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The gastropods from the Barremian of Serre de Bleyton (Drôme, SE France)

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(With 10 plates and 1 figure)

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Abstract

A diverse gastropod fauna of 66 taxa is recorded from Barremian deposits of Serre de Bleyton, SW of the village of Arnayon (Department Drôme, France). Due to the unfavourable preservation of most specimens, only 18 previously described species could be identified, while the majority was named in open nomenclature. Newly described species are: *Nummogaultina tricarinata, Pseudoliotina? parva, Brouzetdiscus? carinatus, Colpomphalus spiralocostatus, Costatomphalus moosleitneri and Bleytonella circumlata. Brouzetdiscus, Costatomphalus* and *Bleytonella* were identified as new genera. Barremian gastropod faunas of south France described in the earlier literature can be assigned to different facies. Accordingly, the great majority of taxa recorded from Serre de Bleyton inhabited shallow water environments of the outer platform. Only two taxa originate from inner platformlagoons. A single taxon of land snails has by-passed the shelf before it was deposited in basin floor fans of the Vocontian Trough.

Keywords: Mollusca, Gastropoda, France, Drôme, Cretaceous, Barremian, New Taxa

Zusammenfassung

In den Ablagerungen des Barrêmiums von Serre de Bleyton, SW des Ortes Arnayon (Department Drôme, Frankreich) wurde eine diverse Gastropodenfauna von 66 Taxa nachgewiesen. Wegen der ungünstigen Erhaltung konnten nur 18 Taxa früher beschriebenen Arten zugeordnet werden, während die Mehrzahl in offener Nomenklatur beschrieben wird. Neu sind die Arten *Nummogaultina tricarinata, Pseudoliotina? parva, Brouzetdiscus? carinatus, Colpomphalus spiralocostatus, Costatomphalus moosleitneri und Bleytonella circumlata*, sowie die *Gattungen Brouzetdiscus, Costatomphalus and Bleytonella*. In der älteren Literatur beschriebene Gastropodenfaunen aus dem Barrêmium Südfrankreichs wurden anhand der in der Literatur

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beschriebenen Lithologien an den Fundorten verschiedenen Faziesbereichen zugeordnet. Aus dem Vergleich mit diesen Daten ergibt sich, dass die große Mehrheit der Gastropoden von Serre de Bleyton aus Seichtwasserbereichen der äußeren Plattform stammt, aber nur zwei Taxa ihren Ursprung in den lagunären Bereichen der inneren Plattform haben. Die Landschnecke *Lychnus* sp. wurde über den Schelfbereich hinweg verfrachtet.

Schlüsselworte: Mollusca, Gastropoda, Frankreich, Drôme, Kreide, Barremium, Neue Taxa

Introduction

The "coulées boueuses" are turbiditic beds of Barremian age introduced through channels into the Vocontian Basin of south France (Adatte et al. 2005; Arnaud 2005). In contrast to other occurrences, megafossils are common in the coulées of the Serre de Bleyton, SW of the village of Arnayon (Drôme, SE France). This extraordinary locality was discovered and has been intensively sampled by Gero Moosleitner. The highly diverse assemblage of fossil invertebrates contains remains of various groups. The following have been published in previous volumes of the Annalen des Naturhistorischen Museums Wien: ostracods (Babinot & Colin 2011); dasycladacean algae (Bucur 2011; brachiopods (Gaspard 2011); crinoids (Jäger 2010); polychaets (Jäger 2011); belemnites (Janssen 2010); corals (Löser 2010); ammonoids (Lukeneder 2010); rhyncholites (Riegraf & Moosleitner 2010); bryozoans (Taylor 2010); ophiuroids (Thuy & Kroh 2011); asteroids (Villier 2010). Other groups will follow in forthcoming volumes of this journal. The present contribution deals with the gastropods, which are among the most abundant and diverse faunal elements of the site.

Study area

The geographical position of the collecting points, the lithostratigraphical subdivision and the lithological character of the rocks have been treated in detail by Kroh et al. (2010) and Lukeneder (2010). The position of the localities is shown in Fig. 1. The exposures reveal a turbiditic sequence of siliciclastic sediments deposited in basin-floor fans in the Vocontian Trough. Most fossils are therefore in allochthonous position. The biostratigraphical interpretation is mainly based on cephalopods (Janssen 2010; Lukeneder 2010). While locality 3 represents the stratigraphically earliest beds (Early Barremian), the sediments of the close-by localities 1 and 2 are slightly younger, presumably of Late Barremian age. Gastropods have been collected exclusively in localities 1 and 2. Locality 1 has yielded the majority of specimens. These are not especially marked in the following text. Specimens from locality 2 are marked with FO 2 ("Fundort" 2).

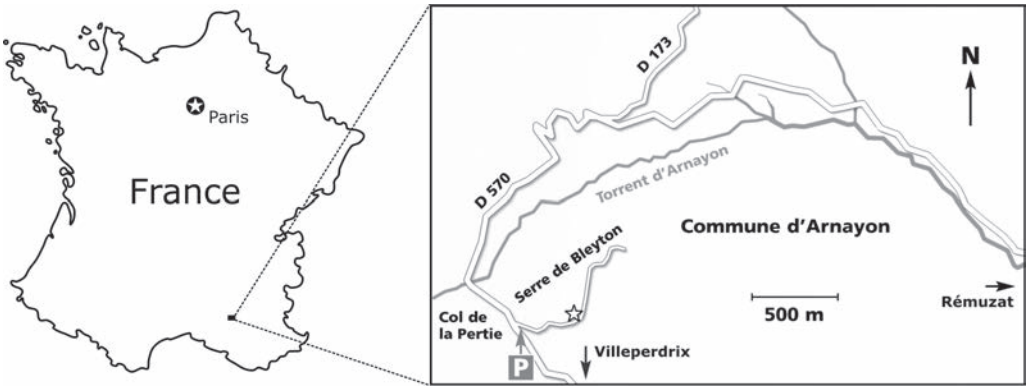

Fig. 1. Study area. Left: Outline map of France. The asterisk indicates the position of the "Serre de Bleyton" area in the Departement of Drôme, SE France. Right: Detailed map of the Serre de Bleyton area. The outcrops are marked by asterisks (after KROH et al. 2010)

Material and Methods

The fossiliferous levels have been sampled several times by G. MOOSLEITNER, who has collected all material described in this and the preceding papers on the fossil assemblage. Larger specimens were picked from the weathered surface. Small specimens were collected from bulk samples treated with ultrasonic and/or the tensid REWOQUAT® following washing with water by G. MOOSLEITNER, who then sent the material to the senior author for scientific investigation. It consists of several hundred specimens and is therefore quite comprehensive. The gastropod assemblage is very diverse. Unfortunately, the preservation is mostly unfavourable. Frequently, the shells are not preserved or recrystallized. As morphological features essential for a taxonomical evaluation (protoconch, aperture) are rarely preserved, only a few specimens could be described in detail. Nevertheless, a systematic assignment under open nomenclature has been possible in most cases. Although 66 taxa have been distinguished, the large number of indeterminable specimens suggests a much higher diversity of the gastropod fauna.

All taxonomically evaluated specimens (types, figured specimens, and reference material to the described taxa) are kept under NHMW 2011/0052/0001–0146 in the Department of Geology and Palaeontology of the Museum of Natural History in Vienna. Additional material which was not considered in this paper because of its preservation is kept in the same collection.

Systematic palaeontology

Subclass Archaeogastropoda THIELE, 1925

Superfamily Fissurelloidea FLEMING, 1822

Family Fissurellidae FLEMING, 1822

Fissurellidae gen. et spec. indet.
(Pl. 1, Figs 1–2)

Material: 5 specimens (FO 1 and 2) (NHMW 2011/0052/0001–0003).

Description: The height of the figured specimen is 3.4 mm. The shell is laterally compressed (dorsal view) and high cap-shaped (side view). The coiled apex extends distinctly over the posterior margin. The sculpture consists of three prominent radial ribs which commence at some distance from the apex and extend to the anterior margin. The middle rib is most prominent. Due to the poor preservation, an additional rib on each side is only indistinctly visible. The selenizone is not discernible. The aperture is oval with a broadly rounded anterior margin.

Superfamily Trochoidea Rafinesque, 1815

Family Trochidae Rafinesque, 1815

Subfamily Margaritinae Thiele, 1924

Genus *Margarites* Gray, 1847

Type species: *Margarites helicinus* (Philipps, 1774 = *Helix margarita* Montagu, 1808); Recent; Atlantic Ocean.

***Margarites* sp.**
(Pl. 1, Figs 3–5)

Material: 1 specimen (NHMW 2011/0052/0004).

Description: The total height of the specimen is 1.7 mm, the maximum diameter 2.6 mm. The shell is low trochospirally coiled. The whorls are convex, without an angulation towards the base. The shell is densely covered by at least 40 spiral ribs. The base is slightly convex but details are not preserved. Presumably, there is an umbilicus surrounded by a carina-like rib. The aperture is circular but details are not discernible.

Discussion: The specimen is assigned to *Margarites* Gray because of its high, convex whorls and the broad umbilicus, which was probably surrounded by a carina. *Striatoconulus* Gründel, 2000 differs by its less convex whorls and the angulate base (see also Kaim 2004).

Family Eucyclidae Koken, 1896

Subfamily Eucycloscalinae Gründel, 2007

Genus *Ooliticia* Cossmann, 1893

Type species: *Turbo phillipsi* Morris & Lycett, 1851; Middle Jurassic; England.

Ooliticia chatillonensis (PICTET & CAMPICHE, 1863)
(Pl. 1, Figs 6–7)

1863 *Turbo chatillonensis n. sp.* – PICTET & CAMPICHE: 477, Pl. 83, Fig. 5

Material: 1 specimen (NHMW 2011/0052/0005).

Description: The maximum diameter of the specimen is 4 mm. The low trochospirally coiled shell consists of convex whorls and has canaliculate sutures. The sculpture of the whorl face consists of 4 or 5 prominent spiral ribs with small, closely spaced tubercles. The spiral ribs decrease in strength on the moderately convex, umbilicate base, where they are more closely spaced than on the whorl face. The number of spiral ribs between the suture and the umbilicus is about 20. The aperture is not preserved.

Discussion: Although the whorls seem to be higher in our specimens than in *Ooliticia chatillonensis* (PICTET & CAMPICHE), they are assigned to this species because of the distinctly umbilicated shell and the tuberculate spiral ribs. The shell is also similar to *Delphinula bicarina* BUVIGNIER, 1852 (p. 36, Pl. 24, Fig. 30, 31). In this species, the sutural ramp is delimited against the outer face of the last whorl by strong rows of tubercles, whereas the rows of tubercles on the base are weaker than in the present specimen.

Subfamily Chilodontinae WENZ, 1938

Genus *Chilodonta* ÉTALLON, 1862

Type species: *Chilodonta clathrata* ÉTALLON, 1862; Late Jurassic; France.

Chilodonta ? *cureti* (COSSMANN, 1900) nov. comb.
(Pl. 1, Figs 8–11)

1900 *Amberleya Cureti n. sp.* – COSSMANN: 9, Pl. 1, Fig. 24
1915 *Eucyclus Cureti* – COSSMANN: 56
1918 *Eucyclus Cureti* – COSSMANN: 372, Pl. 11, Fig. 13, ?14

Material: 12 specimens (NHMW 2011/0052/0006–0008).

Description: The height of the larger of the figured specimens (Pl. 1, Fig. 10–11) is 5.3 mm and its maximum diameter is 4.8 mm. The sutures of the low trochospiral shells are imbricated and moderately deep. Early ontogenetic whorls bear two strong spiral ribs close to the abapical suture and several weaker ones adapically. Later whorls develop four spiral ribs of equal strength, of which the two abapical ones are more distant to each other. Each whorl bears 16–20 narrow but strong axial ribs at ample distances. They are orthocline to moderately prosocline and end at the boundary rib delimiting the whorl face towards the base. The intersections between the spiral and axial ribs are weakly tuberculate. The base is moderately convex. Following the boundary rib, it bears

six smooth spiral ribs at equal distances, diminishing gradually in strength towards the center. The aperture is rounded and adapically notched.

Discussion: The specimens are assigned with reservation to *Chilodonta* because of the clathrate sculpture of their whorls and the spirals on the base. This distinguishes them from the Amberleyoidea, to which this species was assigned by Cossmann (1900, 1915, 1918). Adult species of *Chilodonta* develop numerous teeth or plaits in the peristome. They could not be observed in the present, probably juvenile, specimens. According to Sohl (1998) the teeth and folds of the aperture are only indistinctly developed (or may even be missing?) in early ontogenetic stages and appear in later ontogenetic stages. The base is not as strongly convex as in the type species and others (for example *Chilodonta obliqua* Sohl, 1998).

Family Calliostomatidae Thiele, 1924

Genus *Sensuitrochus* Quintero & Revilla, 1966

Remarks: The type species of *Sensuitrochus* has been re-described by Kiel & Bandel (2002). *Calliostoma morteauensis* Pictet & Campiche, 1863 fits well into this genus. Because of its sinistral coiling, Kiel & Bandel assign *Sensuitrochus* with some reservation to the Cirridae. However, the oblique and angular aperture suggests a systematic position within the Calliostomatidae, which comprise with the extant genus *Sinuator* Cotton & Godfrey another sinistrally coiled taxon (see: Hickman & McLean 1990). Unfortunately, the protoconch is not known and the systematic position therefore remains doubtful.

***Sensuitrochus morteauensis* (Pictet & Campiche, 1863) nov. comb.**
(Pl. 1, Figs 12–13)

? 1850 *Pleurotomaria contraria* d'Orbigny: 70
1863 *Calliostoma morteauensis* n. sp. – Pictet & Campiche: 511, Pl. 85, Fig. 13, 14

Material: 2 specimens (NHMW 2011/0052/0009–0010).

Description: The total height of the figured specimen is 3.1 mm. The sinistrally coiled shell is high conical. The whorls are flat and the sutures are hardly discernible. The sculpture consists of 4 rows of tubercles. The base is flat to moderately concave, anomphalous and bears approximately 10 weak spiral ribs. The aperture is broader than high but incomplete in both specimens.

Discussion: Pictet & Campiche (1863) have described this species from the Swiss Jura Mountains. It is characterized by a row of strong tubercles at the whorl periphery and 2–3 noded spiral ribs. Cossmann (1918) described 2 species of *Calliostoma* from the Urgonian facies: *C. bruni* and *C. sociale.* Both are dextrally coiled and their tubercles are weaker than in *S. morteauensis* Pictet & Campiche. Two other species of comparable

outline but with columellar plaits described by SAYN (1932) belong to *Tectus* or *Discotectus*. An unsculptured internal mould from the "Urgonien" of Morteau (Doubs) was briefly characterized by D'ORBIGNY (1850) under *Pleurotomaria contraria* although no selenizone is visible. We agree with COTTREAU (1934) that *Calliostoma morteauensis* PICTET & CAMPICHE might be synonymous with this species, but this cannot be proved due to the insufficient preservation of D'ORBIGNY's specimen, which is a nomen dubium. PERON (1900) assigned sinistrally coiled shells from the Hauterivian of Gy-Levêque and Fontenoy (Yonne, France) to this species, which he systematically allocates to *Hamusina*. They have 4–5 spiral ribs with irregular tubercles on the whorl face, a noded rib at its abapical margin and spiral ribs on the base.

Family Solariellidae POWELL, 1951

Genus *Solariella* WOOD, 1842

Type species: *Solariella maculata* WOOD, 1842; Pliocene, England.

***Solariella* sp.**
(Pl. 1, Figs 14–15; Pl. 2, Fig. 1)

Material: 1 specimen (NHMW 2011/0052/0011).

Description: The total height of the specimen is 4.1 mm, the diameter 3 mm. The shell is lenticular. An accentuated spiral rib terminates the adapical whorl face externally. The abapical whorl face bears two additional ribs. Seven weaker ribs are developed on the base. All ribs bear weak tubercles. The broad umbilicus is surrounded by a strongly tuberculate rib. There are two further ribs inside the umbilicus. The aperture is rounded.

Discussion: The broadly umbilicate shell with its tuberculate spiral ribs agrees well with *Delphinula sensuyi* VIDAL, 1921 (fide BATALLER 1949). In the latter species, however, the spiral ribs are coarsely tuberculate.

Superfamily Turbinoidea RAFINESQUE, 1815

Family Turbinidae RAFINESQUE, 1815

Subfamily Nododelphinulinae COX, 1969

Gattung *Nododelphinula* COSSMANN, 1916

Type species: *Delphinula buckmanni* MORRIS & LYCETT, 1851; Middle Jurassic; England.

***Nododelphinula* sp.**
(Pl. 2, Figs 2–6)

Material: 3 specimens (NHMW 2011/0052/0012–0014).

Description: The maximum diameter of the largest specimen is 3.2 mm. The shell is broad trochospiral. A carina terminates the broad adapical whorl face, which is inclined and flat to moderately concave. Axial ribs run from the adapical suture towards the carina. They are most prominent near the suture and fade before reaching the carina. The carina is nodose but there is no visible connection to the axial ribs. The abapical whorl face is almost parallel to the shell axis and concave. It is terminated by a (? noded) boundary rib located on the acute edge towards the flat base. The base is distinctly phaneromphalous. The umbilicus is surrounded by a noded spiral rib. The aperture is broad oval.

Discussion: In *Nododelphinula valfinensis* Étallon sensu Sayn (1932) the adapical whorl face is similar but the nodes on the carinae are less accentuated and the umbilicus is narrow compared with the present specimens.

Subfamily Astraeinae Davies, 1935

Genus *Nummogaultina* Kollmann, 2005

Type species: *Solarium dentatum* Deshayes in Leymerie, 1842; Albian, France.

***Nummogaultina tricarinata* nov. spec.**
(Pl. 2, Figs 7–10)

Etymology: After the three prominent spiral ribs, respectively carinae of the last whorl.

Holotype: The specimen figured on Pl. 2, Figs 7–10 (NHMW 2011/0052/0015).

Paratypes: None.

Locus typicus: Locality 1 in Kroh et al. (2010), Serre de Bleyton, SW of Arnayon village, Department Drôme, France.

Stratum typicum: "Coulées boueuses", Barremian, Early Cretaceous.

Diagnosis: The last whorl is high. A median carina angulates the whorl face. The abapical whorl face is terminated abapically by another prominent carina. A comparatively small number of axial ribs running from suture to suture generate nodes at the carinae.

Description: The single specimen has a maximum diameter of 2.6 mm. The shell is low trochospiral. The last whorl is much larger than the preceding ones. The sutures are deep. A carina in the middle of the last whorl gradually increases in strength towards the

last whorl, where it is laterally blade-like expanded. A weaker subsutural rib is developed ontogenetically later and also increases in strength. The boundary rib is strong. The base is flat and the umbilicus broad and deep. Axial ribs run from the adapical suture to the base. They form nodes at the spiral ribs and the carina. Their number and shape are not recognizable because of the unfavourable preservation. The aperture is rounded.

Discussion: This species has the characteristic shell outline of the genus: It is depressed with a convex whorl face and a carina towards the broadly umbilicate base. The carina positioned in the middle of the whorl face, and the axial ribs distinguish the new species from other *Nummogaultina* species.

Subfamily Angariinae GRAY, 1847

Genus *Calliomphalus* COSSMANN, 1888

Type species: *Turbo squamulosus* LAMARCK, 1804; Eocene; France.

