Description of *Schizobrissus obradori* sp. nov. (Brissidae, Spatangoida) from the Upper Miocene of Menorca (Balearic Islands, Western Mediterranean)

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SOCIETAT D'HISTÒRIA NATURAL DE LES BALEARS

Quintana Cardona, J. 2021. Description of *Schizobrissus obradori* sp. nov. (Brissidae, Spatangoida) from the Upper Miocene of Menorca (Balearic Islands, Western Mediterranean). *Boll. Soc. Hist. Nat. Balears*, 64: 131-143. ISSN 0212-260X. e-ISSN 2444-8192. Palma (Illes Balears).

The study of the Tortonian calcarenites located in the Algendar ravine (Ferreries, Menorca) has hallowed the identification of eleven species of echinoids, among which the spatangoids clearly dominate, with eight species included in five genera, in addition to two genera of echinolampadidae and one clypeasteroid. Among the spatangoids, it is worth higlighting the presence of two species of the genus *Schizobrissus* Pomel, 1869, one of which (*Schizobrissus obradori* sp. nov.) is described for the first time. The genus *Schizobrissus* is known in the late Miocene of Europe and North Africa by a single species (*Schizobrissus cruziatus* [Agassiz in Agassiz et Desor, 1847]), so that the description of a new species (with a relatively large size) in the Mediterranian basin is somewhat surprising, given the extensive palaeoechinological tradition existing in Europe and due to the fact that the echinoids of the Upper Miocene of Menorca have been known since the end of the 19th and the beginning of the 20th, thanks above all to the studies carried out by the French echinologist Jules lambert. *Schizobrissus obradori* sp. nov. is described from the calcarenitic facies diposited in the lower part of the infralittoral zone of the Algendar ravine, of Tortonian age (included in the Lower Bar Unit) and the Messinian Reef Unit of Ciutadella de Menorca. The new species differs from the other species included in the genus *Schizobrissus* (*S. cruziatus* and its possible synonyms, *S. latus* [Wrigth, 1855], *S. mauritanicus* Pomel, 1887 and *S. locardi* [Cotteau in Locard, 1877]) by a more anteroposterior compressed test. The greatest similarities are established between *Schizobrissus obradori* sp. nov. and *Schizobrissus* sp. from the Lutecien (Middle Eocene) of Alfaz del Pi (Alicante, east of the iberian peninsula). Emphasis is placed on the need for a thorough revision of the genus *Schizobrissus* in order to understand its origin and distribution, geographically as well as chronologically.

Key words: *Schizobrissus cruziatus, later synonyms, Upper Miocene, Minorcan Geologist, Antoni Obrador Tuduri.*

DESCRIPCIÓN DE *Schizobrissus obradori* SP. NOV. (BRISSIDAE, SPATANGOIDA) DEL MIOCENO SUPERIOR DE MENORCA (ISLAS BALEARES, MEDITERRÁNEO OCCIDENTAL). El estudio de las calcarenitas tortonienses situadas en el barranco de Algendar (Ferreries, Menorca) ha permitido identificar once especies de equinoideos, entre los que dominan claramente los espatangoideos, con ocho especies incluidas en cinco géneros diferentes, además de dos géneros de Echinolampadidade y un clypeasteroideo. Entre los espatangoideos, cabe destacar la presencia de dos especies del género *Schizobrissus* Pomel, 1869, una de las cuales (*Schizobrissus obradori* sp. nov.) se describe por primera vez. El género *Schizobrissus* es conocido en el Mioceno superior de Europa y norte de África por una única especie (*Schizobrissus cruziatus* [Agassiz in Agassiz et Desor, 1847]), de

forma que la descripción de una nueva especie (con un tamaño relativamente grande) en la cuenca mediterránea resulta hasta cierto punto sorprendente, dada la extensa tradición paleoequinológica existente en Europa y por el hecho de que los equinoideos del Mioceno superior de Menorca son conocidos desde finales del siglo XIX y principios del XX, gracias principalmente a los estudios realizados por el equinólogo francés Jules Lambert. *Schizobrissus obradori* sp. nov. se describe a partir de dos ejemplares procedentes de las facies calcareníticas depositadas en la parte inferior de la zona infralitoral del barranco de Algendar, de edad tortoniense (incluidas en la Unidad Inferior de Barras) y la Unidad Arrecifal messiniense de Ciutadella de Menorca. La nueva especie se diferencia del resto de especies incluidas en el género *Schizobrissus* (*S. cruziatus* y sus posibles sinónimos, *S. latus* [Wrigth, 1855], *S. mauritanicus* Pomel, 1887 and *S. locardi* [Cotteau in Locard, 1877]) por un caparazón más comprimido en sentido antero-posterior. Las mayores semejanzas se establecen entre *Schizobrissus obradori* sp. nov. y *Schizobrissus* sp. del Luteciense (Eoceno medio) de Alfaz del Pi (Alicante, este de la Península Ibérica). Se enfatiza la necesidad de una profunda revisión del género *Schizobrissus* en el Mioceno superior de la cuenca mediterránea, con el fin de entender su origen y distribución, tanto geográfica como temporal.
Palabras clave: *Schizobrissus cruziatus, sinónimos posteriores, Mioceno superior, Geólogo menorquín, Antoni Obrador Tudurí.*

