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Short communication

Cantabriconus reocinianus n. gen., n. sp. a new conical agglutinating benthic foraminifera from the upper Aptian-lower Albian of Cantabria, N-Spain

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ABSTRACT

A new large conical agglutinating benthic foraminifer is described as *Cantabriconus reocinianus* n. gen., n. sp. from the upper Aptian-lower Albian Urgonian limestones of the Basque-Cantabrian Basin. It is characterized by a prominent initial trochospire, an undivided marginal zone, an endoskeleton of massive, vertically aligned, and often fused pillars, as well as a thick, most likely pseudo-keriothecal wall structure. Due to the generic characteristics, the new taxon is assigned to the Coskinolinidae. *Cantabriconus* n. gen. is compared with the Cretaceous *Pseudolituonella* Marie, and the early Paleogene taxa *Coskinolina* Stache and *Coskinon* Hottinger & Drobne as well as the Middle Jurassic *Conicopfenderina* Septfontaine. *Cantabriconus reocinianus* n. gen., n. sp. has been observed in the upper Aptian Reocín Formation and in the lower part of the Albian Ramales and Meruelo Formations to the east of Santander. It might therefore be considered an index taxon for Urgonian-type limestones of the Basque-Cantabrian Basin in this time interval.

1. Introduction

The Urgonian-type shallow-water limestones ("Urgo-Aptian", "Urgo-Albian") of the Basque-Cantabrian Basin (BCB) in northern Spain contain a rich fauna of large-sized benthic foraminifera (LBF) such as orbitolinids, many of them with special importance for biostratigraphic dating (e.g., Schroeder, 1963; Ramírez del Pozo, 1971, 1972; Pascal, 1985). Data from here and from the adjacent Aquitanic-Pyrenean area (e.g., Moullade and Peybernès, 1975; Peybernès, 1976) contributed to the biostratigraphic framework of mid-Cretaceous LBF as summarized in Schroeder and Neumann (1985).

In 1979, Collignon et al. reported on the late Aptian ammonite fauna of the Rodezas Formation and benthic foraminifers of the Reocín Formation (= "barre urgonienne superieur" of Collignon et al., 1979, or "seconde masse urgonienne" of Rat, 1959) in the area of Santander, western part of the BCB. Pascal et al. (in Collignon et al., 1979) listed several taxa of orbitolinids and other benthic foraminifera, among *Lituonella montagnettensis* Arnaud-Vanneau. This specific name has never been assigned officially to any taxon, obviously the authors were forward-looking referring to *Lituonella altaretae* described shortly later by Arnaud-Vanneau (1980) from lower Barremian Urgonian limestones of Montagnette in south-western France. Also Peybernès (2004, p. 25) reported (without illustration) the occurrence of a "*Lituonella*"-type taxon in the Gargasian-Clansayesian of Cantabria that he cautiously attributed to *Conicopfenderina* Septfontaine. Although showing some similarities, the upper Aptian-lower Albian form from Cantabria observed in several sections of the Reocín, Ramales and Meruelo Formations along the BCB is different from both *Lituonella*, a synonym of *Coskinolina* Stache (see Loeblich and Tappan, 1987) and *Conicopfenderina* (for details see Systematic Part).

In the framework of ongoing studies of the Early Cretaceous microfauna of the western Basque-Cantabrian Basin (BCB, Fig. 1) (Rosales and Schlagintweit, 2015; Schlagintweit et al., 2016, 2017), this taxon is here described as *Cantabriconus reocinianus* n. gen., n. sp.

2. Geological setting and biostratigraphy

The northwestern margin of the BCB, in northern Spain, was affected by rifting tectonics linked to the opening of the Bay of Biscay and the North Atlantic during the Late Jurassic and the Early

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Cretaceous (Boillot, 1984; Boillot and Malod, 1988; Rat, 1988). The Aptian–Albian succession of the western BCB was firstly studied by Mengaud (1920) who established a first lithostratigraphic and biostratigraphic scheme of the Aptian. Later, Rat (1959), Ramírez del Pozo (1972), Collignon et al. (1979), García-Mondéjar (1982), Pascal (1985), Hines (1985) and Wilmsen (2000, 2005) contributed to the general framework of the lithostratigraphic units of the Aptian to Cenomanian. Recently, the Aptian to lower Cenomanian lithostratigraphic units have been reviewed and updated (Najarro et al., 2007, 2011a; Rosales et al., 2009; Najarro, 2015; Rosales and Schlagintweit, 2015). The Aptian–Albian successions of the study area can be attributed to eleven formations (Fig. 2): 1) Rábago Formation (0–36 m thick, lowermost Aptian), consisting of orbitolinid marls and siltstones, sandstones, packstone-grainstones and rudist-coral-gastropod wackestones, deposited in a heterolithic, mixed shallow platform; 2) Umbrera Formation (0–25 m thick, lowermost Aptian), which consists of cross-bedded oolitic-bioclastic packstone and grainstones deposited in shoal complexes in a high-energy carbonate ramp; 3) Patrocinio Formation (0–80 m thick, lower Aptian *Deshayesites forbesi* Zone, Najarro et al., 2011a), consisting mainly of gray marls with ammonites and minor siltstones and sandstones deposited in offshore to delta front environments; 4) San Esteban Formation (0–55 m thick; lower Aptian), composed of limestone with rudist banks, corals, gastropods and foraminifers deposited in a shallow inner platform; 5) Rodezas Formation (0–105 m thick, lowermost upper Aptian). It is subdivided into two parts; the lower part consists mainly of marls, siltstones and sandstones deposited in siliciclastic shoreface

