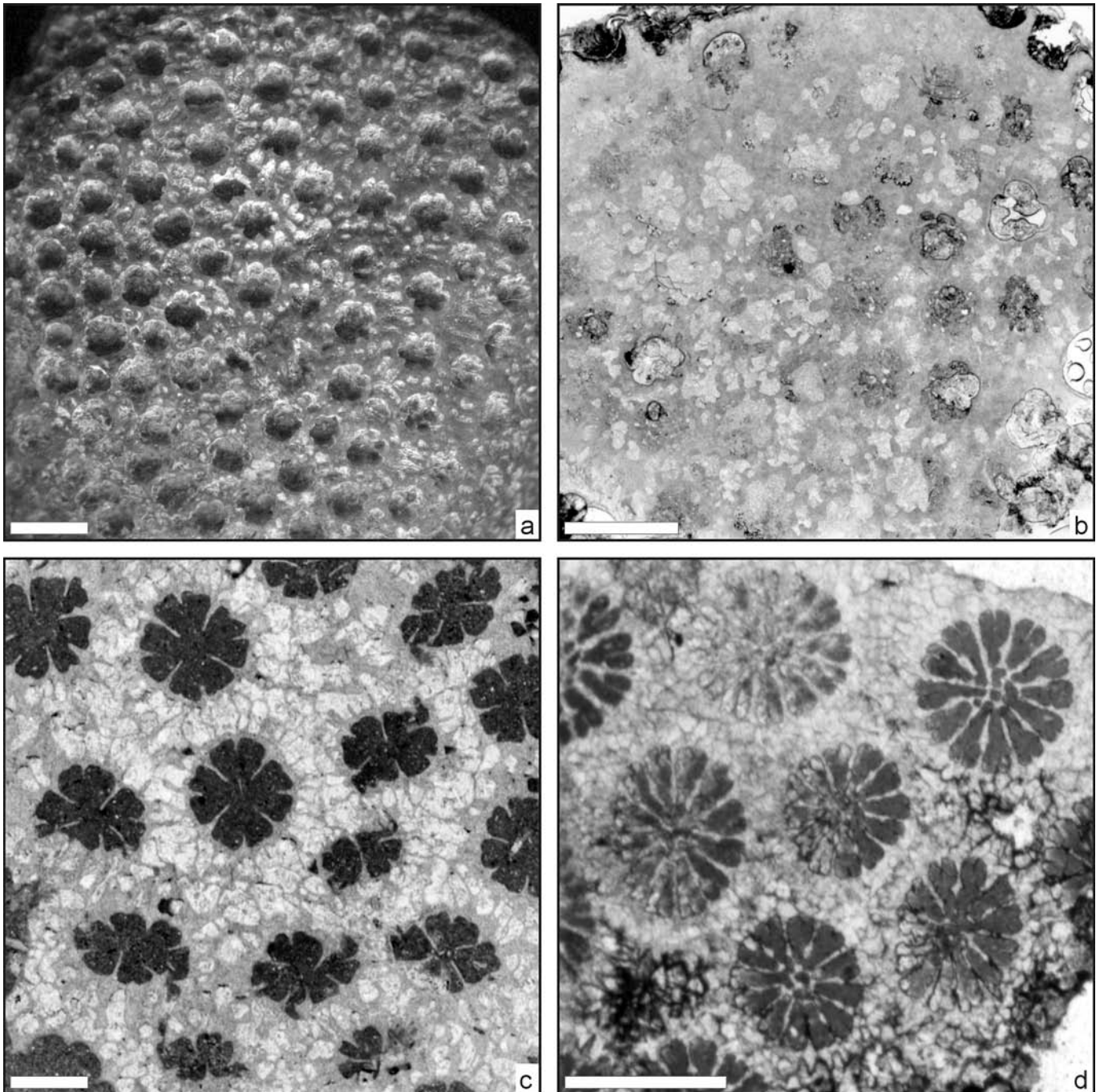


Figure 2. a-b, *Cryptocoenia* sp. n. aff. *C. pygmaea* (Volz, 1903); a, surface; b, acetate peel. c, *Holocystis elegans* (Lonsdale, 1849); thin section. d, *Columnocoenia aragonensis* (Alloiteau, 1946/47); thin section. All scales 2 mm.

Dimensions: c 2.5 - 2.7 mm, ccd 4 mm, s 8-12, sc 16-20.

