

***Montseciella*, a new orbitolinid genus (Foraminiferida) from the Uppermost Hauterivian - Early Barremian of SW Europe**

Antonietta CHERCHI* and Rolf SCHROEDER**

RESUMEN

Se establece *Montseciella*, un nuevo género de foraminíferos de gran tamaño, perteneciente a la familia Orbitolinidae. Este nuevo taxón incluye: *M. glanensis* (Foury, 1968) (Hauteriviense superior terminal - Barremiense inferior basal), encontrándose en la Serra del Montsec (Prov. de Lleida, Pirineo Catalán, España) y en la Baja Provenza y las Cadenas Subalpinas (Francia), y su descendiente directo *M. alguerensis* n. sp. (Barremiense inferior no basal) de Cerdeña (Italia). Los dos especies representan la parte inferior de una línea filogenética, a la cual pertenecen también "*Dictyoconus*" *arabicus* Henson, 1948 y *Rectodictyoconus giganteus* Schroeder, 1964, del Barremiense superior y Aptiense inferior basal.

Palabras clave: Foraminíferos, Orbitolinidae, Pirineo Catalan (España), Cerdeña (Italia), Cadenas Subalpinas (Francia), Provenza (Francia), Hauteriviense, Barremiense.

ABSTRACT

CHERCHI, A. and SCHROEDER, R. *Montseciella*, a new orbitolinid genus (Foraminiferida) from the Uppermost Hauterivian - Early Barremian of SW Europe

Montseciella, a new larger foraminiferal orbitolinid genus, is established. It comprises: *M. glanensis* (Foury, 1968) (uppermost Late Hauterivian to basal Early Barremian) from Serra del Montsec (Lleida Prov., Catalanian Pyrenees, Spain), Basse Provence (France) and the French Subalpine Chains, and its direct phylogenetic descendant *M. alguerensis* n. sp. (higher Early Barremian) from NW Sardinia (Italy). These two species represent the lower part of a phylogenetic lineage to which also belong "*Dictyoconus*" *arabicus* Henson, 1948 and *Rectodictyoconus giganteus* Schroeder, 1964, occurring in the Late Barremian and lowermost Early Aptian.

Key words: Foraminifers, Orbitolinidae, Catalanian Pyrenees (Spain), Sardinia (Italy), Subalpine Chains (France), Provence (France), Hauterivian, Barremian.

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INTRODUCTION

Orbitolinid foraminifera are widespread in the Early Cretaceous platform carbonates from the Tethyan realm. In SW Europe, this so-called Urgonian facies generally starts in the Late Hauterivian and is mainly developed during the Aptian and Albian. The stratigraphically short-ranging species of this foraminiferal group are of great chronostratigraphic and paleoenvironmental importance for this time interval. The study of numerous orbitolinid-bearing sections during the last years makes now possible to arrange a large part of taxa in phylogenetic lineages.

In the present paper we establish the new orbitolinid genus *Montseciella* which includes two species: *M. glanensis* (Foury, 1968) and *M. alguerensis* n. sp. Our material of the former species comes from the basal Early Barremian of the Serra del Montsec (Lleida Prov., Catalan Pyrenees, Spain); the latter species was found in the early Barremian of NW Sardinia (Italy) and is regarded as the direct phylogenetic descendant of *M. glanensis*.

The studied material is housed in the Geologisch-Paläontologisches Institut, Universität Frankfurt.

STRATIGRAPHIC SETTING AND LOCATION OF THE STUDIED SAMPLES

Serra del Montsec (Catalan Pyrenees)

The occurrence of marine Barremian in the Serra del Montsec (Lleida Prov., NE Spain) was recorded for the first time by Cherchi & Schroeder (1973) on the basis of