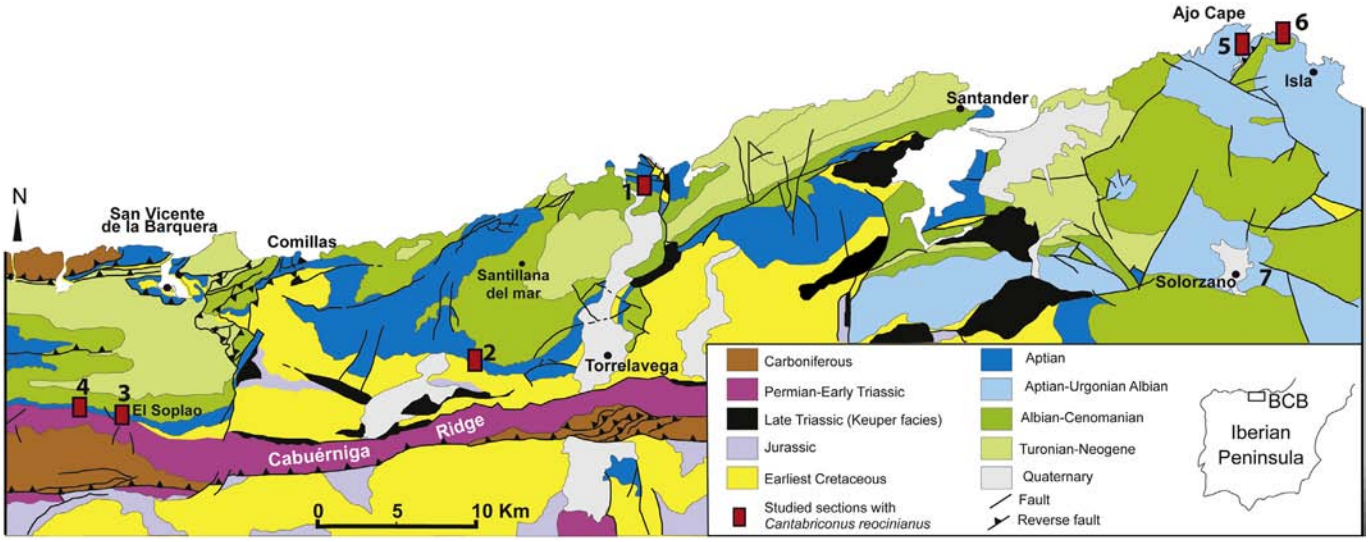

Fig. 1. Geological map of the northwestern margin of the Basque-Cantabrian Basin with location of the studied sections that yielded specimens of *Cantabriconus reocinianus* n. gen., n. sp. (modified after Hines, 1985; Robador et al., 1990). 1: Cantera de Cuchía section (CCU samples), 2: Cantera de Las Lastrías section (CL samples), 3: El Soplao section (SOP samples), 4: Rábago section (LA samples), 5: Ajo Cape section (19-04 GS JP and SOR samples), 6: Quejo Cape section (CQ VI samples).

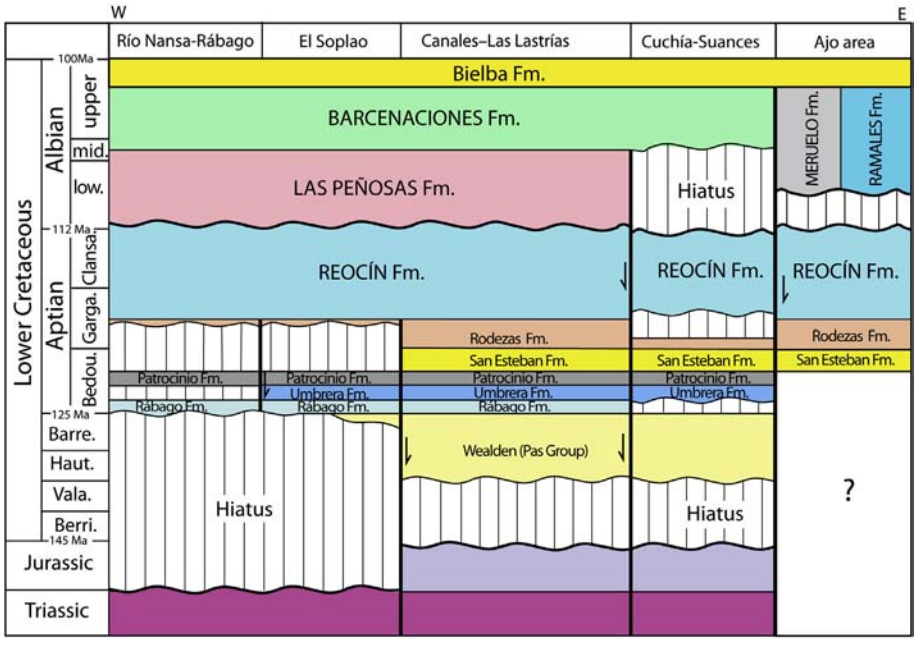

Fig. 2. Lithostratigraphy of the Lower Cretaceous in the northwestern margin of the Basque-Cantabrian Basin (modified from Najarro et al., 2011a).

Table 1
Geographic data on the localities with *Cantabriconus reocinianus* n. gen., n. sp. (from west to east, see Fig. 1).

Section	Location	Coordinates base	Coordinates top	Measured thickness of the Fm.
Rábago	~1.5 km west of Rábago village	43° 18′ 03.32″ N/4° 26′ 12.30″ W	43° 18′ 21.22″ N; 4° 26′ 02.95″ W	~78 m (Reocín Fm.)
El Soplao	~4.8 km east of Rábago village	43° 17′ 44.31″ N/4° 24′ 31.28″ W	43° 18′ 05.54″ N/4° 25′ 10.57″ W	~100 m (Reocín Fm.)
Cantera de Las Lastrías	~11 km west of Torrelavega	43° 20′ 11.41″ N/4° 09′ 15.35″ W	43° 20′ 16.02″ N/4° 09′ 05.23″ W	~130 m (Reocín Fm.)
Cantera de Cuchía	~17 km north of Torrelavega	43° 25′ 55.94″ N/4° 00′ 55.68″ W	43° 25′ 42.23″ N/4° 01′ 03.74″ W	~80 m (Reocín Fm.)
Ajo Cape	~2.5 km north of Ajo village, from Sorrozuela to the Ajo lighthouse.	43° 30′ 38.90″ N/3° 34′ 55.55″ W	43° 30′ 40.06″ N/3° 35′ 53.69″ W	~115 m (Ramales Fm.)
Quejo Cape	~1.5 km northwest of Isla village	43° 30′ 27.09″ N/3° 33′ 33.64″ W	43° 30′ 23.32″ N/3° 33′ 18.88″ W	~167 m (Meruelo Fm.)

