

THE CRETACEOUS CORALS FROM THE BISBEE GROUP (SONORA; LATE BARREMIAN - EARLY ALBIAN): GENUS *STELIDIOSERIS* (ACTINASTRAEIDAE)

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ABSTRACT

The current work constitutes the second part of the systematic revision of the corals from the Bisbee Group (Late Barremian to Early Albian) and deals with the genus *Stelidioseris* (Family Actinastreaeidae, suborder Archeocaeiniina). To distinguish samples within the Sonoran fauna and species of this genus, systematic measurements of the corals were taken and statistically analysed. From the Bisbee Group, six *Stelidioseris* species are here described and illustrated: *S. bellensis*, *S. hourcqi*, *S. japonica*, *S. major*, *S. ruvida*, *S. whitneyi*. Most of them are common Early Cretaceous species with a wide geographic and stratigraphic distribution.

Key Words: Corals, Scleractinia, Early Cretaceous, Bisbee Group.

RESUMEN

El presente trabajo constituye la segunda parte de la revisión sistemática de los corales del Grupo Bisbee (Barremiano Temprano a Aptiano Tardío) trata sobre el género *Stelidioseris* (familia Actinastreaeidae, suborden Archeocaeiniina). Para distinguir las muestras dentro de la fauna y las especies del género, se hicieron mediciones sistemáticas de los corales y se analizaron estadísticamente. Del Grupo Bisbee se describen e ilustran seis especies del género *Stelidioseris*: *S. bellensis*, *S. hourcqi*, *S. japonica*, *S. major*, *S. ruvida*, y *S. whitneyi*. La mayoría de ellas son especies comunes en el Cretácico Temprano con una distribución geográfica y estratigráfica amplia.

Palabras Clave: Corales, Scleractinia, Cretácico Temprano, Grupo Bisbee.

INTRODUCTION

After the first introductory part on the Early Cretaceous coral fauna from the Bisbee Basin (Löser 2011), this second part of the systematic revision of the corals from the Bisbee Group deals with material traditionally assigned to the very common coral genus *Actinastrea*. After re-examination of relevant type material it was concluded that all Bisbee Group material from the Early Cretaceous that was previously assigned to the genus *Actinastrea* actually belongs to the genus *Stelidioseris* (see Löser, 2012a for details). In order to contribute to the species concept in the species rich genus *Stelidioseris*, a large number of measurements were taken and statistically interpreted (see Löser, 2012b).

Details on the study area, lithology, stratigraphy, and outcrops are reported in Löser (2011). Details on the sample locations cited in the occurrence section in the systematic part are given in Löser (2011: tab. 1).

MATERIAL

The material varies in its state of preservation. Samples from marly layers are slightly better preserved than

samples from carbonates. For the latter, it was more difficult to obtain good thin sections for the purpose of exact measurements and illustrations. Colony surfaces are rarely well preserved and fine ornamentation of the septal upper border are often absent. Only thin sections were used for the determination. All material described here is kept at the Universidad Nacional Autónoma de México, Instituto de Geología, Estación Regional del Noroeste in Hermosillo, Sonora, Mexico (acronym ERNO). The material described by Baron-Szabo and González-León (1999, 2003) was available for study and for many specimens, further thin sections were prepared to specify the morphology and taxonomy of species described by the two authors.

METHODS

Sample preparation

Thin sections were prepared from all well-preserved samples in both transversally and longitudinally oriented directions where possible. The thin sections were scanned using a flat bed scanner with an optical resolution of 6400dpi. The images were saved as 8-bit grey scale JPG files without compression. To increase the quality of images, contrast stretching was applied. The images were used to prepare illustrations and to systematically record calicular dimensions.

Species separation

Traditionally, species separation of “Actinastrea” type is based on the following criteria:

- (1) calicular diameter
- (2) number of septal systems (6, 8, 10)
- (3) number of septal cycles (2, 3)
- (4) number of septal cycles that reach the columella (1, 2)

Although these criteria are quite clear and would not seem to make distinguishing species difficult, the number of existing taxa is extremely high: the Mesozoic coral genus *Stelidioseris* and its synonyms, which are the subject of this study, counts according to the literature with up to 120 species (Lathuilière, 1989; Löser, 2000).

This is probably due to the fact that intraspecific variation, even of calicular dimensions, is high, while the number of septal systems and cycles is a more stable characteristic. As shown in Löser (2012b) the calicular diameter is the characteristic with the lowest variation and is therefore preferred to group samples to species and compare these groups to existing taxa.

Based on the statistical analysis and on data obtained from Cenozoic and extant material (see Löser, 2012b for details), the thickness and formation of the wall is not useful to distinguish species. Therefore, samples that have different distances for their calicular margins (thickness of wall and coenosteum), but identical calicular dimensions and septal counts are to be considered the same species. The characteristic of whether the columella is exposed or not (*décolletée*; Alloiteau, 1954) is rejected here because this is due the state of preservation and cannot be found in thin sections. The determination of species is mainly based on the comparison of the calicular dimensions and septal counts.