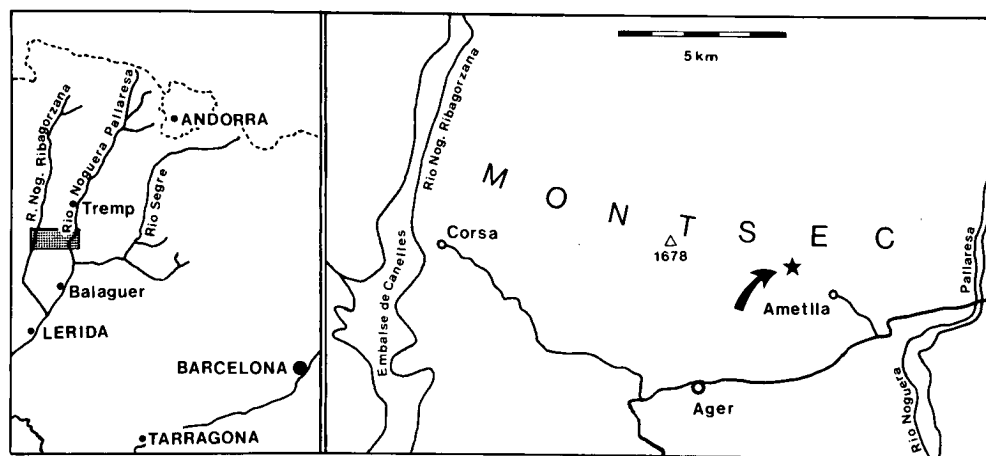


Fig. 1. Location of the samples with *Montseciella glanensis* (Foury, 1968) in the Serra del Montsec (from Schroeder *et al.*, 1982, modified).

Fig. 1. Situación de las muestras con *Montseciella glanensis* (Foury, 1968) en la Serra del Montsec (según Schroeder *et al.*, 1982, modificado).

some orbitolinid-bearing samples collected by Geldmacher (1969). Although Moullade *et al.* (1980) regarded our discovery as an error, Schroeder *et al.* (1982) presented a rich foraminiferal fauna confirming the Barremian age.

The samples studied by us come from the eastern side of the Barranc de l'Aigua Clara, north-west of the village Ametlla (Fig. 1) (sheet Benabarre 1: 50.000; lat. 4° 29' 45", long. approx. 42° 01' 35"). According to Geldmacher, the 10 m thick Barremian beds are situated 10-13 m above Jurassic dolomites (tectonical contact?) and are overlain by approx. 170 m thick characean limestones of uncertain age which develop into marine Early Aptian with *Orbitolinopsis praesimplex* Schroeder, 1972. These few data indicate that a general stratigraphic revision of the section is necessary.

The rich microfauna (see Schroeder *et al.*, 1982) contains the following orbitolinid species: *Paracoskinolina* cf. *sunnilandensis* (Maync, 1955), *Montseciella glanensis* (Foury, 1968), *Orbitolinopsis* sp., *Paleodictyoconus cuvillieri* (Foury, 1963), and *Valserina broennimanni* Schroeder, 1968.

Basing on the occurrence of *Valserina broennimanni*, Schroeder *et al.* (1982) dated this assemblage as Late Barremian, because Arnaud-Vanneau (1980) had recorded from the French Subalpine Chains a pretended specimen of the Late Barremian ammonite *Silesites seranonis* situated at the base of the *V. broennimanni* and *V. primitiva* Zones. However, the determination of this ammonite was incorrect; according to Busnardo *et al.* (1994), it is a *Pseudothurmannia* sp. indicating a Late Hauterivian age. Actually, *Valserina broennimanni* (homogeneous populations without the direct ancestor *V. primitiva*) is regarded as a marker of the lowermost Early Barremian (*hugii* Zone) (Clavel *et al.*, 1995).

Capo Caccia (NW Sardinia)

Hauterivian and Barremian in Urgonian facies are well exposed at the steep coasts of Capo Caccia, a small peninsula situated approx. 13 kms west of Alghero (NW Sardinia).

At the western side of the path from Cala Dragonara in the direction of Torre del Bulo (old road to Capo Caccia), massive Urgonian limestones of Late Hauterivian to Early Barremian age crop out (Fig. 2). This Urgonian series, which we have presented during the 19th European Micropaleontological Colloquium (Cherchi & Schroeder, 1985) is discordantly overlain by Coniacian limestones, which are limited at their southern border by a WNW - ESE striking fault. South of this fault, a second, 80-90 m thick Urgonian series dipping to SE is exposed at the same path and is likewise overlain by transgressive Coniacian.

17-19 m below the top of this second Urgonian series, which is actually under study, a 2 m thick horizon frequently contains *Montseciella alguerensis* n. sp. and represents the type-level of this species. The coordinates of this locality are: lat. 40° 34' 11"; long. 8° 10' 04".

The type-level of *Montseciella alguerensis* contains the following other orbitolinid species: *Urgonina* sp., *Paracoskinolina* cf. *sunnilandensis* (Maync, 1955), "*Paracoskinolina*" *hispanica* Peybernès, 1976, *Valserina charollaisi* (Schroeder,

1968), and *Palorbitolina turbinata* (Foury, 1968) (one single and very questionable specimen). Of special interest is the presence of *Valserina charollaisi*: in the French Subalpine Chains, this direct phylogenetic descendant of *V. broennimanni* occurs in the middle part of the Early Barremian ($\pm$ *compressissima* Zone) (Clavel *et al.*, 1994).

