Zitteliana

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Series A/Reihe A
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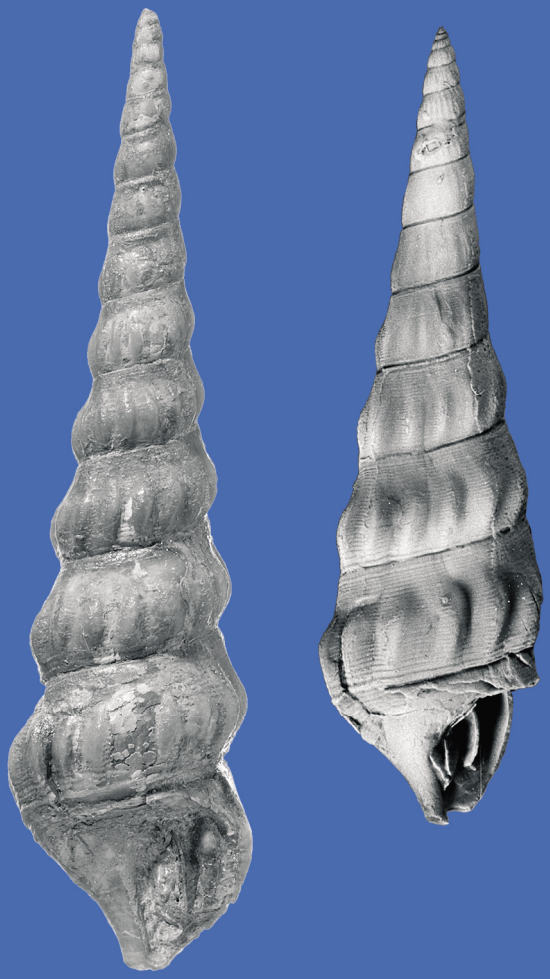

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Cover illustration: Snail *Pseudokatosira undulata* (BSPG 2007 XXII 1 and 2) from the Early Jurassic Amaltheenton of Franconia; this species is relatively rare and is the largest from the Amaltheenton (as large as 10 cm). For details see Nützel, A. & Gründel, J.: Two new gastropod genera from the Early Jurassic (Pliensbachian) of Franconia (South Germany), pp. 59 - 67 in this issue.

Umschlagbild: Schnecke *Pseudokatosira undulata* (BSPG 2007 XXII 1 und 2) aus dem unterjurassischen Amaltheenton Frankens; diese Art ist relativ selten und die größte aus dem Amaltheenton (bis zu 10 cm). Für weitere Informationen siehe Nützel, A. & Gründel, J.: Two new gastropod genera from the Early Jurassic (Pliensbachian) of Franconia (South Germany), S. 59 - 67 in diesem Heft.

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Two new gastropod genera from the Early Jurassic (Pliensbachian) of Franconia (South Germany)

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Abstract

Two new caenogastropod genera are described from the Liassic (Pliensbachian) Amaltheenton Formation of Franconia (South Germany): *Pseudokatosira* and *Francocerithium*. *Pseudokatosira* is a relatively large and high-spired member of the Zygopleuroidea and is based on the type species "*Katosira*" *undulata*. The protoconch of this species is reported for the fist time. *Francocerithium* is based on the species *Francocerithium kochi* (Münster in Goldfuss), a small stout cerithioid which is common in the Amaltheenton Formation of Franconia. A lectoype is selected for *Turbo kochii* Münster in Goldfuss (= *Francocerithium kochi*) and is illustrated. *F. kochi* has a relatively large, complexly ornamented larval shell.

Key words: Gastropods, Caenogastropoda, Jurassic, Pliensbachian, Amaltheenton Formation, South Germany

Kurzfassung

Zwei neue Gattungen der Caenogastropoden werden aus der liassischen (Pliensbachium) Amaltheenton Formation Frankens (Süddeutschland) beschrieben: *Pseudokatosira* und *Francocerithium*. *Pseudokatosira* ist ein relativ großwüchsiger, hochturmförmiger Vertreter der Zygopleuroidea und basiert auf der Typus-Art "*Katosira*" *undulata*. Der Protoconch dieser Art wird erstmals belegt. *Francocerithium* basiert auf der Typus-Art *Francocerithium kochi* (Münster in Goldfuss), einem kleinwüchsigen, gedrungenen Vertreter der Cerithioidea, der in der Amaltheenton Formation Frankens häufig vorkommt. Für *Turbo kochii* Münster in Goldfuss (= *Francocerithium kochi*) wird ein Lectotyp festgelegt und abgebildet. *F. kochi* besitzt eine relativ große, komplex ornamentierte Larvalschale.

Schlüsselwörter: Gastropoden, Caenogastropoda, Jura, Pliensbachium, Amaltheenton Formation, Süddeutschland

1. Introduction

Marine Pliensbachian grey shales of the Amaltheenton Formation of Franconia (N Bavaria, South Germany) commonly yield abundant gastropods. Gastropods often form the most abundant and diverse group in this facies. With a few exceptions, these gastropods are small and most of them do not exceed an adult size of 1 cm and commonly they are even much smaller. These gastropods represent species with a small adult size as well as early juveniles. Typically, these faunas are numerically dominated by a few species, especially the caenogastropods *Levipleura blainvillei*, *Kalchreuthia frankei*, and by the heterobranch (opisthobranch) *Cylindrobullina domeria* (Nützel & Kiessling 1997; Gründel & Nützel 1998; Nützel & Hornung 2002). This paper reviews two long known species from the Amaltheenton Formation: the small cerithioid "*Rhynchocerithium*" *kochi* (Münster in Goldfuss, 1844) and the rather large "*Katosira*" *undulata* (Benz in Zieten, 1830) which are placed in new genera: *Francocerithium* and *Pseudokatosira* respectively. *Francocerithium kochi* is one of the more abundant gastropods from the Amaltheenton Formation of Franconia. It reaches a size of about 1 cm and can be found both by surface collecting and also in washed residues. The large species *Pseudokatosira undulata*, by contrast, is rare and we have never found remains of this characteristic shell in numerous washed residues. However, extensive collecting effort of several amateurs yielded a good number of specimens. Thanks to these collectors we were able to examine well preserved specimens providing new morphological details.