Distribution data

The distribution data (as reflected in the synonymy lists) are almost entirely based on well-examined material. Material only mentioned in the literature and material not available or insufficiently described and illustrated in the literature has not been taken into account. To obtain a better insight into the distribution patterns of the corals from Sonora, additional unpublished material – indicated by a collection acronym and sample number in parenthesis – has been included.

SYSTEMATIC DESCRIPTION

Abbreviations

Collection abbreviations are as follows:

BSPG Bayerische Staatssammlungen für Paläontologie und Geologie München, Germany; ERNO, Instituto de Geología, Estación Regional de Noroeste, Universidad Nacional Autónoma de México, Hermosillo, Mexico;

IGM Instituto de Geología, Mexico City, Mexico;

IPB Geologisch-Paläontologisches Institut der Universität Bonn, Germany; MNHP, Narodni Muzeum, Praha, Czech Republic;

NHM The Natural History Museum, London, United Kingdom; NHMW, Naturhistorisches Museum, Wien, Austria;

RGM Geological collections of NCB Naturalis, Leiden, Netherlands; RLM, Ruhrländmuseum, Essen, Germany;

TUM Tohoku University Museum, Sendai, Japan; UCA, Universidad Católica, Antofagasta, Chile;

UJ Jagiellonian University, Instytut Nauk Geologicznych, Kraków, Poland; UP, Université de Provence, Coll.Masse, Marseille, France.

Taxonomy

Order Scleractinia Bourne, 1900

Suborder Archeoceniina Alloiteau, 1952

Family Actinastreaeidae Alloiteau, 1952

Genus *Stelidioseris* Tomes, 1893

Type species. *Stelidioseris gibbosa* Tomes, 1893 non *Astrocoenia gibbosa* Duncan, 1867, by monotypy.

Diagnosis. Plocoid colony with circular or polygonal calices with small dimensions (not having a diameter of more than three millimeters). The septa consist of few (8-10) large trabeculae, are compact and arranged in a subregular radial symmetry. In the type species ten and eleven systems are present, but other species show six or eight septal systems. The number of systems rarely varies within the same colony. The septa of the first cycle (and in some species those of the second cycle) reach the large styliiform columella and are connected to it. Septa of the second cycle (third cycle in other species) are very often attached to those of the first (second) cycle. Septa of the first cycle (second cycle in some other species) can show mid-septal swellings (French renflements), often having an

arrow like form. This swelling might be related to attached septa of the second (third) cycle. Costae are present, short, and confluent. They form small spaces forming regular small-sized intercalicular chambers (French lacunes). Except in the type species costae may be absent or not visible due to conservation problems. The septal faces bear small ridges parallel to the upper margin and occasional thorns. The inner margin of septa is provided with teeth; this ornamentation corresponds to the ridges at the lateral faces. The endotheca consists of thin, moderately common dissepiments. The wall is septothecal, made of slightly thickened septa. In other species, the wall is also formed by rudimentary septa. In this case, the rudimentary septa can be only counted if costae are present. Budding is intracalicular, rarely extracalicular.

Remarks. The genus was revised and commented on in Löser (2012a). Late Jurassic to Early Cretaceous corals formerly assigned to *Actinastrea* need to be reclassified to *Stelidioseris* or another genus because they do not fit into the concept of *Actinastrea* (as defined by type material and topotypical material presented in Löser (2012a, 2012b).

Species. The determination of species in the framework of this study is mainly based on the direct comparison of the calicular dimensions and septal counts of type material and the studied material. This includes uncertainty because for the majority of the type material statistical values are not available. These values can be only obtained from a thin section, a peel or a large, well-preserved polished section. Most type specimens are without any polished section that would allow measuring these values, and most institutions do not permit making large sections or obtaining thin sections that would result in any destruction of the type specimen. From Sonora, six species are distinguished (Fig. 1). Statistical values of selected specimens are given in

Number of septa	Diameter of the calice ($\mu\pm\sigma$; mm)	Species
6-12	0.8-1.1	<i>hourcqi</i>
	1.3-1.8	<i>ruvida</i>
24	0.9-1.1	<i>bellensis</i>
	1.2-1.6	<i>japonica</i>
	1.5-2.1	<i>whitneyi</i>
	1.9-2.5	<i>major</i>

Figure 1. Septal cycles, septal cycles that reach the columella and calicular diameter of the *Stelidioseris* species found in the study area.

Table 1. To make the obtained data statistically comparable to traditional ranges of calicular diameter and distance, the interval $\mu\pm\sigma$ is given as well. The analysis of variance of the calicular diameter and distance confirms significant differences between the species.

Stelidioseris bellensis (Wells, 1933)

v 1926 *Astrocoenia colliculosa* Trautschold 1886 - Dietrich, p. 94, pl. 5: 3, pl. 14: 1

*v 1933 *Astrocoenia bellensis* Wells, p. 76, pl. 6: 5, 6

Description. Colony with small circular calices. Three cycles of septa where only those of the first cycle reach the columella. Those of the third cycle are slightly shorter and show swellings. Those of the first cycle are very short and often connected to those of the second cycle.

Material examined. ERNO L-4263, L-4281.

Occurrence in Sonora. Early Albian: Municipio Arizpe, Arizpe, Cerro La Ceja (CG1); Municipio Cucurpe, Cucurpe, La Mesa (LM3).