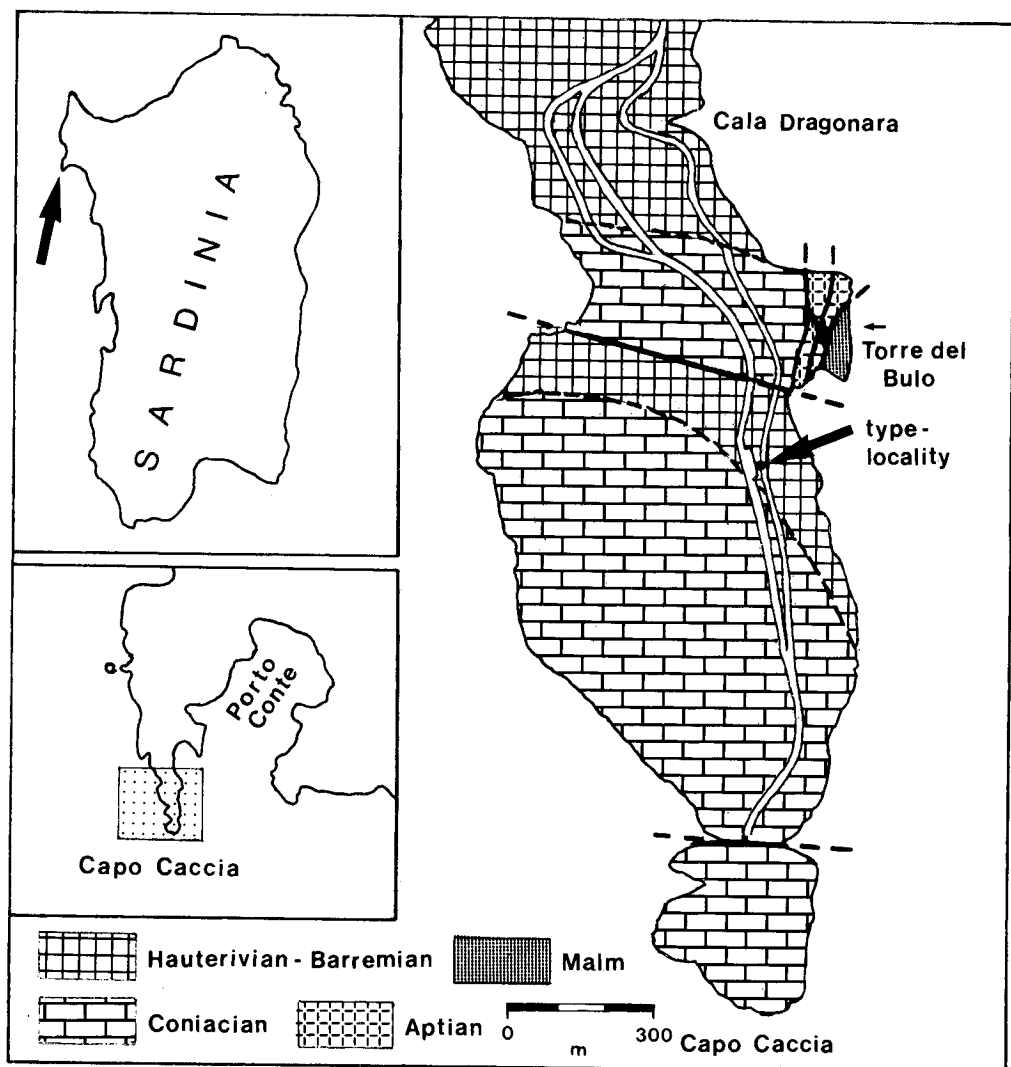


Fig. 2. Location of the type-locality of *Montseciella algerensis* n. sp. - Capo Caccia, NW Sardinia (from Cherchi & Schroeder, 1985, modified).

Fig. 2. Situación de la localidad tipo de *Montseciella algerensis* n. sp. - Capo Caccia, NW de Cerdeña (según Cherchi & Schroeder, 1985, modificado).

SYSTEMATIC PALAEONTOLOGY

Order Foraminiferida Eichwald, 1830
Superfamily Orbitolinacea Martin, 1890
Family Orbitolinidae Martin, 1890

Genus *Montseciella* n. gen.

Derivatio nominis

From Serra del Montsec (Lleida Prov., NE Spain).

Type species

Paleodictyoconus glanensis Foury, 1968.

Diagnosis

High conical tests showing a strongly developed trochospiral. The marginal zone of the conical stage is always subdivided by vertical and sometimes also by horizontal subepidermal plates. The central zone exhibits thin, vermicular partitions forming a labyrinthic structure and bordering relatively spacious hollows. The plates of the marginal zone and the vermicular partitions of the central zone alternate in position from one chamber layer to the next.