2. Material and repository

The material comes from greyish claystones form several clay pits of Franconia (pits in Unterstürmig and Buttenheim near Forchheim as well as Kalchreuth near Nürnberg; see Textfig. 1) (Nützel & Kiessling 1997; Gründel & Nützel

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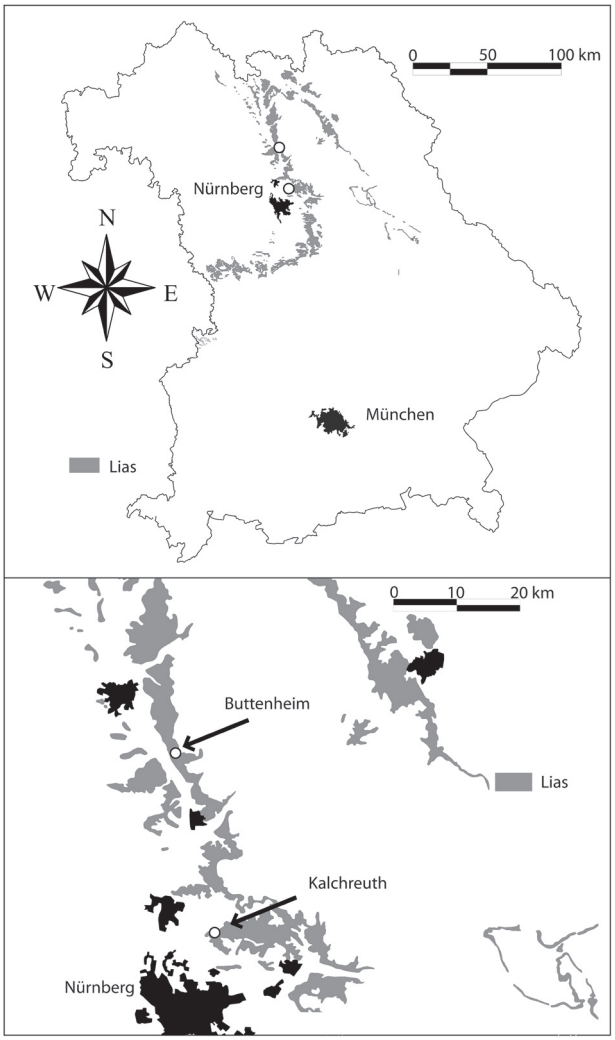


Textfigure 1: Location of the clay pits of Kalchreuth and Buttenheim in Northern Bavaria (Franconia); cities are in black; the outcrop of Liassic strata is shaded in grey.

1998). The Amaltheenton in that area consists of bioturbated mudstones that were deposited under fully marine conditions in an offshore situation. The Amaltheenton is well-known for its rich ammonite faunas but yields also a diverse and abundant benthic fauna of mostly small invertebrates, mainly gastropods, bivalves, and ophiuroids. This benthic fauna represents a soft-bottom community that lived under aerobic to dysaerobic conditions (see Nützel & Kiessling 1997 for further discussion).

The material is housed in the Bayerische Staatssammlung für Paläontologie und Geologie (BSPG) in Munich unless otherwise stated.

3. Systematic Palaeontology

Subclass Caenogastropoda Cox, 1959
Superfamily Zygopleuroidea Wenz, 1938
Family Zygopleuridae Wenz, 1938
Subfamily Ampezzopleurinae Nützel, 1998

Pseudokatosira n. gen.