***Calliomphalus crucianus* (PICTET & CAMPICHE, 1863) nov. comb.**
(Pl. 2, Figs 11–13)

1863 *Trochus crucianus n. sp.* – PICTET & CAMPICHE: 517, Pl. 86, Figs 11, 12
pars 1907 *Calliomphalus Pellati* – COSSMANN: 18, Pl. 4, Fig. 10 (non: Pl. 4, Figs 8, 9, 11; Pl. 5, Fig. 14)

Material: 7 specimens (NHMW 2011/0052/0016–0018)

Description: The height of the specimen on Pl. 2, Figs 12–13 is 3.5 mm, the diameter 3.7 mm. The shell is moderately trochospiral. A carina divides the whorl face into a broad, oblique subsutural ramp and a moderately convex abapical part. A weaker spiral rib is located on the subsutural ramp between the carina and a heavily noded subsutural rib. Weak axial ribs extend from the suture to the carina. Two rather strong spiral ribs are located abapically of the carina, and about ten more weakly spiral ribs follow towards the center of the base (the exact number is undeterminable). The umbilicus is encircled by a reinforced spiral rib. The aperture is round.

Discussion: In the original description of *Calliomphalus pellati,* COSSMANN (1907) figured at least 2 divergent specimens: Pl. 4, Figs 8, 9, 11, and Pl. 5, Fig. 15, show almost globular shells, whereas *Calliomphalus crucianus* is broad trochospiral. The specimen of Pl. 4, Fig. 10, is 13 mm in height, trochospiral and its whorl face is concave as in *C. crucianus.* Despite the almost complete lack of sculpture, our specimens are therefore transferred to this species.

***Calliomphalus* ? sp.**
(Pl. 2, Figs 14–15; Pl. 3, Fig. 1)

Material: 1 specimen (NHMW 2011/0052/0019).

Description: The low trochiform shell has a maximum diameter of 1.5 mm. The apex is flattened. The convex whorls gain first slowly, later more rapidly in height. The sutures are narrowly canaliculate. A rounded edge forms the margin towards the flat, distinctly umbilicate base. The shell is covered uniformly by axial ribs of equal strength (about ten between the adapical suture and the carina delimiting the base). The umbilicus is surrounded by a slightly stronger spiral rib. The aperture is broad oval but incompletely preserved.

Family Ataphridae Cossmann, 1915

Subfamily Ataphrinae Cossmann, 1915

Tribe Homalopomatini Keen in Knight et al., 1960

Genus *Boutillieria* Cossmann, 1888

Type species: *Turbo eugenei* Deshayes, 1863; Eocene; France.

***Boutillieria* ? sp.**
(Pl. 3, Figs 2–3)

Material: 3 specimens (NHMW 2011/0052/0020–0021).

Description: The maximum diameter of the figured specimen is 2.8 mm. The shell is broad conical. Early whorls are poorly preserved. Two spiral ribs give the whorl face an angular appearance. A third rib of equal strength is positioned at the suture. Three additional ribs on the base become gradually weaker towards the center. The spiral ribs are crossed by numerous prosocyrt axial ribs. The axial ribs are considerably weaker than the spiral ribs and extend from the whorl face to the base without developing distinct nodes. The base is narrowly umbilicate. The aperture is very broad, almost oval and adapically rounded.

Discussion: The generic assignment is mainly based on the combination of the turbiniform shell, the dominant spiral sculpture and the small umbilicus (Knight et al., 1960). The aperture is not preserved and the assignment of the specimens therefore remains provisional.

Family Liotiidae Gray, 1850

Genus *Pseudoliotina* Cossmann, 1925

Type species: *Liotia sensuyi* Vidal, 1921; Maastrichtian; Spain.

***Pseudoliotina* ? *parva* nov. spec.**
(Pl. 3, Fig. 4–6)

Etymology: Lat. *parvus* – small; alluding to the small size.

Holotype: The specimen figured on Pl. 3, Figs 4–6 (NHMW 2011/0052/0022).

Paratypes: None.

Locus typicus: Locality 1 of KROH et al. (2010), Serre de Bleyton, Department Drôme, France.

Stratum typicum: "coulées boueuses", Barremian, Early Cretaceous.

Diagnosis: Shell planispiral, with impressed adapical and abapical umbilici. The abapical whorl face bears a spiral rib and is delimited adapically and abapically by carinae. The shell is densely covered with axial riblets. They are orthocline and extend from suture to suture.

Description: The diameter of the discoidal and planispirally coiled shell is 0.9 mm. The protoconch is insufficiently preserved. Both the adapical whorl face and the base are concave, the ventral side somewhat deeper than the other. The weakly concave abapical whorl face is delimited on both sides by carinate spiral ribs and bears a distinctively weaker spiral in the middle. The whole shell is covered by numerous axial riblets which are broader than the intervals between them. They are orthocline and extend from suture to suture. The aperture outline is trapezoidal.

Discussion: COSSMANN (1925) described *Pseudoliotina* as a subgenus of *Eucycloscala,* while KNIGHT et al. (1960) considered this taxon as a synonym of *Cyclostrema*. In the latter, the lateral side of the whorls is convex and is terminated abapically by a heavily noded keel which circumscribes a broad umbilicus, wheras *Pseudoliotina* possesses a flat base. In the present specimen the aperture is adapically and abapically angular (see Pl. 3, Fig. 6), but the reinforcement of the aperture and its sexangular outline described by COSSMANN in *Pseudoliotina* cannot be observed. For this reason the taxonomic position of this obviously juvenile specimen is not determinable with certainty. Similar shell outlines appear in various gastropod groups. One of them is *Zardinihelix luciensis* GRÜNDEL, 2004 from the Late Bathonian. Typical for *Zardinihelix* are distinctly prosocline growth lines, while they are orthocline in our specimen. Similar shell outlines occur also in *Pseudomalaxis* FISCHER, 1885 (see for example BIELER 1984). This genus has a heterostrophic protoconch.

There is no other explicit species of *Peudoliotina* known besides the type species, *P. sensuyi* VIDAL, 1921 sensu KIEL & BANDEL (2002) from Campanian deposits of Torallola (northern Spain). In this species, the rib on the abapical whorl face and all other carinae are noded.

Costatomphalus nov. gen.

Etymology: Derived from *costate* = possessing a sculpture of costae (collabral rib) and omphalus = Lat. *umbilicus*.

Type species: *Costatomphalus moosleitneri* n. sp., Barremian, South France

Diagnosis: The shell is low trochospiral. The adapical whorl face is moderately convex. The sculpture consists of strong collabral ribs which extend from suture to suture. In the last whorl the adapical whorl face is limited towards the convex abapical whorl face by a rectangular carina. It is limited towards the concave base by another carina. The collabral ribs extend into the broad umbilicus.

Discussion: Other species belonging to *Costatomphalus* are *Solarium dentatocarinatum* Wollemann, 1900 and *Straparolus michaillensis* Pictet & Campiche, 1863 (see below).

Systematially, *Costatomphalus* might belong to the Discohelicidae, but as in other planispiral and trochospiral taxa the systematic position is ambiguous. While *Costatomphalus* is low trochospiral with a rectangular carina towards the convex abapical whorl face and an indistinct carina towards the narrow base, *Discohelix* is discoidal with impressed dorsal and ventral sides and distinct carinae towards the abapical whorl face and the base. In contrast to *Costatomphalus*, both the adapical and the abapical side are concave in the Middle Triassic *Brochidium* Koken, 1889 and the margin of the almost circular aperture is heavily reinforced. The Late Triassic *Sorapisella* Bandel, 1993 is possibly adapically concave and also has strong collabral ribs. Their number is larger and there are no collabral threads in between. In the equally Late Triassic *Brochidiella* Nützel & Erwin, 2001 the collabral ribs are very strong and lack collabral threads in between. The shell is covered by closely spaced, distinct spiral lirae.

Discohelix bandeli Schroeder, 1995 and *Discohelix* sp. by the same author belong to *Costatomphalus* nov. gen., too. They are smaller than our specimens (< 1 mm) but possess angulate whorls and strong collabral ribs. The base is broadly umbilicate. Kaim (2004) has allocated *Discohelix bandeli* to the Skeneidae and Kano et al. (2009) to the family Seguenzoidea Verrill, 1884.

Costatomphalus moosleitneri nov. spec.
(Pl. 3, Figs 7–9)

Etymology: Dedicated to Gero Moosleitner, who has collected the fossil material and made it available for scientific investigations.

Holotype: The specimen figured on Pl. 3, Figs 7–9 (NHMW 2011/0052/0023).

Paratypes: None.

Locus typicus: Locality 1 of Kroh et al. (2010), Serre de Bleyton, SW of Arnayon village, Department Drôme, France.

Stratum typicum: "coulées boueuses", Barremian, Early Cretaceous.

Diagnosis: See diagnosis of genus.

Description: The discoidal shell has a maximum diameter of 2.1 mm and is adapically flat. The sutures are deep. The base is moderately convex and broadly umbilicate. A distinct carination, which is reinforced by a rib, separates the adapical from the abapical whorl face. A carina between the lateral whorl face and the base is only weakly developed. Strong, almost sharp axial ribs extend from suture to suture, numbering 19 on the last whorl. They are somewhat noded at the carina separating the upper and the lateral whorl face. The distance between the ribs increases with ontogeny. The space between the main ribs is covered by smaller axial ribs (close to the aperture 7–8). The aperture outline is trapezoid.

Discussion: Strong axial ribs extend in *Costatomphalus moosleitneri* nov. spec. from the whorl face over the convex base into the umbilicus. *Solarium dentatocarinatum* WOLLEMANN, 1900: 161, Pl. 8, Figs 3, 4), from Barremian deposits of the Moorhütte near Braunschweig, North Germany, is closely related to *C. moosleitneri* but has fold-like ribs on the dorsal side and tubercles around the extremely broad umbilicus.

Costatomphalus michaillensis (PICTET & CAMPICHE, 1863) nov. comb.
(Pl. 3, Figs 10–12)

1863 *Straparolus Michaillensis* nov. sp. – PICTET & CAMPICHE: 556, Pl. 88, Fig. 13.

Material: 11 specimens (FO 1 and FO 2) (NHMW 2011/0052/0024–0026).

Description: The figured specimen has a maximum diameter of 4.5 mm and a total height of 2.7 mm. The first whorls are planispirally coiled, convex and probably smooth. The steepness of the coiling increases gradually in the final whorls of larger specimens. A carina developing shortly afterwards is reinforced by a prominent spiral rib. On later whorls, the lower whorl face bears two additional spiral ribs and another one at the margin towards the base. Two indistinct spiral ribs each are developed below the adapical suture and on the base. Axial ribs appear gradually, first on the lower whorl face and on the base, later also on the upper whorl face. They extend from the adapical suture to the large umbilicus. They are weak in the beginning but increase rapidly in strength and are finally bulging and prominent. There are 12 axial ribs on the final whorl of the figured specimen; these ribs are noded at the intersections with spiral ribs. The aperture is rounded.

Discussion: This species differs from *C. moosleitneri* nov. spec. by its more prominent and less numerous axial ribs. In contrast to the present genus, the exclusively Palaeozoic genus *Straparollus* DE MONTFORT is discoidal to low turbiniform and generally smooth (Knight et al. 1960).

? Familie Liotiidae Gray, 1850

Liotiidae indet.
(Pl. 3, Figs 13–15)

Material: 4 specimens (NHMW 2011/0052/0027–0028)

Description: The figured specimen has a maximum diameter of 2.4 mm and a total height of 1.7 mm. The shell is broad conical, its whorls are convex and the sutures impressed. The sculpture is hardly preserved, consisting of a few spiral ribs on both the whorl face and the base. They are relatively strong and of equal strength. The whorl face passes without a strict margin into the moderately convex base, which is relatively broad and deeply umbilicate. Towards the aperture the last whorl is loosely coiled. The aperture is circular, the peristome varicose.

Discussion: These specimens presumably represent a new genus but the preservation is insufficient to introduce a new taxon. The turbiniform shell, the orbicular and varicose aperture, and the irregular coiling of the last whorl are reminiscent of members of the Liotiidae. In *Crossotoma* Morris & Lycett, 1851, the aperture is equally orbicular but much larger than in the Liotiidae and the shell is smooth. Under *Turbo fenestratus* d'Orbigny, 1850, Peron (1900) figured a Hauterivian specimen in which the last whorl is equally loosely coiled towards the final stage of ontogeny. It is a younger synonym of *Turbo yonninus* d'Orbigny, 1842, which Kollmann (2005) transferred to *Metriomphalus*. In contrast to the present specimen, the space between the rows of nodes is narrow.

Superfamily unknown
Family Discohelicidae Schröder, 1995
Genus *Brouzetdiscus* nov. gen.

Etymology: Derived from the community Brouzet-lès-Languedoc, type locality of this species and the ending *-discus* = Lat. disc.

Type species: *Discohelix brouzetensis* Cossmann, 1916, p. 20, Pl. 2, Figs 14–16: Barremian; southern France.

Diagnosis: The discoidal shell consists of a few whorls increasing rapidly in diameter. The adapical whorl face is flat to moderately convex. The abapical whorl face is delimited adapically and abapically by rounded carinae. The base is broadly umbilicate. There is either no sculpture or it is only weakly developed. The aperture is generally rectangular in outline with rounded edges.

Discussion: The whorls gain more rapidly in size in *Brouzetdiscus* nov. gen. than in *Discohelix*, and its abapical whorl face is concave. The sculpture consists of close and weak axial ribs in *Brouzetdiscus*, while there is a row of strong nodes in *Discohelix*. *Cenocampoides* Kollmann, 2005 differs from this genus by its lack of carinae,

respectively keels and whorls, which are circular in cross-section. *Platybasis* COSSMANN, 1915, possesses a single, acute carina and axial ribs in ontoenetically earlier whorls.

***Brouzetdiscus* ? *carinatus* nov. spec.**
(Pl. 4, Figs 1–6)

Etymology: Lat. *carina*; from the carinate whorls.

Holotype: The specimen figured on Pl. 4, Fig. 1–5 (NHMW 2011/0052/0029).

Paratypes: 11 specimens (localities 1 and 2) (NHMW 2011/0052/0030–0032).

Locus typicus: Locality 1 of KROH et al. (2010), Serre de Bleyton, SW of Arnayon village, Department Drôme, France.

Stratum typicum: "coulées boueuses", Barremian, Early Cretaceous.

Diagnosis: See generic diagnosis. The abapical whorl face is delimited by distinct carinae, yielding a trapezoidal whorl outline. The sculpture consists of numerous weak axial ribs.

Description: The maximum diameter of the figured specimens is 2.5 mm and 2.7 mm. The planospirally coiled shell is adapically and abapically concave, the latter slightly more so. The cross-section of the whorls is trapezoidal. The abapical whorl face is concave and delimited on boths sides by strong carinae. The adapical carina is slightly less prominent. The whorls are covered by minute, densely spaced axial ribs. They are orthocline on the dorsal and ventral side and weakly opisthocyrt laterally. The sculpture is only partly preserved.

Discussion: This species differs from the type species by its distinct carinae and the axial sculpture. It is therefore assigned with some reservation to *Brouzetdiscus* nov. gen. In the paratypes, the carinae vary between very strong to almost non-existing.

Genus *Colpomphalus* COSSMANN, 1915

Type species: *Straparollus altus* D'ORBIGNY, 1853; Bathonian; France.

***Colpomphalus spiralocostatus* nov. spec.**
(Pl. 4, Figs 7–10)

Etymology: After the distinct spiral ribs.

Holotype: The specimen on Pl. 4, Figs 7–9 (NHMW 2011/0052/0033).

Paratypes: 9 specimens (locality 1 and 2) (NHMW 2011/0052/0034–0036)

Locus typicus: Locality 1 of KROH et al. (2010), Serre de Bleyton, SW of Arnayon village, Department Drôme, France.

Stratum typicum: "coulées boueuses", Barremian, Early Cretaceous.

Diagnosis: The shell is low trochospiral. The upper whorl face is flat and delimited by a carina, which is noded in large specimens. The lower whorl face is convex to concave, the umbilicus is broad and delimited by a noded carina. The shell is covered by spiral ribs of equal strength.

Description: The maximum diameters of the figured specimens are 2.4 mm and 1.8 mm. The diameter of the largest specimen is 4.0 mm. The shell is flat trochospiral. Delicate collabral ribs on the adapical whorl face are only locally preserved. An acute carina delimiting the upper whorl face is weakly noded in larger specimens. The abapical whorl face is moderately convex to concave and converges towards the base. The umbilicus is broad and delimited by a noded carina. Weak axial ribs extend from the nodes into the umbilicus. The whole shell including the umbilicus is evenly covered with minute spiral ribs.

Discussion: Hitherto, the genus is exclusively known from the Lower and Middle Jurassic (Gründel 2003, 2005). In the similar *Discohelix biconcava* Cossmann, 1916 the whorl face is not carinate and the number of spiral threads is considerably larger. Juvenile stages of the Bathonian *Discohelix? disculum* (Morris & Lycett, 1851) sensu Gründel (2004) are similar, but late ontogenetic stages differ by varicose sculptural elements.

***Colpomphalus* ? sp.**
(Pl. 4, Fig. 11–14)

Material: 1 specimen (NHMW 2011/0052/0037).

Description: The height of the low trochospiral shell is 4.2 mm. Details cannot be recognized on the spire whorls due to the poor preservation. In the last whorl the adapical whorl face is oblique and limited abapically by a blunt carina. Another carina delimits the narrow and slightly inclined abapical whorl face towards the base. The base is only feebly convex. A spiral rib encircles the broad umbilicus. Eight large axial costae extend from the suture to the umbilicus and form blunt nodes at the carinae. Apart from a slight adapical angulation the aperture is circular.

Genus *Cenocampoides* Kollmann, 2005

Type species: *Solarium scalare* d'Orbigny, 1842; Cenomanian; France.

***Cenocampoides* sp.**
(Pl. 4, Figs 15–17)

Material: 1 specimen (NHMW 2011/0052/0038)

Description: The single specimen has a maximum diameter of 0.8 mm. The shell is planispiral, adapically flat and abapically umbilicate. The diameter of the protoconch, which comprises one complete whorl, is 0.22 mm. Only little more than two whorls of the teleoconch are preserved. They are rounded and covered by spiral ribs. The ribs are most prominent on the whorl face and make the whorls appear carinate towards the lateral side.

Discussion: The planispiral, umbilicate shell, the whorls which are circular in cross-section, and the strong spiral ribs identify this single specimen as belonging to *Cenocampoides* KOLLMANN, 2005. COSSMANN (1916, 1918) has assigned 3 planispiral shells from the Barremian of south France to *Discohelix: D. biconcava, D. brouzetensis and D. pangymna.* The abapical whorl face is convex and delimited by two carinae in *D. brouzetensis* but keeled in *D. biconcava*. Like *Cenocampoides* they belong to the Euomphalidae, but a generic assignment is not possible. *D. pangymna* is allocated to *Lychnus* (see there).

Subclass Neritimorpha KOKEN, 1896

Order Cycloneritimorpha FRÝDA, 1998

Superfamily Neritoidea RAFINESQUE, 1815

Family Neritidae RAFINESQUE, 1815

Genus *Neridomus* MORRIS & LYCETT, 1851

Type species: *Neridomus anglica* COX & ARKELL, 1950 [= *Nerita* (*Neridomus*) *hemisphaerica* ROEMER, 1836 sensu MORRIS & LYCETT, 1851, non *Nerita hemisphaerica* ROEMER, 1836. Non: *Neridomus nuda* (PIETTE) sensu COSSMANN, 1925 (pars); non *Nerita nuda* PIETTE, 1855; see COX & ARKELL 1950, p. 65]; Bathonian; England.

Discussion: In their monograph on the gastropods of the English Great Oolite, MORRIS & LYCETT (1851) established *Neridomus* as a subgenus of *Nerita* and defined it as follows: "Shell smooth, ovately globose; spire small, oblique; last whorl very large; aperture ovate, or semilunar; outer lip thick; inner lip thick, convex, and smooth". MORRIS & LYCETT allocated two species to this subgenus: *Nerita hemisphaerica* ROEMER and *Nerita minuta* SOWERBY but did not select a type species. F. A. ROEMER (1836) had described *Nerita hemisphaerica* based on an inadequately preserved internal mould of which he figures the abapertural side. The last whorl is very large and the whorls are adpressed. COX & ARKELL (1950) consider it as an ampullinid. The specimen described and figured by MORRIS & LYCETT under this name (Pl. 11, Figs 16, 16a) is totally different: It is globular with a short but distinct spire and convex whorls. The aperture with its broad inductura and the columellar septum identifies it as Neritidae.