DESCRIPCIÓ DE *Schizobrissus obradori* SP. NOV. (BRISSIDAE, SPATANGOIDA) DEL MIOCÈ SUPERIOR DE MENORCA (ILLES BALEARS, MEDITERRÀNIA OCCIDENTAL). L'estudi de les calcarenites tortonianes situades en el barranc d'Algendar (Ferreries, Menorca) ha permès identificar onze espècies d'equinoideus, entre els quals dominen clàrament els espatangoideus, amb vuit especies incloses en cinc gèneres diferents, a més de dos gèneres d'Echinolampadidae i un clipeasteroid. Entre els espatangoideus cal destacar la presència de dues espècies del gènere *Schizobrissus* Pomel, 1869, una de les quals (*Schizobrissus obradori* sp. nov.) es descriu per primer cop. El gènere *Schizobrissus* és conegut en el Miocè superior d'Europa i nord d'Àfrica per una única espècie (*Schizobrissus cruziatus* [Agassiz in Agassiz et Desor, 1847]), de forma que la descripció d'una nova espècie (amb una mida relativament grossa) en la conca mediterrània resulta fins a cert punt sorprenent, degut a la extensa tradició paleoequinològica existent a Europa i pel fet que els equinoideus del Miocè superior de Menorca són coneguts des de finals del segle XIX i principis del XX gràcies principalment als estudis realitzats per l'equinòleg francès Jules Lambert. *Schizobrissus obradori* sp. nov. es descriu a partir de dos exemplars procedents de les fàcies calcarenítiques dipositades en la part inferior de la zona infralitoral del barranc d'Algendar, d'edat tortoniana (incloses en la Unitat Inferior de Barres) i la Unitat Arrecifal messiniana de Ciutadella de Menorca. La nova espècie es diferencia de la resta d'espècies incloses en el gènere *Schizobrissus* (*S. cruziatus* i els seus possibles sinònims, *S. latus* [Wrigth, 1855], *S. mauritanicus* Pomel, 1887 and *S. locardi* [Cotteau in Locard, 1877]) per una closca més comprimida en sentit antero-posterior. Les majors semblances s'estableixen entre *Schizobrissus obradori* sp. nov. i *Schizobrissus* sp. del Lutecià (Eocè mitjà) d'Alfaz del Pi (Alacant, est de la península Ibèrica). S'enfatitza la necessitat d'una profunda revisió del gènere *Schizobrissus* en el Miocè superior de la conca mediterrània, per tal d'entendre el seu origen i distribució, tant geogràfic com temporal.
Paraules clau: *Schizobrissus cruziatus, sinònims posteriors, Miocè superior, geòleg menorquí, Antoni Obrador Tudurí.*

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Recepció del manuscrit: 8-12-2021; revisió acceptada:13-12-2021; publicació online: 15-12-2021.

Introduction

The sediments of the upper Miocene calcareous platform of Menorca preserve a rich and interesting equinological fauna known since the late 19th and early 20th century (Table 1). Among the first geological and palaeontological studies, it is worth highlighting the work of Hermite (1879) and, especially, Lambert (1906), who describes ten species of Menorcan echinoids, of which three turned out to be new taxa. Equally interesting are the works of Obrador (1972-1973) and Bourrouilh (1983). These contributions, although of an eminent geological nature, incorporate numerous faunal data which include several species of echinoids.

Among the most recent contributions concerning the equinological fauna of the Miocene of Menorca it is worth mentioning Quintana (2017, 2019, 2020a and 2020b), whose work focuses mainly on the (still incomplete) revision of the genus *Echinolampas* Gray, 1825 and, in particular, the spatangoids, an order within which Quintana (2020b) cites and describes, among others, *Schizobrissus cruziatus* (Agassiz in Agassiz et Desor, 1847) and *Schizobrissus* sp.

The genus *Schizobrissus* Pomel, 1869 is represented in the Eocene and Miocene of Europe and Carib (Fischer, 1986).The taxonomic position and diversity of this genus is still controversial (see Chesher, 1970). Some authors consider *Schizobrissus* as a subgenus of *Meoma* Gray, 1851 (Fischer, 1986; Lachkhem & Roman, 1995; Philippe, 1998), while others (Chesher, 1970) consider it an independent genus, but from which the type specimen is not known (contrary to the opinion of Lambert & Jeannet, 1928). In any case, the differences between *Schizobrissus* and *Meoma* are apparently not significant: both genera are distinguished by the different depth of the anterior ambulacrum, greater in *Schizobrissus*.

It is also necessary a revision of the Miocene species of the Mediterranean basin (*Schizobrissus latus* [Wrigth, 1855], *Schizobrissus locardi* [Cotteau in Locard, 1877] and *Schizobrissus mauritanicus* Pomel, 1887). These three taxa show apparent insignificant morphological differences, interpreted in some cases (Quintana, 2020b) as part of the intraspecific variability of *S. cruziatus*.