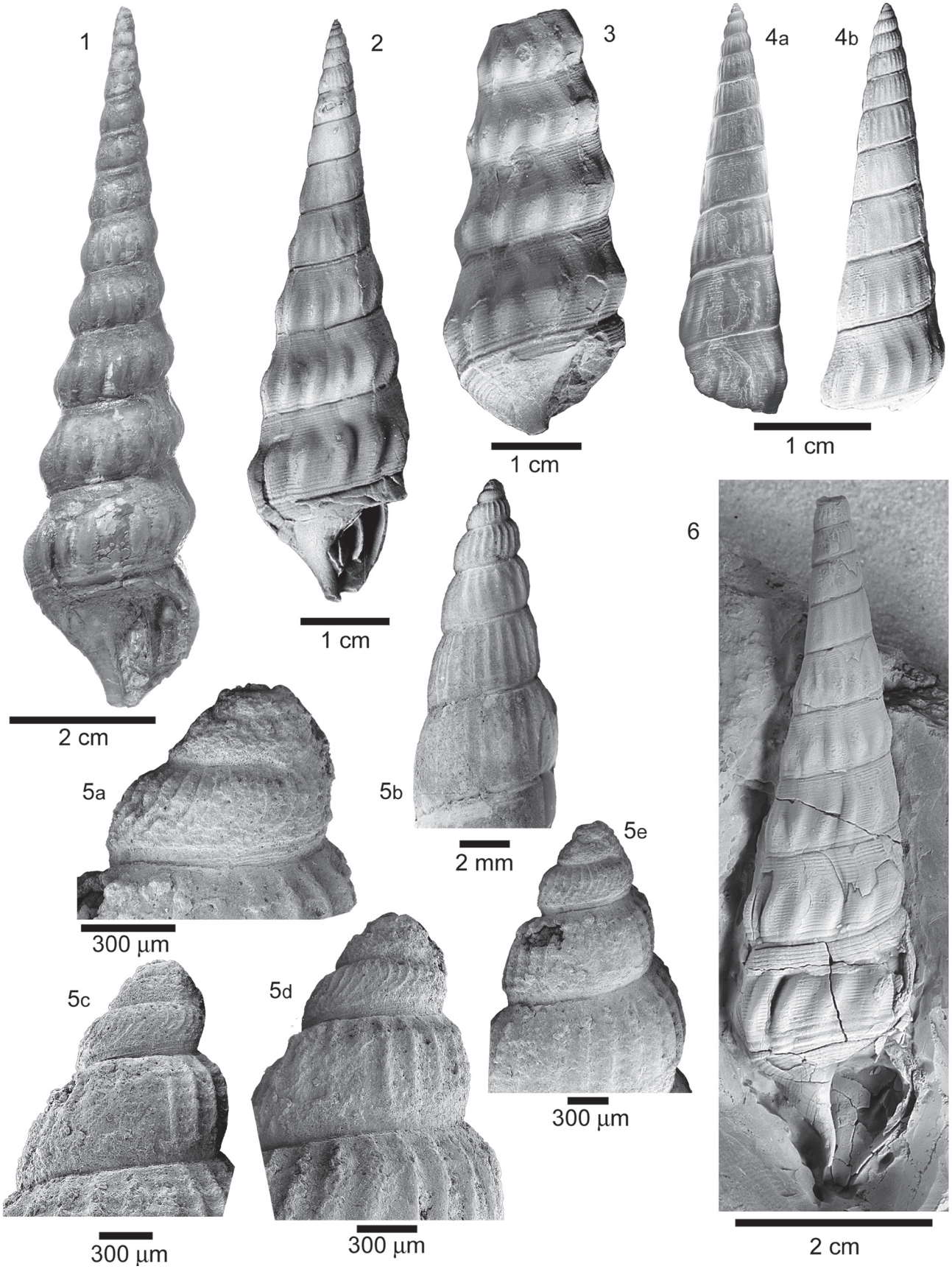
Type species: *Turritella undulata* Benz in Zieten, 1830, Early Jurassic, South Germany. The genus is monotypic so far. There are several similar Mesozoic species which could belong to *Pseudokatosira* but the status of the diagnostic characters is unknown for these species.

Etymology: *Pseudokatosira* resembles the genus *Katosira* but differs from it in several respects.

Diagnosis: Relatively large, high-spired caenogastropod; larval shell broad, multi-whorled, with numerous opisthocyrt, oblique axial ribs which end at a distinct spiral rib somewhat above the abapical suture; early teleoconch with straight axial ribs extending from suture to suture; axial ribs reduced after several whorls; mature teleoconch whorls with few, broad, round axial ribs which become increasingly nodular and are not extending to adapical suture; teleoconch covered with numerous fine spiral ribs and furrows; aperture with anterior siphonal canal.

Discussion: *Pseudokatosira undulata* was previously placed in the genus *Katosira* Koken, 1892 (type species: *Katosira periniana*, Pliensbachian, France). Fischer & Weber (1997) designated and illustrated a lectotype for this species which is poorly preserved. The protoconch of this species is unknown and even the teleoconch ornament is insufficiently preserved. The original illustrations in d'Orbigny (1851-60) and those of Cossmann (1909) show that *K. periniana* does not exhibit the marked change in teleoconch ontogeny which is present in *Pseudokatosira*. Instead the ribs are continuous from suture to suture throughout and a reduction of the axial ribs cannot be observed in *K. periniana*. The teleoconch ornament of *K. periniana* (wavy axial ribs and fine spiral striation)

Plate 1: *Pseudokatosira undulata* (Benz in Zieten, 1830).
Fig. 1: Largest specimen studied (10 cm high), apertural view; Buttenheim, Am Holzbachacker; Schobert coll.; BSPG 2007 XXII 1.
Fig. 2: Apertural view of specimen showing ontogenetic change of teleoconch ornament; Kalchreuth; BSPG 2007 XXII 2.
Fig. 3: Mature teleoconch fragment in lateral view; Kalchreuth; Gradl coll.; BSPG 2007 XXII 3.
Fig. 4: Kalchreuth; juvenile specimen showing ontogenetic change of teleoconch ornament; BSPG 2007 XXII 4.
Fig. 5: Specimen with preserved larval shell; Buttenheim, Am Holzbachacker; Gradl coll.; a: larval shell side view; b: apical whorls, side view; c: larval shell and first teleoconch whorl in side view; d: Larval shell and early teleoconch in side view; e: larval shell and early teleoconch in side view; BSPG XXII 5.
Fig. 6: Specimen with fairly complete aperture, showing siphonal canal; Buttenheim, Am Holzbachacker; Dietz coll.