Description: The pillar-like colony is attached to a *Montlivaltia* and partly overgrew this solitary coral. Calices in plocoid arrangement, with a wide coenosteum, made of the non-confluent or sub-confluent costae. Calices round or rectangular, very regular in form and size. Septa in four systems. Those of the first cycle are long, almost reaching the centre of the calice. Those of the second cycle are much shorter, reaching only 10% of the calicular diameter. Septal faces smooth. Septa of both cycles always straight and free. The third cycle of up to four septa can be traced as small ridges. There may be more costae than septa, they can be long and interconnected with costae of other calices. Wall septo-parathecal. Endotheca well developed and made up by tabulae. Budding extracalicular.

Remarks: In other locations the species has been found in facies with an input of siliciclastica. Based on its dimensions, the specimen fits completely in the range of *H. elegans*. This is the first indication of this species in Spain.

Material: MGSB 73675 with one thin section.

Occurrence: Early Aptian of the United Kingdom (Isle of Wight, Atherfield/Atherfield point). Late Barremian-Early Aptian of Mexico (Sonora, Municipio Ures, Cerro de Oro). Early Albian of Mexico (Sonora, Municipio Ures, Cerro de Oro).

Range: Late Barremian to Early Albian.

Suborder FAVIINA Vaughan & Wells, 1943
Family **Placocoeniidae** Alloiteau, 1952
Genus *Columnocoenia* Alloiteau, 1952

Columnocoenia aragonensis
(Alloiteau, 1946/47)

Fig. 2d

- v 1926 *Astrocoenia asteriscus* Weissmerl; Dietrich, p. 96.
- * v 1946-47 *Stephanocaenia aragonensis* Alloiteau, p. 208, pl. 3: 10.
- 1959 *Stephanocaenia aragonensis* Alloiteau 1947; Bataller, p. 28, text-fig. 790.
- v 1989 *Columastrea striata* (Goldfuss 1829); Löser, p. 116, text-fig. 22, pl. 25: 1.
- v 1994 *Columnocoenia kszakiewiczzi* Morycowa 1964; Löser, p. 19, text-fig. 10.
- v 2008 *Columnocoenia aragonensis* Alloiteau, 1946-47; Tomás *et al.*, fig. 14E.

Dimensions: c 2 mm, ccd 2 - 2.5 mm, s 24.

Description: Fragment of a large poorly preserved colony. Attachment area not preserved. Colony plocoid. Calices round. Coenosteum narrow. Septa compact, thin, in six systems. Those of the first cycle reach to the centre of the calice and bear pali-

forme lobes that may unite in the centre of the calice hide a small circular columella. The septa of the second cycle are slightly shorter and slightly thickened in the middle. The septa of the third cycle are short, reaching only half the length of those of the second cycle. Often they are connected to those of the second cycle (which clearly causes the swellings). The septal faces bear rare thorns. Septal upper border unknown. The costae are non-confluent. Endotheca made of dissepiments. Budding extracalicular.

Occurrence: Late Barremian to Early Aptian of Mexico (Sonora, Municipio Ures, Cerro de Oro, ERNO L-4321). Early Aptian of Egypt (Shebh Gezirat Sena, Maghara Mt, GPIB SM01), Germany (Bayern, Allgäuer Helvetikum, ZSH H-KU 793) and Spain (Valencia, Castellón, Benicasin, La Venta). Early Late Aptian of Spain (Aragón, Las Aras). Late Aptian of Mexico (Sonora, Municipio Ures, Cerro de Oro, ERNO L-4362) and Tanzania (Tanganyika, Nambawala plateau, Pilepile). Early Albian of France (Aude, Padern, SLD 4514) and Spain (Castilla la Vieja, Cabo de Ajo, SLD 4686).

Early Albian Mexico (Baja California Norte, El Progreso; ERNO L-4391). Early Cenomanian of Germany (Nordrhein/Westfalen, Mülheim/Ruhr; Sachsen, Meißenzscheila) and Greece (Kozani, Nea Nikopolis, SLD 5876). Middle Cenomanian of Belgium (Hainaut, Montignies-sur-Roc, IRScNB I. G. 4919 / LOE 5).

Range: Late Barremian to Middle Cenomanian.

SUMMARY

The coral species described here are common cosmopolitan species found during the same general time span, with the exception of *Columnocoenia aragonensis*, which spans a wider period. All species were found elsewhere in comparable facies (such as the Early Aptian of the Isle of Wight, the Early Cretaceous of Tanzania, the Albian of Padern in France or Cabo de Ajo in Northern Spain, Cenomanian of Germany and Belgium), but also in transitional zones (such as the outcrops in Mexico) and pure carbonates (Early Cretaceous of Slovenia and Serbia, Early Aptian of Benicassim in Spain). Their morphology (plocoid colony with reduced coenosteum, small calices) suggests that they should be considered species that are well adapted to difficult environments (Sanders & Baron-Szabo, 2005).

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