On p. 43, Pl. 6, Fig. 4 of the same monograph, MORRIS & LYCETT (1851), described a new species under *Natica neritoidea.* The figure shows an eroded internal mould which

resembles the original figure of *Nerita hemisphaerica* Roemer. Without describing it properly, Pietте (1855), introduced the name *Nerita nuda* for a species from Rumigny, France, and emphasized the close affinity with *Natica neritoidea.* Cossmann (1925) applies this name to *Nerita hemisphaerica* Morris & Lycett (non Roemer) and considers it as type species of "*Neritodomus*" (which is a misspelling of the original name by Morris & Lycett). He is later followed by Wenz (1938). Finally, Cox & Arkell (1950) changed the name of *Nerita hemisphaerica* Morris & Lycett (non Roemer) into *Neridomus anglica* and declared it as type species of *Neridomus.* They are followed by Knight et al. (1960).

***Neridomus* sp.**
(Pl. 5, Figs 1–2)

Material: 5 specimens (NHMW 2011/0052/0039–0040).

Description: The shell is globular and smooth. Although the maximum diameter of the figured specimen is only 23 mm, specimens may become much larger. The height of the last whorl is about 9/10 of the total height. The aperture is semicircular. The outer lip is flaring, the inductura is semicircular in outline and flat. The columellar lamella is straight and acute.

Discussion: The shell outline, the flaring peristome and the shape of the aperture comply with those of the genus *Neridomus*. A ridge close to the parietal margin inside the aperture, as shown by Gründel (1975) is not visible.

Two species of *Neridomus* are known from the Urgonian facies: *N. dolichostoma* Cossmann, 1907 and *N. barremicus* Sayn, 1932. The first is roughly globular and its sutures are weakly impressed. In *N. barremicus* the whorls form a subsutural ramp, the spire is elevated and the sutures are well discernible. Our specimens share the pronounced spire with *N. barremicus* but lack the subsutural ramp.

Family Pileolidae Bandel, Gründel & Maxwell, 2000

Genus *Pileolus* G. B. Sowerby I, 1823

Type species: *Pileolus plicatus* G. B. Sowerby I, 1823; Bathonian; England.

***Pileolus* aff. *michaillensis* Pictet & Campiche, 1863**
(Pl. 5, Figs 3–5)

? 1863 *Pileolus michaillensis n. sp.* – Pictet & Campiche: 413, Pl. 76, Fig. 8.
? 1900 *Pileolus michaillensis* – Cossmann: 529, Pl. 2, Fig. 4–6.
? 1916 *Pileolus michaillensis* – Cossmann: 386: Pl. 11, Fig. 42–43.

Material: 7 specimens (FO 1 and 2) (NHMW 2011/0052/0041–0044)

Description: The total height of the figured specimen is 4.5 mm. The shell is low cap-shaped with a posterior apex. The dorsal side bears a variable number of radial ribs (between 12 and 20) and sometimes additional, weaker ribs in between. The ventral side is flat with a moderately convex septum. Compared with the shell height, the aperture is very broad. Its anterior and posterior margins are broadly rounded, the inner lip is almost straight.

Discussion: From the Urgonian facies of south France, 4 species of *Pileolus* have been recorded:

- *P. inaequicostatus* COSSMANN, 1916
- *P. urgonensis* PICTET & CAMPICHE, 1863
- *P. michaillensis* PICTET & CAMPICHE, 1863
- *P. altus* SAYN, 1932

These taxa have been distinguished based on their height, the excentricity of the nucleus and the number and strength of the ribs. Our specimen fits into *P. michaillensis* PICTET & CAMPICHE by the height of the shell and the sculpture. This allocation is, however, doubtful as the dorsal side is heavily eroded, the ribs are only incompletely preserved and the exact position of the nucleus cannot be determined.

Subclass Caenogastropoda COX, 1960

Order Cerithiimorpha GOLIKOV & STAROBOGATOV, 1975

Superfamily Cerithioidea FLEMING, 1822

Family Cryptaulacidae GRÜNDEL, 1976

Remarks: The content and the delimitation of this family against the Procerithiidae by BANDEL (2006) need a thorough rconsideration which, however, cannot be the subject of this faunal descripon. The following generic allocations are therefore provisional.

Genus *Infacerithium* GRÜNDEL, 1974

Type species: *Procerithium* (*Infacerithium*) *klebyensis* GRÜNDEL, 1974; Bathonian-Callovian; NW Poland.

***Infacerithium* ? sp.**
(Pl. 5, Figs 6–9)

Material: 10 specimens (localities 1 and 2) (NHMW 2011/0052/0045–0049).

Description: The height of the larger figured specimen is 6 mm. The shell is high turriform and the whorls are convex with indistinct and slightly inclined ramps. The

sutures are accentuated. Each whorl bears 13–15 orthocline to weakly opisthocline spiral ribs with broad intervals between them. They are crossed by 4–5 weak spiral ribs. The intersections between the ribs are noded. The base is moderately convex, delimited by a rib towards the whorl face, and bears an unknown number of spiral ribs. The aperture is rounded rectangular.

Genus *Cryptaulax* Tate, 1869

Type species: *Procerithium* (*Xystrella*) *protortile* Cox, 1969; Callovian; France.

***Cryptaulax* ? sp.**
(Pl. 5, Figs 10–11)

Material: 7 fragments (NHMW 2011/0052/0050–0052).

Description: The height of the figured specimen is 7.3 mm, the maximum diameter 2.2 mm. The whorls of the very slender shell are high and the sutures broad and canaliculate. There are three strong spiral ribs and a weaker subsutural rib on each whorl. They are crossed by 6–7 narrow but prominent axial ribs which extend from suture to suture. Their strength decreases in a depression adjacent to the adapical suture. Nodes are generated at the intersections between the spiral and axial ribs. It is not certain that additional weak spiral ribs are developed between the large spiral ribs. The flat base is delimited towards the whorl face by a carina which bears an additional spiral rib. The axial ribs end at this carina.

Discussion: *Cryptaulax* sp. may be synonymous with *Procerithium* (*Rhabdocolpus*) *cureti* Cossmann, 1916, but the original figure is too indistinct to distinguish details.

Our specimens differ by their very slender shell, numerous whorls and few but twisting axial ribs from typical representatives of the genus. They compare well with Middle Jurassic species of *Cryptaulax* [for example *Cryptaulax hystrix* (Eudes-Deslongchamps, 1843), *C. tetrataeniatum* Cossmann, 1913]. In *Ageria* Abbass, 1973, the whorls are distinctly broader compared with their height, the whorl face is mostly convex and the sculpture more complex (see Abbass 1973; Kollmann 2005).

Cryptaulacidae ? gen. et sp. indet.
(Pl. 5, Figs 12–13)

Material: 1 specimen (NHMW 2011/0052/0053).

Description: The total height of the specimen is 3 mm. The shell is very slender and consists of numerous whorls which are twice as broad as high. The whorl face is slightly convex in early ontogenetic stages but almost flat in later ones. The sutures are narrow and only slightly canaliculate. The sculpture consists of approximately 15 markedly opisthocline axial ribs on each whorl which extend from suture to suture. They are

crossed by two spiral grooves in the abapical portion. The border towards the moderately convex base is carinate. The originally obviously rounded aperture is incompletely preserved.

Discussion: This incompletely preserved specimen is provisionally compared with *Procerithium* because of the affinity of the shell outline and the sculpture with the type species, *P. quinquegranosum* COSSMANN (in CHARTRON & COSSMANN, 1902) from the Hettanginian (Lower Jurassic) of the Vendée, France (see GRÜNDEL 1997). A close relationship is, however, unlikely.

Family Cerithiidae FLEMING, 1822

Subfamily Uchauxiinae KOLLMANN, 2005

Genus *Provolibathra* KOLLMANN, 2005

Type species: *Cerithium prosperianum* D'ORBIGNY, 1843; Turonian; France.

***Provolibathra* ? *dubiosa* (COSSMANN, 1918) nov. comb.**
(Pl. 5, Fig. 14–15)

1918 *Exechestoma? dubiosum* n. sp. – COSSMANN: 368, Text-fig. 16.

Material: 11 specimens (NHMW 2011/0052/0054–0056).

Description: The height of the larger of the two figured specimens is 5.2 mm, its maximum diameter 2.7 mm. The whorls are convex and the sutures impressed. The sculpture consists of 6 narrow spiral ribs and 11–13 costae on each whorl. The costae bear small nodes. The base is moderately convex and carinate towards the whorl face. The aperture is oblique with a short abapical channel.

Discussion: COSSMANN (1918) has assigned this species with reservations to the genus *Exechostoma* COSSMANN, 1889 (Potamididae). It does not, however, possess the re-inforced sigmoidal labrum typical for this family.

Family Metacerithiidae COSSMANN, 1906

Genus *Metacerithium* COSSMANN, 1906

Type species: *Cerithium trimonile* MICHELIN, 1838; Albian; France.

Discussion: Based on a smooth and globular protoconch consisting of 2–2½ whorls which is terminated by a distinct varix, KIEL et al. (2000) allocated *Metacerithium* to the Campaniloidea. According to KOLLMANN (2005), *Metacerithium ponsi* KIEL et al., on which this allocation was based, does not belong to this genus but to the Campaniloidea and does not support the new assignment of *Metacerithium*. However, TRACEY (2010, Pl.

21, Fig. 11) has reported a comparable protoconch in the type species of *Metacerithium, M. trimonile* (Michelin).

In contrast to this analogy of protoconchs, there are considerable differences between the teleoconchs of the Metacerithiidae and the Campanilidae (Kollmann 2005). While the labrum and the growth lines are opisthocline in *Campanile*, they are opisthocyrt in *Metacerithum*. The aperture is flaring, with a distinct twisted siphonal canal and a subsutural canal in *Campanile*, while it is low and rhombic in outline in *Metacerithium*.

Judging from the morphology of the teleoconch, *Metacerithium* therefore differs considerably from the Campaniloidea. We therefore share the doubts of Tracey (2010) whether the described protoconch is actually exclusively specific for the Campaniloidea.

Metacerithium coquandi (Pictet & Campiche, 1863) nov. comb.

(Pl. 5, Figs 16–17)

1863 *Cerithium Coquandi* Pictet & Campiche: 284, Pl. 71, Figs 4, 5.

Material: 7 specimens (NHMW 2011/0052/0057–0059).

Description: The height of the larger figured specimen is 5.5 mm, its diameter 2.2 mm. There are broad shells (Pl. 5, Fig. 17) and more slender shells (Pl. 5, Fig. 6). The sides of the shells are flat, the sutures are hardly visible. The sculpture consists of 3, in later whorls 4 densely noded spiral ribs of approximately equal strength. Numerous weak axial ribs extend from suture to suture. A carina bearing a rib delimits the whorl face abapically. The base is flat and bears at least one additional spiral rib.

Discussion: The base, which typically is flat in *Metacerithium*, is not preserved in the specimens of Pictet & Campiche (1863). The flat whorls and the sculpture of noded spiral ribs are, however, identical in our specimens. There is a dimorphism of braod and more slender shells, which is also observable in the the type species *M. trimonile* (Michelin). Pictet & Campiche mention a "forme pupoide" in *M. coquandi*. It cannot be recognized in our specimens and might have developed in later ontogenetic stages.

Family Paracerithiidae Cossmann, 1906

Genus *Paracerithium* Cossmann, 1902

Type species: *Paracerithium acanthocolpum* Cossmann, 1902; Hettangian; France.

Paracerithium ? sp.

(Pl. 6, Fig. 1)

Material: 2 specimens (NHMW 2011/0052/0060–0061).

Description: The height of the figured specimen is 4.3 mm. The apex is not preserved. The teleoconch is high trochospiral with convex whorls and an impressed suture. Six spiral ribs of equal strength are regularly distributed over the whorl face. Their intervals are as broad as the ribs themselves. The whorl face merges into the moderately convex base, which is anomphalous and covered with (poorly preserved) spiral ribs. The aperture is very broad and oval, almost circular.

Discussion: The broad turriculate shell and the convex whorls resemble those of *Paracerithium* COSSMANN, 1902: 173. The type species, *Paracerithium acanthocolpum* COSSMANN, differs by fewer and more acute axial ribs. The small siphonal canal which is typical for *Paracerithium* is not visible in our specimens. Their allocation to *Paracerithium* therefore remains uncertain.

Family Cerithideidae HOUBRICK, 1988

? Genus *Atractostoma* SAYN, 1932

Type species: *Atractostoma gibbosa* SAYN, 1932; Lower Cretaceous; France.

Diagnosis (after Sayn 1932, translated from the French and shortened): The whorls besides the last are moderately convex and increase regularly in size. The last whorl is disproportionately larger. The sculpture consists of strong collabral ribs and more delicate spiral ribs. The collabral ribs disappear on the last whorl. The aperture is oblique and the peristome varicose with an abapical beak and an adapical channel.

Discussion: The shell outline, the disappearance of the collabral ribs, and the aperture are in accordance with other representatives of the Cerithideidae. *Atractostoma* differs from other genera by its enlarged last whorl and its strong collabral ribs.

***Atractostoma gibbosa* SAYN, 1932**
(Pl. 6, Figs 2–3)

1932 *Atractostoma gibbosum* n. sp. – SAYN: 40, Pl. 3, Figs 14–16, Text-fig. 8.

Material: 2 specimens (NHMW 2011/0052/0062–0063).

Description: The height of the figured specimen is 8 mm, its maximum diameter 5.5 mm. The whorls are weakly convex, the aperture is canaliculate. The whorls have broad costae. Two prominent spiral ribs let the last whorl appear angulated. The whorl face between them bears some weak spiral ribs. No costae are developed in the final growth stages. The boundary rib to the base is located on an indistinct carina. The aperture is holostomatous and the labrum varicose. The aperture is flaring and ends abapically in a short canal. The labrum spreads adapically.

Discussion: The figures by SAYN (1932) are suboptimal and the preservation of the present specimens is mediocre. The increased size of the last whorl, the disappearance of

the collabral ribs on the last whorl and the aperture with its abapical beak and adapical channel are, however, indicative for the specific assignment.

Genus *Urgonella* Cossmann, 1916

Type species: *Urgonella mumiola* Cossmann, 1916; Barremian; France.

***Urgonella mumiola* Cossmann, 1916**
(Pl. 6, Figs 4–6)

1916 *Urgonella mumiola* n. sp. – Cossmann: 360, Pl. 10, Figs 27–28.
1932 *Urgonella mumiola* Cossmann – Sayn: 44, Pl. 3, Figs 25, 25a.

Material: 10 specimens (NHMW 2011/0052/0064–0067).

Description: The height of the larger figured specimen is 7.5 mm, its maximum diameter 2.5 mm. The shell is very slender. The whorls are much broader than high, with modestly convex sides and only slightly impressed sutures. The diameter of the whorls increases faster at the beginning than in later growth stages. Accordingly, the spire converges towards the apex in early ontogenetic stages and becomes cylindrical later on. Of the 5–6 spiral ribs, the subsutural rib is generally most prominent. The 10–12 smooth and opisthocline axial ribs are distant from each other. The base is flat. The aperture is low and distinctly siphonostomatous.

Discussion: In the original description, Cossmann (1916) emphasized the high variability of this species. Besides specimens with noded ribs in the 15 initial whorls and smooth ribs in later ones (like in the figured specimen), others are noded throughout ontogeny or lack nodes entirely.

The shell and whorl outline is the same as in *Cerithium clementinum* d'Orbigny, 1843 from the Hauterivian of the Paris Basin. Based on its small siphonal plait, Kollmann (2005) assigned this species with reservations to *Alocaxis* Cossmann, 1889. This taxonomically relevant criterion has neither been observed by Cossmann (1916) and Sayn (1932) nor does it occur in our specimens. The specimens from the Urgonian facies therefore clearly represent another taxon.

Family Potamididae H. & A. Adams, 1854

Genus *Exechocirsus* Cossmann, 1906

Type species: *Cerithium cingillatum* Zekeli, 1852; Santonian; Austria.

***Exechocirsus* ? sp.**
(Pl. 6, Figs 10–11)

Material: 3 specimens (NHMW 2011/0052/0072–0074).

Description: The height of one of the figured specimens is 2.9 mm, the diameter 1.5 mm. The whorls of the high trochospiral shell are low and the sutures flush. Whorl diameter is greatest just above the abapical suture. Each whorl bears two distinct spiral ribs. In late ontogenetic stages an additional weaker rib appears in between. Numerous weakly opisthocyrt axial ribs extend from suture to suture and are noded at the intersections with the spiral ribs. Following the distinct rib delimiting the whorl face, additional spiral ribs may have been located on the convex base but are not discernible with certainty. The aperture is distinctly excavated abapically.

Discussion: *Cerithium limaeformis* BUVIGNIER, 1852: 41, Pl. 4, Figs 3a, b from the "Calcaire à spatangue" (of Hauterivian age according to the Lexique stratigraphique) belongs to the same genus. It is more slender and has three rows of nodes. *Exechocirsus pustulosus* J. DE C. SOWERBY, 1832 from the Late Cretaceous Gosau Group has 4 rows of nodes (see ABBASS 1973)

Cerithioidea, family indet.

Genus *Tomaszoviella* KAIM, 2001

Type species: *Tomaszoviella polonica* KAIM, 2001; Valanginian; Poland.

***Tomaszoviella cureti* (COSSMANN, 1918)? nov. comb.**
(Pl. 6, Fig. 7)

? 1918 *Procerithium* (*Rhabdocolpus*) *Cureti*. – COSSMANN: 364, Pl. 11, Figs 7–8.

Material: 1 specimen (NHMW 2011/0052/0068).

Description: The total height of the slender shell is 4.5 mm. The whorls are low and convex, the sutures channelled. The sculpture consists of approximately 11 orthocline axial ribs on each whorl. They extend from suture to suture, are most prominent in the adapical half, and are generally arranged in continuous rows the length of the shell. The base is moderately convex. The last whorl is detached and deflected downward.

Discussion: Axial ribs extending from suture to suture and the detached last whorl are characteristic for *Tomaszoviella* KAIM. The keel described by KAIM (2001, 2004) in the abapical portion of the whorl face is only indistinctly recognizable. Because of the strong erosion of the shells, which was already mentioned by COSSMANN (1918), the assignment of our single specimen remains doubtful.

Cryptaulacidae (gen. indet.) *bruni* (COSSMANN, 1916)
(Pl. 6, Fig. 9)

1916 *Nerinella Bruni* n. sp. – COSSMANN: 15, Pl. 1, Figs 13–14.

Material: 1 fragment (NHMW 2011/0052/0071)

Description: The height of the fragment is 6.1 mm, its maximum diameter 1.1 mm. The very slender shell consists of numerous whorls which increase slowly in size. The whorl face is flat and the sutures only moderately grooved. Four prominent spiral ribs of equal strength are evenly spread over the whorl face. There are only a few axial ribs. They extend from suture to suture and are slightly noded at the intersections with the axial ribs. The base is moderately convex but no details are visible.

Discussion: This species definitely does not belong to *Nerinella*, to which it was allocated by Cossmann (1916). The sculpture of spiral ribs extends from suture to suture. There is neither a visible subsutural notch which would identify the species as belonging to the Nerineoidea nor is there a trace of a siphonal canal which identifies the Nerinellidae within the Nerineoidea. The systematic position is therefore uncertain. The basally rounded aperture suggests a systematic position of the high and narrow turriculate shell in the Cryptaulacidae.

Superfamily Campaniloidea Douvillé, 1904

Family Diozoptyxidae Pchelintsev, 1965

Genus *Diozoptyxis* Cossmann, 1896

Type species: *Nerinea monilifera* d'Orbigny, 1842; Cenomanian; France.