1
2
3
4a
4b
1 cm
1 cm
1 cm
2 cm
6
5a
5b
2 mm
5e
300 µm
5c
5d
300 µm
300 µm
2 cm

is also present in species with a smooth larval shell e.g., in the Bajocian *Katosira flexuosa* (Münster in Goldfuss, 1844) sensu Gründel (1999a). The smooth larval shell of this species was documented by Gründel (1999a: fig. 1.8–1.10). Other Zygopleuridae (Zygopleurinae, e.g., *Zygopleura*, *Levipleura*, and similar forms) have largely smooth larval shells, sometimes with short ribs or nodes near the sutures (Bandel 1991; Nützel 1998; Gründel & Nützel 1998; Gründel 1999a). Other Ampezzopleurinae have more slender larval shells with axial ribs from suture to suture; e.g., *Striazyga* Nützel, 1998 (type species from the Late Triassic Cassian Formation) is similar but the known species are much smaller (all known specimens less than 10 mm), have fewer, better confined spiral ribs, and continuous axial ribs on the larval shell. *Katosira anaroides* (Schmidt, 1905) from the Late Jurassic of Poland as illustrated and described by Gründel & Kaim (2006) is small and lacks the characteristic ontogenetic change of the teleoconch ornament of *Pseudokatosira*. It does not belong to that genus. The protoconch of *K. anaroides* is unknown.

Pseudokatosira is clearly a caenogastropod and belongs probably in the superfamily Zygopleuroidea. The family assignment of *Pseudokatosira* is somewhat more problematic. The shape and teleoconch ornament would place *Pseudokatosira* in Zygopleuridae. However, a siphonal canal is untypical for this family, i.e. it is absent in the typical genus *Zygopleura* Koken, 1892 (see Nützel 1998) as well as in most other genera included in this family. But given the zygopleuroid habitus and teleoconch ornament (high-spired with ornament of wavy axial ribs) as well as the axially ribbed larval shell, we place *Pseudokatosira* nevertheless in Zygopleuridae.

Pseudokatosira undulata (Benz, 1830)
Pl. 1, Figs 1–6

1830 *Turritella undulata* n. sp. – Benz in Zieten: 43, pl. 32, fig. 2.
1836 *Turritella triplicata* Benz – Roemer: 154.
1839 *Cerithium undulatum* (Benz) – Roemer: 44.
?1854 *Scalaria liasica* Quenstedt – Oppel: 98, pl. 3, figs 13–18.
1856 *Chemnitzia undulata* (Benz) –Oppel: 289.
1858 *Turritella undulata* (Benz) – Quenstedt: 153, pl. 19, figs 13–14, 9–12.
1861 *Chemnitzia undulata* (Benz) – Stoliczka: 163, pl. 1, fig. 1.
1871 *Turritella undulata* (Benz) – Brauns: 256.
1884 *Turritella undulata* (Benz) – Quenstedt: 305, pl. 196, figs 48–54.
1884 *Chemnitzia carusensis* (d'Orbigny) – Quenstedt: 306, pl. 196, figs 55–56.
1884 *Scalaria tornatelloides* n. sp. – Quenstedt: 307, pl. 196, fig. 57.
1896 *Katosira undulata* (Benz) – Koken: 705.
?1901 *Loxonema liasicum* (Quenstedt) – Schlosser: 524.
1909 *Katosira undulata* (Benz) – Brösamlen: 286, pl. 21, fig. 18.
1934 *Katosira undulata* (Benz) – Frentzen: 47.
1983 *Katosira undulata* (Benz) – Szabó: 31, pl. 2, figs 1–2.
1997 *Katosira undulata* (Benz) – Hägele: 81 (with fig.).
v. 2002 *Katosira undulata* (Benz) – Nützel & Hornung: 58, pl. 1, figs 4–5.

Material: 66 specimens from the clay pits Buttenheim (Am Holzbachacker) (mostly collected by Johann Schobert, Hirschaid) and Kalchreuth:
BSPG 2007 XXII 1: 1 specimen, Buttenheim (Am Holzbachacker, Schobert coll.) (Pl. 1, Fig. 1)
BSPG 2007 XXII 2: 1 specimen, Kalchreuth (Pl. 1, Fig. 2)
BSPG 2007 XXII 3: 1 specimen, Kalchreuth (Gradl coll.) (Pl. 1, Fig. 3)
BSPG 2007 XXII 4: 1 specimen, Kalchreuth (Pl. 1, Fig. 4)
BSPG 2007 XXII 5: 1 specimen, Buttenheim (Am Holzbachacker, Gradl coll.) (Pl. 1, Fig. 5)
BSPG 2007 XXII 6: 18 specimens, Buttenheim (Am Holzbachacker, Schobert coll.)
BSPG 2007 XXII 7: 40 specimens, mostly teleoconch fragments (Am Holzbachacker, Schobert coll.)
BSPG 1999 XXII 8: 1 specimen, Buttenheim (Am Holzbachacker, Schobert coll.)
BSPG 1999 XXII 9: 1 specimen, Buttenheim (Am Holzbachacker, Schobert coll.)
BSPG 1999 XXII 10: 1 specimen, Buttenheim (Am Holzbachacker, Schobert coll.)
BSPG 2007 XXII 11: 3 specimens, Kalchreuth, (Gradl coll.)

Description: Shell high-spired, slender; largest specimen at hand has 14 whorls (apex missing) is 10 cm high and 2.4 cm wide (Pl. 1, Fig. 1); specimen with about 16 whorls (apex present) 65 mm high, 20 mm wide (Pl. 1, Fig. 2); protoconch

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Plate 2: *Francocerithium kochi* (Münster in Goldfuss 1844).