Occurrence elsewhere. Late Valanginian to Early Aptian of Tanzania (Tanganyika, Mtwara) Lipogiro plateau, western margin. Hauterivian to Barremian of Chile (Antofagasta) El Way (UCA). Aptian of Mexico (Puebla) San Juan Raya, Lomo de los Gatos (ERNO L-R10956). Middle Albian (Lautus zone) of USA (Texas) Bell County, Santa Fe Railroad quarry.

Range. Early Cretaceous.

Discussion. The material is poorly preserved and does not allow detailed description. The material cannot be confused with *Stelidioseris hourcqi* because the septa of the second cycle in *S. hourcqi* are very short, whereas in *S. bellensis* they almost reach the columella and bear swellings.

Stelidioseris hourcqi (Alloiteau, 1958)

Fig. 2a-c

v 1909 *Astrocoenia minima* - Prever, p. 129, pl. 14: 12-14

v ? 1932 *Astrocoenia scyphoidea* Wells, p. 231, pl. 32: 3, pl. 33: 3

*v 1958 *Actinastrea Hourcqi* Alloiteau, p. 108, pl. 6: 8, pl. 7: 3 v 2010 *Actinastrea hourcqi* Alloiteau, 1958 - Löser, p. 582, fig. 2.1

Table 1. Dimensions of the calicular diameters in representative *Stelidioseris* samples. n, number of measurements; Vmin- Vmax, range (mm); μ , arithmetic mea, standard deviation (mm); v, coefficient of variation (%); $\mu\pm$, first interval (mm); $\mu\pm\%$, number of measured values within the range of the first interval (%); cl, calicular diameter (lumen); ccd, distance of calicular centres; w, thickness of intercalicular space; cd, number of calices per 25mm².

Species/values	n	Vmin-Vmax	μ	σ	v	$\mu\pm$	$\mu\pm\%$
<i>Stelidioseris bellensis</i> (ERNO L-4281)							
cl	10	0.86-1.22	1.02	0.11	10.4	0.91-1.12	70
ccd	10	1.18-1.75	1.53	0.16	10.6	1.37-1.69	70
w	10	0.25-0.54	0.41	0.09	20.8	0.32-0.49	60
cd							12
<i>Stelidioseris hourcqii</i> (ERNO L-4213)							
cl	65	0.67-1.19	0.94	0.13	13.5	0.81-1.07	66
ccd	105	0.71-2.04	1.28	0.29	22.4	0.99-1.56	70
w	55	0.14-0.64	0.35	0.12	34	0.22-0.46	69
cd							17/21
<i>Stelidioseris japonica</i> (ERNO L-4272)							
cl	60	1.19-1.89	1.47	0.16	11	1.31-1.63	65
ccd	100	1.46-2.48	1.92	0.22	11.4	1.69-2.19	71
w	35	0.23-0.76	0.47	0.12	25	0.35-0.59	60
cd							7/7/7/7/8
<i>Stelidioseris japonica</i> (ERNO L-4815)							
cl	40	1.03-1.69	1.34	0.19	13.9	1.15-1.52	58
ccd	50	1.21-2.2	1.67	0.22	12.9	1.45-1.88	70
cd							8/10
<i>Stelidioseris major</i> (ERNO L-4838)							
cl	25	1.89-2.79	2.24	0.25	10.4	2.00-2.47	72
ccd	35	1.62-2.76	2.12	0.27	12.5	1.84-2.38	69
w	15	0.15-0.63	0.35	0.13	38.7	0.21-0.48	73
cd							5/5
- (ERNO L-4944)							
cl	20	1.715-2.524	2.158	0.248	11.6	1.91-2.40	665
ccd	40	2.248-3.275	2.639	0.246	9.3	2.39-2.88	70
w	25	0.371-0.893	0.579	0.120	20.8	0.45-0.70	72
cd							3/3/4/4/4
<i>Stelidioseris ruvida</i> (ERNO 2153)							
cl	210	1.17-2.15	1.53	0.18	11.9	1.34-1.71	71
ccd	355	1.59-3.61	2.27	0.35	15.4	1.91-2.61	87
w	70	0.24-1.04	0.63	0.15	23.7	0.47-0.77	73
cd							3/4/4/4/5/5/5/5/5/5/5/6/6/6/6/6/6/6/6/7/7/8
- (ERNO L-4417)							
cl	20	1.22-2.03	1.63	0.24	14.8	1.38-1.87	60
ccd	30	1.79-3.68	2.59	0.24	16.9	2.15-3.03	60
cd							3/3/4/4/4/5
<i>Stelidioseris ruvida</i> (ERNO L-4483)							
cl	28	1.28-1.02	1.6	0.17	10.3	1.43-1.76	68
ccd	50	2.03-3.84	2.95	0.47	15.8	2.48-3.41	66
w	20	0.86-1.81	1.34	0.25	18.3	1.09-1.58	70
cd							2/2/3/3/4/4
<i>Stelidioseris whitneyi</i> (ERNO L-4253)							
cl	100	1.35-2.54	1.93	0.3	15.3	1.63-2.22	64
ccd	80	1.49-2.39	1.87	0.22	11.9	1.64-2.00	68
w	65	0.12-0.46	0.28	0.06	22.8	0.21-0.34	72
cd							6/6/7/7/8/8/10
- (ERNO L-4426)							
cl	20	1.33-2.21	1.72	0.23	13.2	1.48-1.94	75
ccd	30	1.79-2.56	2.17	0.19	8.7	1.97-2.37	70
cd							6/7