Montseciella glanensis (Foury, 1968)
Pl. 1, figs. 1-6; Pl. 2, figs. 1-7

1968 *Paleodictyoconus glanensis* n. sp.; Foury: 146-148; pl. 18, figs. 1-12.

1969 *Urgonina* cf. *alpillensis* (Foury, 1963); Schroeder *et al.*: pl. 2, figs. 1-6.

1982 "*Paleodictyoconus*" *glanensis* Foury; Schroeder *et al.*: pl. 4, figs. 5-6.

Description

The high conical tests have a diameter of 1.4-1.7 mm and a height of 1.1-1.5 mm. The specimen represented on Pl. 2, fig. 6 is exceptionally svelte (diameter: 0.8 mm). The ventral surface is predominantly convex (Pl. 1, fig. 4; Pl. 2, fig. 5), but sometimes planar (Pl. 2, fig. 1). A concave outline in axial sections of adult specimens (Pl. 1, fig. 5) indicates a central depression in the last growth stage.

The test is composed of (1) a strongly developed spire and (2) a following conical stage.

(1) The initial part of the spire is compressed showing a sharply angular carina (Pl. 2, fig. 2); its axis of coiling differs up to 90° from that of the later conical part of

test (Pl. 1, fig. 3; Pl. 2, fig. 4). The embryonic chamber is globular (diameter: 0.06-0.08 mm) and followed by a series of 8-9 flat, apparently undivided chambers showing an interiomarginal aperture (Pl. 1, fig. 3; Pl. 2, figs. 3-4). The marginal zone of the following chambers of the compressed initial spire is subdivided into marginal chamberlets by vertical main partitions which alternate in position from one chamber to the next (Pl. 2, fig. 3).

(2) The conical stage of the test is composed of a curved series of chambers (Pl. 1, fig. 5; Pl. 2, fig. 5) and a following rectilinear series (Pl. 1, fig. 5: lower part). Within the curved stage, the parts of the chamber layers situated below the initial spire are markedly lower than the remaining parts (Pl. 1, figs. 4-5; Pl. 2, fig. 5).

The marginal zone of the conical stage is regularly subdivided into marginal chamberlets by vertical main partitions alternating in position from one chamber layer to the next. In tangential sections, these chamberlets are broader than high and hexagonal in outline (Pl. 1, fig. 6). Some of them are subdivided in its outer part by a vertical plate (Pl. 1, fig. 1). Horizontal plates are lacking in our specimens.

Thin, vermicular partitions, alternating in position from one chamber layer to the next, subdivide the central zone. They form a labyrinthic structure and border relatively spacious hollows (Pl. 1, fig. 1; Pl. 2, fig. 7). Some of these partitions, situated at the border of the central zone, are connected with vertical main partitions of the marginal zone. The subvertical apertural openings are irregularly distributed (Pl. 2, fig. 7).

Remarks

According to Foury (1968: 147), this species shows a clear dimorphism: a microspheric form with a very pronounced initial spire and a megalospheric form characterized by a very important ("très importante") apical, somewhat eccentric protoconch. The wall of this pretended protoconch was described by that author as a "couche claire de calcite et de deux couches sombres microgranulaires de part et d'autre". This description obviously refers to the one section published by Foury (Pl. 18, fig. 3) as a megalospheric form which shows laterally of the apical region a thick semicircular sparitic wall. In our opinion, this structure does not belong to the figured specimen; it could be a transversal section of an encrusting organism, perhaps an annelid tube. Hence follows, that up to now a dimorphism of *M. glanensis* cannot be proved.

Montseciella alguerensis n. sp.
Pl. 3, figs. 1-3; Pl. 4, figs. 1-5

1980 *Paleodictyoconus* n. sp. 2; Arnaud-Vanneau: 665-666; pl. 106, fig. 5.

Derivatio nominis

Alguer is the medieval Catalan name of Alghero (Sardinia). The type-locality of the new species is located in the vicinity of this town.

Holotype

Tangential section of a juvenile specimen (CC 27-1) showing the initial spire with the embryonic chamber (Pl. 4, fig. 4).

Locus typicus

Old road between Cala Dragonara and Capo Caccia, south of Torre del Bulo (Capo Caccia peninsula, NW Sardinia).

Stratum typicum

Early Barremian, 19 m below the base of the transgressive Coniacian. Sample CC 27.

Diagnosis

A species of *Montseciella* characterized by the regular occurrence of horizontal plates within the marginal zone.