Fig. 1a: Münster's (in Goldfuss 1844: pl. 193, fig. 15) original illustration of "*Turbo kochii*"; **b:** lectoptype here designated (BSPG AS VII 1814) from Münsters's type lot (specimen illustrated by Münster, see Fig. 1a).

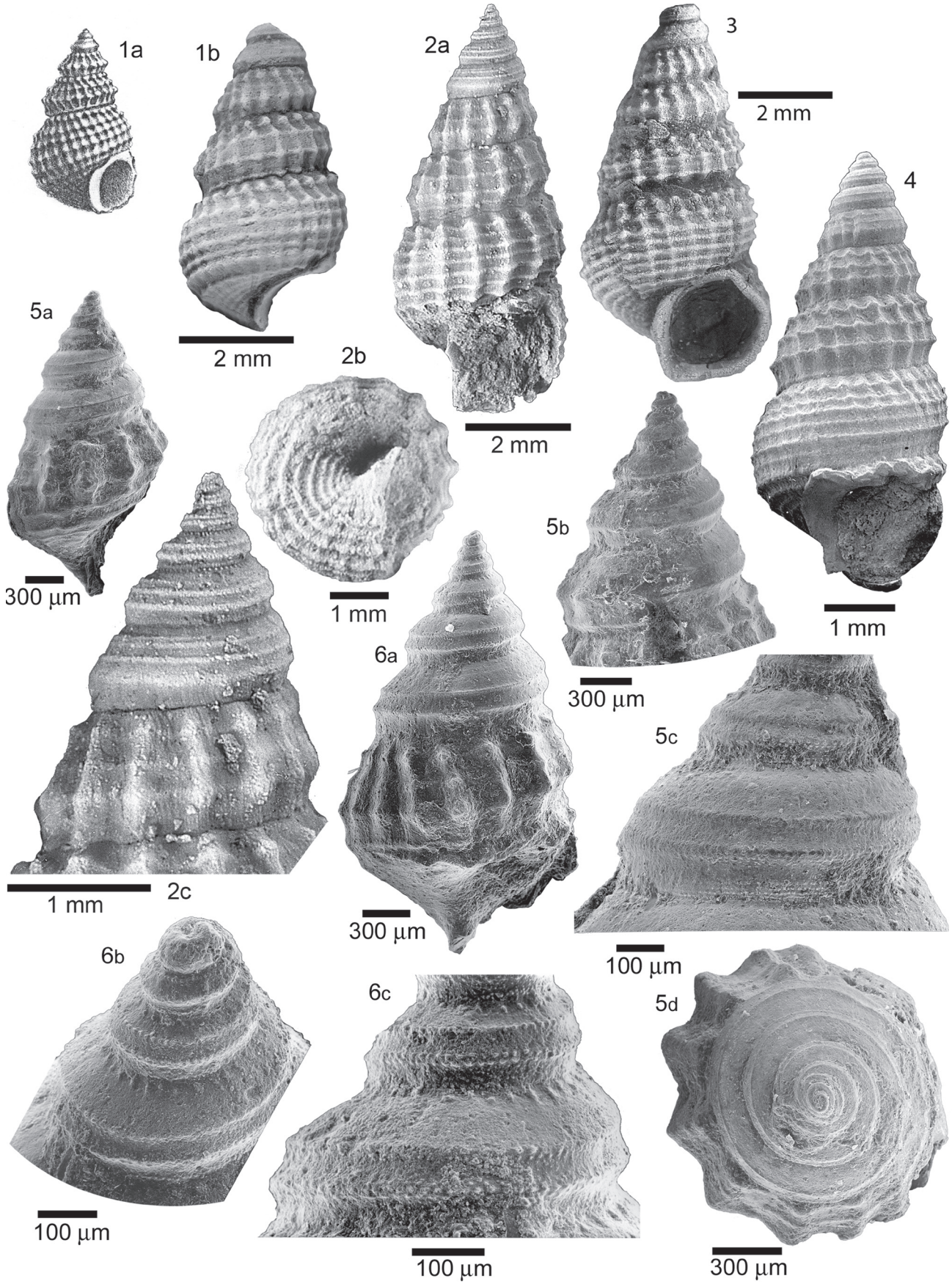
Fig. 2: Specimen from Unterstürmig, *Pleuroceras spinatum* Zone; BSPG 2007 XXII 12; **a:** lateral view; **b:** basal view; **c:** lateral view of larval shell and first teleoconch whorl.

Fig. 3: Specimen with complete aperture; Buttenheim, Am Holzbachacker; Schobert coll.; BSPG 2007 XXII 13.

Fig. 4: Specimen from Kalchreuth, *spinatum* Zone; side view, apertural; from Nützel & Kiessling (1997: pl. 35, fig. 3); BSPG 2007 XXII 14.

Fig. 5: Juvenile specimen from Unterstürmig, *spinatum* Zone, larval shell and about one teleoconch whorl, original of Muckelbauer's (1987: pl. 13, fig. 15) "*Cryptaulax* cf. *scobina* (Eudes-Deslongchamps)", collection of the Institut für Paläontologie, Universität Erlangen; **a:** lateral view; **b:** lateral view; **c:** detail of larval shell, fine nodes above lower suture; **d:** apical view.

Fig. 6: Specimen from Kalchreuth, *spinatum* Zone, from Gründel & Nützel (1998, pl. 2, fig. 10 and pl. 3, fig. 1); BSPG 1998 II 12; **a:** lateral view, showing larval shell and one teleoconch whorl; **b:** apex of larval shell, side view; **c:** detail of larval shell with fine nodes on spiral carinae.