environments, and the upper part consists of oyster-rich marly limestone and glauconitic marls with ammonites deposited in offshore-open sea environments; 6) Reocín Formation (9–300 m thick, upper Aptian), consisting mostly of limestones, partially dolomitized, with rudists, corals and bacinellid fabrics deposited in shallow inner platform to platform margin environments; 7) Las Peñosas Formation (0–200 m thick, lower Albian), deposited to the west of Santander, consists of siltstones, marly limestones with oysters, coal-rich claystones and sandstones deposited in deltaic to estuarine environments; 8) Ramales Formation (300–500 m thick, mainly Albian) deposited to the east of Santander, consists mainly of rudist-coral-foraminiferal limestones and grainstones deposited in platform to platform-margin environments. It grades laterally to the Meruelo Formation; 9) Meruelo Formation (100–170 m thick, Albian), deposited also to the east of Santander, is made mainly of nodular marls interbedded with slumped marls, carbonate breccias and calcarenites. It was deposited in slope and intraplatform basinal environments; 10) Barcenaciones Formation (13–120 m thick, Middle-Upper Albian), deposited to the west of Santander, consists of glauconite- and algae-rich packstone-grainstones and wackestones-packstone with *Caprina choffati* Douvillé interbedded with nodular limestones and marls, deposited in platform environments; and finally 11) Bielba Formation p.p. (Somocuevas Member, ~128 m thick, uppermost Albian, Rosales and Schlagintweit, 2015), which consists of siltstones and cross-bedded sandstones deposited in siliciclastic environments ranging from deltaic-estuarine to shoreface and offshore marine.

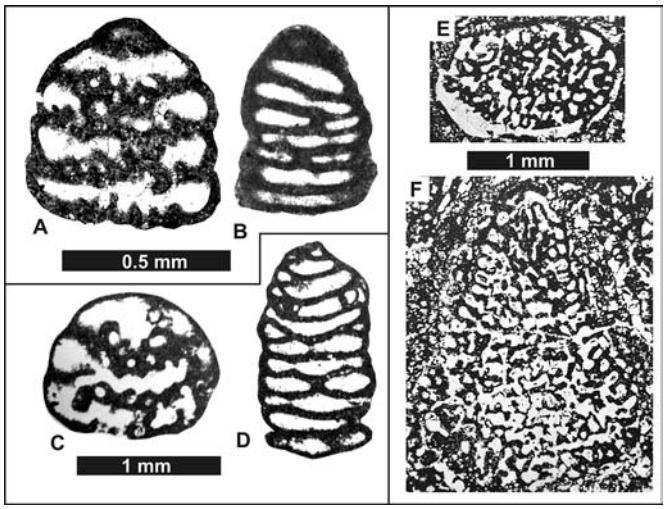

Fig. 3. Comparison of upper Aptian *Cantabriconus reocinianus* n. gen., n. sp. (A–B), the middle Paleocene *Coskinon rajkae* Hottinger & Drobne, type-species of the genus (from Hottinger and Drobne, 1980: pl. 12, figs. 16 and 8) (C–D), and the Middle Jurassic *Conicopfenderina* Septfontaine, type-species of the genus (from Maync, 1972, pl. 1, fig. 1 = holotype, pl. 3, fig. 1) (E–F). Note also the differences in size between the three taxa.

The Rábago section located ca. 1.5 km west of the Rábago village (western Cantabria) represents the type-locality of the new foraminifer *Cantabriconus reocinianus* n. gen., n. sp. It is exposed along a path of access to the La Cuerre mine and along the road of access to the El Soplao cave from the village of Rábago. At this section, the lowermost Aptian Rábago Formation rests with angular unconformity on Triassic continental red beds (Buntsandstein), showing a lithostratigraphic succession similar to some other sections in the westernmost margin of the BCB (Fig. 2), that is, with absence of the Umbrera, San Esteban and Rodezas Formations (Najarro et al., 2011a). The ca. 237-m-thick Rábago section starts with the Rábago Formation (ca. 16 m) followed by the Patrocinio Formation (ca. 33 m) (Fig. 2). The contact between both is represented by an unconformity with paleokarst features at the top of the Rábago Formation (Najarro et al., 2011b). The succession continues with the upper Aptian Reocín Formation (ca. 78 m), which exhibits a dissolution surface on its top, followed by a mixed carbonate-siliciclastic ca. 70-m-thick succession of the Las Peñosas Formation, and a ca. 40-m-thick succession of the Barcenaciones

Table 2
Comparison of *Cantabriconus reocinianus* n. gen., n. sp. with some allied taxa of the Coskinolinidae (compiled from Loeblich and Tappan, 1987). * see Serra-Kiel et al. (2016) for further details.

	Pseudolituonella Marie, 1955	*Coskinon* Hottinger & Drobne, 1980	*Coskinolina* Stache, 1875	*Cantabriconus* n. gen.
Initial part	Short to elongate trochospire	Much reduced, low trochospiral, with proloculus in apical position	Trochospiral as in *Pfenderina*	Trochospiral as in *Pfenderina*, axis of coiling may be up to 90° from that of the uniserial part
Wall structure	Pseudo-keriothecal?*	Simple, imperforate	Pseudo-keriothecal	Pseudo-keriothecal ?
Endoskeleton	Absent	Pillars	Pillars numerous, regularly distributed	Pillars, thick, vertically aligned, may fuse to form irregular central columella-like masses
Exoskeleton	Absent			
Aperture	Cribrate (numerous in the central area), with peristomal lips	Cribrate (numerous in the central area)		
Marginal apertures	No	Yes	Yes	No
Stratigraphy	Barremian?, Cenomanian–Campanian, Priabonian*	Selandian-Barthonian	Cuisian-Bartonian	Upper Aptian–Lower Albian

Formation consisting of cross-bedded, glauconite-rich grainstones with *Involutina hungarica* (Sido) and *Boueina camenitzae* (Dragastan & Bucur) interbedded with nodular marls. Here the contact between Las Peñosas and Barcenaciones formations is conformable.

Cantabriconus reocinianus n. gen., n. sp. was observed in the Reocín Formation as well as some specimens in the lower part of the Ramales and Meruelo Formations to the east of Santander (Ajo Cape sector, Schlagintweit et al., 2017). Details on the biostratigraphy of the upper Aptian Reocín Formation in general and the Rábago type-section in particular are provided in the systematic part. Apart from the Rabágo section, *Cantabriconus reocinianus* n. gen., n. sp. has been observed furthermore in the Reocín Formation of the Cantera de Cuchía, Cantera de las Lastrías, and El Soplao sections, as well as in limestones beds of the Ajo Cape and Quejo Cape sections (Fig. 1, Table 1).