***Diozoptyxis* sp.**
(Pl. 6, Figs 12–13)

Material: 7 fragments (NHMW 2011/0052/0075–0077).

Description: The total height of the specimens figured in Pl. 6, Fig. 13 is 3.5 mm and the maximum diameter 1.5 mm. The multispiral shell is very slender. The whorl face is broad and strongly carinate in the middle. The sutures are deep. The strong axial ribs (about 15 per whorl) extend from suture to suture and are mammilate at the median carination. In later whorls a small additional rib may appear between the carina and the abapical suture. On the last whorl, the axial ribs end at the rib delimiting the whorl face abapically. The base is slightly convex and narrowly umbilicate. The aperture features a distinct, weakly inclined canal but is incomplete in all specimens.

Discussion: The umbilicus and the slightly oblique canal are characteristic for *Diozoptyxis* Cossmann, 1896. *D. coquandiana* (d'Orbigny, 1842) and *D. renauxiana* (d'Orbigny, 1842), both of Barremian age, were allocated to *Diozoptyxs* by Cossmann (1907). In contrast to this genus, their columella is hollow and they exhibit strong internal plaits. Kollmann (2005) has therefore assigned them to the Nerineoidea genus *Pchelincevia* Lyssenko & Aliev, 1987.

Order Littorinimorpha Golikov & Starobogatov, 1975

Superfamily Littorinoidea Children, 1834

Family Pickworthiidae IREDALE, 1917

Genus *Bleytonella* nov. gen.

Etymology: From the type locality.

Type species: *Bleytonella circumlata* nov. spec.

Diagnosis: Shell high turriculate with detached final whorl. The protoconch is not known. The sculpture consists of a few strong axial ribs and weaker spiral ribs which are evenly distributed over the whorls. The aperture is circular, the peristome is flange-like expanded in adult specimens.

Discussion: The obliquely attached protoconch, which distinguishes the Pickworthiidae from other families (BANDEL & KOWALKE 1997), could not be observed in *Bleytonella circumlata* nov. spec. It is assigned to this family because of the circular, reinforced aperture which it shares with other genera. These include the late Cretaceous *Urceolabrum* WADE (1916) (see SOHL 1960, 1964 and DOCKERY 1993) and the extant genera *Sansonia* JOUSSEAUME and *Gania* BANDEL & KOWALKE, 1997. *Bleytonella* nov. gen. differs by its turriculate shell and especially by its detached last whorl from other genera of the Pickworthiidae.

***Bleytonella circumlata* nov. spec.**
(Pl. 6, Figs 14–16)

Etymology: Lat. *circumlatus* – circular, from the circular aperture.

Holotype: The specimen figured on Pl. 6, Figs 14–16 (NHMW 2011/0052/0078).

Paratypes: 5 specimens (NHMW 2011/0052/0079).

Locus typicus: Locality 1in KROH et al. (2010), Serre de Bleyton, SW of Arnayon village, Department Drôme, France.

Stratum typicum: "Coulées boueuses", Barremian, Early Cretaceous.

Diagnosis: As for the genus.

Description: The height of the figured specimen is 4.0 mm, the diameter 1.6 mm. The whorls of the slender shell are convex, the sutures are strongly impressed. In adult specimens, the final whorl is detached completely from the preceding one and is directed in an abapical and lateral direction. The sculpture consists of spiral and axial ribs. In the tightly coiled part of the shell, the sculpture consists of 7–8 spiral and 10–12 axial ribs per whorl. The axial ribs are moderately flaring, straight and extend from suture to suture. The sculpture decreases in strength on the detached whorl.

Discussion: *Scalaria brevis* PICTET & CAMPICHE, 1862: 331, Pl. 72, Figs 11a,b from Aptian deposits of the Swiss Jura is also included in *Bleytonella*. The last whorl is equally detached but the number of spiral and axial ribs is higher and the shell is broader and not as high as in *Bleytonella circumlata* nov. spec. Another species of *Bleytonella* is

Turbo michaillensis PICTET & CAMPICHE, 1862: 475, Pl. 83, Figs 2a–c, of the "Urgonian" of the Swiss Jura Chain. The shell outline is the same but there are fewer spiral ribs. A specimen from Bogaris (Drôme, France) allocated by SAYN (1932: 50, Pl. 4, Figs 10, 10a) to *Turbo michaillensis* PICTET & CAMPICHE does not belong to *Bleytonella* nov. gen. It is loosely coiled but much broader, the final whorl is not detached and the number of spiral ribs is higher.

Superfamily Rissooidea GRAY, 1847

Family Palaeorissoinidae GRÜNDEL & KOWALKE, 2002

Genus *Buvignieria* COSSMANN, 1921

Type species: *Rissoina unicarina* BUVIGNIER, 1852; Oxfordian; France.

***Buvignieria* sp.**
(Pl. 6, Figs 17–20)

Material: 19 specimens (NHMW 2011/0052/0080–0083)

Description: The height of the specimen figured on Pl. 6, Fig. 17–18 is 1.8 mm, and 2.8 mm in the specimen on Pl. 6, Fig. 19. The moderately broad shell consists of distinctly carinate whorls. The carina is located close to the adapical suture in early whorls and around the middle of later whorls. A spiral rib might be located between the adapical suture and the carina in the specimen figured on Pl. 6, Fig. 17–18, but it is not visible in other specimens. Numerous straight to slightly opisthocline axial ribs extend from suture to suture and generate weak nodes at the carina. They end at the boundary rib towards the base. The sculpture seems to be reduced on the last whorl of adult specimens. The base is imperforate, weakly convex and covered by at least 5 spiral ribs of equal strength. The aperture is broad oval and adapically angulate. The labrum is varicose in adult specimens.

Discussion: The shell outline agrees well with *Buvignieria*, but the delicate spiral sculpture which is characteristic for this genus (see KAIM 2004) is not discernible on the specimens. They are therefore described in open nomenclature.

Family Rissoidae GRAY, 1847

Genus *Rissoa* A.G. DESMAREST, 1814

Type species: *Rissoa ventricosa* A.G. DESMAREST, 1814; Recent; Mediterranean.

***Rissoa ? cureti* COSSMANN, 1918**
(Pl. 7, Figs 1–3)

1918 *Rissoa Cureti* n. sp. – COSSMANN: 374, Pl. 11, Figs 15–16

Material: 8 specimens (NHMW 2011/0052/0084–0086)

Description: The height of the specimens figured in Pl. 7, Figs 2–3 is 3.8 mm. The slender shell consists of a few moderately convex whorls. The sutures are slightly impressed. Approximately 10–12, partly opisthocline axial ribs extend from suture to suture and fade on the convex base. The aperture is D-shaped with an oblique straight inner lip and a strongly convex labrum. In adult specimens, unattached parts of the aperture are strongly varicose.

Discussion: *R. cureti* shows close affinities with *Rissoa/Rissoina* and related genera. It is, however, not congeneric because it has fewer and stronger axial ribs. The teleoconch shows great affinities with the Recent *Pseudoschwarziella jordanica* BANDEL, 2006, which is mainly defined by its protoconch morphology. Together with similar taxa, for example the Oxfordian *Rissoa valfini* GUIRAND & OGÈRIEN, 1865 sensu GRÜNDEL & KAIM (2006), the present specimens might represent a new genus.

Relationships: Small specimens show almost no sculpture. According to COSSMANN (1918) the suture is impressed, the whorls are moderately convex and the axial ribs strong. There are no spiral ribs and the aperture is oblique and oval. The labrum is reinforced by the final rib.

Rissoidae gen. indet.
(Pl. 7, Figs 4–5)

Material: 5 specimens (NHMW 2011/0052/0087–0089.

Description: The specimen figured on Pl. 7, Fig. 5 is 4.4 mm high, the other one 4.2 mm. The maximum diameter of the slender shells is remarkably variable. The whorls are only weakly convex, the sutures moderately impressed. Ontogenetically later whorls are slightly concave below the adapical suture (see side view). The sculpture consists of numerous opisthocline to weakly opisthocyrt axial ribs. They are as broad or may be even broader than the space in between. The growth lines are slightly parasigmoidal. The whorl face passes into the strongly convex base, which is covered by backwards bent axial ribs. The broad and oval aperture is adapically acuminate. The labrum is moderately varicose.

Discussion: The specimens are assigned to the Rissoidae based on the oval aperture and the varicose labrum. Because of the infavourable preservation they are allocated with reservations to this family.

Superfamily Stromboidea RAFINESQUE, 1815

Family Aporrhaidae GRAY, 1850

Subfamily Pterocerellinae BANDEL, 2007

Genus *Ceratosiphon* GILL, 1870

Type species: *Rostellaria bicarinata* DESHAYES IN LEYMERIE, 1842; Albian; France.

Ceratosiphon ? sp.
(Pl. 7, Figs 6–7)

? 1850 *Rostellaria varusensis* – d'Orbigny: 105 (Nr. 694).
? 1918 *Anchura* cf. *varusensis* d'Orbigny – Cossmann: 355, Pl. 10, Fig. 20.

Material: 1 specimen (NHMW 2011/0052/0090).

Description: The height of the specimen is 2.7 mm. The apex is flat and the early whorls are low. They are succeeded by a high, convex whorl. The last two whorls are carinate, with the carina positioned in the middle of the whorl face. After small nodes at the beginning, the nodes become increasingly larger and the distance between them increases. Indistinct axial ribs extend from the carina to the sutures. A second, smooth carina is located abapically at the suture. On the last whorl, this smooth carina delimits the whorl face towards the convex base. No sculpture is recognizable on the base. The aperture is oval and distinctly siphonostomous.

Discussion: d'Orbigny (1850) only briefly characterized *Rostellaria varusensis* without figuring it. Referring to this vague diagnosis, Cossmann (1918) assigned a fragment from Orgon (Region Provence-Alpes Côte d'Azur, France) to this species. To the extent that they are preserved, the morphological characters of the present specimen agree with Cossmann's figure, but they are not adequately preserved for a systematic assignment.

Family Colombellinidae P. Fischer, 1884

Genus *Eoranella* Sayn, 1932

Type species: *Eoranella kiliani* Sayn, 1932; Lower Cretaceous; south France.

Eoranella kiliani Sayn, 1932 ?
(Pl. 7, Figs 8–9)

? 1932 *Eoranella Kiliani* n. sp. – Sayn: 28, Pl. 3, Figs 37, 37a.

Material: 1 specimen (NHMW 2011/0052/0091).

Description: The height of the moderately slender specimen is 4.8 mm, its maximum diameter 2.4 mm. A spiral rib generates a carina above the middle of the whorl. There is no spiral sculpture between the adapical suture and the carina, but there are two ribs abapically. Strong axial ribs extend from suture to suture. Seven such ribs are located on the last whorl; they are slightly reinforced at the suture. One or two of the axial ribs on each whorl are clearly reinforced. The base is convex. The narrow, oval aperture extends into a siphonal canal. The columellar and the parietal lip form an obtuse angle. At least the rostrum bears several spiral ribs. Other significant details cannot be distinguished because of the unfavorable preservation.

Discussion: In *Eoranella kiliani* SAYN, 1932 the labrum is acutely dentate and the last whorl bears a strong, dentate varix opposite to the aperture. These parts of the shell are not developed in the present specimen because of its juvenile stage. Its sculpture, however, agrees with that of the initial whorls of *Eoranella kiliani*. Additionally, the carinate high whorls, the sculpture of strong collabral and spiral ribs and the high columella resemble this species, which SAYN allocated to the Tritoniidae. The figure by SAYN shows a reinforced but smooth columella, a dentate labrum and a short but deep canal. These morphological characters suggest a systematic position of *Eoranella* within the Colombellinidae.

Colombellinidae gen. et sp. indet.
(Pl. 7, Fig. 12–13)

Material: 1 specimen (NHMW 2011/0052/0093).

Description: The height of the figured specimen is 7.5 mm. Three whorls are preserved. They are weakly convex, the sutures feebly impressed. A spiral rib is located immediately below the adapical suture and another one delimits the whorl face towards the convex base. On the whorl face, broad, diffusely limited and roughly orthocline axial ribs are located. Their number per whorl is unknown. The base is smooth. The elongate oval aperture extends abapically into a distinct, twisted canal. The labrum is reinforced by an axial rib.

Discussion: The specimen is tentatively assigned to the Colombellinidae because of its convex whorls and the broad, twisted canal. Representatives of this family described by PICTET & CAMPICHE (1864) show a comparable sculpture of low collabral ribs on early ontogenetic whorls.

Family Ranellidae Gray, 1854

Genus *Triton* MONTFORT, 1810

Type species: According to the Nomenclator Zoologicus, *Triton* MONTFORT, 1810, is a younger homonym of *Triton* LAURENTI, 1768 and *Triton* LINNÉ, 1758, and has to be renamed. The taxonomic revision of this frequently quoted generic name goes beyond the scope of the present paper. It is therefore used in brackets.

***"Triton" urgonense* PICTET & CAMPICHE, 1864**
(Pl. 7, Figs 10–11)

1864 *Triton urgonense* n. sp. – PICTET & CAMPICHE: 662, Pl. 96, Figs 3a–c.

Material: 1 specimen (NHMW 2011/0052/0092).

Description: The total height of the specimen is 3.4 mm, its diameter 2.3 mm. The stout shell exhibits convex whorls with distinct sutures. About 14 orthocline axial ribs extend from suture to suture. They are crossed by about 8 spiral ribs of which 3–4 abapical ones are stronger than the others. At the intersections, weak nodes are develeoped. The base is convex and smooth. The labrum is broad convex. The columellar and the parietal lip form a blunt angle.

Discussion: The shell outline and the short spiral ribs agree with the figures by Pictet & Campiche (1864). These figures do not show the reinforced outer lip described in the text. The preservation state of the single specimen does not allow a generic assignment.

Superfamily Xenophoroidea Troschel, 1852

Family Lamelliphoridae Korobkov, 1955

Genus *Lamelliphorus* Cossmann, 1915

Type species: *Trochus ornatissimus* d'Orbigny, 1850; Bajocian; France.

***Lamelliphorus couveti* (Pictet & Renevier, 1854) nov. comb.**
(Pl. 7, Figs 14–16)

1854 *Trochus Couveti* n. sp. – Pictet & Renevier: 40, Pl. 4, Fig. 4.
1863 *Trochus Couveti* Pictet & Renevier – Pictet & Campiche: 518, Pl. 88, Fig. 1.

Material: 1 specimen (NHMW 2011/0052/0094).

Description: The height of the specimen is 1.7 mm, the diameter 2.9 mm. The shell is broad conical with flat sides converging towards the apex. There are 5 spiral ribs on the whorl face. The lowermost rib angulates the whorl profile slightly above the suture. About 20 prosocline axial ribs extend from suture to suture. The intersections with the spiral ribs are noded. The nodes of the two abapical spiral ribs are most prominent. The base is flat and anomphalous. At least two additional spiral ribs follow the boundary rib. The aperture is broader than high but no further details are recognizable.

Discussion: *Onustus tortilis* Peron, 1900: 140, Pl. 3, Fig. 2 from the Hauterivian of Gy l'Evêque, Yonne, France, is similar but its spiral ribs are more delicate.

Order Ptenoglossa Gray, 1853

Superfamily Janthinoidea Lamarck, 1812

Family Epitoniidae Berry, 1910

Genus *Confusiscala* Boury, 1909

Type species: *Scalaria dupiniana* d'Orbigny, 1842; Albian; France.

Confusiscala sp.
(Pl. 8, Figs 1–3)

Material: 2 specimens (NHMW 2011/0052/0095–0096).

Description: The larger of the two specimens is a fragment of two whorls with a total height of 10.0 mm. The whorls are convex, the sutures heavily impressed. The sculpture consists of approximately 9 strong, slightly bulging and weakly opisthocyrt axial ribs. They are far apart from each other and extend from suture to suture. Because of the poor preservation, the spiral ribs (about 15) are only weakly recognizable. The flat and smooth base (basal disc) of Pl. 8, Fig. 3 is limited by a prominent boundary rib. The aperture is not preserved.

Discussion: The convex whorls, the strong collabral ribs extending from suture to suture, and the basal plait are significant features of *Confusiscala.*

Superfamily unknown

Ptenoglossa gen. indet.
(Pl. 8, Figs 4–6)

? 1918 *Ceritiella tenuiplicata* n. sp. – COSSMANN: 346, Text-fig. 10.

Material: 4 specimens (localities 1 and 2) (NHMW 2011/0052/0097–0099).

Description: The height of the specimen figured on Pl. 8, Fig. 6, is 2.8 mm. Early whorls are flat with a carina close to the abapical suture. The whorl face becomes convex in later whorls, the sutures become deeper and the carina is transformed into a flat ribbon. Numerous opisthocyrt axial ribs extend from the adapical suture to the carina or to the spiral rib. The axial ribs are strongest near the adapical suture and become weaker in an abapical direction. On the last whorl, the adapical whorl face bears several spiral ribs. The whorl face passes smoothly into the convex base, which is covered by 5 equally strong spiral ribs. The aperture is oval, adapically angular but without a distinct siphonal canal.

Discussion: The general habitus is conclusive for a systematic position within the Ptenoglossa. A carina comparable to that in early whorls of the present specimen is typical for the protoconch of the Cerithiotopsidae. There is, however, no distinct demarcation between the protoconch and the teleoconch. Such a gradual transition would be characteristic for the Newtoniellidae and Eumetulidae, but in these families the protoconch lacks an abapical carina.

The description of *Ceritiella tenuiplicata* COSSMANN, 1918, is based on a single, incomplete shell. Our specimens agree well by their outline and the collabral ribs. A noded spiral rib in the adapical part of the whorls, as described by COSSMANN, is developed

only in early ontogenetic whorls. The basal spiral ornamentation has not been recorded in the type specimen of *Ceritiella tenuiplicata*. Both the assignment of our specimens to *C. tenuiplicata* and the generic position of this taxon remain unresolved.

Caenogastropoda of doubtful taxonomic position

Family Pseudomelaniidae R. Hoernes, 1884

Genus *Pseudomelania* Pictet & Campiche, 1862

Type species: *Pseudomelania lineata* J. Sowerby, 1818, Late Bajocien, Saint-Vigor-le-Grand (Calvados, France)

Discussion: When Pictet & Campiche (1862) established the genus *Pseudomelania*, they described the species *P. gresslyi, P. jaccardi* and *P. germani* but did not select a type species. P. Fischer (1887) quoted *P. normaniana* d'Orbigny, 1851, as typical for this genus, and Cossmann (1909) established this species as "néogénotyp" of *Pseudomelania*. According to Fischer & Weber (1997), *P. normania* is a younger synonym of *Pseudomelania lineata* J. Sowerby, 1918.

In contrast to Cossmann, Wenz (1938) selects *P. gresslyi* Pictet & Campiche as type species of *Pseudomelania*. This is in accordance with Article 67.2 of the "International Code of Zoological Nomenclature", which limits the species eligible as type species to originally included nominal species.

Pseudomelania ? *leptomorpha* Cossmann, 1900

(Pl. 8, Fig. 7)

1900 *Pseudomelania leptomorpha* n. sp. – Cossmann: 525, Pl. 1, Figs 14–16.
1918 *Pseudomelania leptomorpha* Cossmann – Cossmann: 371, Text-fig. 18

Material: 3 specimens (NHMW 2011/0052/0100–0101).

Description: The height of the figured specimen is 5.2 mm. The shell is very slender and the whorl profile flat. Sutures are poorly recognizable. Equally, no sculpture can be recognized. The relatively high aperture is drop-shaped and extremely narrow-acuminate adapically. Abapically it is distinctly enlarged and rounded at the base.

Discussion: Some of the morphological characters (very slender shell, high whorls with oblique sutures, adapically acuminated aperture) are reminiscent of the Eulimidae, but the poor preservation does not allow a distinct generic determination.