1a
1b
2 mm
2a
2 mm
3
2 mm
4
1 mm
5a
300 µm
2b
1 mm
5b
300 µm
2c
1 mm
6a
300 µm
5c
100 µm
6b
100 µm
6c
100 µm
5d
300 µm

with at least three to four whorls, representing planktotrophic larval shell; larval shell broad, turbiniform with convex whorls and subsutural shoulder, 0.56 mm high and 0.74 mm wide; initial whorl (embryonic shell) not preserved; last larval whorl with ornament of numerous (about 30 per whorl), oblique (opisthocline), opisthocyrt, fine axial ribs; axial ribs curving forward somewhat above abapical suture, forming a spiral thread; narrow band between spiral thread and abapical suture without ribs but with several fine spiral threads; teleoconch whorls rather high; first teleoconch whorls distinctly convex, with straight, narrow axial ribs (more than 20 per whorl); early teleoconch whorls with at least seven spiral ribs; teleoconch whorls gradually less convex until 5th to 7th teleoconch whorl which are almost straight-sided; at the same time axial ribs are continuously reduced, so that about seventh whorls has almost no axial ribs but numerous fine spiral threads only; after the seventh whorl, axial ribs become increasingly stronger but cease well below adapical suture and somewhat above abapical suture; axial ribs round, wide and restricted the lower to third of whorl, giving whorls pending appearance; axial ribs strongest, almost node-like somewhat below mid-whorls; distance between ribs equals width of ribs; mature teleoconch whorls also covered with numerous spiral threads and furrows; spirals somewhat stronger near abapical suture; base round, convex, covered with numerous spiral ribs and furrows; aperture higher than wide, with anterior siphonal canal.

Discussion: *Pseudokatosira undulata* is one of the largest, most characteristic gastropods of the Amaltheenton Formation. It is relatively rare but due to its large size rather conspicuous and therefore present in several private and public collections. For the first time, the axially ribbed larval shell and the early teleoconch are reported here which give crucial information about the systematic placement of this gastropod. The characteristic early whorls were never found in washed residues although a great abundance of such residues was studied. Also the anterior siphonal canal is reported here for the first time for *P. undulata*. As discussed by Nützel & Hornung (2002), *Pseudokatosira undulata* was reported from South Germany (e. g., Quenstedt 1884; Brösamlen 1909; Nützel & Hornung 2002), Hungary (Szabó 1983), and possibly from the Hierlatz strata (Austria) (Stoliczka 1861).

Superfamily Cerithioidea Fleming, 1822
Family Cryptaulacidae Gründel, 1976

Francocerithium n. gen.

Type species: *Turbo kochii* Münster in Goldfuss (1844). The genus is monotypic so far.

Etymology: "*Franco-*" after "Franconia", the South German area of Franken and "*-cerithium*" after the modern genus *Cerithium*).

Diagnosis: Small, relatively stout cerithioid; protoconch large (more than 1 mm high), broadly conical, with many whorls, two to three spiral ribs and ornament of tubercles; teleoconch whorls convex without distinct ramp or shoulder; three spiral ribs on the early teleoconch, fourth emerging at the abapical suture; on mature teleoconch whorls, additional spirals are intercalated between primary spirals so that there are about seven spirals on the whorl face; number of teleoconch axial ribs increasing during ontogeny; relatively few, widely spaced axial ribs on early teleoconch; more numerous, densely spaced and weaker axial ribs on late teleoconch whorls; base convex; aperture about as high as wide, almost detached, without distinct anterior canal.

Discussion: *Francocerithium* is a characteristic, relatively stout cerithioid with a broad, large larval shell and an increasing number of spiral ribs on the teleoconch during ontogeny. *Francocerithium* resembles *Rhynchocerithium* Cossmann, 1906 where *Francocerithium kochi* was previously classified (Gründel & Nützel 1998). However, *Rhynchocerithium* has a distinct subsutural ramp and has only a few (mostly three) spiral ribs on the whorl face throughout ontogeny. Moreover, *Rhynchocerithium* has fewer and stronger axial ribs which are more widely spaced. The base of *Rhynchocerithium* is strongly convex and the aperture has a distinct siphonal canal. Only the last protoconch whorl of *Rhynchocerithium* has been reported (Gründel 1997: pl. 6, fig. 5). It is 0.5 mm wide and bicarinate. Guzhov (2004: 483, 531) placed *Rhynchocerithium* including *Francocerithium kochi* in the Maturifusidae. However, members of this family have a distinct anterior siphonal canal which is absent in *F. kochi*. Moreover, the larval shell of *F. kochi* has rather gradual transition to the teleoconch whereas *Maturifusus* has an abrupt transition (see Gründel 1999b, 2001; Guzhov 2004; Kaim 2004). The larval shell of *Francocerithium* differs considerably from that of *Maturifusus*. *Maturifusus* has a subsutural ramp on the larval shell with a bordering spiral rib. However, *Francocerithium* has a bicarinate larval shell with two closely spaced spiral carinae. In addition, the teleoconch ornament is quite distinct. *Maturifusus* has rounded wide, prosocline axial ribs whereas *Francocerithium* has sharp orthocline to opisthocyrt ribs. Gründel (1997) studied the type species of *Rhynchocerithium, R. fusiforme.* This species has a relatively small (ca. 0.5 mm width) bicarinated larval shell which is very distinct and much smaller than that of the Maturifusidae and *Francocerithium*. Therefore, we doubt in Guzhov's interpretation that *Rhynchocerithium* as well as *Francocerithium kochi* are members of the Maturifusidae. In contrast, we think that *Rhynchocerithium* is more closely related to the Cryptaulacidae. *Francocerithium* resembles the common Jurassic cerithioid genus *Cryptaulax* Tate, 1869 and is probably closely related to it. However, *Cryptaulax* is more slender and multi-whorled. It lacks the increase in spiral ribs on the last teleoconch whorl (see Gründel 1999c). *Cryptaulax* has fewer but stronger axial ribs and the nodes at the intersections are commonly very strong and almost spine-like. Moreover, the bicarinate larval shell *Cryptaulax* is smaller and not as broad. Kaim (2004) reported several Jurassic/Cretaceous species which have been assigned to *Cryptaulax*. Of these, *C. kulickii* (Schröder, 1995) and *C. tricuspis* (Schröder, 1995), and *C. mutabilis* (Gerasimov, 1955) are relatively broad and some have a relatively high number of teleoconch spirals. Thus, they resemble *Francocerithium kochi*. However, we doubt whether these species represent *Cryptaulax* - their morphology is not very close to that of the type species of *Cryptaulax*. The genus *Cirsocerithium* Coss-