3. Material and repository

In this study more than 350 thin sections have been studied from altogether 15 stratigraphic sections logged along the northwestern BCB. Although the main objective of the study was focussed in the Reocín Formation, limestone samples from the Rábago, San Esteban, Rodezas, Las Peñosas, Ramales and Meruelo Formations were also studied. *Cantabriconus reocinianus* n. gen., n. sp. was observed in about 19 samples from 6 localities (Table 1). From some samples, e.g. LA 23 containing the holotype, several

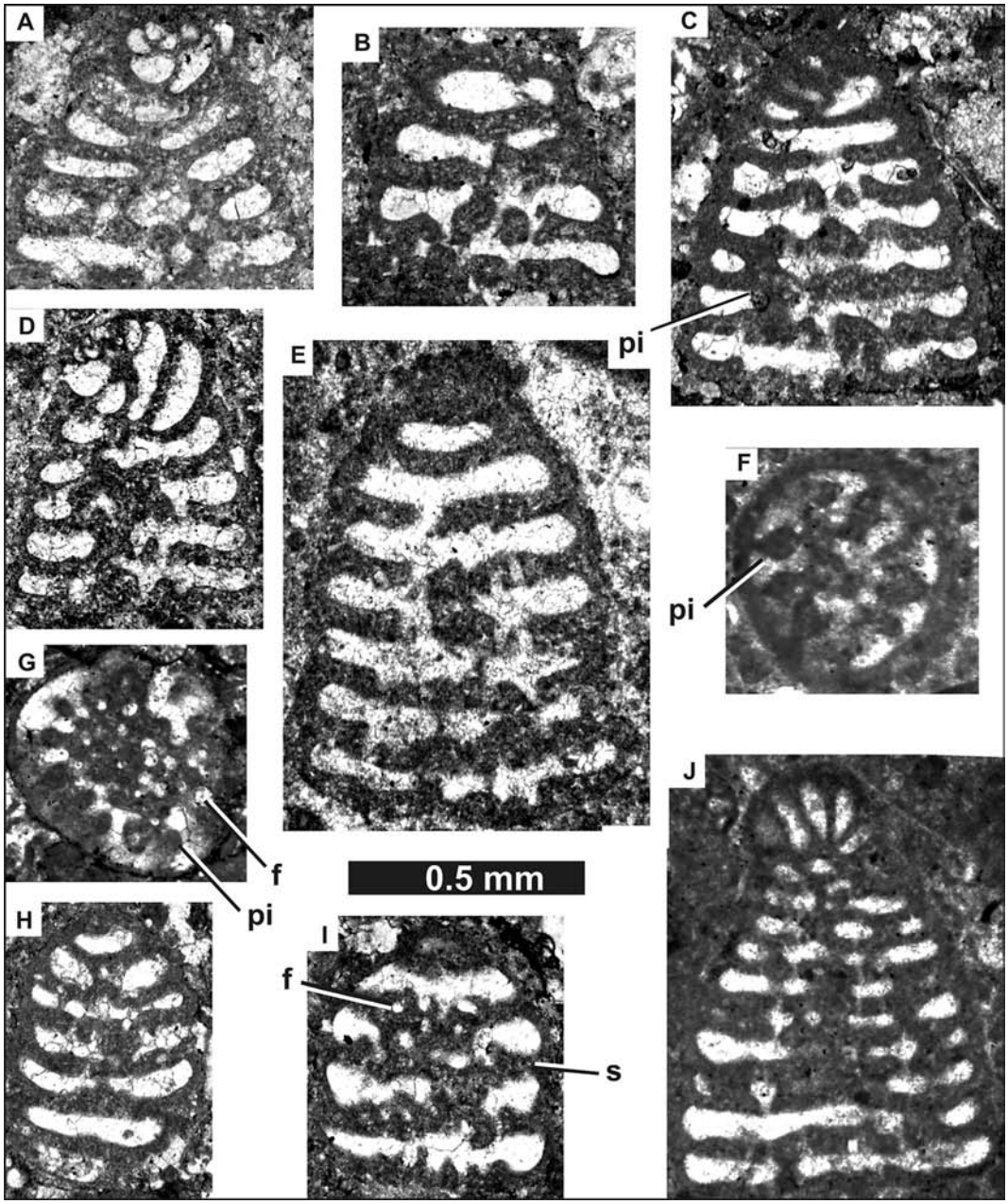

Fig. 4. *Cantabriconus reocinianus* n. gen., n. sp., upper Aptian Reocín of Cantabria. **A, D** (holotype), **J**, axial sections. **C, E**, subaxial sections. **B, H,** tangential sections. **F, G**, slightly oblique transverse sections. **I**, oblique section. Abbreviations: f = foramen, pi = pillar, s = septum. Thin-sections SNSB-BSPG 2017 I 43 (**A, H, I**), SNSB-BSPG 2017 I 42 (**B, D**), SNSB-BSPG 2017 I 44 (**C**), CCU 7 (**E**), CCU 14 (**F, J**), CL 9 (**G**).

thin-sections were prepared. The description of the new taxon is based on about 40 thin-sections (30 from the Reocín Formation, 7 from the Ramales Formation and 3 from the Meruelo Formation) containing about 100 variously oriented specimens.

All thin-sections from the studied stratigraphic sections of the Reocín and Meruelo Formations, including those containing the new species are housed at the Instituto Geológico y Minero de España, Madrid, in the Magna Sample Repository and collection Idoia Rosales. The seven thin-sections from the Ramales Formation of Ajo Cape, are deposited at the Bayerische Staatssammlung für Paläontologie und historische Geology (BSPG), Munich, under the official numbers SNSB-BSPG 2016 XX 2 to 5, 8, 11, and 13. Three thin-sections from sample LA 23 (type-locality) containing also the holotype are also stored at the BSPG under the official numbers SNSB-BSPG 2017 I 42 to 44.

4. Systematic description

The high-rank classification follows Pawlowski et al. (2013), the low-rank classification Kaminski (2014).