Besides some large, doubtful taxa, Cossmann (1900, 1918) described two small ones under *Pseudomelania: P. urgonensis* and *P. leptomorpha.* Of these, *P. urgonensis* is broader and its aperture lower, whereas *P. leptomorpha* is more slender and compares therefore with the present specimen. Sayn (1932) determined specimens with only

slightly convex whorls as *Pseudomelania* cf. *urgonensis*. *P. leptomorpha* and *P. urgonensis* may fall into the variability of a single taxon, but the material is too scarce to ascertain this.

Because of a close match between the teleoconchs of *Pseudomelania* and *Azyga* NÜTZEL, 1998 (Zygopleuroidea, Zygopleuridae), a position of ?*Pseudomelania leptomorpha* in the latter cannot be excluded. The protoconch, which bears typical subsutural nodes in *Azyga*, is not preserved in the present specimen.

Caenogastropoda indet.

We cannot give a founded generic assignment of the following taxa.

Caenogastropoda indet. 1

(Pl. 8, Figs 8–9)

Material: 1 specimen (NHMW 2011/0052/0102).

Description: The height of the specimen is 1.5 mm. The apex is missing. The shell is high trochospiral with convex whorls and grooved sutures. The whorl face is evenly covered by 6 spiral ribs of equal strength. They are as broad as the space between them. The base, which is feebly convex and covered by poorly preserved spiral ribs, is anomphalous. The aperture is very broad and oval, almost rounded.

Caenogastropoda indet. 2

(Pl. 8, Figs 10–11)

Material: 2 specimens (NHMW 2011/0052/0103–0104).

Description: The broad conical internal mould is 1.2 mm in height. The boundary between the protoconch and the teleoconch is not visible. The whorls are convex and increase only gradually in height. The sutures are impressed. The whorl face passes without onset into the weakly convex and narrow-umbilicate base. The aperture is broad oval in outline and adapically indistinctly acute.

Caenogastropoda indet. 3

(Pl. 8, Fig. 12–13)

Material: 1 specimen (FO 2) (NHMW 2011/0052/0105).

Description: The height of the specimen is 0.8 mm, the diameter 0.3 mm. The apex of the very slender internal mould is flattened and consists of 6 whorls. The boundary protoconch/ teleoconch is not discernible. The weakly convex base is not onset. The very broad aperture is adapically narrow and rounded.

Subclass Heterobranchia Burmeister, 1837

Order Allogastropoda Haszprunar, 1985

Superfamily Mathildoidea Dall, 1889

Family Mathildidae Dall, 1889

Genus *Jurilda* Gründel, 1973

Type species: *Mathilda* (*Jurilda*) *crasova* Gründel, 1973 [= junior subjective synonym of *Promathilda* (*Teretrina*) *concava* Walther, 1951]; Middle Jurassic; northern Germany.

***Jurilda* sp.**
(Pl. 8, Fig. 14–15)

Material: 2 specimens (NHMW 2011/0052/0106–0107).

Description: The height of the figured specimen is 2.5 mm. The apex is not preserved. Of the two spiral ribs of early whorls, one is positioned closely above the abapical suture. It shifts during ontogeny in an adapical direction, where it gains in strength and is positioned on top of a carina. The second rib develops between this and the abapical suture and becomes almost as strong. A third rib develops between this rib and the carina. The weakly convex base is delimited against the whorl face by a strong spiral rib. It bears at least 4 more ribs which decrease in strength towards the center. Accentuated opisthocyrt growth lines extend from suture to suture but are difficult to trace due to the poor preservation. The aperture is broad oval.

Discussion: Abbass (1973) assigned a form with a similar spiral sculpture to *Rhabdocolpus forbesianum* (d'Orbigny). The protoconch is not known in this and similar taxa, and their systematic position therefore remains doubtful. In contrast to our specimens, the spiral ribs are not as prominent in Abbass's specimens, and the intersections between spiral and axial ribs are noded. For specimens from the Lower Greensand of Atherfield (Lower Aptian, England), which Forbes (1845) assigned to *Cerithium phillipsi* Leymerie, 1842, d'Orbigny (1850) established the species *Cerithium forbesianum*. While Abbass (1973) considered both species as synonymous, *C. phillipsi* can be distinguished by its more slender shell and strong collabral ribs from *C. forbesianum* (see Kollmann 2005). *Jurilda* sp. is similar to *C. forbesianum* but the sutures are deeper.

Genus *Tricarilda* Gründel, 1973

Type species: *Mathilda* (*Tricarilda*) *plana* Gründel, 1973; Callovian; NW Poland.

***Tricarilda* ? sp.**
(Pl. 8, Figs 16–18)

Material: 2 specimens (NHMW 2011/0052/0108–0109).

Description: The height of the figured specimen is 3.6 mm. The shell is slender and the poorly preserved protoconch heterostrophic. The sutures are grooved; a carina divides the whorl face into two almost equal parts. The whorl face abapically of the carina is almost parallel to the shell axis and delimited abapically by a rib. An indeterminate number of weaker ribs is distributed over the whole whorl face. The growth lines are accentuated but only rudimentarily preserved. The base is moderately convex and bears several relatively strong spiral ribs. The aperture is broad oval, almost circular.

Superfamily Streptacidoidea KNIGHT, 1931

Family Ebalidae WARÉN, 1995

Remarks: Most researchers allocate the Ebalidae to thePyramidelloidea. There is, however, a great affinity between hard parts of the type species of *Streptacis* MEEK, 1871 and *Ebala* LEACH in GRAY, 1847. Furthermore, WAREN (1995) recognized differences in the jaw apparatuses of the Pyramidellidae and the Ebalidae. In contrast to the Ebalidae, the teleoconch of the Pyramidellidae is generally heavily sculptured and bears internal plaits. BANDEL argued therefore several times in favor of a systematic position of the Ebalidae in the Streptacoidea (for example 1996, 2002, 2005).

Genus *Falsoebala* GRÜNDEL, 1998

Type species: *Falsoebala compacta* GRÜNDEL, 1998; Callovian; NE Germany and NW Poland.

Remarks: Growth lines are not discernible. The specimens described below may therefore belong either to *Falsoebala* or to *Ebala* LEACH in GRAY, 1847.

***Falsoebala* ? sp. 1 – sp. 5**
(Pl. 9, Figs 7–11)

Material: 5 specimens (localities 1 and 2) (NHMW 2011/0052/0118–0122).

Description: These specimens may belong to different taxa. They are characterized by a highly elevated medio- to transaxial, entirely visible protoconch. The teleoconch whorls are relatively high. Their height increases more rapidly than their diameter. The shell is therefore very slender and cylindrical. The protoconch size varies between 0.2 and 0.25 mm. Neither the protoconch nor the teleoconch show traces of a sculpture.

Family unknown

Genus *Rigauxia* Cossmann, 1885

Type species: *Chemnitzia canaliculata* Rigaux & Sauvage, 1868; Bathonian; France.

Remarks: Cossmann (1885) described *Rigauxia* under "incertae sedis" and has mentioned similarities with the Nerineoidea. Cossmann (1909) allocated this genus to the Loxonematidae, and Brookes et al. (1964) propose a systematic position within the Zygopleuridae. In both groups the growth lines are parasygmoidal. This is not the case in *Rigauxia.* Cossmann (1885, 1909), and Gründel (1997) describe the prosocyrt growth lines, which are reflecting close to the adapical suture. The assignments by Cossmann (1909) and Brookes et al. (1964) therefore cannot be upheld.

Gründel (1997) follows Cossmann (1885) in positioning *Rigauxia* in the Nerineoidea, mainly because of the reflection of the growth line at the adapical suture. There are, however, differences in the shell morphology of the Nerineoidea: In members of this superfamily the sutures linear and frequently located on more or less accentuated ridges, whereas they are broadly and deeply grooved in *Rigauxia.* The figures given by Cossmann (1885, 1909) show an oval, holostomatous aperture, while Nerineoidea taxa have a siphonal notch or canal. To our knowledge, the run of the growth lines, the shell outline and the morphology of the aperture are indicative for a position of *Rigauxia* in the Streptacidoidea. The determination of the family is not possible.

***Rigauxia* sp.**

(Pl. 6, Fig. 8)

Material: 7 fragments (NHMW 2011/0052/0069–0070).

Description: The figured shell fragment has a height of 8.2 mm and a maximum diameter of 1.8 mm. It is therefore very slender and the number of whorls is large. The sutures are grooved. A broad, ribbon-like bulge adjacent to the adapical suture is subdivided by a flat depression. After a convave zone, a prominent spiral rib follows slightly before the middle of the whorl. A less prominent rib is located betweeen this rib and the abapical suture.

Discussion: The present specimens may belong to two or more species. In at least one of them, an abapical bulge is developed that is as prominent as the adapical one. The whorl face between these bulges is concave.

Superfamily Valvatoidea Gray, 1840

Family Cornirostridae ? Ponder, 1990

Remarks: According to Bieler, Ball & Mickelsen (1998) extant cornirostrids can only be confirmed as members of this family based on anatomical features. The present

specimens are tentatively allocated to this family because of their protoconchs and the turbiniform, smooth shells.

Genus *Bandellina* SCHRÖDER, 1995

Type species: *Bandellina laevissima* SCHRÖDER, 1995; Valanginian; Poland.

***Bandellina* sp.**
(Pl. 9, Figs 12–14)

Material: 2 specimens (locality 1 and 2) (NHMW 2011/0052/0123–0124).

Description: The diameter of the smaller specimen is 0.5 mm. The well preserved protoconch is of the "tofanelloid type" (see BANDEL 1996). It consists of 1⅔ whorls and measures 0.32 mm. The transition to the teleoconch is marked by a weak growth interruption. The shell is very broad conical with a flat apex. The whorls are convex and smooth, the sutures impressed. The base is slightly convex and umbilicate. The aperture outline is circular.

Superfamily Nerineoidea ZITTEL, 1873

Family Nerinellidae PCHELINTSEV, 1960

Genus *Eunerinea* COX, 1947

Type species: *Nerinea castor* D'ORBIGNY, 1851; Oxfordian; France.

***Eunerinea gigantea* (D'HOMBRE-FIRMAS, 1838) nov. comb.**
(Pl. 9, Figs 3–4)

1838 *Nerinea gigantea* n. sp. – D'HOMBRE-FIRMAS: 207, Pl. 5, Figs 1–2.
1907 *Nerinea gigantea* D'HOMBRE-FIRMAS – COSSMANN: 9, Pl. 1, Figs 1–5.
1918 *Nerinea gigantea* D'HOMBRE-FIRMAS – COSSMANN: 350.

Material: 7 specimens (NHMW 2011/0052/0112–0114).

Description: The height of the larger figured specimen is 8.7 mm, the diameter 4.0 mm. The shell consists of numerous low and deeply concave whorls. The sutures, which are located on the acute and irregularily dentate crest formed by adjacent whorls, are not visible. On early whorls, coarse fold-like axial ribs are developed between the adapical suture and the maximum depression. The base is delimited against the whorl face by an acute carina and is almost flat and smooth. The aperture is not preserved. The whorl cross-section is broader than high. Three internal plaits are visible: a horizontal columellar plait close to the base, a parietal plait and a broad triangular palatal plait.

Discussion: The shell angle, the low and deeply concave whorls and the sharp crest formed by adjacent whorls identify the specimens as *Eunerinea gigantea* (d'Hombre–Firmas). It is known from Barremian deposits (d'Orbigny 1842, Cossmann 1907, 1918, Kollmann 2005). The three internal plaits are characteristic for the subfamily Eunerineinae.

Family Nerineidae Pchelintsev, 1965

Cossmann (1896) considered *Nerinea tuberculosa* Defrance as type species of *Nerinea*. This name is invalid from a taxonomical standpoint because Cossmann has latinized the vernacular "Nerinée tuberculeuse" by Defrance (1825). All later researchers including Wenz (1940) followed Cossmann in this taxonomical interpretation.

In fact, *Nerinea* was introduced formally with *Nerinea mosae* Deshayes, 1827 [see Bouchet & Rocroi (2005) and remarks by Kollmann in footnote 185 of this compilation]. Cox (1947) was the first to point out that *Phaneroptyxis* Cossmann, 1896, includes also *Nerinea mosae* and is therefore a younger synonym of *Nerinea*, which he re-named into *Eunerinea*. Consequently, the family name Phaneroptyxidae established by Pchelintsev (1965) has to be replaced by the family name Nerineidae.

Type species established by Cossmann (1896): *Nerinea moreana* d'Orbigny, 1851.

Genus *Favria* Cossmann, 1916

Type species: *Nerinea pellati* Cossmann, 1907; Barremian; France.

Favria pellati (Cossmann, 1907) nov. comb.
(Pl. 9, Figs 5–6)

1907 *Phaneroptyxis Pellati* n. sp. – Cossmann: 8, Pl. 1, Figs 10–11, Pl. 2, Figs 9–12, Text-fig. 1.
1916 *Phaneroptyxis* (*Favria*) *Pellati* Cossmann – Cossmann: 13, Pl. 1, Figs 21–26.
1916a *Phaneroptyxis* (*Favria*) *Pellati* Cossmann – Cossmann: 348, Pl. 10, Figs 13–14.
1932 *Phaneroptyxis* (*Favria*) *conica* n. sp. – Sayn: 20, Pl. 1, Figs 22, 24, 24a, 25.
1932 *Phaneroptyxis* (*Favria*) *lanceolata* n. sp. – Sayn: 20, Pl. 1, Figs 26, 26a.

Material: 3 specimens (NHMW 2011/0052/0115–0117)

Description: The height of the figured specimen is 9.2 mm. The spire is very slender and consists of numerous broad and weakly convex whorls. A sculpture is not discernible with certainty but may have consisted of axial ribs. The last whorl is very broad and strongly carinate. A narrow adapical ramp develops beginning with the penultimate whorl. The whorl face between the ramp and the carina is concave, abapically of the carina convex. The aperture is not preserved. A short siphonal canal and 2 columellar plaits can be recognized.

Discussion: The species is highly variable. The carina at the periphery of the last whorl protrudes more in the present specimen than in those figured by COSSMANN (1907), SAYN (1932) and COSSMANN (1916).

Order Architectibranchia HASZPRUNAR, 1985

Superfamily Acteonoidea D'ORBIGNY, 1843

Family Acteonidae D'ORBIGNY, 1843

Genus *Ovactaeonina* COSSMANN, 1895

Type species: *Acteonina sparsisulcata* D'ORBIGNY, 1852; Pliensbachian; France.

***Ovactaeonina* sp. 1**
(Pl. 10, Figs 5–7)

Material: 2 specimens (locality 1 and 2) (NHMW 2011/0052/0134–0135).

Description: The largest of the figured specimens has a height of 1.2 mm. The diameter of the transaxial, highly elevated protoconch is 0.15 mm. The specimens are cylindrical and very slender compared to the known species of *Ovactaeonina*. The whorls are cylindrical, increase rapidly in height and are finally almost as high as broad. Impressions of a sculpture cannot be recognized. The relatively low aperture is adapically acute and rounded abapically.

Remarks: Based on the high spire and cylindrical whorls the specimens are assigned to *Ovactaeonina.*

***Ovactaeonina* sp. 2**
(Pl. 10, Fig. 8–11)

Material: 2 specimens (NHMW 2011/0052/0136–0137).

Description: The height is 1 mm in both specimens. The almost transaxial protoconch has a diameter of 0.17 mm. One third is covered by the first whorl of the teleoconch. The teleoconch whorls are high and smooth. The last one constitutes about 2/3 of the total height. A narrow ramp accentuates the sutures. This ramp merges with a rounded edge into the lateral side. The base is convex. The drop-shaped aperture is adapically acute.

Genus *Tornatellaea* CONRAD, 1860

Type species: *Tornatellaea bella* CONRAD, 1860; Eocene; USA

Discussion: The two taxa described below have oviform shells, a sculpture consisting of grooves and columellar folds. They belong without doubt to *Tornatellaea* but their preservation state differs and they may belong to a single species.

***Tornatellaea* sp. 1**
(Pl. 10, Figs 12–13)

Material: 2 specimens (NHMW 2011/0052/0138–0139).

Description: The height of the figured specimen is 4.2 mm, its diameter 2.2 mm. The protoconch is not preserved. The spire whorls are relatively high and exhibit a narrow subsutural ramp. The diameter is largest close to the adapical suture. The last whorl is uniformly convex. It is covered by at least 12 spiral grooves that are adapically further apart than abapically. The high aperture is oval, adapically acute and abapically rounded. The columella is thick and bears two plaits.

***Tornatellaea* ? sp. 2**
(Pl. 10, Figs 14–15)

Material: 8 specimens (FO 1 and 2) (NHMW 2011/0052/0140–0143).

Description: The larger of the two figured specimens has a total height of 4.8 mm. The protonch is not preserved. The shell is oviform. The whorl sides are almost flat and the sutures slightly impressed. Two of the specimens show a furrow below the adapical suture. Although they are poorly visible the whole shell including the base was covered by narrow spiral grooves. The aperture is elongate and oval and bears 2 strong columellar plaits.

Subfamily Liocareninae Wenz, 1930

Genus *Liocarenus* Harris & Burrows, 1891

Type species: *Liocarenus conovuliformis* (Deshayes in d'Orbigny, 1850); Eocene, Vandancourt; France.

***Liocarenus* ? *gymna* (Cossmann, 1916) nov. comb.**
(Pl. 9, Figs 15–17)

? 1900 *Actaeonina icaunensis* Cotteau – Peron: 47, Pl. 2, Fig. 5.
1916 *Zittelia gymna* n. sp. – Cossmann: 359, Text-fig. 12.

Material: 5 specimens (NHMW 2011/0052/0125–0126).

Description: The height of the specimen figured on Pl. 9, Fig. 15–17 is 2.7 mm; the largest specimen of the assemblage is 3.5 mm high. The protoconch is small, almost transaxial, and has a diameter of 0.2 mm. It is about half covered by the first teleoconch whorl. On the spire, the whorl faces are flat and the sutures weakly accentuated. No sculpture can be recognized. The last whorl covers about 2/3 of the total shell height. Its diameter is largest close to the suture but decreases in an abapical direction. The growth

lines are parasigmoidal from the adapical suture to the middle of the base. The aperture extends adapically almost to the suture; it is narrow and gains slightly in breadth towards the abapical end. The labrum is straight, no plaits are discernible.

Discussion: The shell outline and the course of the growth lines agree with the figure in PERON (1900), who determined the species after the description by COTTEAU (1854). This allocation is, however, doubtful because COTTEAU did not illustrate the species. Because of these doubts we assign the present specimens to the synonymous *Zittelia gymna* COSSMANN (1916). It does, however, belong to *Liocarenus* and not to the genus *Zittelia* GEMMALARO, which COSSMANN positioned systematically close to the Colombellinidae. This genus is characterized by an oviform shell and a narrow aperture.

A specimen allocated by PICTET & CAMPICHE (1862: 184, Pl. 60, Fig. 11a–d) to *Acteonina icaunensis* COTTEAU, 1854, has to be excluded from this species because of its broader spire and distinct subsutural ramps of the whorls.

Superfamily Ringiculoidea PHILIPPI, 1853

Family Ringiculidae PHILIPPI, 1853

Genus *Avellana* D'ORBIGNY, 1843

Type species: *Cassis avellana* BRONGNIART, 1822; Upper Cretaceous; France.

***Avellana* sp.**
(Pl. 9, Fig. 1–2)

Material: 3 specimens (NHMW 2011/0052/0110–1011).

Description: The height of the specimen figured on Pl. 9, Fig. 1–2, is 3.0 mm. The shell outline is broad oval with a large last whorl. The whorls of the spire are weakly convex, the sutures adpressed. The sculpture consists of approximately 5 grooves with broad spaces in between. The last whorl is evenly convex. The distances between the grooves are largest in the median part of the whorl. The aperture, which is incomplete in all specimens, is broad oval, adapically acute and rounded abapically. The columella bears at least two folds. In one of the unfigured specimens a larger plait is visible adapically and a weaker one in an abapical position.

Discussion: The oviform shell, the sculpture of grooves and the columellar folds are characteristic for *Avellana* D'ORBIGNY, 1843.