Schizobrissus sp. (Quintana, 2020b: Fig. 2), known only from two specimens, differs from *S. cruziatus*, *S. latus*, *S. locardi* and *S. mauritanicus* by a notably wider and more compressed anteroposterior test. These differences are considered to be significant and suggest that this is a new species, which is described below.

Methods

This study has followed the taxonomic criteria of Chesher (1970), who considers *Schizobrissus* a valid genus independent of *Meoma* Gray, 1851.

Schizobrissus sp. has been compared with five specimens of *S. cruziatus* from the Miocene of Menorca stored in the author's natural history collection (Ciutadella de Menorca) (for full details, see Quintana, 2020: p. 127-128), as well as with the original figures by Wrigth (1855), Locard (1877) and Pomel, (1887). Acronyms: MDM, Museu Diocesà de Menorca (Ciutadella de Menorca, Balearic Islands, Spain); CBQ: Josep (Bep) Quintana Collection (Ciutadella de Menorca, Balearic Islands, Spain). Measurements have been taken with

Table 1. Quoted echinoidea in the Upper Miocene of Menorca.
Taula 1. *Echinoidea citades del Miocè superior de Menorca.*

Taxa	Temporal range	Source
REGULARIA		
***Dorocidaris balearis* Lambert, 1906**	Upper Miocene	Lambert (1906)
***Prionocidaris sismondai* (Mayer in Hartung, 1864)**	Upper Oligocene-Upper Miocene	Quintana (2019)
***Psammechinus serrezii* Desor, 1856**	?	Hermite (1879)
***Schizechinus duciei* (Wright, 1855)**	Upper Miocene	Obrador (1972-1973)
***Schizechinus mortenseni* Lambert, 1906**	Upper Miocene	Lambert (1906)
IRREGULARIA		
***Amphiope bioculata* (Desmoulins, 1791)**	Middle Miocene	Obrador (1972-1973) / Llompart (1983)
***Brissopsis consobrinus* Lambert, 1908**	Middle Miocene	Obrador (1972-1973)
***Brissopsis crescenticus* (Wright, 1855)**	Langhian	Hermite (1879)
***Clypeaster altus* (Klein, 1734)**	Langhian-PLiocene	Quintana (2004)
***Clypeaster alticostatus* Michelin, 1865**	Langhian-Tortonian	Lambert (1906)
***Clypeaster crassicostatus* Sismonda, 1841**	Langhian-Tortonian	Obrador (1972-1973)
***Clypeaster ibericus* Lambert, 1928**	Tortonian	Bourrouilh (1973)
***Clypeaster latirostris* Agassiz, 1840**	Aquitanian-Serravalian	Obrador (1972-1973)
***Clypeaster malladai* Lambert, 1906**	Upper Miocene	Lambert (1906) / Obrador (1972-1973)
***Clypeaster marginatus* Lamarck, 1816**	Langhian-Tortonian	Lambert (1906) / Quintana (2004)
***Clypeaster martinianus* Desmoulins, 1837**	Langhian-Tortonian	Hermite (1879)
***Clypeaster portentosus* Desmoulins, 1837**	Langhian-Tortonian	Hermite (1879) / Quintana (2004)
***Clypeaster scillae* Desmoulins, 1837**	Langhian-Tortonian	Obrador (1972-1973)
***Echinolampas angulata* Merian in Agassiz et Desor, 1847**	Lower-Upper Miocene	Quintana (2019)
***Echinolampas atrophus* Lambert, 1906**	Middle-upper Miocene	Lambert (1906) / Quintana (2019)
***Echinolampas francei* Desmoulins, 1837**	Burdigalian	Obrador (1972-1973)
***Echinolampas hemisphericus* (Lamarck, 1916) (**	Serravalian-Tortonian	Hermite (1879) / Obrador (1972-1973)
***Echinolampas scutiformis* Desmoulins, 1837**	Oligocene-Serravalian	Hermite (1879) / Obrador (1972-1973) / Quintana (2019)
***Hypsoclypus plagiosomus* Agassiz, 1840 =*Hypsoclypus subpentagonalis* (Gregory, 1891)**	Langhian	Hermite (1879) / Bourrouilh (1973)
***Hypsoclypus semiglobus* (Lamarck, 1816)**	Serravalian-Upper Miocene	Hermite (1879)
***Opissaster almerai* Lambert, 1906**	Lower-Upper Miocene	Quintana (2019)
***Pericosmus latus* Agassiz, 1847**	Miocene	Lambert (1906)
***Prospatangus* sp.**	Upper Miocene	Obrador (1972-1973)
***Schizaster desori* Wrigth, 1855**	Lower-Upper Miocene	Quintana (2017)
***Schizaster dilatatus* Pomel, 1887**	Middle Miocene-Pliocene	Quintana (2020)
***Schizaster eurynotus* Sismonda, 1841**	Lower-Upper Miocene	Quintana (2020)
***Schizaster gymnesiae* Lambert, 1906 =*Ova karreri* (Laube, 1869)**	Upper Miocene	Lambert (1906) / Quintana (2020)
***Schizastyer ilottoi* Lambert, 1909**	Middle-Upper Miocene	Quintana (2020)
***Schizaster* cf. *Parkinsoni* (Defrance, 1827)**	Langhian-Tortonian	Hermite (1879) / Obrador (1972-1973)