Phylum Foraminiferida d'Orbigny, 1826
Class Globothalamea Pawlowski et al., 2013
Order Loftusiida Kaminski & Mikhalevich, 2004
Suborder Orbitolinina Kaminski, 2004

Superfamily Coskinolinoidea Moullade, 1965
Family Coskinolinidae Moullade, 1965

Remarks. The family includes a small group of Late? Cretaceous to early Paleogene conical taxa displaying an early trochospiral stage, later becoming uniserial with broad and low chambers. The interior is "subdivided by pillars or irregular partitions"; the wall is agglutinating, simple or with pseudo-keriothecal structure (e.g., in the family name given genus *Coskinolina* Stache syn. *Lituonella* Schlumberger, e.g., Schroeder, 1974); aperture cribrate (see Loeblich and Tappan, 1987, p. 154). According to the classifications of Loeblich and Tappan (1987), and Kaminski (2014), five genera are included in the Coskinolinidae: *Coskinolina* Stache, 1875 (Paleocene to middle Eocene), *Coskinon* Hottinger & Drobne, 1980 (middle Paleocene to middle Eocene), *Coleiconus* Hottinger & Drobne, 1980 (lower to middle Eocene), *Lituonelloides* Henson,

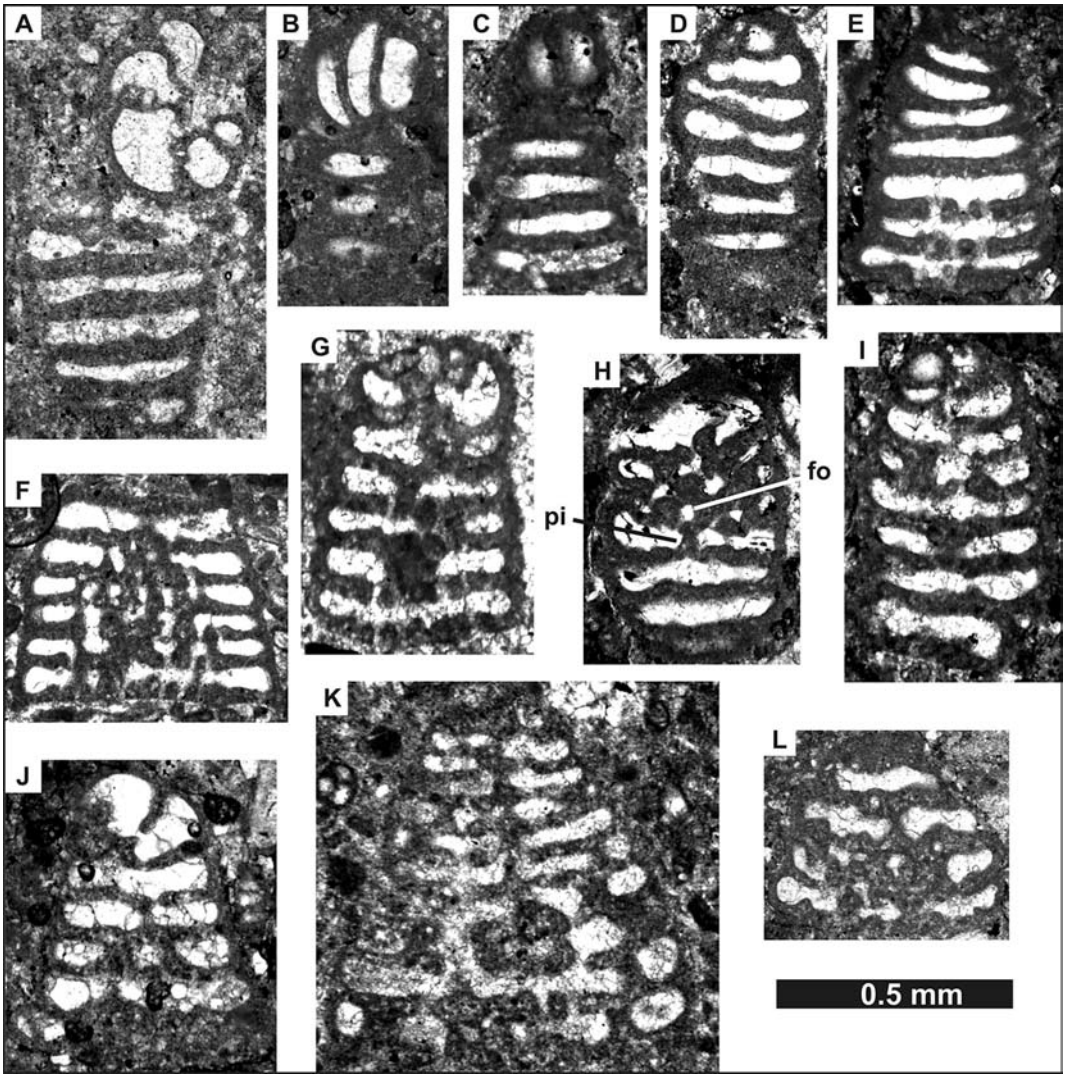

Fig. 5. *Cantabriconus reocinianus* n. gen., n. sp., upper Aptian Reocín Formation and lower Albian Ramales Formation of Cantabria. **A**–**D**, Tangential sections passing the voluminous initial spire (**A**–**C**) and the undivided, unperforated marginal zone of chambers. **E**–**F**, **H**–**J**, **L**–**M**, Oblique sections. Note vertically aligned pillars in **F**. **G**, Axial section. Note fused pillars in the penultimate chamber. **K**, Subaxial section. Note the vertically aligned pillars in the central part. Thin-sections: SNSB-BSPG 2017 I 42 (**A, L**), SNSB-BSPG 2017 I 43 (**B, J**), LA 23-5 (**C, I**), SNSB-BSPG 2017 I 44 (**D**), LA 23-2 (**E**), SOR 2 (**F**), CL 7 (**G**), LA 23-4 (**H**), SOP 78-1 (**K**).

1948 (Maastrichtian), and *Pseudolituonella* Marie, 1955 (Cenomanian to Campanian).