MANN, 1906 (type species *C. subspinosum*, Early Cretaceous, France) as reported by KIEL (2006) based on *C. collignoni* KIEL, 2006 from the Early Cretaceous of Madagaskar differs from *Francocerithium* in having a well developed anterior siphonal canal. The type species of *Cirsocerithium* has a distinct varix which is absent in *Francocerithium* (WENZ 1938–44).

Francocerithium kochi (MÜNSTER, 1844)
Pl. 2, Figs 1–6

? 1842 *Cerithium reticulatum* E.-D. – EUDES-DESLONGCHAMPS: 208, pl. 11, figs 38–39.
*1844 *Turbo kochii* n. sp. – MÜNSTER in GOLDFUSS: 91, pl. 193, figs 15a–b.
? 1867 *Cerithium Ilminsterensis* MOORE – MOORE: 200, pl. 4, figs 12, 12a.
? 1869 *Cerithium reticulatum* (E. DESLONGCHAMPS) – DUMORTIER: 254, pl. 29, figs 2–3.
? 1889 *Cerithium Ilminsterensis* MOORE, 1866 – WILSON & CRICK: 302, pl. 9, figs 5a–c.
v. 1935 *Cerithinella kochii* v. MÜNSTER – KUHN: 485, pl. 18, fig. 21.
v. 1935 *Cerithinella kochii* v. MÜNSTER var. *schlosseri* n. var – KUHN: 485, pl. 18, fig. 33.
v. 1997 *Procerithium kochi* (MÜNSTER) – NÜTZEL & KIESSLING: 392, pl. 35, figs 3–4.
v. 1998 *Rhynchocerithium? kochi* (v. MÜNSTER, 1844) – GRÜNDEL & NÜTZEL: 69, pl. 2, figs 8–10, pl. 3, fig. 1.
v. 1999 *Rhynchocerithium kochi* (v. MÜNSTER, 1844) – GRÜNDEL: 14, pl. 2, figs 21–22.
v. 1999 *Rhynchocerithium* sp. 1 – GRÜNDEL: 640, pl. 5, figs 1–4.
v. 2002 *Rhynchocerithium kochi* (MÜNSTER 1844) – NÜTZEL: 61, fig. 5.
2004 *Rhynchocerithium kochi* (MÜNSTER 1844) – GUZHOV: 483.

See NÜTZEL & KIESSLING (1997) and GRÜNDEL & NÜTZEL (1998) for additional synonymy.

Material:
BSPG AS VII 1814 lectotype, original of MÜNSTER in GOLDFUSS (1844), from Creez near Bayreuth (N Bavaria, Franconia).
BSPG AS VII 1815: paralectotype from the type-lot of MÜNSTER in GOLFUSS (1844), from Creez near Bayreuth (N Bavaria, Franconia).
BSPG 1934 IV 35: 1 specimen, original of KUHN (1935: pl. 18, fig. 21), streamlet Sendelbach near Bamberg.
BSPG 1934 IV 36: More than 100 specimens, material of KUHN (1935), streamlet Sendelbach near Bamberg.
BSPG 1934 IV 37: 1 specimen, original of KUHN (1935: pl. 18, fig. 33), streamlet Sendelbach near Bamberg.
BSPG 1998 II 11-17: Seven specimens from Kalchreuth, material of GRÜNDEL & NÜTZEL (1998) including illustrated material.
BSPG 2007 XXII 12: 1 specimen, Unterstürmig (Pl. 2, Fig. 2).
BSPG 2007 XXII 13: 1 specimen, Buttenheim (Am Holzbachacker, SCHOBERT coll.) (Pl. 2, Fig. 3).
BSPG 2007 XXII 14: Specimen from Kalchreuth, *spinatum* Zone; side view, apertural; from NÜTZEL & KIESSLING 1997: pl. 35, fig. 3) (Pl. 2, Fig. 4).
BSPG 2007 XXII 15: Several hundreds of specimens from Buttenheim (Am Holzbachacker, coll. SCHOBERT).
BSPG 2007 XXII 16: Several hundred specimens from Kalchreuth (coll. NÜTZEL).
BSPG 2007 XXII 17: 56 juvenile or larval specimens from Wernsdorf, near Bamberg.