Description

The high conical tests have a diameter of 2.5-3.0 mm and a height of approx. 1.8 mm. The chamber layers, averaging 9-10 per last millimetre of the test surface, are disc-shaped and convex in growth direction; therefore, the ventral surface of tests is also convex (Pl. 3, fig. 1; Pl. 4, fig. 5) or occasionally (in adult specimens) nearly planar, showing in this case sometimes a central depression.

The embryo of the holotype (Pl. 4, fig. 4) is circular in outline and has a diameter of 0.07 mm. Another tangential section through the initial spire (Pl. 4, fig. 2) indicates a subdivision of the embryo into a globular protoconch and a hemispherical deutoconch.

The first part of the chamber layers is arranged in a trochospire (Pl. 4, figs. 2, 4) showing a carina (Pl. 4, figs. 2, 4: top). This stage is followed by a curved series (Pl. 3, fig. 1: upper half) and finally by a rectilinear series of chambers (Pl. 3, fig. 1: lower half).

The marginal zone of the chamber layers is subdivided into marginal chamberlets by vertical main partitions which alternate in position from one chamber layer to the next (Pl. 3, fig. 2: central part; Pl. 4, figs. 2-4: lowermost parts). The outer part of each marginal chamberlet is subdivided by one horizontal (Pl. 3, fig. 1; Pl. 4, fig. 5) and one vertical plate (Pl. 2, fig. 3; Pl. 4, fig. 1) forming four secondary marginal chamberlets (Pl. 3, fig. 2: borders of the section).

The central zone is characterized by the presence of thin, vermicular partitions alternating in position from one chamber layer to the next. They form a labyrinthic structure (Pl. 3, fig. 3: upper half) and border relatively spacious hollows (Pl. 3, fig. 1; Pl. 4, figs. 3, 5). Some partitions, situated at the border of the central zone, are connected with vertical main partitions of the marginal zone (Pl. 3, fig. 3: upper part). The subvertical and irregularly distributed apertural openings are situated at the base of the vermicular partitions (Pl. 3, figs. 1, 3; Pl. 4, figs. 1, 5).

Remarks

Montseciella algerensis n. sp. differs from *M. glanensis* (Foury, 1968) by the regular presence of horizontal plates within the marginal zone, which are generally absent in the latter species.

PHYLOGENETIC CONSIDERATIONS

A structural comparison between *Montseciella glanensis* (Foury) and *M. algerensis* n. sp. reveals that the two species are closely related. In our opinion, they belong to a hitherto unknown phylogenetic lineage which also includes "*Dictyoconus*" *arabicus* Henson, 1948 and *Rectodictyoconus giganteus* Schroeder, 1964. This lineage is mainly characterized by the following evolutionary trends: (1) increase of size of the tests, (2) disappearance of the initial spiral stage, (3) shift of the embryo to a centric position and development of a subembryonic cellular layer, (4) progressive complexity of the network of septula within the marginal zone, and (5) formation of rudimentary radial partitions within the central zone. The same evolutionary trends (except the last-named) were already noticed within two other important lineages of Early Cretaceous primitive orbitolinids: (1) *Valserina* - *Palorbitolina* (Schroeder, 1993) and (2) *Praedictyorbitolina* - *Dictyorbitolina* (Schroeder *et al.*, 1999).

Montseciella glanensis is the oldest and most primitive representant of this lineage. In the northern French Subalpine Chains (Rocher de Cluses section) it already occurs in the uppermost Late Hauterivian (*angulicostata* Zone) and in the basal Barremian (*hugii* Zone) (Charollais *et al.*, 1998). In the Serra del Montsec, *M. glanensis* was found in the lowermost part of the Early Barremian (*hugii* Zone), and at its type-locality (Alpilles, Bouches-du-Rhône, southern France; Foury, 1968) this species seems to be limited to the same stratigraphic interval. *M. glanensis* is mainly characterized by the absence of horizontal plates within the marginal zone. However, some of the specimens from the type-locality (Foury, 1968: pl. 18, figs. 2, 4) already show sporadically this structural characteristic which subsequently is regularly present in *M. algerensis*. Therefore, this latter species can be considered as the direct descendant of *M. glanensis*. The stratigraphic position of *M. algerensis* confirms this interpretation: at its type-locality it occurs in the higher part of the Early Barremian ($\pm$ *compressissima* Zone), i.e., in younger horizons as the interval characterized by *M. glanensis*.