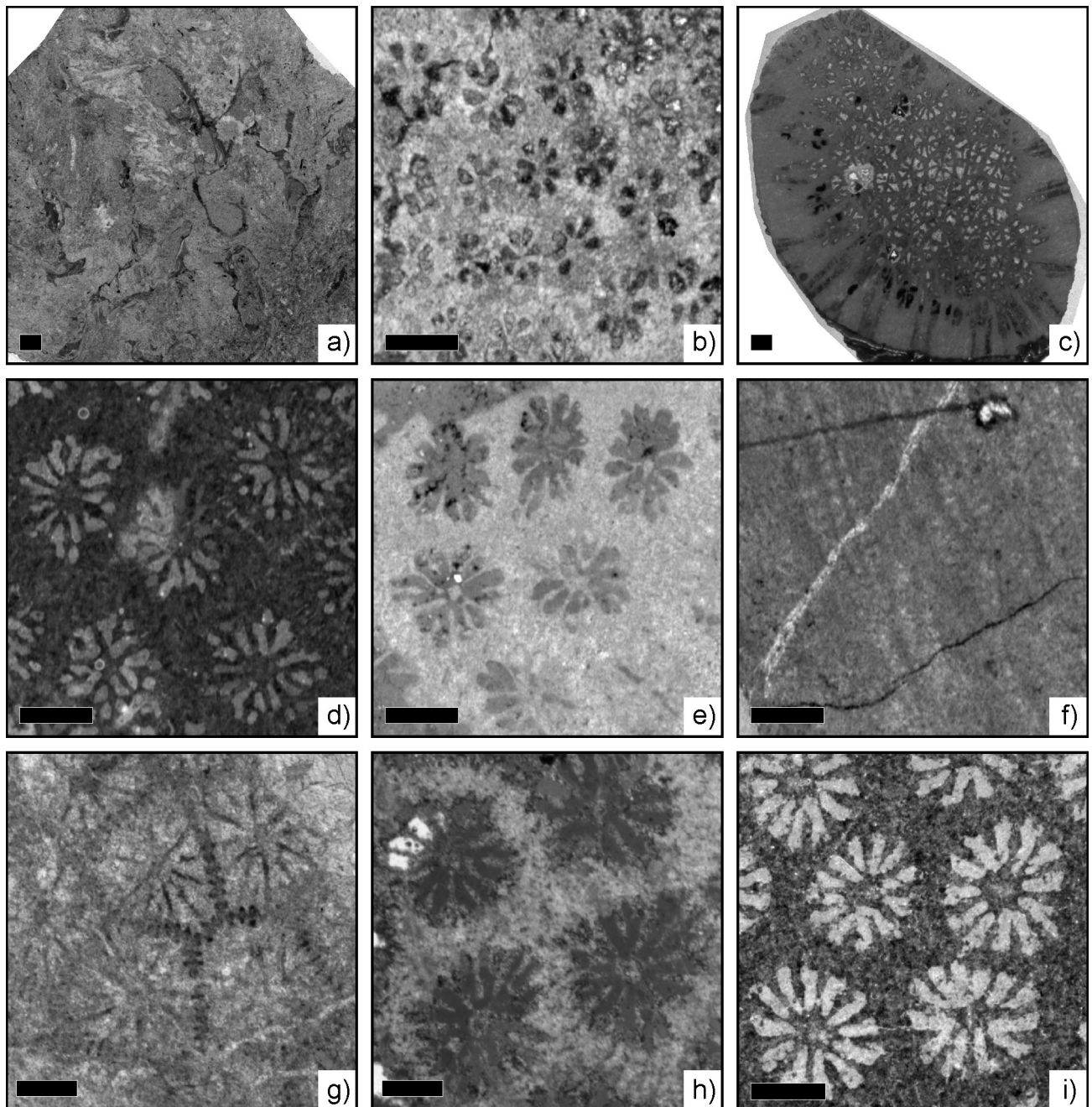


Figure 2. (scale 1 mm).

a-c, *Stelidioseris hourcqi* ALLOITEAU, 1958. a, ERNO L-4254. Lower Albian of Municipio Opodepe, Tuape, Cerro de la Espina, thin section showing the general colony form. b, ERNO L-4213. Lower Albian of Municipio Opodepe, Tuape, Cerro de la Espina, transverse thin section. c, ERNO L-4241, transverse and longitudinal thin section of a small branch.

d-f, *Stelidioseris japonica* (EGUCHI, 1951). d, ERNO L-4272. Lower Albian of Municipio Arizpe, Arizpe, Cerro La Ceja, transverse thin section. e, ERNO L-4815. Lower Albian of Municipio Santa Ana, Santa Ana, Transverse thin section. f, longitudinal thin section.

g-h, *Stelidioseris major* (MORYCOWA, 1971). g, ERNO L-4838. Upper Aptian of Municipio Ures, Rayón, Cerro de Oro, transverse thin section. h, ERNO L-4944. Lower Albian of Municipio Ures, Rayón, Cerro de Oro, transverse thin section.

i, *Stelidioseris ruvida* (PREVER, 1909). PU 17933. Lower Aptian of Monti d'Ocre, Fossa MezzaSpada (Abruzzi, L'Aquila, Italy), transverse peel.