***Schizaster peroni* Cotteau, 1877**	Miocene	Hermite (1879)
***Schizaster saheliensis* Pomel, 1887 =*Ova saheliensis* (Pomel, 1887)**	Messinian	Obrador (1972-1973) / Bourrouilh (1973) / Quintana (2020)
***Schizaster scillae* (Desmoulins, 1837)**	Langhian-Pliocene	Hermite (1879)
***Schizaster trigonalis* Mazzetti, 1885**	Middle-Upper Miocene	Quintana (2020)
***Schizobrissus cruziatus* (Agassiz in Agassiz et Desor, 1847)**	Middle Tertiary-Upper Miocene	Quintana (2020)
***Scutella* sp.**	Upper Miocene	Quintana (2004)
***Spatangus* sp.**	Upper Miocene	Obrador (1972-1973) / Quintana (2004)
***Trachyspatagus tuberculatus* Wrigth, 1864**	Eocene-Pliocene	Lambert (1906)

a digital calliper with a margin of error of ± 0.01 mm.

SYSTEMATIC PALAEONTOLOGY

Phylum ECHINODERMATA Klein, 1734
Class ECHINOIDEA Leske, 1778
Order SPATANGOIDA L. Agassiz, 1840
Suborder BRISSIDINA Stockley et al., 2005
Family BRISSIDAE Gray, 1855
Genus *Schizobrissus* Pomel, 1869
Type species: *Brissus cruciatus* Agassiz, 1847. Miocene of North Africa.

Schizobrissus obradori sp. nov.
(Figs. 1 and 2)

Holotype**.** Practically complete specimen, with a length of 93.6 mm, a width of 105.2 mm and a height of 61.5 mm (Fig. 1), registered with number MDM-2029 (Josep Quintana Cardona leg., 20/IX/1992), from Ses Mongetes (Ciutadella de Menorca). The specimen will be permanently stored in the Diocesan Museum of Minorca (Ciutadella de Menorca, Balearic Islands, Spain).

Paratype. Incomplete and somewhat deformed test, with registration number CBQ-3165, recovered on 25/VIII/1999 in the Algendar ravine (Ferreries, Menorca), in an area very close to the entrance of the road leading to Sa Penya Fosca-Es Pas den Revull (UTM coordinates: 31SEE830260) (Fig. 2).

Stratigraphic distribution**.** The holotype (MDM-2029) comes from the white, fine-grained calcarenite of the Messinian Reef Unit (Rosell *et al*., 1989; Obrador and Pomar, 2004), while the paratype (CBQ-3165) is associated with the yellowish, fine-grained calcarenite from lagoon facies (sensu Rosell *et al.*, 1989), included in the Lower Bar Unit (sensu Obrador and Pomar, 2004) and dated as Tortonian (Pomar, 2001).

Type locality. Son Sineta Orchad (plot no. 37 of Ses Mongetes, Ciutadella de Menorca, Balearic Islands, Spain) (UTM coordinates: 31SEE726231) (Fig. 3). The holotype was recovered from one of the stones forming part of the dry wall located on the southern edge of the orchard.

Geographical distribution. Species endemic to calcareous sediments of the Upper Miocene of Menorca (Balearic Islands, western Mediterranean).

Derivatio nominis. Species dedicated to Dr. Antoni Obrador Tudurí, for his numerous contributions to the geology of Menorca, especially to the study of the sedimentary facies and units that form the upper Miocene calcareous platform of the island.

Differential diagnosis. *Schizobrissus obradori* sp. nov. clearly differs from *S. cruziatus*, *S. latus*, *S. mauritanicus* and *S. locardi* by a more anteroposterior compressed test. *Schizobrissus obradori* sp.