Structurally, *Montseciella algerensis* n. sp. is very similar to "*Dictyoconus*" *arabicus* Henson, 1948, a taxon which is widespread in Late Barremian and probably also in the basal Aptian of the Tethys realm (Baud *et al.*, 1994; Cherchi & Schroeder, 1999). The central zone of the latter species exhibits vermicular or pillar-like structures merging into rudimentary radial partitions in the upper part of each chamber layer. The system of subepidermal plates within the marginal zone is highly developed (Cherchi & Schroeder, 1999: pl. 2, fig. 3). The relatively large embryonic chamber of megalospheric specimens is slightly eccentrically situated in the tip of the test and shows a small but well-developed alveolar layer in its uppermost part (Cherchi & Schroeder, 1999: pl. 2, figs. 1-2, 4-5). Compared to *M. algerensis*, "*D.*" *arabicus* is

a structurally advanced form and may be regarded, also with respect of its age, as the phylogenetic descendant of this species. However, the transition between the initial stages of *Montseciella alguerensis* (well developed trochospire; protoconch not subdivided) and "*Dictyoconus*" *arabicus* (slightly eccentric, large embryonic chamber showing a layer of subepidermal chamberlets) is very abrupt, and no intermediate forms were observed. These facts suggest the existence of a still unknown phylogenetic stage, resp. a connecting link between the two species. A comparison between the stratigraphic position of the two taxa supports this presumption: *M. alguerensis* was found in the higher Early Barremian ($\pm$ *compressissima* Zone), whereas "*D.*" *arabicus* occurs in the higher part of the Late Barremian and perhaps in the basal Aptian. Consequently, the missing link between the two species might be placed approximately in the lower part of the Late Barremian.

According to Schroeder (in Correia *et al.*, 1982), "*Dictyoconus*" *arabicus* grades into *Rectodictyoconus giganteus* which has been described by Schroeder (1964) from the lowermost Aptian of Villarroya de los Pinares (Teruel Prov., eastern Spain). This latter species differs from "*D.*" *arabicus* by the centric position of the embryo and its generally larger test.

Summing up, it may be said that *Montseciella glanensis* (Foury) and *M. alguerensis* n. sp. represent the first stage of a phylogenetic lineage ranging from the Late Hauterivian up to the lowermost Early Aptian.

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Plate 1

Montseciella glanensis (Foury, 1968).- Barranc de l'Aigua Clara, north-west of Ametlla (Serra del Montsec, Lleida Prov.).- Early Barremian.

1. Oblique transversal section (AC 7-3).
2. Vertical section, perpendicularly to the median plain (AC 8-4).
3. Tangential section showing the initial spire (AC 5-4).
4. Vertical section, parallel to the median plain (AC 8-3).
5. Median section (AC 8-4).
6. Tangential section (AC 8-8).

All sections x 50.

Lámina 1

Montseciella glanensis (Foury, 1968).- Barranc de l'Aigua Clara, NW de Ametlla (Serra del Montsec, Provincia de Lleida).- Barremiense inferior.

1. Sección transversal oblicua (AC 7-3).
2. Sección vertical, perpendicular al plano medio (AC 8-4).
3. Sección tangencial mostrando la espira inicial (AC 5-4).
4. Sección vertical, paralela al plano medio (AC 8-3).
5. Sección media (AC 8-4).
6. Sección tangencial (AC 8-8).

Todas las secciones x 50.