Superfamily Acteonelloidea AKOPJAN, 1976

Family Acteonellidae GILL, 1871

Genus *Neocylindrites* SAYN, 1932

Type species: *Trochactaeon boutillieri* Cossmann, 1918. *N. barremicus* Sayn, 1932, originally designated as type species, is a younger synonym. Barremian; France.

Remarks: In contrast to *Cylindrites* Morris & Lycett, 1851, the columella of *Neocylindrites* is separated by a deep constriction from the parietal portion and exhibits 2 to 3 strong plaits. There is, however, a great affinity between *Neocylindrites* and *Cylindrites*, which is considered as the earliest representative of the Acteonelloidea. The origin of the Acteonelloidea has to be sought in the Cylindrobullinidae (Sohl & Kollmann, 1985).

Neocylindrites boutillieri (Cossmann, 1916) nov. comb.
(Pl. 10, Fig. 2–4)

1918 *Trochactaeon boutillieri* n. sp. – Cossmann: 341, Fig. 5.
1932 *Trochactaeon barremicus* n. sp. – Sayn: 7–10, Pl. 1, Fig. 1–7 (various „subspecies“)
1967 *Trochactaeon* (*Neocylindrites*) *barremicus* Sayn – Kollmann: 215 ff.

Material: 8 specimens (FO 1 and 2) (NHMW 2011/0052/ 0130–0133).

Description: The total height of one of the figured specimens is 4.6 mm, its diameter 2.2 mm. The spire is low. The last whorl envelops earlier ones almost completely. The shell is smooth and broadest in the adapical portion of the last whorl. The aperture is very high and narrow, with two columellar plaits.

Discussion: This stratigraphically earliest species of *Neocylindrites* features 2 columellar plaits, whereas three plaits are developed in stratigraphically younger taxa.

Superfamily Philinoidea Gray, 1850

Family Cylichnidae H. Adams & A. Adams, 1854

Genus *Acteocina* Gray, 1847

Type species: *Acteon wetherilli* (Lea, 1777); Miocene; New Jersey?

Acteocina tenuistriata (Cotteau, 1854) nov. comb.
(Pl. 9, Figs 18–19)

1854 *Bulla tenuistriata* Cotteau: 47
1895 *Retusa tenuistriata* (Cotteau) – Cossmann: 151, Pl. 6, Fig. 30.
1900 *Tornatina* (*Retusa*) *Peroni* n. sp. – Cossmann: 521, Pl. 1, Fig. 12.

Material: 1 specimen (NHMW 2011/0052/127).

Description: The height of the specimen figured on Pl. 9, Fig. 18–19 is 3.2 mm and its maximum diameter 1.4 mm. The shell is almost cylindrical and its spire is low. The aperture is narrow and equals in height the last whorl.

Remarks: *Acteocina tenuistriata* closely resembles *Bulla* (*Tornatina*) *urgonensis* PICTET & CAMPICHE, 1862. In contrast to this species, which belongs to *Goniocylindrites* MEEK, 1863, the last whorl of *Acteocina tenuistriata* does not envelop the preceding ones completely.

Relationships: COTTEAU (1854) has described *Bulla tenuistriata* as follows: "Coquille étroite, allongée, à spire presque plane, tranchante et carénée sur les bords. Surface partout recouverte des stries longitudinales, fines et régulières". COSSMANN (1895) mentioned very delicate spiral threads on the base, fading towards the center. *Acteocina tenuistriata* differs from *Acteonina jaccardi* PICTET & CAMPICHE, 1862 and *Cylichna urgonensis* (PICTET & CAMPICHE, 1862) by its consistently cylindrical outline and the spiral sculpture, while no collabral sculpture is developed in the adapical portion. Differences in the spiral sculpture which led COSSMANN (1900) to describe *R. peroni* might depend on the preservation or would fall within the variability of *C. tenuistriata.*

Genus *Cylichna* LOVÉN, 1847

Type species: *Acteon cylindraceus* PENNANT, 1722; Recent; offshore Norway.

***Cylichna urgonensis* (PICTET & CAMPICHE, 1862)? nov. comb.**

(Pl. 10, Fig. 1)

? 1862 *Bulla Urgonensis* n. sp. – PICTET & CAMPICHE: 177, Pl. 55, Figs 9, 10.

Material: 2 specimens (NHMW 2011/0052/0128–0129).

Description: The height of the figured specimen is 4.5 mm, its diameter 2.2 mm. The shells are cylindrical and involute, with the maximum diameter approximately at half height. The final volution conceals earlier ones, which are only visible on the depressed spire. The shells are smooth. The aperture extends over the total height of the whorl. It is very narrow adapically and widens in abapical direction.

Discussion: The shell is almost perfectly cylindrical. For this reason and because of the depressed spire, the taxon has been transferred from *Bulla* to the closely related *Cylichna.* The original figure of *Bulla urgonensis* PICTET & CAMPICHE, 1862 shows traces of collabral ribs only adapically, while spiral threads occur abapically. Their absence in the present specimens may have been caused by the destruction of the exterior shell layer. Without knowing the sculpture, the specific assignment remains doubtful.

Subclass Stylommatophora SCHMIDT, 1855

Superfamily Clausiloidea GRAY, 1855

Family Anadromidae WENZ, 1940

Subfamily Anadrominae Wenz, 1940

Genus *Lychnus* Matheron, 1832

Type species: *Lychnus ellipticus* Matheron, 1832 (fide Matheron 1843); Late Cretaceous, France.

***Lychnus* sp.**
(Pl. 10, Figs 17–19)

? 1918 *Discohelix pangymna* n. sp. – Cossmann: 21, Pl. 2, Figs 6–8.

Material: 9 specimens (locality 1 and 2) (NHMW 2011/0052/0144–0145).

Description: The maximum diameter of the figured specimen is 3.6 mm. The preservation is generally poor. The whorls are adapically convex and elliptic in cross-section. The sutures are deep. A sculpture is not discernible. The first whorls form a broad conical shell which can only be recognized from the apical side. The last whorl increases rapidly in size and embraces the earlier whorls. Synchronously, the coiling plane and the shell axis change. Only the final 1.5 whorls are visible at the base.

Discussion: The specimen from Brouzet-Les-Alais figured by Cossmann (1918) shows well the characteristic change of the coiling direction and the rapid change in diameter of *Lychnus* Matheron.

Conclusions

The gastropod assemblage comprises a large number of taxa and is taxonomically very diverse. In total, 66 taxa have been distinguished but presumably they do not represent the complete diversity of the assemblage. Six species and two genera have been newly described, 18 others could be assigned to previously described species. The remaining taxa have been named by using open nomenclature. Despite all the questions which remain open due to poor preservation, the assemblage allows insight into the poorly known gastropod fauna of the Lower Cretaceous, especially of the Barremian.

The present fauna originates from basin-floor fans that were introduced from the Provence Platform into the Vocontian Trough (Kroh et al. 2010). By comparison with previously described assemblages, the faunal elements can be traced back to their original environments.

Barremian gastropod faunas of south France were described under the heading Urgonian by Cossmann (1900, 1907, 1916, 1918) and Sayn (1932). Closer examination of the literature, however, shows that rocks of different facies are involved. The most detailed section is that of Orgon (Departement Bouches-du-Rhône, France) described by Pellat in Cossmann & Pellat (1907) and Cossmann (1918). It shows from top to base:

- Limestones termed "calcaire crayeux" by COSSMANN. They contain rudists (Requieniidae, *Toucasia*) and other large mollusks, among them Nerineoidea.
- White oolithic limestone with orbitolinids. The mollusk assemblage listed by COSSMANN (1918) under "calcaire oolithique" and described earlier (COSSMANN, 1900) originates from this part of the section. The gastropods and other biota are small in size.
- Yellowish limestone with intercalations of white limestone containing cidarids and fragments of pentacrinids and asterozoans.

Among these lithologies, the white "reefal" limestone of the Urgonian facies is a transgressional formation that developed on an inner platform (ADATTE et al. 2005). It has yielded an assemblage of large mollusks, mainly Nerineoidea. Similarily to Orgon, the assemblage of large Nerineoidea described by COSSMANN (1916) from Brouzet-Les-Alais (departement Gard) stems from irregularily bedded rudist limestones ("stratification des plus confuse" after COSSMANN 1918) and clearly represents a marginal deposit of the inner platform.

The oolithic limestone of Orgon represents the outer platform or platform slope (COTILLON et al. 1979; ADATTE et al. 2005). Besides mollusks, this lithology has yielded Orbitolinidae and various echinoderm remains. The gastropod fauna is much more diverse than the fauna of the inner platform and consists of small to very small specimens. Platform and transitional assemblages can also be distinguished in the fauna described by SAYN (1932) from the surroundings of Barcelonne (Drôme). A characteristic faunal element is *Neocylindrites* SAYN. Based on its columellar plaits and sutural notch, KOLLMANN (1967) and SOHL & KOLLMANN (1985) deduced an infaunal or semi-infaunal mode of life.

The comparative list of assemblages given by COSSMANN (1918) shows only few gastropod taxa that are common to both the Urgonian facies and the oolithic limestone facies. This reflects different ecological conditions. Only three Nerineoidea taxa also recorded by COSSMANN (1918) from Orgon and Brouzet are of inner shelf origin. The Nerineoidea are restricted to comparatively stable substrates and medium to low water energy conditions in subtidal protected environments of the inner platform ("lagoons" in a broad sense) (see HERM 1977; WIECZOREK 1979; KOLLMANN 2005a).

Besides the higher diversity in general, the diversity of Archaeogastropoda and Heterobranchia in the outer platform deposits is striking. According to ADATTE et al. (2005) the grainstones with oolites were deposited in the photic zone in shallow tidal to subtidal environments of medium energy level. This was a zone of high algal production, which obviously has provided the diets of the diverse fauna of Archaeogastropoda and partially of the Caenogastropoda. The calcarenites and especially the oolites also indicate a soft substrate with high sediment mobility. This promoted the development of a diverse assemblage of infaunally living Heterobranchia such as the Acteonoidea (FRETTER 1954) and Ringiculoidea (FRETTER 1960). As in the case of extant Pickworthiidae, *Bleytonella* nov. gen. may have inhabited submarine cavities (see KASE 1998).

Based on the small size of the specimens and the compositon of the studied fauna, most of taxa recorded from Serre de Bleyton clearly originated from outer platform environments. The lack of turritellids, which were already widely distributed in the Lower Cretaceous, indicates an occurrence above the storm wave base.

Finally, small specimens of the land snail genus *Lychnus* are present; these were transported across the platform before they were deposited.

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Explanation of Plates

All figured specimen have been collected in ?Late Barremian deposits of "Serre de Bleyton"

Plate 1

Figs 1–2: Fissurellidae gen. et sp. indet. (NHMW 2011/0052/0001); side and posterior view; length 3.4 mm, height 1.8 mm.

Figs 3–5: *Margarites* sp. (NHMW 2011/0052/0004); basal, abapertural and apical view; width 2.6 mm.

Figs 6–7: *Ooliticia chatillonensis* (Pictet & Campiche, 1863) (NHMW 2011/0052/0005); abapertural and basal view; width 4 mm.

Figs 8–9: *Chilodonta* ? *cureti* (Cossmann, 1900) nov. comb. (NHMW 2011/0052/0006); basal and abapertural view; width 2.1 mm.

Figs 10–11: *Chilodonta* ? *cureti* (Cossmann, 1900) nov. comb. (NHMW 2011/0052/0007); abapertural and apertural view; height 5.3 mm.

Figs 12–13: *Sensuitrochus morteauensis* (Pictet & Campiche, 1863) nov. comb. (NHMW 2011/0052/0009); apertural and abapertural view; height 3.1 mm.

Figs 14–15: *Solariella* sp. (NHMW 2011/0052/0011); apical and basal view; width 4.1 mm.

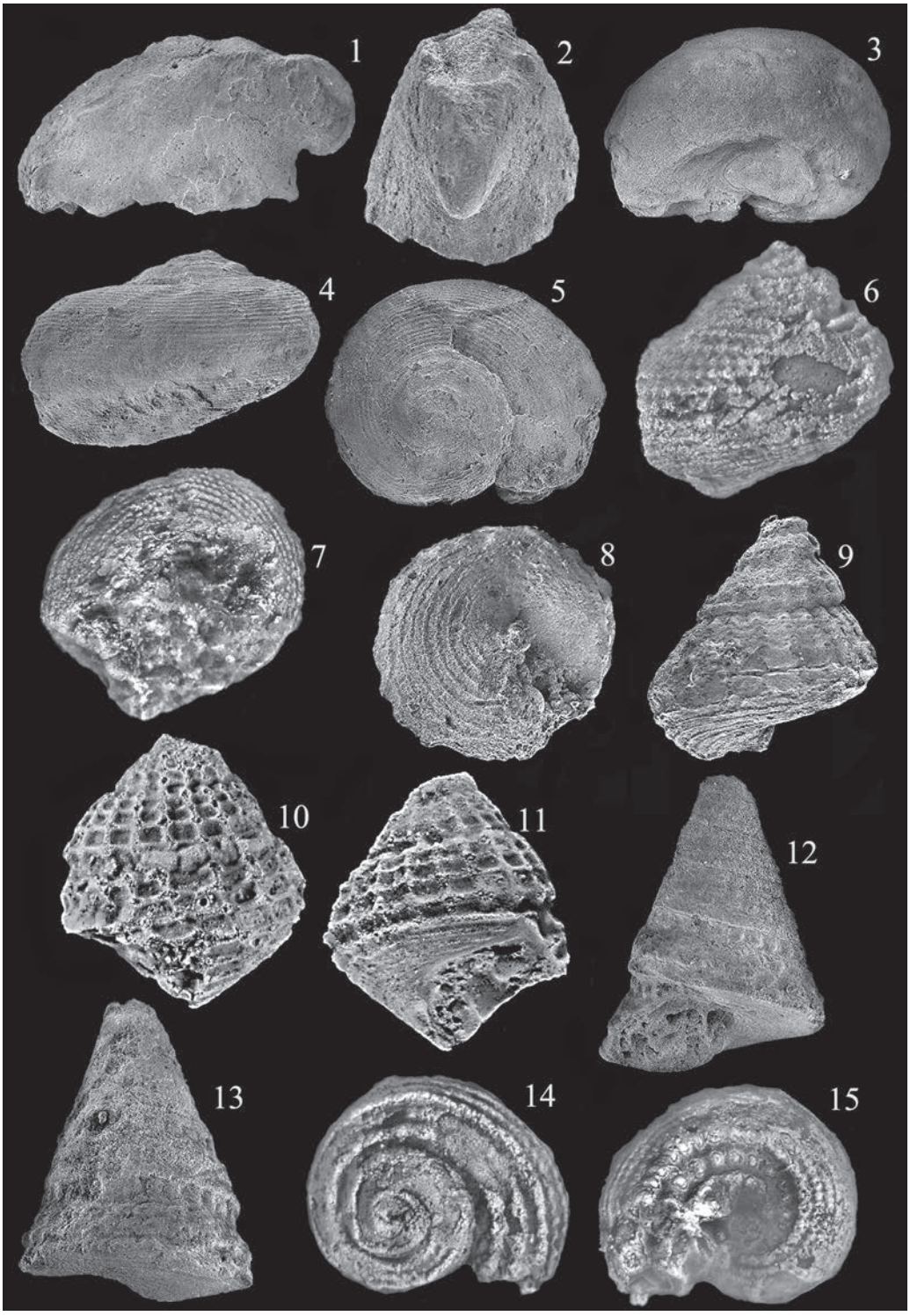
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Plate 2

Fig. 1: *Solariella* sp. (NHMW 2011/0052/0011); abapertural view; width 4.1 mm.

Figs 2–3: *Nododelphinula* sp. (NHMW 2011/0052/0012); abapertural and basal view; width 2.8 mm.

Fig. 4: *Nododelphinula* sp. (NHMW 2011/0052/0013); abapertural view; width 3.1 mm.

Figs 5–6: *Nododelphinula* sp. (NHMW 2011/0052/0014); abapertural and apical view; width 1.4 mm.

Figs 7–10: *Nummogaultina tricarinata* nov. spec., holotype (NHMW 2011/0052/0015); apical, inclined apical, basal and abapertural view; width 2.6 mm.

Fig. 11: *Calliomphalus crucianus* (Pictet & Campiche, 1863) nov. comb. (NHMW 2011/0052/0016); basal view; width 3 mm.

Figs 12–13: *Calliomphalus crucianus* (Pictet & Campiche, 1863) nov. comb. (NHMW 2011/0052/0017); apical and abapertural view; width 3.7 mm.

Figs 14–15: *Calliomphalus* ? sp. (NHMW 2011/0052/0019); apical and basal view; width 1.5 mm.

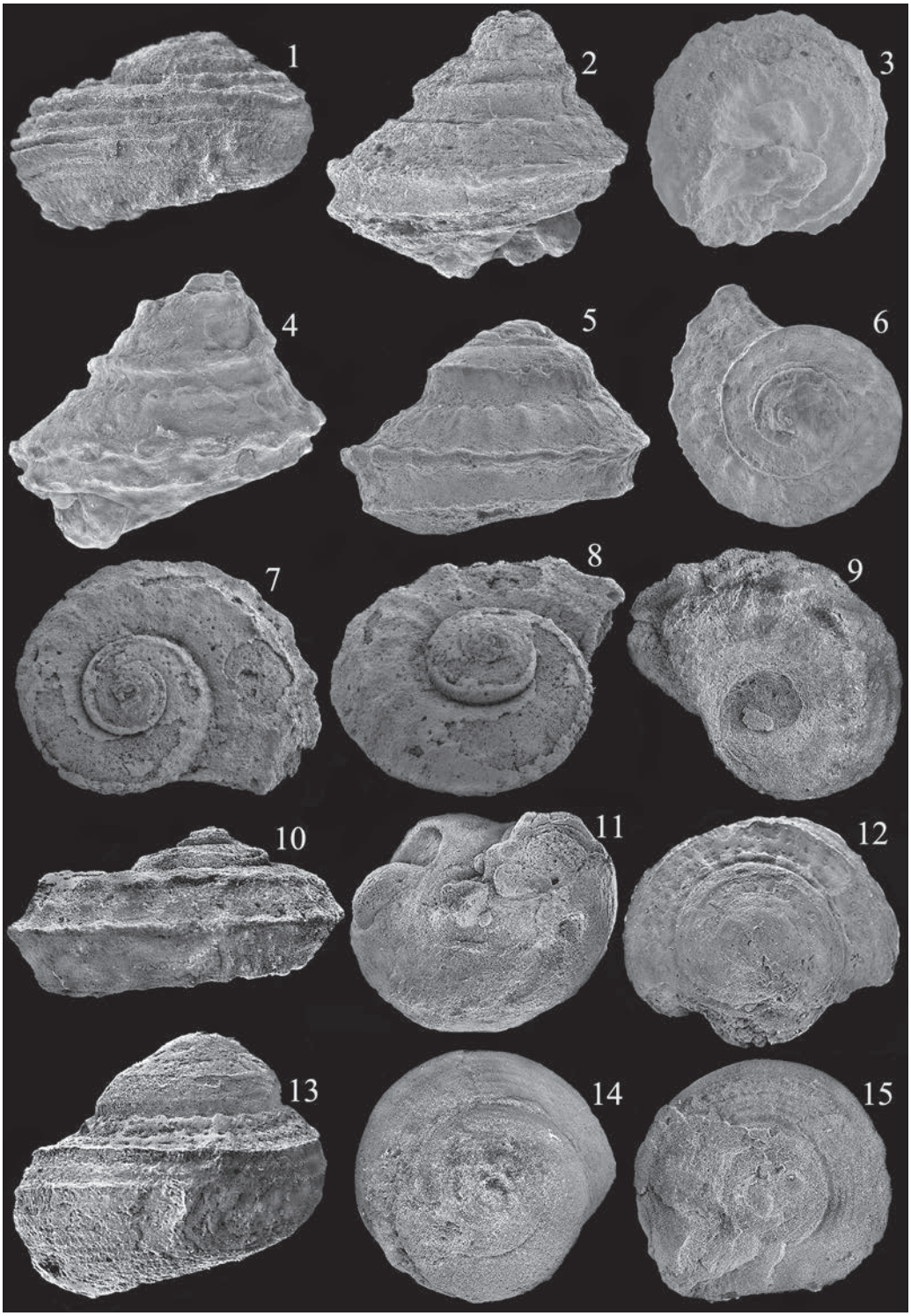
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Plate 3

Fig. 1: *Calliomphalus* ? sp. (NHMW 2011/0052/0019); abapical view; width 1.5 mm.