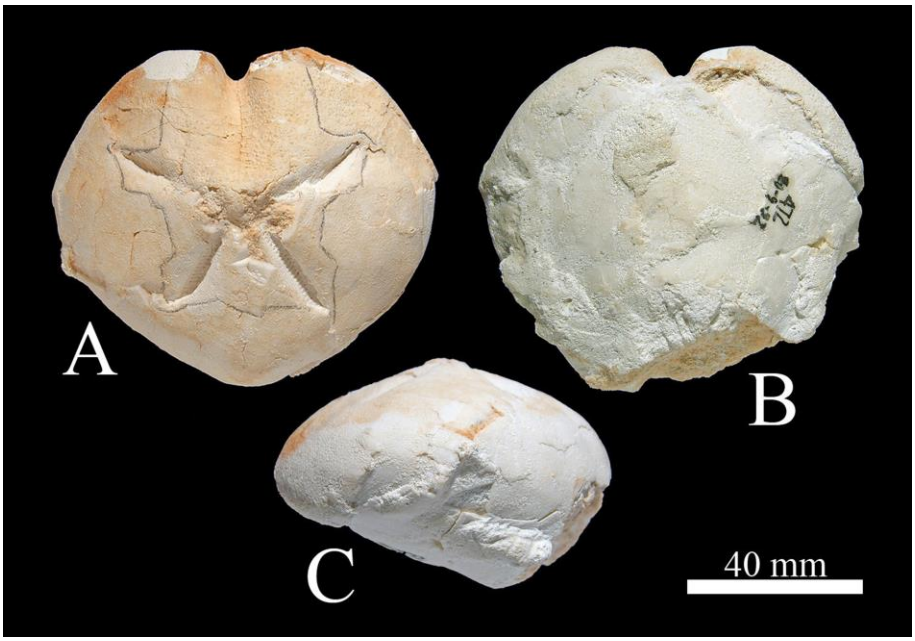

Fig. 1. Holotype of *Schizobrissus obradori* sp. nov. in aboral (A), adoral (B) and lateral (C) views, from Ses Mongetes (Ciutadella de Menorca).
Fig. 1. *Holotipus de* Schizobrissus obradori *sp. nov. en visió aboral (A), adoral (B) i lateral (C), de Ses Mongetes (Ciutadella de Menorca).*

nov. has certain similarities with *Schizobrissus* sp. from the Lutecien of Alfaz del Pi (Alicante) (Saura-Vilar and García-Vives, 2012: pl.77, Fig. 2). The two species differ in that the distance between the anterior paired ambulacrum and the ambitus, is greater in the species from Menorca.

Description. Cordiform test, wider than its length (Table 2). The unpaired ambulacrum forms a wide, open U-shaped groove, which is deepest in the ambitus. The lateral margins of the unpaired ambulacrum show an attenuated, not sharpened, profile. Paired ambulacrum petaloid and sunken, with two files of matched pores (Fig. 2A). The anterior paired ambulacrum forms a more open angle (113º) than the posterior ones (59º). The anterior paired ambulacrum is slightly bent forward. Very tight peripetal fasciola. On its posterior margin, the peripetal fasciola is distinctly asymmetrical, with a very open, inverted "W" shape. The fasciola defines the area where the larger tubercles appear. On the rest of the aboral surface, the tubercles are noticeably smaller in diameter. In addition, they are also very dense and evenly distributed. Viewed laterally, the aboral surface shows a rounded profile, forming a very regular arc, except in the apical area, where there is a well-defined protrusion. The ridge of the posterior interambulacrum is very poorly defined. In none of the specimens has it been possible to observe the characteristics of the apical system, peristome, labrum and periproct, nor the total number of pores in

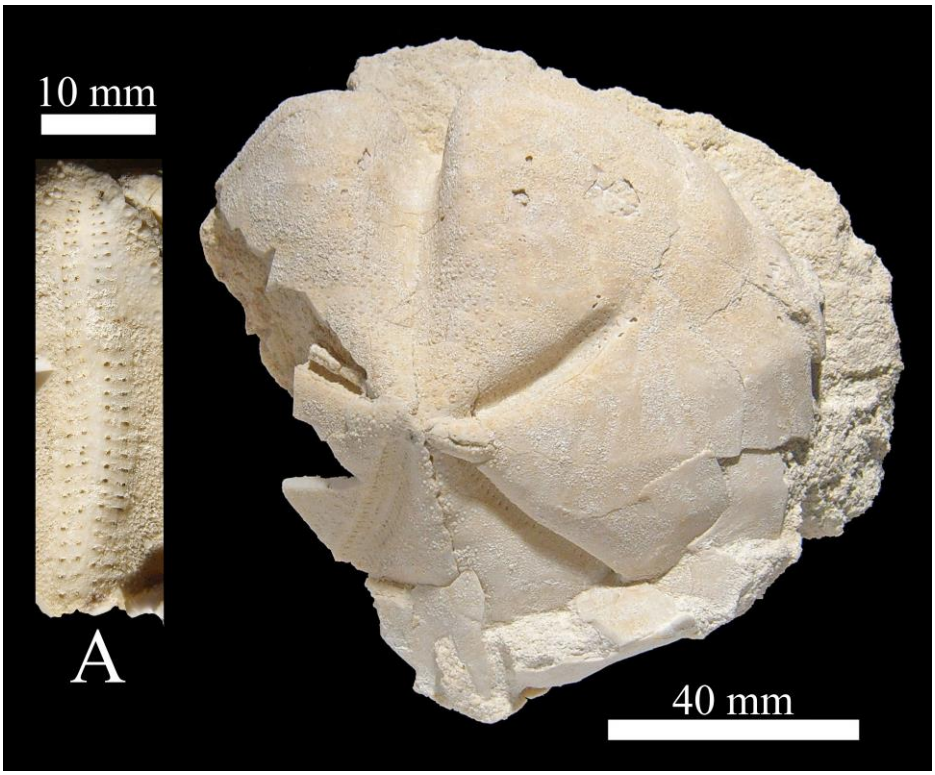

Fig. 2. Paratype of *Schizobrissus obradori* sp. nov. in aboral view, from the Algendar ravine (Ferreries, Menorca). A: detail of ambulacre V with the two rows of paired pores.
Fig. 2. *Paratipus de* Schizobrissus obradori *sp. nov. en vista aboral, del barranc d'Algendar (Ferreries, Menorca). A: detall de l'ambulacre V amb les dues fileres de porus emparellades.*

the paired ambulacrum.