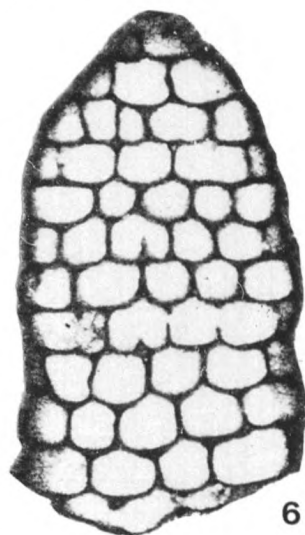
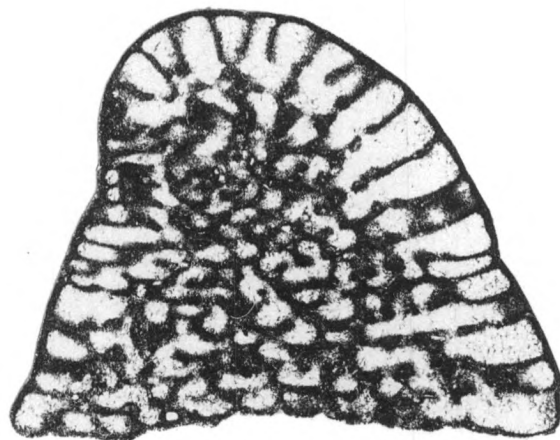
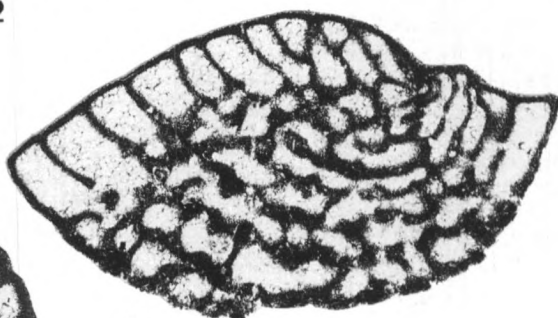
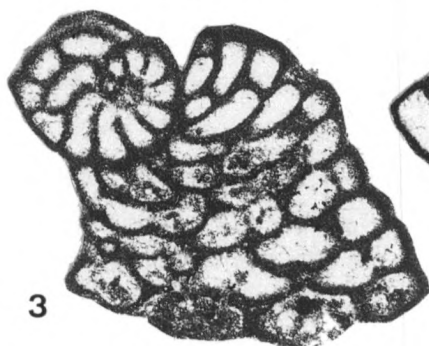
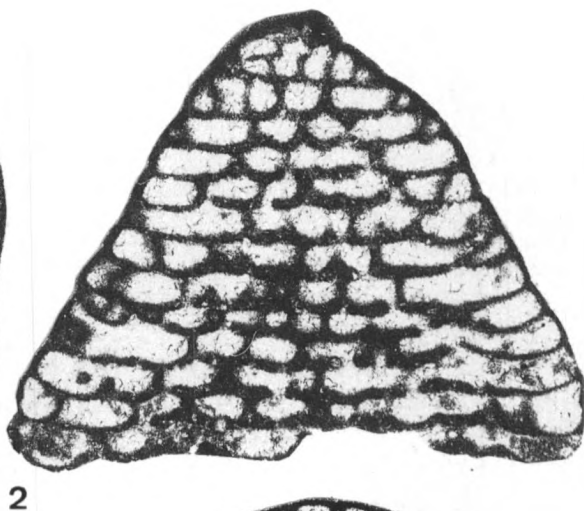


Plate 2

Montseciella glanensis (Foury, 1968).- Barranc de l'Aigua Clara, north-west of Ametlla (Serra del Montsec, Lleida Prov.).- Early Barremian.

1. Median section (AC 8-3).
2. Oblique tangential section (AC 8-1).
3. Tangential section of the initial spire (AC 8-1).
4. Tangential section showing the initial spire (AC 8-4).
5. Vertical section, parallel to the median plain (AC 8-9).
6. Median section of a svelte specimen (AC 7-3).
7. Oblique transversal section (AC 8-4).

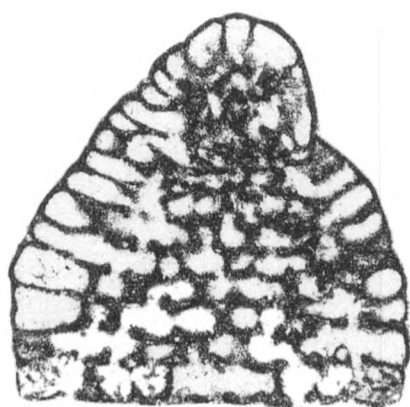
All sections x 50.

Lámina 2

Montseciella glanensis (Foury, 1968).- Barranc de l'Aigua Clara, NW de Ametlla (Serra del Montsec, Provincia de Lleida).- Barremiense inferior.

1. Sección media (AC 8-3).
2. Sección tangencial oblicua (AC 8-1).
3. Sección tangencial de la espira inicial (AC 8-1).
4. Sección tangencial mostrando la espira inicial (AC 8-4).
5. Sección vertical, paralela al plano medio (AC 8-9).
6. Sección media de un espécimen esbelto (AC 7-3).
7. Sección transversal oblicua (AC 8-4).

Todas las secciones x 50.



1



2



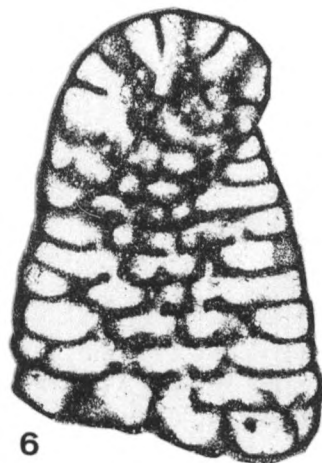
3



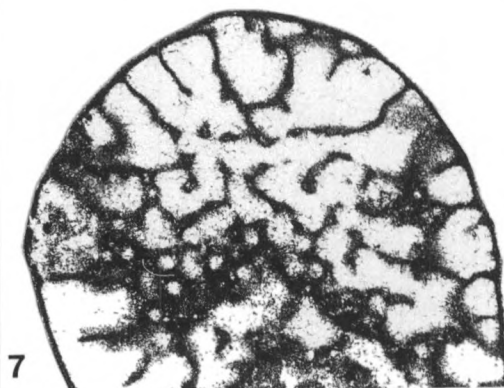
4



5



6



7

Plate 3

Montseciella alguerensis n. gen., n. sp.- Old road between Cala Dragonara and Capo Caccia, south of Torre del Bulo (Capo Caccia peninsula, NW Sardinia).- Early Barremian.