Description. The coral forms dense colonies of branching corals. The branches have a diameter of five to fifteen millimetres. The space between the branches is narrow. The calices are very small, polygonal in the centre of the branches, circular and with larger distances at its surface. Septa in two cycles of six septa. The first cycle always reaches the centre of the calice and is connected to the columella. The septa of the second cycle are short, often not traceable, probably due to the poor state of preservation. The columella is large. The endotheca is poorly developed.

Material examined. ERNO L-4213, L-4241, L-4254, L-4262, L-4271, L-4436, L-4443, L-4460, L-4468, L-4909, L-4910, L-4911.

Occurrence in Sonora. Early Albian: Municipio Arizpe, Arizpe, Cerro La Ceja (CG1); Municipio Naco, Naco, Sierra San Jose (SJ2); Municipio Opodepe, Tuape, Cerro de la Espina (ES3, ES4); Municipio Ures, Rayón, Cerro de Oro (CO10).

Occurrence elsewhere. Barremian (Moutoniceras - Giraudi zone) of France (Drôme) Serre de Bleyton. Aptian of Mexico (Puebla) San Juan Raya (IGM 9262). Early Aptian of Italy (Abruzzi, L'Aquila) Monti d'Ocre, Fossa Agnese. Early Albian (Tardefurcata zone) of the USA (Texas) Hays County, Blanco River, Pleasant Valley Crossing. Late Albian of Madagascar (Mahajanga) Mokaraha. Late Cenomanian (Guerangeri zone) of Czech Republic (Central Bohemian region) Korycany (MNHP ex Zitt 4/27.4.00).

Range. Barremian to Cenomanian.

Discussion. Because of its poor description and illustration in Alloiteau (1958), *Stelidioseris hourcqi* remains a quite unknown species. *Astrocoenia scyphoidea* is probably a senior synonym, but the holotype is so poorly preserved that a comparison with other material is difficult. In places, colonies of *Stelidioseris hourcqi*, together with phaceloid corals of other species, form small bioherms.

Stelidioseris japonica (Eguchi, 1951)

Figures 2d-f

v 1926 *Astrocoenia pseudominima* Koby - Dietrich, p. 93, pl. 6: 9

v 1936 *Astrocoenia pseudominima* Koby 1896 - Hackemesser, p. 71, pl. 7: 14

*v 1951 *Astrocoenia japonica* Eguchi, p. 17, pl. 8: 7, [?]8, pl. 10: 4, 5 [pl. 8: 8 was not available for study]

v 1981 *Heliocoenia carpathica* Morycowa 1964 - Turnšek and Mihajlovic, p. 11, pl. 4: 1-3

v 1989 *Actinastraea* cf. *pseudominima* (Koby 1896) - Löser, p. 98, text-fig. 3, pl. 21: 3

v 1989 *Heliocoenia* ? *actinastrae* Turnšek 1981 - Löser, p. 108, text-fig. 14, 15, pl. 21: 7, 8

v 1994 *Actinastrea* cf. *tourtiensis* (Bölsche 1871) - Löser, p. 7

v 1995 *Actinastrea aequibernensis* (Hackemesser 1936) - Löser and Raeder, p. 42

v 1999 *Thecidiosmilia morycowa* Kolodziej, 1995 - Baron-Szabo and González-León, p. 483, fig. 6g, j

v 2006 *Actinastrea whitneyi* (Wells, 1932) - Löser and Ferry, p. 475, fig. 3.4, 3.5

v 2012 *Astrocoenia japonica* Eguchi 1951 - Löser, p. 383, fig. 1d

Description. Colony with circular or polygonal calices. Septa in three cycles. Those of the first cycle reach to the columella, those of the second are slightly shorter and show swellings. The septa of the third cycle are very short and often attached to those of the second cycle. The septa of the third cycle are often not visible due to the poor state of preservation. The wall can show intercalicular chambers. The endotheca consists of thin tabulae.

Material examined. ERNO L-4206, L-4214, L-4215, L-4217, L-4246, L-4247, L-4248, L-4261, L-4272, L-4351, L-4408, L-4453, L-4455, L-4456, L-4457, L-4469, L-4815, L-4836, L-4837.

Occurrence in Sonora. Early Albian: Municipio Agua Prieta, E San Bernardino Valley, Cordon Caloso (CC1A); Municipio Arizpe, Arizpe, Cerro La Ceja (CG1, CG2); Municipio Arizpe, El Salmón (SN); Municipio Naco, Naco, Sierra San Jose (SJ3); Municipio Opodepe, Tuape, Cerro de la Espina (ES3, ES4); Municipio Santa Ana, Santa Ana (SA2); Municipio Ures, Rayón, Cerro de Oro (CO5).