Paleoecology

Schizobrissus obradori sp. nov. is associated with two different facies: the Messinian reef calcarenites and, on the other hand, the massive Tortonian calcarenites. Due to their special characteristics (Miocene sediments only crop out occasionally), there is very little available data on the equinological fauna of the area where the holotype was found (Table 3). On the contrary, the outcrop of the Algendar ravine of Tortonian age, provides some interesting palaeoenvironmental data, both due to the characteristics of the sediment (massive, fine-grained yellowish calcarenites) (figure 4) and the associated equinological fauna (Table 3). Thus, the presence in this outcrop of *Clypeaster marginatus* Lamarck, 1816 with a low and wide test, with very narrow edges (Fig. 5C) is associated with the lower part of the infralittoral zone (between 20 and 40 m deep), where the effects of the waves are attenuated (Néraudeau *et al.*, 2001).

It should also be noted that all the echinoids from this outcrop were found in a living position and one of them (a single

		L				W				H		
Taxon	**n**	**Max.-min.**	**Average**	**SD**		**Max.-min.**	**Average**	**SD**		**Max.-min.**	**Average**	**SD**
S. obradori	1	-	93,69	-			105,22	-		-	61,59	
S. cruciatus	2	123,66-118,62	121,14	3,5638		114,11-106,51	110,31	5,3740		-	-	-

Table 2. Measurements (in mm) of *Schizobrissus obradori* sp. nov. test, compared with *S. cruziatus*. L: length; W: width; H: height; n: number of individuals; Max.: maximum; Min.: minimum: SD: standard deviation.

Taula 2. *Mesures (en mm) de* Schizobrissus obradori *sp. nov. comparada amb* S. cruziatus*. L: longitud; W: amplada; H: altura; n: número d'individus; Max.: màxim; Min.: mínim: SD: desviació estàndard.*

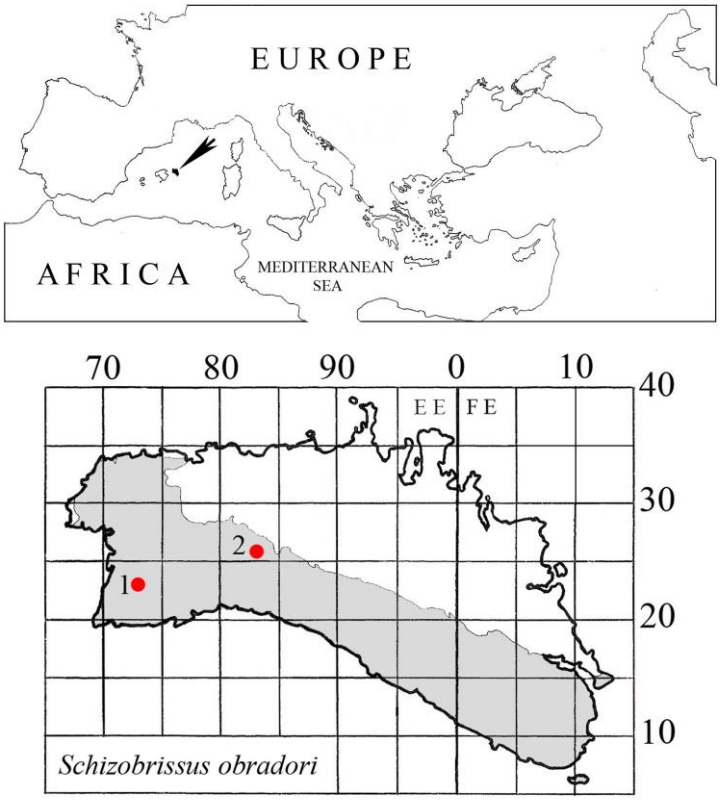

Fig. 3. Provenance of the holotype (1) and paratype (2) of *Schizobrissus obradori* sp. nov. The grey area indicates the extent of the Upper Miocene sediments on the island of Menorca (5X5 km U.T.M. grid).

Fig. 3. *Ubicació geogràfica de l'holotipus (1) i paratipus (2) de* Schizobrissus obradori *sp. nov. La zona gris indica l'àrea de sediments del Miocè superior de Menorca (quadrícula de 5X5 km U.T.M.).*