The genus *Barattolites* (Eocene of Italy) with exo-/endoskeleton, and simple agglutinating wall, described as a representative of the Orbitolinidae (subfamily Dictyoconinae) by Vecchio and Hottinger (2007) was treated as a member of the Coskinolinidae by Boudagher-Fadel (2008). This view however was in our opinion correctly not followed in the recent classification by Kaminski (2014). *Coskinon* is treated a member of the Pfenderinidae Smout by Di Carlo et al. (2010). In several contributions, the presence/absence of a pseudo-keriothecal wall structure is adequately discussed as to whether or not certain taxa are members of the Orbitolinidae or Coskinolinidae (e.g., Douglass, 1960; Moullade, 1965; Maync, 1972; Schroeder et al., 1975). Vicedo et al. (2014) remarked the often observed masking of this structure by diagenetic processes, and consequently the resulting difficulties for its use as a feature for identification. It is worth mentioning that Douglass (1960, p. 260) also stressed the differences in the wall thickness of the pseudo-keriothecal *Coskinolina*, "about five times as thick as that found in the Orbitolinidae". From the Albian of Greece, Decrouez and Moullade (1974) described an orbitoliniform

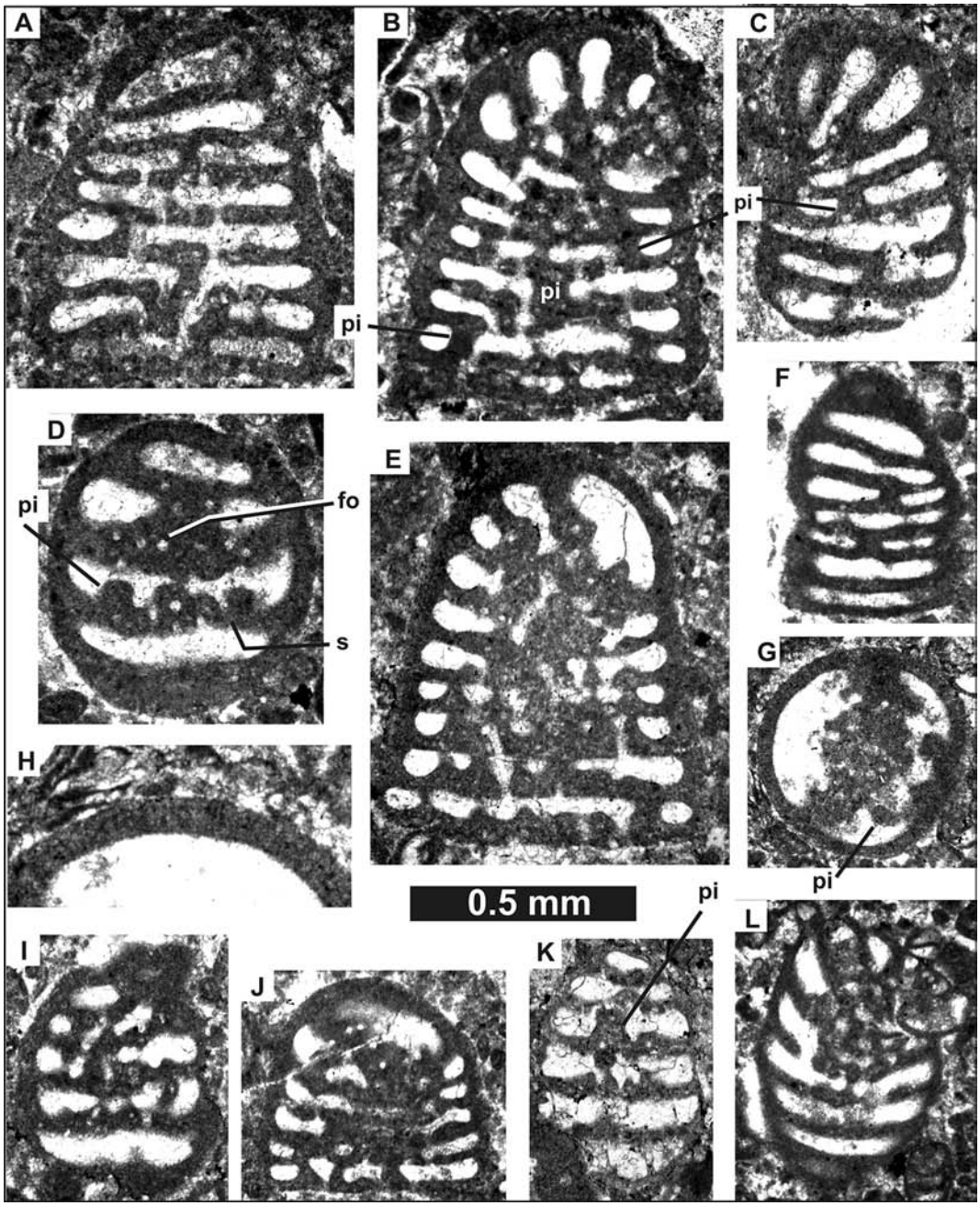

Fig. 6. *Cantabriconus reocinianus* n. gen., n. sp., upper Aptian Reocín Formation (**K**), and the lower Albian Ramales Formation of Cantabria (all others). **A**, tangential-oblique section. **B**, **E,** Subaxial sections. Note vertically aligned pillars and foramina. **C, F**, tangential sections. **G, H**, slightly oblique transverse section. **H**, detail showing fine parallel striae interpreted as a pseudo-keriothecal texture. **J**–**L**, oblique sections. Note the random sectioning of the eccentric trochospire in **L**. Thin-sections: SNSB-BSPG 2016 XX 3 (SOR 2) (**A, E**), SNSB-BSPG 2016 XX 5 (SOR 2-2) (**B, L**), SNSB-BSPG 2016 XX 4 (SOR 2-1) (**C**), SNSB-BSPG 2016 XX 2 (SOR 1) (**D, G**–**H, J**), SNSB-BSPG 2016 XX 8 (SOR 3-1) (**F, I**), SNSB-BSPG 2017 I 43 (**K**). Abbreviations: f = foramen, pi = pillar, s = septum.

taxon as *Valdanchella*? *dercourti*. Due to the presence of a pseudo-keriothecal wall structure it has been removed from the Orbitolinidae by Schroeder (1985) noting similarities to *Coskinolina* Stache. These examples clearly demonstrate that the Coskinolinidae are far away from being a well defined group and that there is no consensus in the literature about its taxonomic composition.

Genus ***Cantabriconus*** n. gen.
Type species: *Cantabriconus reocinianus* n. sp.