Occurrence elsewhere. (? Early) Cretaceous of Greece (Fokída) Kiona massif, Panourgias; Serbia (East Serbia) Planinica. Early Hauterivian (Radiatus zone) of France (Yonne) Fontenoy (BSPG 2003 XX 5064) and Gy-l'Evêque (BSPG 2003 XX 6535). Barremian of Mexico (Puebla) Tehuacán, La Compañía (ERNO L-R10908). Early Aptian of Tanzania (Tanganyika, Mtwara) Lipogiro plateau, Niongala; Greece (Viotía) Levadia, Perachorion (BSPG 2003 XX 1874). Aptian to Albian of a high number of outcrops in Japan (Kochi-ken, Iwate-ken). Late Aptian of Algeria (Constantine) Sidi R'Gheiss (UP M 6313); Spain (Cataluña, Tarragona) Com. Baix Penedès, Mun. Masllorç, Masarbones, field N (BSPG 2003 XX 6010).

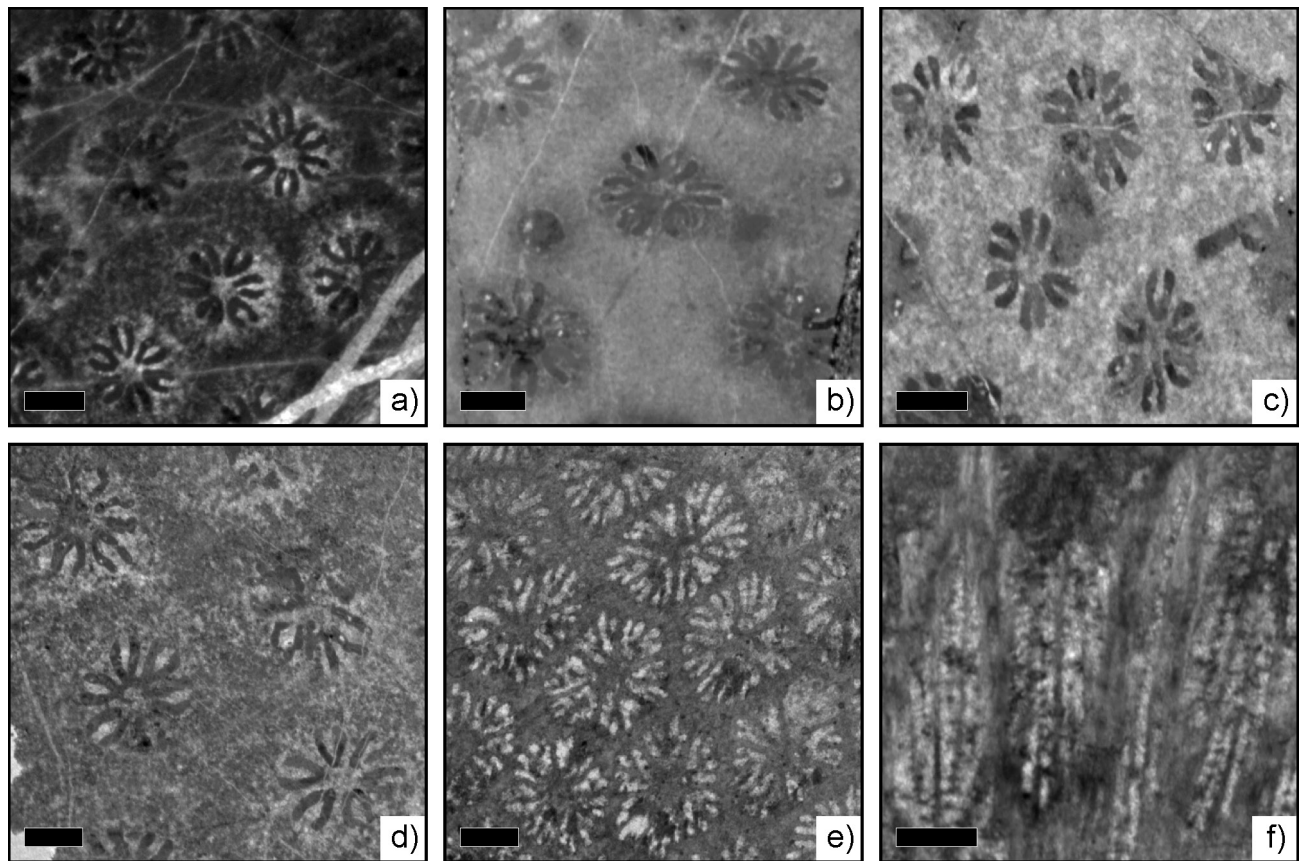


Figure 3. (scale 1 mm).

a-c, *Stelidioseris ruvida* (PREVER, 1909). a, ERNO 2153. Upper Barremian to Lower Aptian of Municipio Ures, Rayón, Cerro de Oro, transverse thin section. b, ERNO L-4483. Upper Barremian to Lower Aptian of Municipio Ures, Rayón, Cerro de Oro, Transverse thin section. c, ERNO L-4417. Upper Barremian to Lower Aptian of Municipio Ures, Rayón, Cerro de Oro, transverse thin section.

d-f, *Stelidioseris whitneyi* (WELLS, 1932). d, ERNO L-4808. Lower Albian of Municipio Ures, Rayón, Cerro de Oro, transverse thin section. e, ERNO L-4253. Lower Albian of Municipio Opodepe, Tuape, Cerro de la Espina, transverse thin section, f, longitudinal thin section.