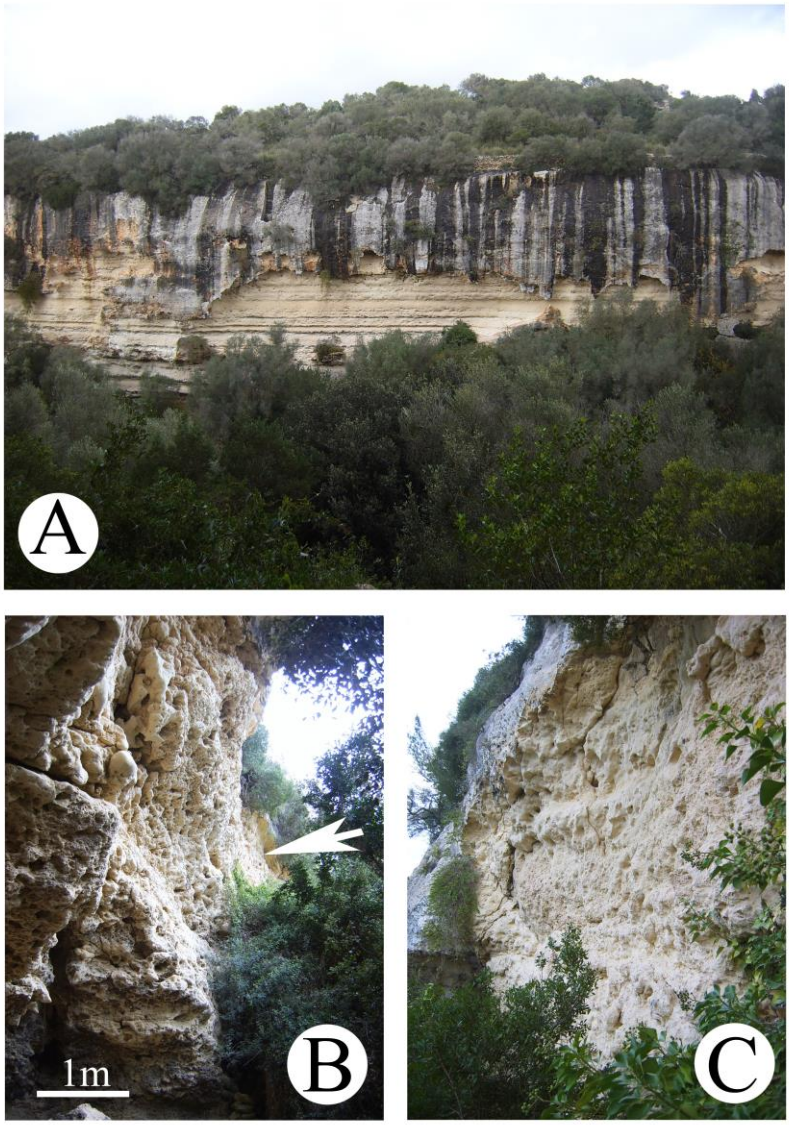

Fig. 4. Algendar ravine near Sa Penya Fosca-Es Pas den Revull. A: General view of the western margin of the ravine. B: Outcrop from which the paratype of *Schizobrissus obradori* sp. nov. was found, on the eastern margin of the ravine. The exact upper point of finding is indicated by a white arrow. C: Detailed view of this area.

Fig. 4. *Barranc d'Algendar prop de Sa Penya Fosca-Es Pas den Revull. A: Vista general del marge oest del barranc. B: Aflorament on es trobà el paratip de* Schizobrissus obradori *sp. nov., al marge oriental del barranc. El punt de la troballa s'indica amb una fletxa blanca. C: Vista detallada d'aquesta zona.*

SON SINETA	
Schizobrissus obradori sp. nov. (Holotype)	∗,3
Ova saheliensis (Pomel, 1887)	2
***Fibularia* sp.**	0
***Cidaris* sp**.	0
ALGENDAR RAVINE	
Schizobrissus obradori sp. nov**.** (Paratype)	∗,3
Schizobrissus cruziatus (Agassiz in Agassiz et Desor, 1847)	3
Schizaster dilatatus Pomel, 1887	2
Schizaster desori Wrigth, 1855	2
Schizaster trigonalis Mazzetti, 1885	0
Ova karreri (Laube, 1869)	2
***Spatangus* sp.**	0
Opissaster almerai Lambert, 1906	1
Hypsoclypus semiglobus (Lamarck, 1816)	0
Echinolampas scutiformis Desmoulins, 1837	1
Clypeaster marginatus Lamarck, 1816	∗

Table 3. List of echinoids from Son Sineta (locus tipicus of *Schizobrissus obradori* sp. nov.) and the Algendar ravine outcrop (Ferreries, Menorca) where appear the paratype of *Schizobrissus obradori* sp. nov. Sources of data: unpublished (0); Quintana, 2019 (1); Quintana, 2020a (2); Quintana, 2020b (3); this work (∗).

Taula 3. *Llista d'echinoids de Son Sineta (locus tipicus de Schizobrissus obradori sp. nov.) i del barranc d'Algendar (Ferreries, Menorca) a on es troba el paratipus de Schizobrissus obradori sp. nov. Fonts de les dades: no publicat (0); Quintana, 2019 (1); Quintana, 2020a (2); Quintana, 2020b (3); aquest treball (∗).*

specimen of *Schizaster dilatatus* Pomel, 1887), retain part of the spines. These characteristics are consistent with the data provided by the morphological features of *C. marginatus*, e.g., the sedimentation took place in a relatively calm sedimentary environment. The marks on the test of *C. marginatus* also indicate the presence of unkown predators (Fig. 5).

Conclusions

This study describes *Schizobrissus obradori* sp. nov., a new spatangoid endemic to the Tortonian and Messinian sediments of the island of Menorca, characterised by a very compressed, anteroposterior, test. This characteristic differentiates the new species from *S. cruziatus* and the rest of the species included in this genus that are present in the Upper Miocene of the Mediterranean region. In this sense, the greatest similarities are established between the species from Menorca and *Schizobrissus* sp. from the Lutecien of Alicante (east of the iberian peninsula).