Etymology. The genus name refers to Cantabria and the conical test morphology.
Diagnosis. Test conical, with early low trochospiral (pfenderinid) coiling and eccentric embryo, later becoming uniserial with up to 10 low chambers. Cone base slightly convex in early growth stage, almost flat in adult chambers. Chambers display an undivided and unperforated marginal zone, and rather thick and often fused pillars (partly forming masses) in the center of the test. Position of foramina unclear in the trochospiral, and cribrate in the uniserial stage. Foramina and pillars continuously arranged from one chamber to the next. Wall thick, microgranular to finely agglutinating, and most likely with pseudo-keriothecal texture.
Comparison. Due to the rather thick, most likely pseudo-keriothecal wall, the prominent initial spire, conical test morphology, and pillared endoskeleton, *Cantabriconus* n. gen is placed here in the Coskinolinidae Moullade. Particularly, *Cantabriconus* shares some similar features to *Coskinolina* Stache, *Coskinon* Hottinger & Drobne and *Pseudolituonella* Marie. In fact, tangential sections through the unperforated marginal zone or other sections of both *Cantabriconus* n. gen. and *Coskinon* Hottinger & Drobne are very similar (Fig. 3A–D). Common characteristics and differences to some allied taxa are summarized in Table 2. One important difference that should be highlighted here is the occurrence of marginal apertures sensu Hottinger and Drobne (1980) (see also Hottinger, 2006) in *Coskinolina* and *Coskinon*, lacking in *Cantabriconus* n. gen.

The mentioned late Aptian "*Lituonella*"-type taxon of the Cantabric Chains was cautiously assigned by Peybernès (2004) to the genus *Conicopfenderina* Septfontaine (in Kaminski, 2000). Type-species is the Middle Jurassic *Lituonella mesojurassica* Maync, 1972. *Conicopfenderina* represents a conical agglutinating taxon with a rather small initial trochospire, undivided marginal zone, the presence of irregular interseptal pillars in the center of the test, and a pseudo-keriothecal wall structure (Maync, 1972; Septfontaine in Kaminski, 2000, p. 215) (Fig. 3E–F). The occurrence of numerous, rather thin and irregularly arranged pillars and other features (e.g., comparably thin wall and septa, saucer-shaped chambers) differentiate *Conicopfenderina* from *Cantabriconus*. It is worth mentioning that the presence of an exoskeleton (= subdivided marginal zone) of the Early Cretaceous (Valanginian)

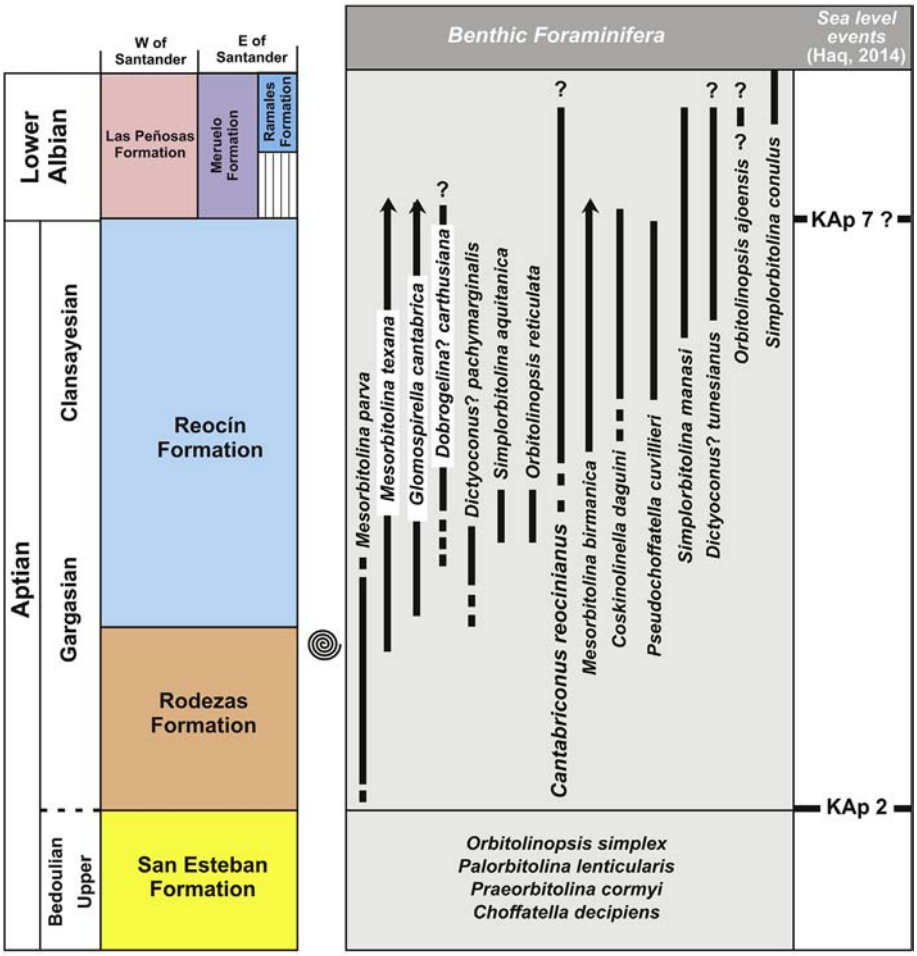

Fig. 7. Biostratigraphy of the Cantabrian Urgonian (Aptian-lower Albian) and distribution of selected benthic foraminifera (orbitolinids and others). The boundary Bedoulian-Gargasian is tentatively placed based on the biostratigraphy of orbitolinids and other benthic foraminifera. The Gargasian-Clansayesian and Aptian–Albian boundaries are intentionally left open. Ammonite data: *Epicheloniceras martini* Zone, *Epicheloniceras gracile* subzone (Collignon et al., 1979; Moreno-Bedmar et al., 2011; Haq, 2014).

Conicopfenderina? *balkanica* Peybernès excludes in our opinion its belonging to this genus. The generic affiliation of this taxon however is beyond the scope of the present paper.