Latest Aptian to Early Albian of Greece (Viotía) Aliartos, Chiarmena (BSPG 2003 XX 6176). Early Cenomanian (Mantelli zone) of Germany (Nordrhein/Westfalen) Mülheim/Ruhr, Kassenberg (RLM Coll. Linke 3418). Early Cenomanian of Greece (Kozani) Kozani, Nea Nikopolis (BSPG 2003 XX 5838). Early Cenomanian (Saxbii - Dixoni zone) of Germany (Sachsen) Meißen-Zscheila, Trinitatis church. Late Cenomanian (Plenus zone) of Germany (Sachsen) Dresden-Plauen, Ratssteinbruch. Late Cenomanian (Geslinianum zone) of Germany (Sachsen) Dresden- Coschütz.

Range. Hauterivian-Cenomanian.

Discussion. The species is relatively unknown, mainly because of the imprecise figures in Eguchi (1951). Eguchi (1951) did not designate a holotype. A lectotype was designated in Löser (2012b). The lectotype and paralectotypes from the type area kept at the TUM are

comparable in their calicular dimensions and seem to belong to only one species.

***Stelidioseris major* (Morycowa, 1971)**

Figures 2gh

*v 1971 *Actinastraea pseudominima major* Morycowa, p. 37, text-fig. 13, 14, pl. 1: 3, pl. 2: 1

v 1994 *Diplocoenia nicolau* Reig Oriol, p. 21, pl. 1: 2, pl. 3: 6, 7

Material examined. ERNO L-4207, L-4353, L-4838, L-4944.

Occurrence in Sonora. Early Albian: Municipio Agua Prieta, E San Bernardino Valley, Cordon Caloso (CC1A); Municipio Ures, Rayón, Cerro de Oro (CO5, CO6, CO10).

Occurrence elsewhere. Early Hauterivian (Radiatus zone) of France (Yonne) Leugny (BSPG 2003 XX 5179), Fontenoy (BSPG 2003 XX 5100), Gy-l'Evêque (BSPG 2003 XX 6542). Early Aptian (Lenticularis zone) of Romania (Suceava) Pojorîta area, Cîmpulung- Moldovenesc, Valea Izvorul Alb. Early Late Aptian of Spain (Cataluña, Lérida) Com. La Noguera, Mun. Vilanova de Meià, Montsec de Rubies, section NW La Cabrua quarry (BSPG 2003 XX 6316). Late Aptian of Spain (Cataluña, Tarragona) Com. Baix Penedés, Mun. Montmell, Marmellà, Can Xuec. Early Albian of USA (Arizona) Douglas, Paul Spur Ridge (BSPG 2003 XX 4720).

Range. Hauterivian to Early Albian.

Discussion. The material is almost identical with *Stelidioseris whitneyi*, but clearly differs by its larger calicular dimensions. *Astrocoenia asteriscus* Weissermel, 1900 could be a senior synonym of *Stelidioseris major*, but the exact calicular dimensions of *Astrocoenia asteriscus* are unknown; Weissermel (1900) gives for his material from East Africa 2-3mm as the calicular diameter, which is not very precise. The type material is lost. The revision of East African material (Löser 2008) did not yield comparable samples.

***Stelidioseris ruvida* (Prever, 1909)**

Fig. 2i, 3a-c

*v 1909 *Astraea ruvida* Prever, p. 93, pl. 6: 3

v 1909 *Astrocoenia Konincki* - Prever, p. 130, pl. 14: 11

v 1909 *Holocoenia polymorpha* - Prever, p. 128, pl. 14: 1-7

v 1933 *Astrocoenia whitneyi* Wells 1932 - Wells, p. 73, pl. 6: 7

v 1956 *Astrocoenia revellei* Hamilton, n. sp. - Hamilton, p. 57, pl. 5: 3

v 1999 *Columastrea paucipaliformis* n. sp. - Baron-Szabo and González-León, p. 472, fig. 2g, k

v 1999 *Columactinastraea* sp. - Baron-Szabo and González-León, p. 469, fig. 2 a

v 2003 *Columastrea paucipaliformis* Baron-Szabo and González-León, 1999 - Baron-Szabo and González-León, p. 204, fig. 7J

v 2012 *Holocoenia polymorpha* Prever 1909 - Löser, p. 383, fig. 1e

v 2012 *Astrea ruvida* Prever, 1909 - Löser, p. 383, fig. 1f

Description. Colony with small circular calices. The septa occur in two cycles. The septa of the first cycle reach the columella, those of the second cycle are slightly shorter and bear swellings. The beginning of a third cycle may exist, resulting in 12 to 14 septa. Wall thickness varies greatly in this species.

Material examined. ERNO 2153, 2171, 3051, L-4300, L-4314, L-4318, L-4358, L-4379, L-4385, L-4402, L-4417, L-4483, L-4806, L-4807, L-4855, L-4862.