There is no doubt that further taxonomic studies on the genus *Schizobrissus* and its relationship with the genera *Meoma* and *Macropneustes* Agassiz in Agassiz et Desor, 1847 are necessary, as pointed out by Chesher (1970) and Fischer (1986). A morphological and morphometric comparison between *S. cruziatus*, *S. latus*, *S. mauritanicus* and *S. locardi* would be equally interesting in order to assess and understand more precisely the faunal richness of Miocene echinoids in the Mediterranean basin.

In a way, the description of a new equinoid species in the Miocene of Menorca is quite surprising, filling a gap that dates back to the early 19th century, when

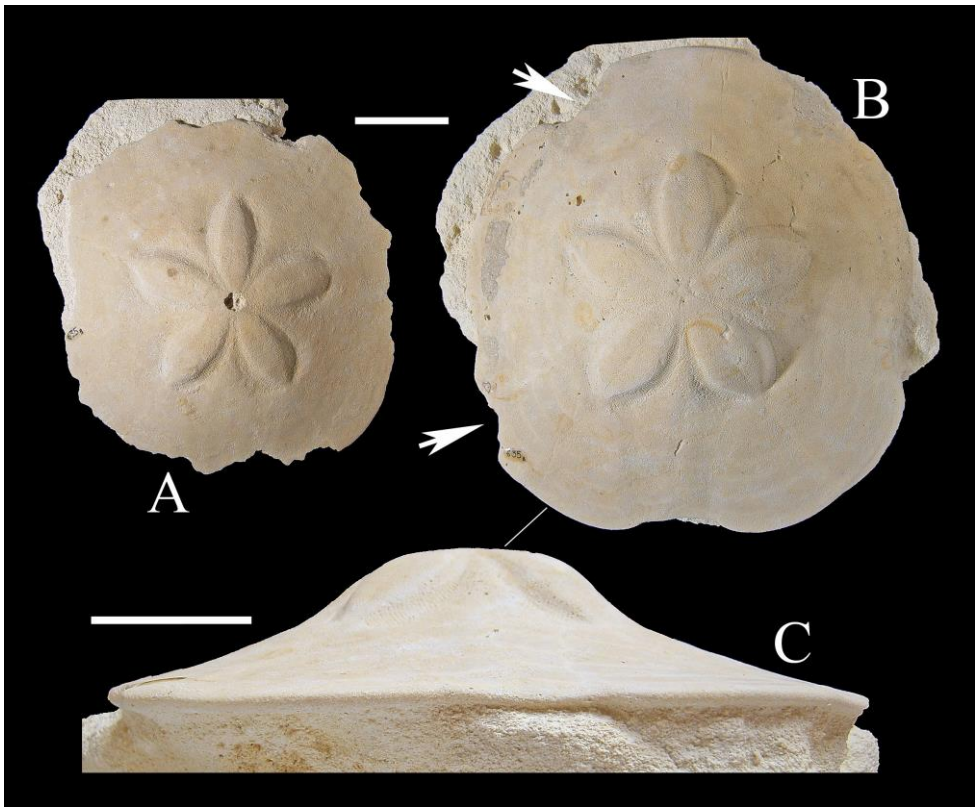

Fig. 5. *C. marginatus* (CBQ- 635A & CBQ-635B) with predation marks from the Algendar ravine (same outcrop where appear the paratype of *Schizobrissus obradori* sp. nov.). In test B marks are less evident and are indicated with white arrows. C: lateral view of specimen B, with low and wide test, and very narrow edges. Scale: 30 mm.

Fig. 5. C. marginatus *(CBQ- 635A & CBQ-635B) amb marques de predació, del barranc d'Algendar (la mateixa localitat en que apareix el paratipus de* Schizobrissus obradori *sp. nov.). En la imatge B, les marques són menys evidents i s'indiquen amb fletxes blanques. C:vista lateral de l'exemplar B, amb una closca ampla i baixa i marges molt estrets. Escala: 30 mm.*

the eminent French equinologist Jules Lambert (1906) described five new taxa from the nearby Miocene sediments of Ciutadella: *Dorocidaris balearis*, *Schizechinus mortenseni*, *Clypeaster malladai* (=? *Clypeaster portentosus* Desmoulins, 1837), *Echinolampas atrophus* and *Schizaster gymnesiae* (= *O. karreri*). All this highlights the undoubted interest that the Miocene equinological fauna of Menorca represents in the context of the western Mediterranean.

Undoubtedly, carrying out new studies of Miocene equinological faunas in different areas of the Mediterranean basin will help to understand more precisely the real distribution of *Schizobrissus obradori* sp. nov., that is, if it really is an endemic species of the Balearic Islands or if, on the contrary, it has a wider distribution.

Acknowledgements

The author wishes to express his sincere thanks Dr. Sebastián Calzada (Museu Geològic del Seminari de Barcelona), Dr. Guillem X. Pons (Univeristat de les Illes Balears), Servei de Documentació I Prèstec Interbibliotecari de la Universitat de les Illes Balears and the anonymous reviewer, for their help in obtaining some of the bibliographic references cited in this work. This work has been funded by the Agencia Estatal de Investigación del Gobierno de España [The Spanish State Research Agency] (project PID2020-117118GB-100).

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