Figs 2–3: *Boutillieria* ? sp. (NHMW 2011/0052/0020); abapical and basal view; width 2.8 mm.

Figs 4–6: *Pseudoliotina* ? *parva* nov. spec., holotype (NHMW 2011/0052/0022); apical, basal and abapertural view; width 0.9 mm.

Figs 7–9: *Costatomphalus moosleitneri* nov. spec., holotype (NHMW 2011/0052/0023); abapertural, apical and basal view; width 2.1 mm.

Figs 10–12: *Costatomphalus michaillensis* (Pictet & Campiche, 1863) nov. comb. (NHMW 2011/0052/0024); apical, abapertural and basal view; width 44.5 mm.

Figs 13–15: Liotiidae indet. (NHMW 2011/0052/0027); apertural and abapertural view (Figs 13, 15) and basal view (Fig. 14); height 1.7 mm, width 2.4 mm.

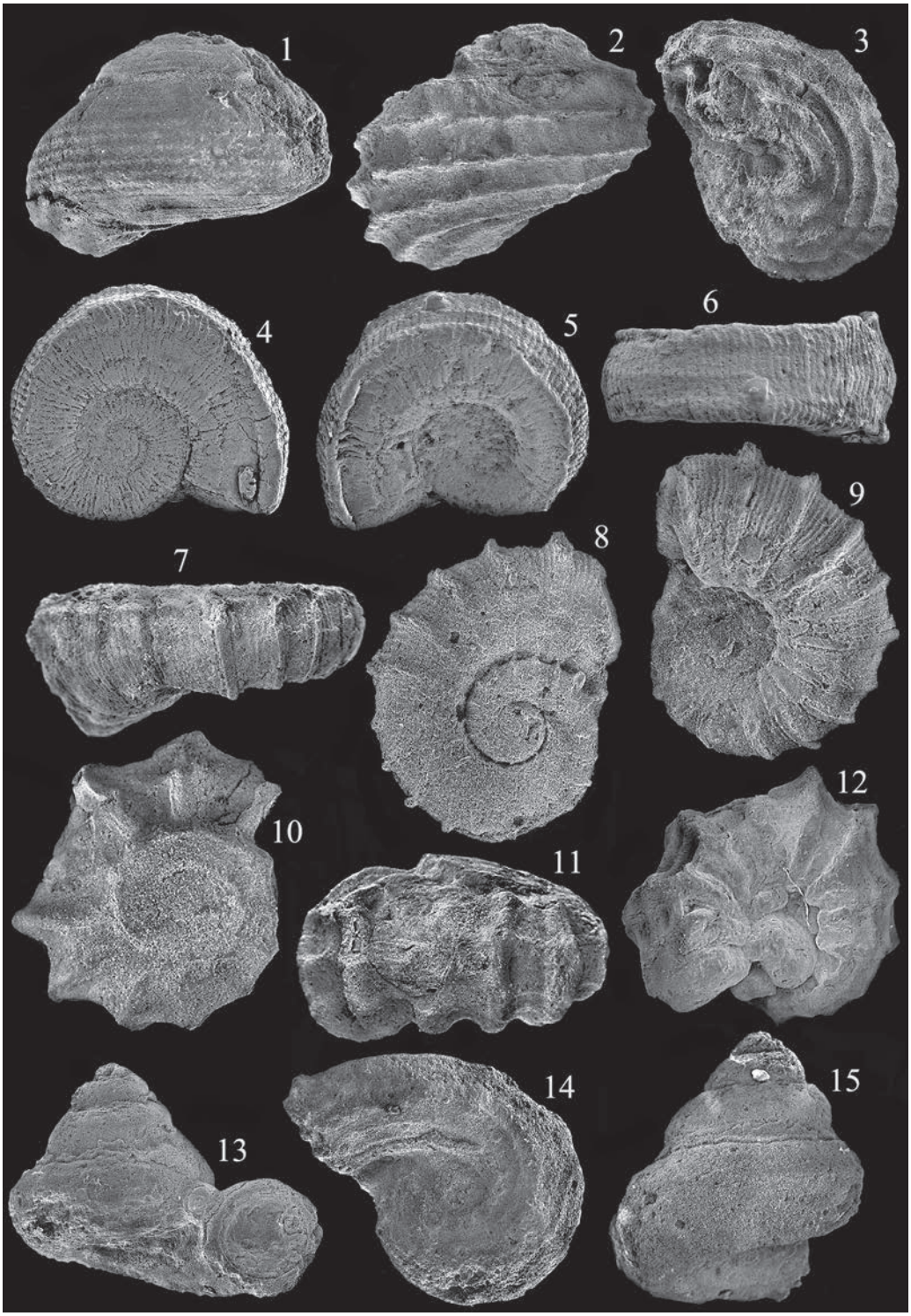
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Plate 4

Figs 1–5: *Brouzetdiscus* ? *carinatus* nov. spec., holotype (NHMW 2011/0052/0029); Figs 1–2: apical and basal view, Figs 4–5: abapertural and apertural view, width 2.7 mm; Fig. 3: sculpture detail from apical side, height 0.55 mm.

Fig. 6: *Brouzetdiscus* ? *carinatus* nov. spec., paratype (NHMW 2011/0052/0030); apical view; width 2.5 mm.

Figs 7–9: *Colpomphalus spiralocostatus* nov. spec., holotype (NHMW 2011/0052/0033); apical, apertural and basal view; width 1.8 mm.

Fig. 10: *Colpomphalus spiralocostatus* nov. spec., paratype (NHMW 2011/0052/0034); adapical view; width 2.4 mm.

Figs 11–14: *Colpomphalus* ? sp. (NHMW 2011/0052/0037); Fig. 11–13: abapertural, apical and basal view, width 4.2 mm; Fig. 14: sculpture detail from the apical side.

Figs 15–17: *Cenocampoides* sp. (NHMW 2011/0052/0038); apical, basal and apertural view; width 0.8 mm.

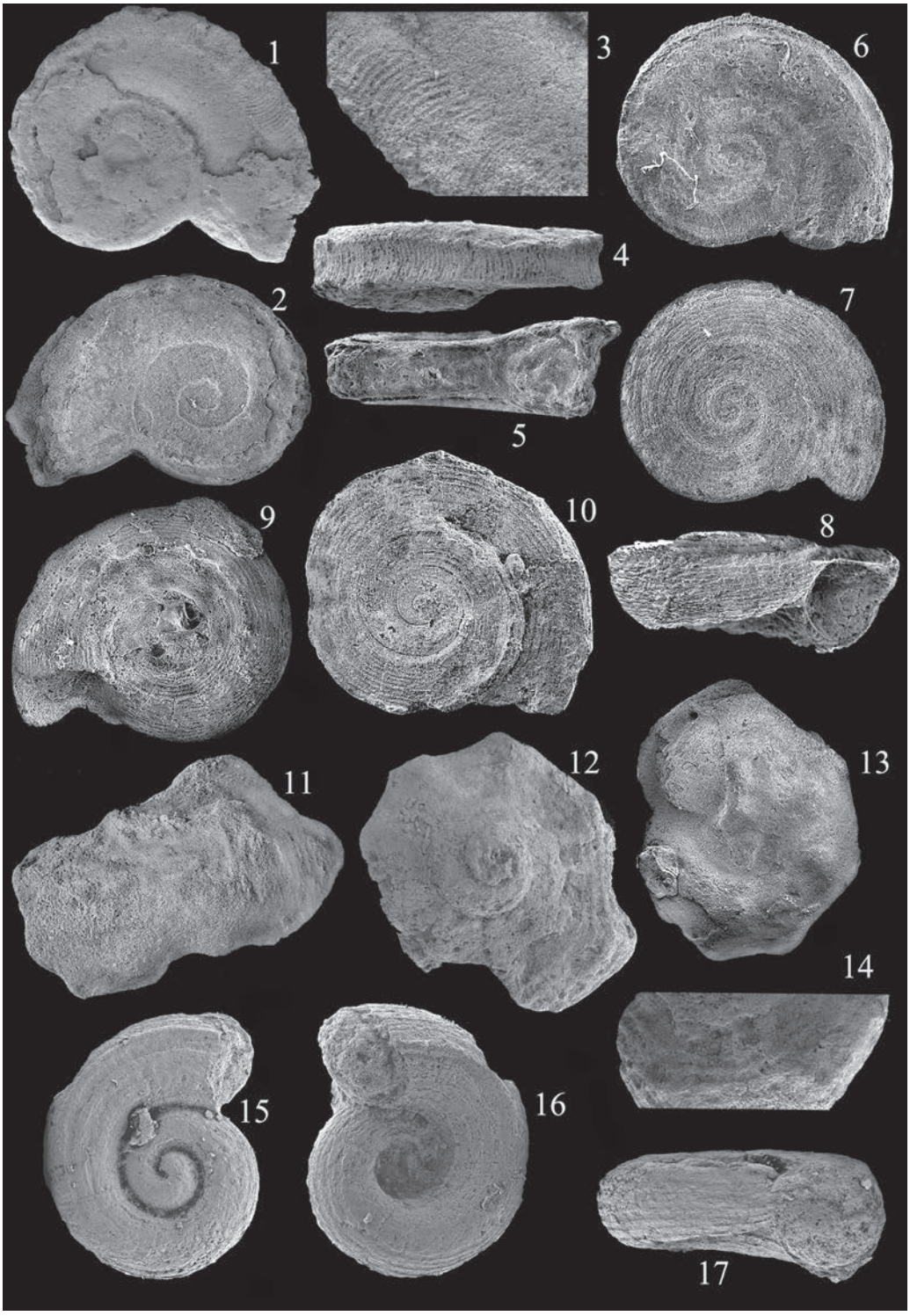
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Plate 5

Figs 1–2: *Neridomus* sp. (NHMW 2011/0052/0039); abapertural and apertural view; width 2.3 mm.

Figs 3–4: *Pileolus* aff. *michaillensis* Pictet & Campiche, 1863 (NHMW 2011/0052/0041); apical and lateral view; length 3.8 mm.

Fig. 5: *Pileolus* aff. *michaillensis* Pictet & Campiche, 1863 (NHMW 2011/0052/0042); basal (= apertural) view; length 4.5 mm.

Fig. 6: *Infacerithium* ? sp. (NHMW 2011/0052/0045); abapertural view, height 4.3 mm.

Figs 7–8: *Infacerithium* ? sp. (NHMW 2011/0052/0046); apertural and abapertural view; height 6 mm.

Fig. 9: *Infacerithium* ? sp. (NHMW 2011/0052/0047); lateral view; height 3.7 mm.

Fig. 10: *Cryptaulax* ? sp. (NHMW 2011/0052/0050); lateral view; height 7.3 mm.

Fig. 11: *Cryptaulax* ? sp. (NHMW 2011/0052/0051); apertural view; height 3.8 mm.

Figs 12–13: Cryptaulacidae gen. et sp. indet. (NHMW 2011/0052/0053); abapertural and apertural view; height 3 mm.

Fig. 14: *Provolibathra* ? *dubiosa* (Cossmann, 1918) nov. comb. (NHMW 2011/0052/0054); apertural view; height 5.2 mm.

Fig. 15: *Provolibathra* ? *dubiosa* (Cossmann, 1918) nov. comb. (NHMW 2011/0052/0055); apertural view; height 2.7 mm.

Fig. 16: *Metacerithium coquandi* (Pictet & Campiche, 1863) nov. comb. (NHMW 2011/0052/0057); lateral view; height 5.5 mm.

Fig. 17: *Metacerithium coquandi* (Pictet & Campiche, 1863) nov. comb. (NHMW 2011/0052/0058); abapertural? view; height 2.3 mm.

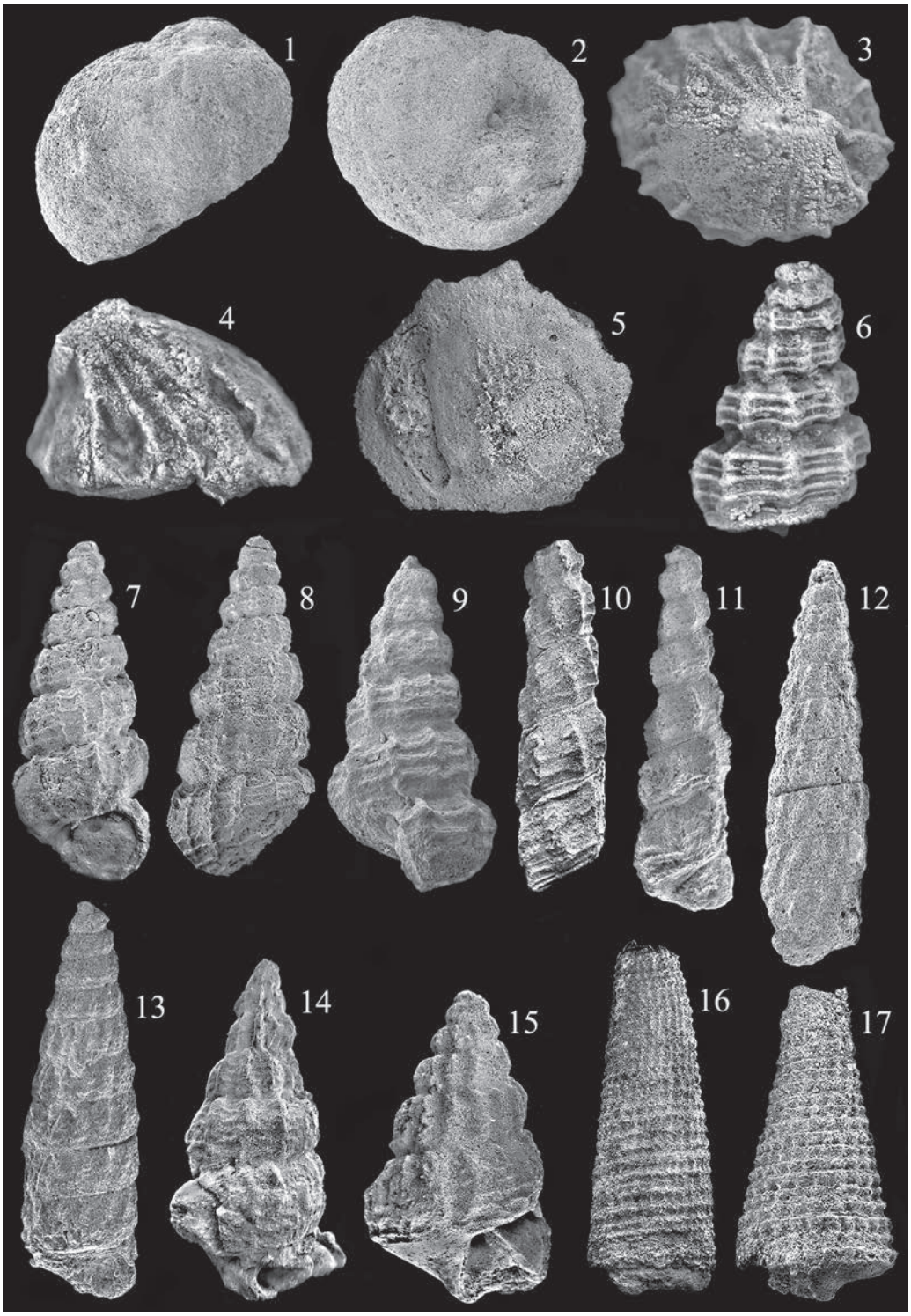
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Plate 6

Fig. 1: *Paracerithium* ? sp. (NHMW 2011/0052/0060); abapertural view; height 4.3 mm.

Figs 2–3: *Atractostoma gibbosa* Sayn, 1932 (NHMW 2011/0052/0062); apertural and abapertural view; height 8 mm.

Fig. 4: *Urgonella mumiola* Cossmann, 1916 (NHMW 2011/0052/0064); apertural view; height 5.8 mm.

Fig. 5: *Urgonella mumiola* Cossmann, 1916 (NHMW 2011/0052/0065); lateral view; height 7.5 mm.

Fig. 6: *Urgonella mumiola* Cossmann, 1916 (NHMW 2011/0052/0066); abapertural view; height 7.5 mm.

Fig. 7: *Tomaszoviella cureti* (Cossmann, 1918)? nov. comb. (NHMW 2011/0052/0068); lateral view; height 4.5 mm.

Fig. 8: *Rigauxia* sp. (NHMW 2011/0052/0069); abapertural view; height 8.2 mm.

Fig. 9: Cryptaulacidae (gen. indet.) *bruni* (Cossmann, 1916) (NHMW 2011/0052/0071); apertural view; height 6.1 mm.

Fig. 10: *Exechocirsus* ? sp. (NHMW 2011/0052/0072); apertural view; height 2.9 mm.

Fig. 11: *Exechocirsus* ? sp. (NHMW 2011/0052/0073); abapertural view; height 2.6 mm.

Fig. 12: *Diozoptyxis* sp. (NHMW 2011/0052/0075); abapertural view; height 3.8 mm.

Fig. 13: *Diozoptyxis* sp. (NHMW 2011/0052/0076); abapertural view; height 3.5 mm.

Figs 14–16: *Bleytonella circumlata* nov. spec., holotype (NHMW 2011/0052/0078); abapertural, lateral and apertural view; height 4 mm.

Figs 17–18: *Buvignieria* sp. (NHMW 2011/0052/0080); apertural and abapertural view; height 1.8 mm.

Fig. 19: *Buvignieria* sp. (NHMW 2011/0052/0081); abapertural view; height 2.7 mm.

Fig. 20: *Buvignieria* sp. (NHMW 2011/0052/0082); apertural view; height 2.6 mm.