Species	Valangin.		Hauteriv.		Barremian		Aptian		Albian			Cenoman.		
	E.	Late	E.	Late	E.	Late	Early	Late	Early	Middle	Late	Early	M.	L.
<i>bellensis</i>														
<i>hourcqi</i>														
<i>japonica</i>														
<i>major</i>														
<i>ruvida</i>														
<i>whitneyi</i>														

Figure 4 Stratigraphic distribution and commonness of species. The thickness of the bars indicates the number of localities (multiples localities within the same lithostratigraphical unit are counted as one) in which the species concerned was found.

Occurrence in Sonora. Late Barremian to Early Aptian: Municipio Ures, Rayón, Cerro de Oro (CO, CO4, COBS1). Early Albian: Municipio Cucurpe, Cucurpe, La Mesa (LM3); Municipio Opodepe, Tuape, Cerro de la Espina (ESC8); Municipio Ures, Rayón, Cerro de Oro (CO5, CO7, CO9).

Occurrence elsewhere. Early Hauterivian (Radiatus zone) of France (Yonne) Fields 1.5 km W Coulange-la Vineuse (BSPG 2003 XX 5448). Aptian to Cenomanian of the Pacific, Hess Guyot. Early Aptian of Italy (Abruzzi, L'Aquila) Monti d'Ocre, Fossa Agnese, Margine N di Fossa Mezza Spada and Fossa Mezza Spada. Late Aptian (Nutfieldensis zone) of United Kingdom (Berkshire) Faringdon (NHM R. 49362). Middle Albian (Lautus zone) of USA (Texas) Hudspeth County, Quitman Canyon.

Range. Hauterivian to Middle Albian.

Discussion. The taxa *Astraea ruvida* and *Holocoenia polymorpha* created by Prever (1909) belong to the same species. *A. ruvida* is selected here as senior synonym because it is better preserved than the various syntypes of *H. polymorpha*. *Columastrea paucipaliformis* is here considered a *Stelidioseris*. Its holotype shows the typical septal swellings, and has no pali.

***Stelidioseris whitneyi* (Wells, 1932)**

Figures 3d-f

*v 1932 *Astrocoenia whitneyi* Wells, p. 230, pl. 31: 6, pl. 32: 1, 2, pl. 37: 1

v 1933 *Astrocoenia guadalupae* Roemer 1849 - Wells, p. 74, pl. 5: 11-13

v 1933 *Astrocoenia whitneyi* Wells 1932 - Wells, p. 73, pl. 6: 7

v 1936 *Astrocoenia* ex. aff. *aequibermensis* n. sp. - Hackemesser, p. 75, pl. 8: 10, 11

v 1944 *Astrocoenia whitneyi* Wells - Shimer and Shrock, p. 115, pl. 42: 16

v non 1991 *Actinastrea whitneyi* (Wells 1932) - Prinz, p. 193, pl. 7: 3 [= *S. retifera*]

v non 2006 *Actinastrea whitneyi* (Wells, 1932) - Löser and Ferry, p. 475, fig. 3.4, 3.5 [= *S. japonica*]

Description. Colony with circular or polygonal calices. Six septa of the first cycle reach the columella, those of the second cycle are slightly shorter, with swellings that are more pronounced in colonies with a thicker wall and more circular calices. The septa of the third cycle are often

not clearly visible due to the poor state of preservation. Often they are connected to septa of the second cycle. The endotheca consists of thin tabulae.

Material examined. ERNO L-4208, L-4216, L-4253, L-4426, L-4458, L-4808, L-4913, L-4915, L-4928.

Occurrence in Sonora. Early Albian: Municipio Agua Prieta, E San Bernardino Valley, Cordon Caloso (CC1A); Municipio Opodepe, Tuape, Cerro de la Espina (ES3, ES4); Municipio Ures, Rayón, Cerro de Oro (CO10).

Occurrence elsewhere. (? Early) Cretaceous of Greece (Fokida) Kiona massif, Panourgias. Aptian/Albian of the USA (Texas) Comal County, Travis and Travis County. Late Aptian (Jacobi zone) of USA (Texas) Comal County, New Braunfels, Spring branch. Early Albian (Tardefurcata zone) of the USA (Texas) Hays County, Blanco River, Pleasant Valley Crossing; Blanco and Hays Counties, Blanco River narrows; Comal County, New Braunfels. Middle Albian (Lautus zone) of the USA (Texas) Val Verde County, Devil's River; Kerr County, Kerrville, Hiram Hall Ranch; Williamson County, Round Rock; Hudspeth County, Quitman Canyon.

Range. Late Aptian to Middle Albian.

DISCUSSION

The Sonoran species of the genus *Stelidioseris* show a long stratigraphical (Fig. 4) and wide palaeogeographical distribution. Many of the species occur since the Hauterivian; most of them are already indicated in the Aptian. Their range into the early Late Cretaceous is limited. The distribution in the Albian is almost entirely limited to the Western Hemisphere (Puebla, Sonora, Texas) because Albian faunas are less present in the western and central Tethys due to massive oceanic anoxic events (Löser 2013). The species are globally distributed and found almost everywhere. The closest relationships are to the Late Aptian to Albian faunas of Texas (USA), as already shown in Löser and Minor (2007).

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