Description: Shell high-spired, relatively stout with spire somewhat higher than last whorl; fully grown shells as high as 10 mm and 4.5 mm wide, but usually about 6 to 8 mm high; an adult specimen of about 10 whorls is 6.8 mm high and 3.1 mm wide; teleoconch whorls convex without distinct ramp or shoulder; three spiral ribs on the early teleoconch, a fourth emerging at the abapical suture; on mature teleoconch whorls, additional spirals are intercalated between primary spirals so that there are about seven spirals on the whorl face of the last whorl; number of teleoconch axial ribs per whorl increasing during ontogeny; relatively few, widely spaced axial ribs on early teleoconch; more numerous, densely spaced and weaker axial ribs on late teleoconch whorls; spiral and axial ribs form fine and dense reticulate pattern with nodes at the intersections; base weakly convex; aperture almost detached from previous whorl, without distinct anterior canal, approximately as high as wide; transition from larval shell to teleoconch indistinct, seemingly gradual; protoconch broadly conical, with about six whorls c. 1.5 mm high and 1.3 mm wide; initial whorl has diameter of about 0.12 mm; larval shell with two spiral ribs on whorl face at which whorls are angulated; adapical spiral at about mid-whorl; abapical spiral about half way between lower suture and upper spiral; area above adapical spiral gently rounded, sloping; third spiral may be present on this area; spirals ornamented with rows of small alternating nodes; in addition, a subsutural row of nodes is present; subsutural nodes are somewhat larger and more distant to each other than nodes on spirals; a suprasutural zone of minute, spirally arranged granules is also present (Pl. 2, Fig. 5c); nodular larval ornament fading on ribs of last protoconch whorls so that only spirals are visible; larval spiral ribs develop into teleoconch spiral ribs.

Selection of lectotype: MÜNSTER in GOLDFUSS (1844) did not formally designate a holotype for *Turbo kochii* (= *Francocerithium kochi*). We have examined MÜNSTER's in GOLDFUSS (1844) type material; it contained three specimens, two of which are attached to rock matrix and one extracted shell. The latter specimen is obviously the illustrated original of *Turbo kochii* (MÜNSTER in GOLDFUSS 1844: pl. 193, fig. 15a-b) (Pl. 2, Fig. 1a, b). We select this specimen as lectotype (BSPG AS VII 1814). It lacks parts of the apex and parts of the aperture. The fragment comprises about 5 whorls, is 5 mm high and 2.8 mm wide. It matches the above description and MÜNSTER's illustration well and shows the increase of teleoconch spirals on the last whorl. One of the other specimens is poorly preserved but also seems to represent *F. kochi*. We designate this specimen a paralectotype (BSPG AS VII 1815). The third specimen is clearly not conspecific and represents a trochoid vetigastropod (BSPG AS VII 1816).

Discussion: *Francocerithium kochi* was illustrated and described in detail by NÜTZEL & KIESSLING (1997) and GRÜNDEL & NÜTZEL (1998). It is as high as about 10 mm and can be found frequently in washed residues and by surface collecting. The protoconch is rather large and broad with

rapidly increasing whorls. The transition from the larval shell to the teleoconch is indistinct and seemingly gradual. Several specimens have been studied carefully with the SEM and no sinusigera or other distinct demarcations of the larval shell have been found. There is a clear relationship between protoconch and teleoconch spiral ornamentation, i.e. the spirals of the larval shell develop into teleoconch spirals. This is also the case in other cryptaulacids (e.g., Gründel 1999c). A marked change in ornamentation indicating the end of the larval shell occurs at about the sixth or seventh whorl and the nodular teleoconch ornament is present subsequently. The larval shell has usually two pronounced spiral ribs. However, a third spiral may be developed above these primary spirals. Most specimens from Franconia have only two spirals on the larval shell but specimens with a third spiral do also occur (Pl. 2, Fig. 2c). Three spirals are developed on the larval shells from Grimmen (NE Germany) which were reported as "*Rhynchocerithium* sp. 1" by Gründel (1999b). Since these specimens with two and three spiral ribs on the larval shell closely resemble each other in any other respect, we now consider this material to be conspecific with the *F. kochi*.

The aperture of *Francocerithium kochi* is incomplete in almost all specimens. The specimen illustrated in Pl. 2, Fig. 3 is the only one at hand which has a complete aperture. This is the first report of a good aperture for this species. It has no pronounced siphonal canals. An anterior weak outlet seems to be present. The aperture is almost detached from the preceding whorl as is the case in some Jurassic species of the cerithioid genera *Cryptaulax*, *Exelissa*, *Rhabdocolpus*, *Tomaszoviella* etc. (e.g., Gründel 1999c; Kaim 2004; Guzhov 2004).

The variety *Cerithinella kochii* var. *schlosseri* Kuhn, 1935 was based on minor morphological differences which are partly due to preservation. We examined the original material of Kuhn's variety (BSPG 1934 IV 37) and consider this taxon to represent a synonym of *Francocerithium kochi*.

It is likely that *F. kochi* (including other closely related forms) was wide-spread in the middle Lias of central and western Europe as is also suggested by its planktotrophic larval shell. However, it has not yet been reported with certainty. *Cerithium reticulatum* Eudes-Deslongchamps, 1842 and *C. ilminsterensis* Moore, 1867 from the Lias of France and England closely resemble *F. kochi* and could be conspecific. However, the protoconchs of both species are unknown and the original descriptions and illustrations do not allow a synonymization. *Cerithium asperulum* Moore, 1867 from the middle to upper Lias of England is more slender and has higher whorls. Moreover, it has more spiral ribs on the whorl face. The holotype of *Buvignieria carixensis* Cox, 1936 could possibly represent the juvenile stage of an undeterminable species of *Francocerithium*.

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