Cantabriconus reocinianus n. sp.
Figs. 3A–B, 4–6

Etymology. The species name refers to the Reocín Formation where the new taxon represents a typical constituent of the benthic foraminiferan assemblage.
Holotype. Subaxial section of a megalospheric specimen, slightly oblique, illustrated in Fig. 4D, thin-section SNSB-BSPG 2017 I 42. The holotype specimen has a test diameter of 0.55 mm and height of 0.65 mm.
Paratypes. Different oriented sections illustrated in Figs. 4A, C, F–G, J, 5G, K, 6B.
Type locality. Upper Aptian limestones of the Reocín Formation, Rábago section (Fig. 1, Table 1).
Type level. Sample LA 23 from the Rábago section, a wackestone/packstone that contains also *Akcaya minuta* (Hofker), *Nautiloculina cretacea* Arnaud-Vanneau & Peybernès, *Glomospira urgoniana* Arnaud-Vanneau, *Glomospira* sp., *Charentia cuvillieri* Neumann, *Dobrogelina*? *carthusiana* Arnaud-Vanneau, some debris of *Thaumatoporella.* In samples LA 25 and LA 26, there are in addition *Coskinolinella daguini* Delmas & Deloffre, *Pseudochoffatella cuvillieri* Deloffre, and *Simplorbitolina manasi* Ciry & Rat.
Diagnosis. As for the genus by monotypy.
Description. Test a medium- to high-angled cone with slightly convex to almost flat base. The initial part is formed by a low trochoid spire with eccentric embryo ("pfenderinid" sensu Hottinger and Drobne, 1980 or "arenobuliminid" sensu Boudagher-Fadel, 2008) of inflated chambers, enlarging rapidly in size and number arranged in up to 4 (?5) whorls. The spire is inclined to the longitudinal axis, and may be almost perpendicular to it. In the trochospiral growth stage, the position of the foramina is unclear. In assumed megalospheric specimens, the initial spire is rather voluminous (Fig. 4D). In the uniserial stage chambers are discoidal, more rarely slightly cup-shaped, and usually inflated marginally. Chamber lumen and septa are equal in thickness. In the central area, the chambers are perforated by numerous (cribrate) foramina, aligned vertically, surrounded by a non-perforated marginal zone without exoskeleton. The central part of the uniserial chambers contains an endoskeleton formed by rather thick pillars aligned vertically from one chamber to the next (Figs. 5F, K, 6B, E). The pillars may fuse to form micritic columella-like masses (Figs. 4J, 5G, K, 6E, J). These masses however do not form a continuous central solid part. Wall thick, agglutinated, most likely with a pseudokeriothecal texture that is mostly obliterated by diagenetic processes. This texture has only been observed (in some specimens) as fine striation from the wall, not from the septa (e.g., Figs. 4G, 5A, 5K, 5P).
Dimensions. Chamber height (h) = chamber lumen + thickness septum (see Arnaud-Vanneau, 1980: fig. 210).
Height of cone (H): 0.5 up to 1.0 mm (medium about 0.75 mm)
Diameter of cone (D): 0.4–1.0 mm (medium about 0.65 mm)
Cone angle: 20–50°
Thickness of septa (uniserial adult stage): 0.05–0.065 mm
Adult chamber height (h): 0.08–0.11 mm
Number of chambers per last 0.5 mm cone length (n): 4–6 (mostly 6)
Comparison. The early Barremian "*Lituonella*" *altaretae* Arnaud-Vanneau with its clear pseudo-keriothecal wall structure is morphologically and structurally very similar to *Cantabriconus reocinianus.* The former however is distinctly larger (H: 1.24–1.78 mm, D: 0.94–1.46 mm, h: 0.14–0.18 mm, n: 3–4, acc. to Arnaud-Vanneau, 1980), the morphology is slightly differing (broader conical, convex cone base), and the pillars seem to be more numerous appearing in a much wider central zone (e.g., holotype specimen, Arnaud-Vanneau, 1980: pl. 90, fig. 7). As in *Cantabriconus reocinianus* apertural pores and the thick, sometimes also fusing pillars may appear in continuous vertical arrangement for several chambers. "*Lituonella*" *altaretae* Arnaud-Vanneau is here tentatively attributed to the genus *Cantabriconus* becoming *Cantabriconus altaretae* (Arnaud-Vanneau). It is worth mentioning that Peybernès (2004) proposed the combination *Conicopfenderina altaretae* (Arnaud-Vanneau). This view is not followed due to generic differences between both as discussed above.
Occurrences and stratigraphy. Cantabriconus reocinianus was observed almost exclusively in the Reocín Formation that, based on orbitolinids and other benthic foraminifera, can be ascribed to the upper Aptian (?upper Gargasian-Clansayesian) (Schlagintweit et al., 2016, for details). Here it is recorded from the strata overlying the levels with *Dictyoconus*? *pachymarginalis* Schroeder (Fig. 7). The topmost parts of the Reocín Formation contain *Coskinolinella daguini* Delmas & Deloffre and *Simplorbitolina manasi* Ciry & Rat. Both taxa range into the lowermost Albian (Schroeder and Neumann, 1985, tab. 1). The higher evolved taxa *Coskinolinella santanderensis* Ramírez del Pozo and *Simplorbitolina conulus* Schroeder, however, that have their first appearances in the late early Albian have not been observed. In conclusion, there are so far no indications that the Reocín Formation reaches into the lowermost Albian.

Regarding the other findings of *Cantabriconus reocinianus*, it has been observed in the lower part of the Ramales and Meruelo Formations in the sections of the Ajo Cape area. These outcrops formerly attributed to the upper Aptian in regional geological maps (Ramírez del Pozo and Portero-García, 1974), are of late early Albian age indicated by the co-occurrence of *S. manasi* and *S. conulus* (Baron-Szabo and Fernández-Mendiola, 1997; Schlagintweit et al., 2017).

5. Conclusions

The benthic foraminifer *Cantabriconus reocinianus* n. gen., n. sp, assigned to the Coskinolinidae, is described from Urgonian-type shallow-water carbonates from the northwestern Basque-Cantabrian Basin where it is considered to represent an upper Aptian-lower Albian marker taxon. *Cantabriconus reocinianus* is included into a biostratigraphic scheme of the Cantabrian Urgonian besides orbitolinids and other larger benthic foraminifera. *Cantabriconus reocinianus* might be restricted in its Lower Cretaceous occurrence to the Iberian plate, respectively the Basque-Cantabrian realm. *Lituonella altaretae* Arnaud-Vanneau from the lower Barremian of southern France is here tentatively attributed to the genus *Cantabriconus* becoming *Cantabriconus altaretae* (Arnaud-Vanneau).

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