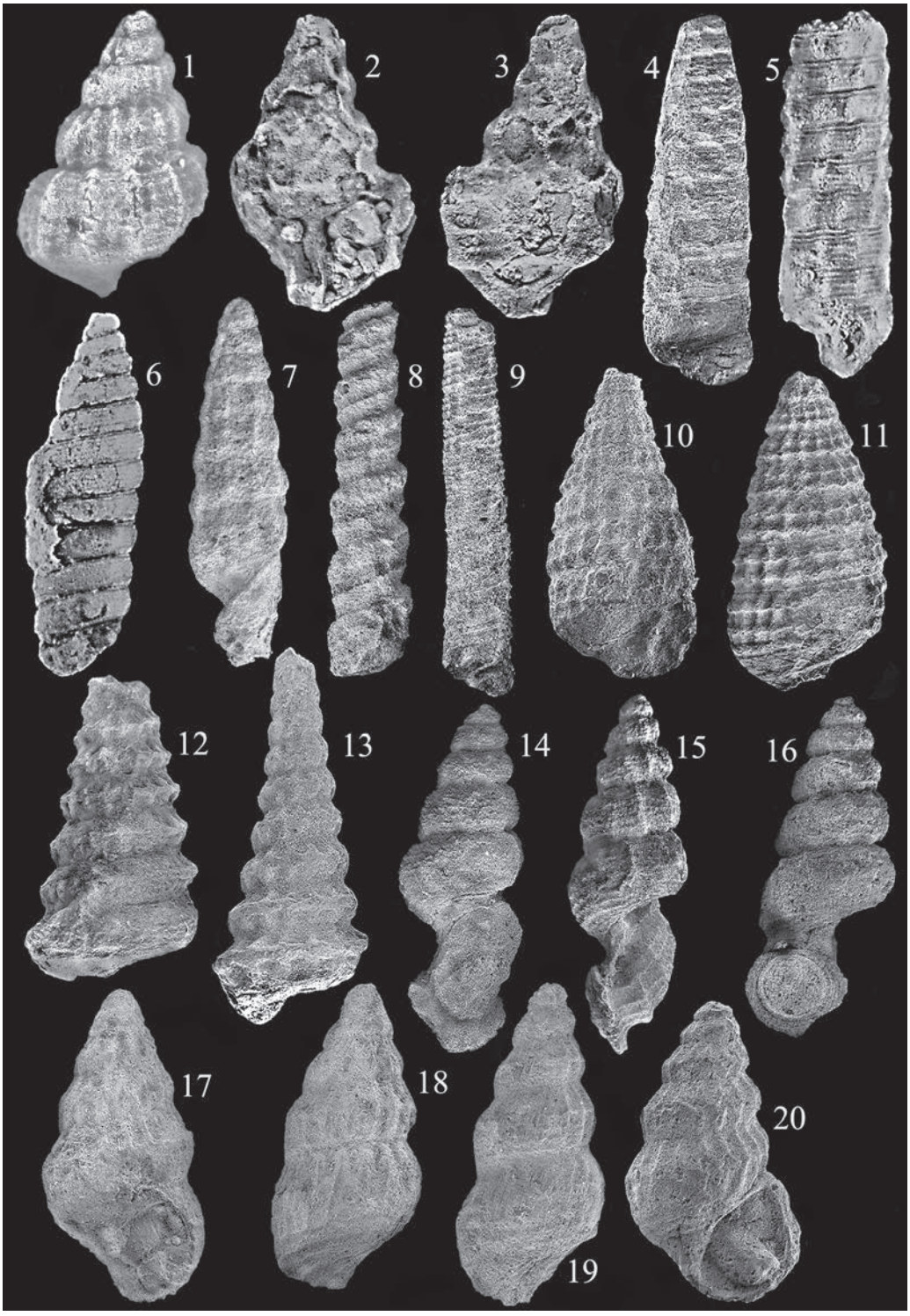
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Plate 7

Fig. 1: *Rissoa* ? *cureti* Cossmann, 1918 (NHMW 2011/0052/0084); lateral view; height 2,8 mm.

Figs 2–3: *Rissoa* ? *cureti* Cossmann, 1918 (NHMW 2011/0052/0085); apertural and lateral view; height 3.8 mm.

Fig. 4: Rissoidae gen. indet. (NHMW 2011/0052/0087); lateral view; height 4.4 mm.

Fig. 5: Rissoidae gen. indet. (NHMW 2011/0052/0088); abapertural view; height 4.2 mm.

Figs 6–7: *Ceratosiphon* ? sp. (NHMW 2011/0052/0090); lateral and abapertural view; height 2.7 mm.

Figs 8–9: *Eoranella kiliani* Sayn, 1932? (NHMW 2011/0052/0091); apertural and abapertural view; height 4.8 mm.

Figs 10–11: "*Triton*" *urgonense* Pictet & Campiche, 1864 (NHMW 2011/0052/0092); apertural and abapertural view; height 3.4 mm.

Figs 12–13: Colombellinidae gen. et sp. indet. (NHMW 2011/0052/0093); lateral and apertural view; height 7.5 mm.

Figs 14–16: *Lamelliphorus couveti* Pictet & Renevier, 1854 nov. comb. (NHMW 2011/0052/0094); apertural, abapertural and basal view; width 2.9 mm.

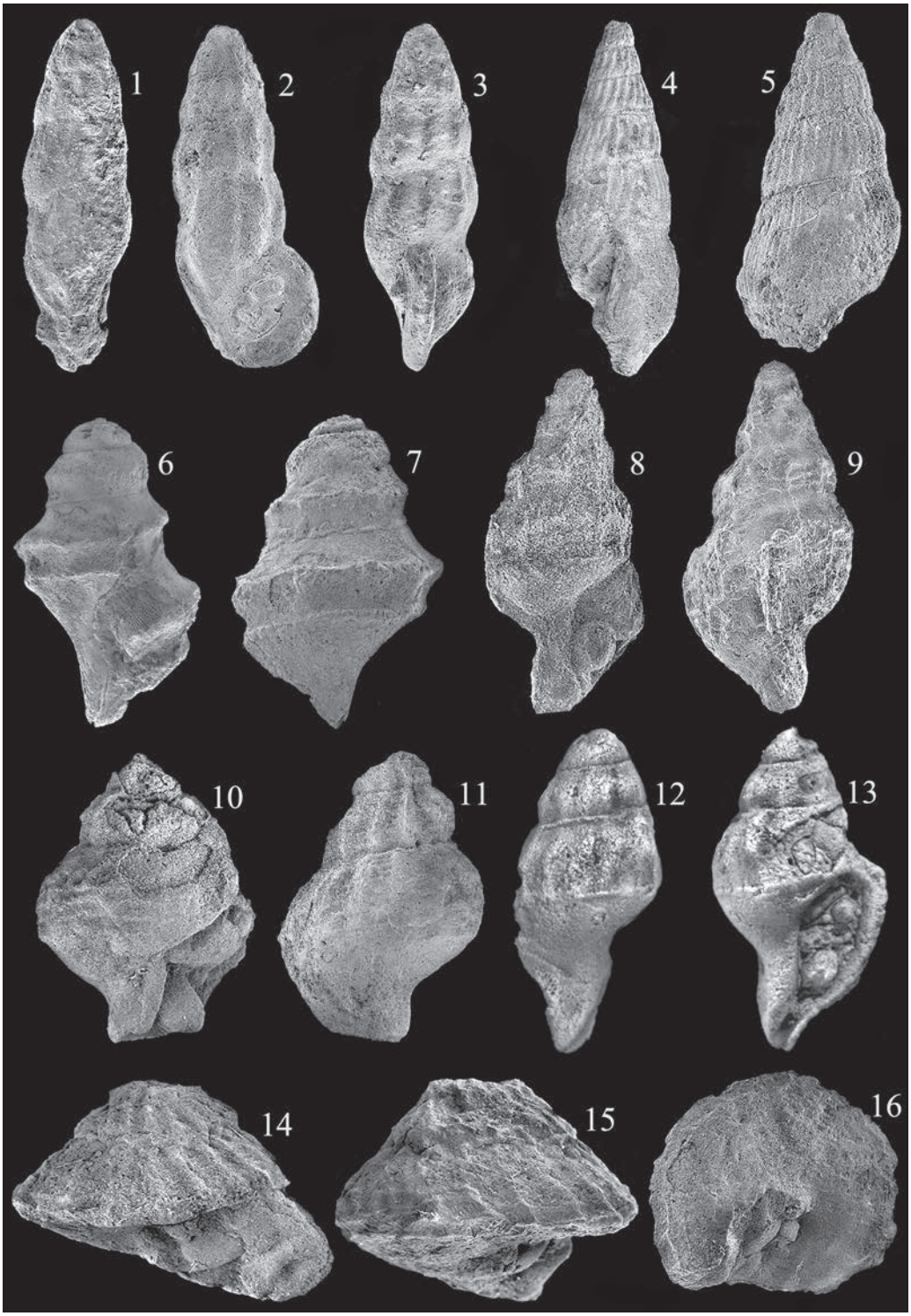
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Plate 8

Figs 1–3: *Confusiscala* sp. (NHMW 2011/0052/0095); abapertural, detail of sculpture and oblique apertural view; height 10 mm, width 5.4 mm; height of sculpture detail 4.2 mm.

Figs 4–5: Ptenoglossa sp. indet. (NHMW 2011/0052/0097); abapertural, and oblique apertural view, height 2.7 mm, width 1.4 mm.

Fig. 6: Ptenoglossa sp. indet. (NHMW 2011/0052/0098); abapertural view; height 2.8 mm.

Fig. 7: *Pseudomelania* ? *leptomorpha* Cossmann, 1900 (NHMW 2011/0052/0100); lateral view; height 5.2 mm.

Figs 8–9: Caenogastropoda indet. 1 (NHMW 2011/0052/0102); apertural and apical view; width 0.95 mm.

Figs 10–11: Caenogastropoda indet. 2 (NHMW 2011/0052/0103); apertural and apical view; width 0.75 mm.

Figs 12–13: Caenogastropoda indet. 3 (NHMW 2011/0052/0105); apical and abapertural view; width 0.3 mm.

Figs 14–15: *Jurilda* sp. (NHMW 2011/0052/0106); apertural and abapertural view; height 2.5 mm.

Figs 16–18: *Tricarilda* ? sp. (NHMW 2011/0052/0108); Figs: 16–17 abapertural and lateral view; height 3.6 mm; Fig. 18 = abapertural view of last whorl; height 1.3 mm.


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Plate 9

Figs 1–2: *Avellana* ? sp. (NHMW 2011/0052/0110); abapertural and apical view; width 3 mm.

Fig. 3: *Eurinea gigantea* (D'HOMBRE-FIRMAS, 1838) nov. comb. (NHMW 2011/0052/0112); apertural view; height 4.2 mm.

Fig. 4: *Eurinea gigantea* (D'HOMBRE-FIRMAS, 1838) nov. comb. (NHMW 2011/0052/0113); abapertural view; height 8.7 mm.

Figs 5–6: *Favria pellati* (COSSMANN, 1907) nov. comb. (NHMW 2011/0052/0115); apertural and abapertural view; height 9.2 mm.

Fig. 7: *Falsoebala* ? sp. 1 (NHMW 2011/0052/0118); oblique adapical view; height 0.65 mm.

Fig. 8: *Falsoebala* ? sp. 2 (NHMW 2011/0052/0119); abapertural view; height 1.1 mm.

Fig. 9: *Falsoebala* ? sp. 3 (NHMW 2011/0052/0120); lateral view; height 0.7 mm.

Fig. 10: *Falsoebala* ? sp. 4 (NHMW 2011/0052/0121); apertural view; height 0.95 mm.

Fig. 11: *Falsoebala* ? sp. 5 (NHMW 2011/0052/0122); abapertural view; height 0.73 mm.

Fig. 12: *Bandellina* sp. (NHMW 2011/0052/0123); oblique apical view; width 1.3 mm.

Figs 13–14: *Bandellina* sp. (NHMW 2011/0052/0124); abapertural and apical view; width 0.5 mm.

Figs 15–17: *Liocarenus* ? *gymna* (COSSMANN, 1916) nov. comb. (NHMW 2011/0052/0125); apertural, abapertural and apical view; height 2.7 mm, width 1.8 mm.

Figs 18–19: *Acteocina tenuistriata* (COTTEAU, 1854) (NHMW 2011/0052/0127); apical and apertural view; height 3.2 mm, width 1.4 mm.

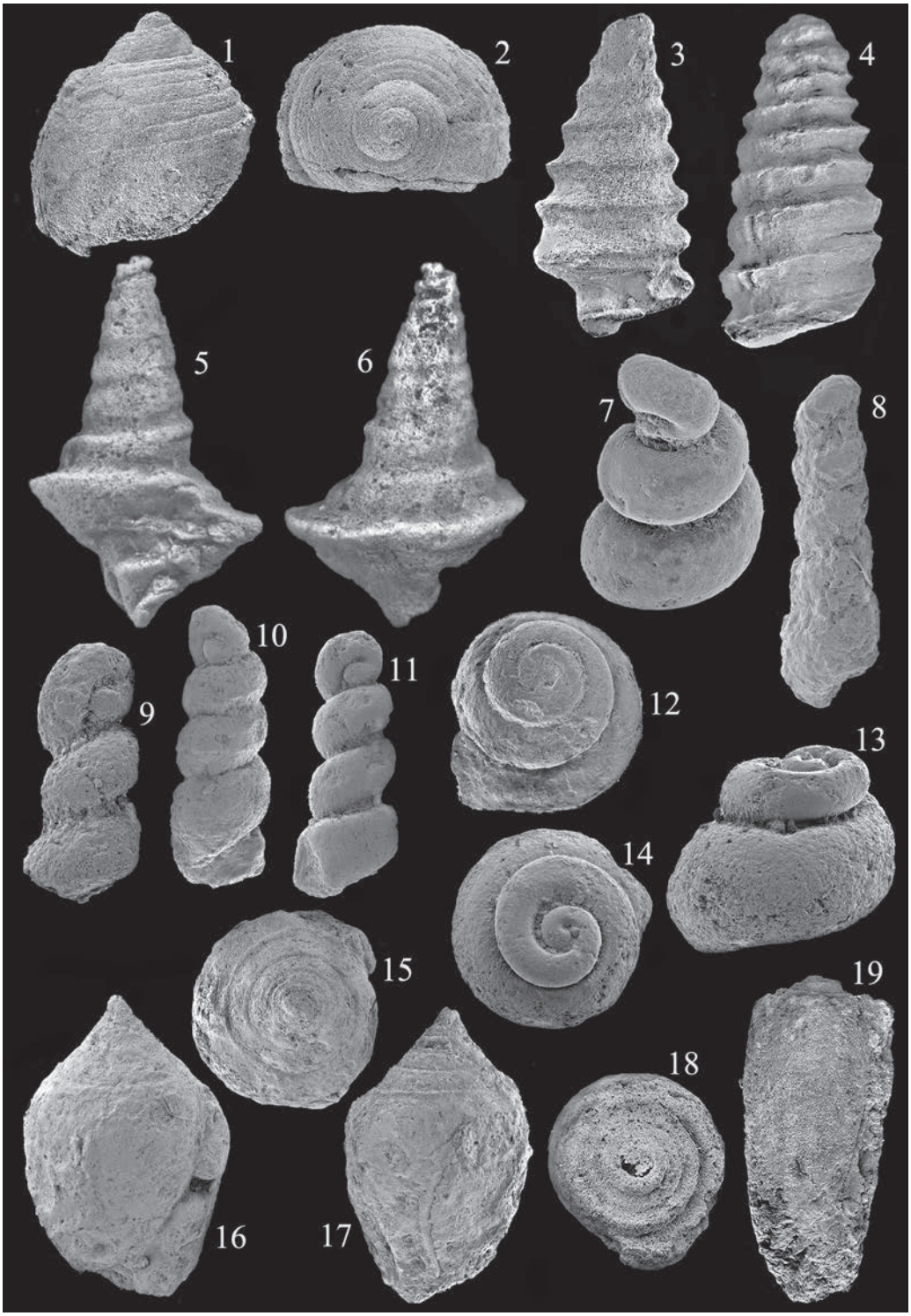
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Plate 10

Fig. 1: *Cylichna urgonensis* (Pictet & Campiche, 1862) ? nov. comb. (NHMW 2011/0052/0128); apertural view; height 4.5 mm.

Fig. 2: *Neocylindrites boutillieri* (Cossmann, 1916) (NHMW 2011/0052/0130); apertural view; height 4.6 mm.

Figs 3–4: *Neocylindrites boutillieri* (Cossmann, 1916) (NHMW 2011/0052/0131); apertural view, height 4.2 mm; columellar, view, height 1.6 mm.

Fig. 5: *Ovactaeonina* sp. 1 (NHMW 2011/0052/0134); abapertural view; height 1 mm.

Figs 6–7: *Ovactaeonina* sp. 1 (NHMW 2011/0052/0135); apertural and abapertural view; height 1.2 mm.

Figs 8–9: *Ovactaeonina* sp. 2 (NHMW 2011/0052/0136); apertural and abapertural view; height 1 mm.

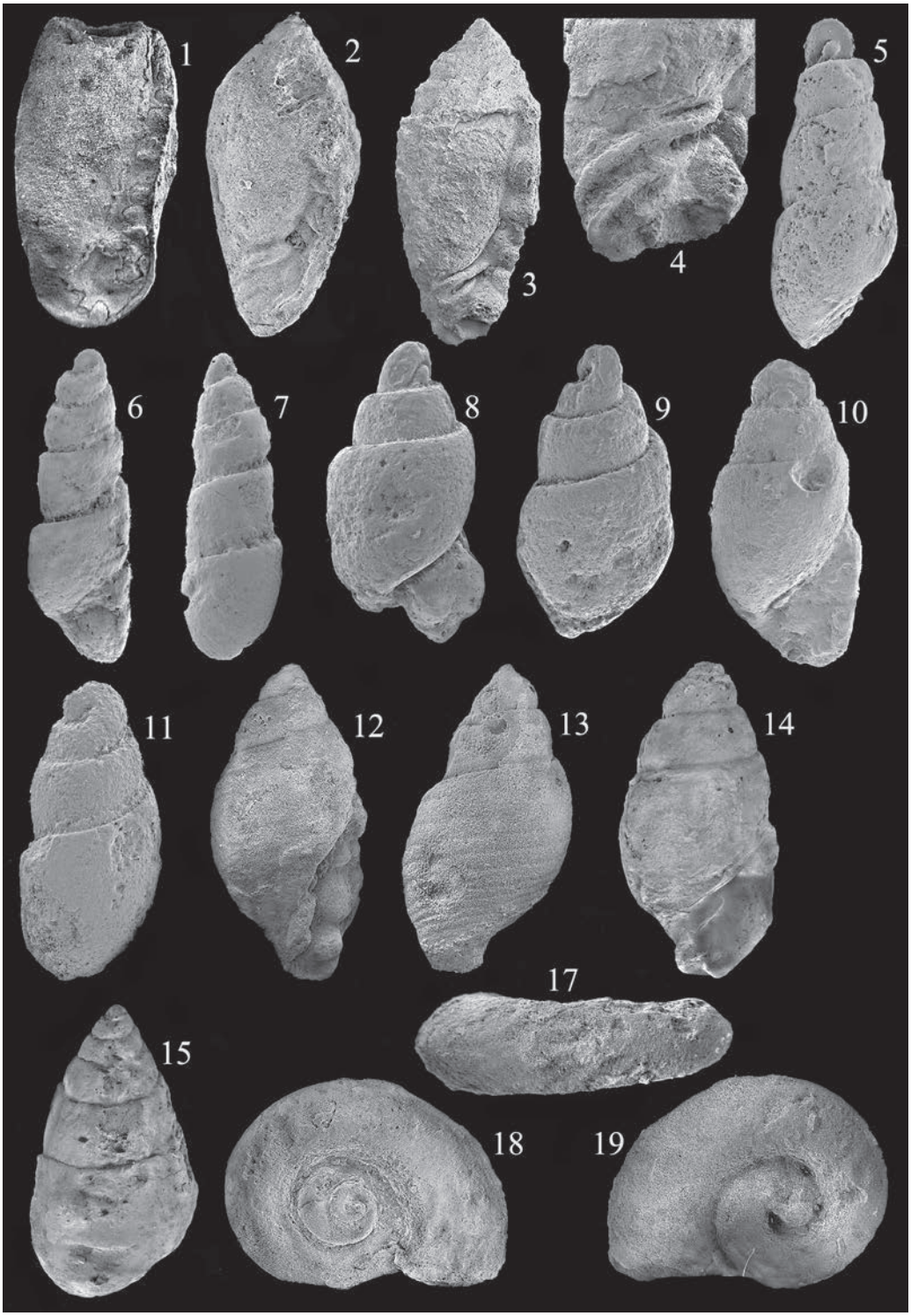
Figs 10–11: *Ovactaeonina* sp. 2 (NHMW 2011/0052/0137); apertural and abapertural view; height 1 mm.

Figs 12–13: *Tornatellaea* sp. 1 (NHMW 2011/0052/0138); apertural and abapertural view; height 4.2 mm.

Fig. 14: *Tornatellaea* ? sp. 2 (NHMW 2011/0052/0140); apertural view; height 4.4 mm.

Fig. 15: *Tornatellaea* ? sp. 2 (NHMW 2011/0052/0141); shell in side view; height 4.8 mm.

Figs 17–19: *Lychnus* sp. (NHMW 2011/0052/0144); abapertural, apical and basal view; width 3.6 mm.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