1. Vertical section, parallel to the median plain (CC 33-3).
2. Tangential section (CC 33-2).
3. Oblique transversal section (CC 27-1).

All sections x 50.

Lámina 3

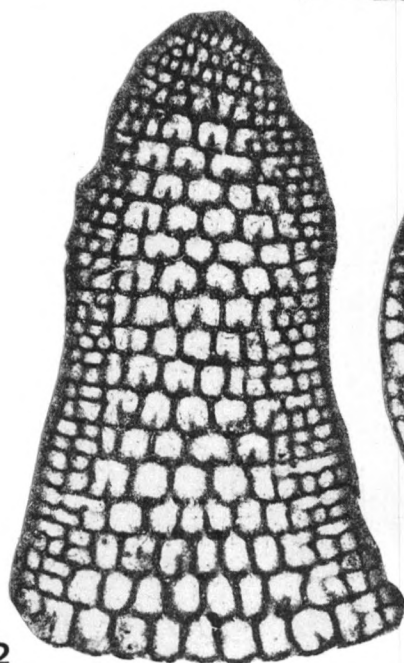
Montseciella alguerensis n. gen., n. sp.- Carretera vieja entre Cala Dragonara y Capo Caccia, al sur de Torre del Bulo (Península de Capo Caccia, NW de Cerdeña).- Barremiense inferior.

1. Sección vertical, paralela al plano medio (CC 33-3).
2. Sección tangencial (CC 33-2).
3. Sección transversal oblicua (CC 27-1).

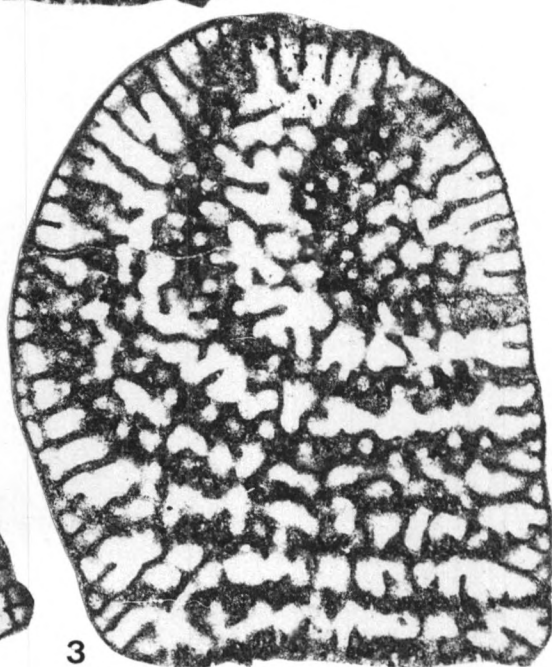
Todas las secciones x 50.



1



2



3

Plate 4

Montseciella alguerensis n. gen., n. sp.- Old road between Cala Dragonara and Capo Caccia, south of Torre del Bulu (Capo Caccia peninsula, NW Sardinia).- Early Barremian.

1. Somewhat oblique transversal section (CC 28-1).
2. Oblique tangential section showing the embryo (arrow) (CC 33-1).
3. Oblique tangential section (CC 30-1).
4. Oblique tangential section showing the embryo (arrow) (CC 27-1). Holotype.
5. Vertical section (CC 28-2).

All sections x 50.

Lámina 4

Montseciella alguerensis n. gen., n. sp. - Carretera vieja entre Cala Dragonara y Capo Caccia, al sur de Torre del Bulu (Península de Capo Caccia, NW de Cerdeña).- Barremiense inferior.

1. Sección transversal ligeramente oblicua (CC 28-1).
2. Sección tangencial oblicua mostrando el embrión (flecha) (CC 33-1).
3. Sección tangencial oblicua (CC 30-1).
4. Sección tangencial oblicua mostrando el embrión (flecha) (CC 27-1). Holotipo.
5. Sección vertical (CC 28-2).

Todas las secciones x 50.

