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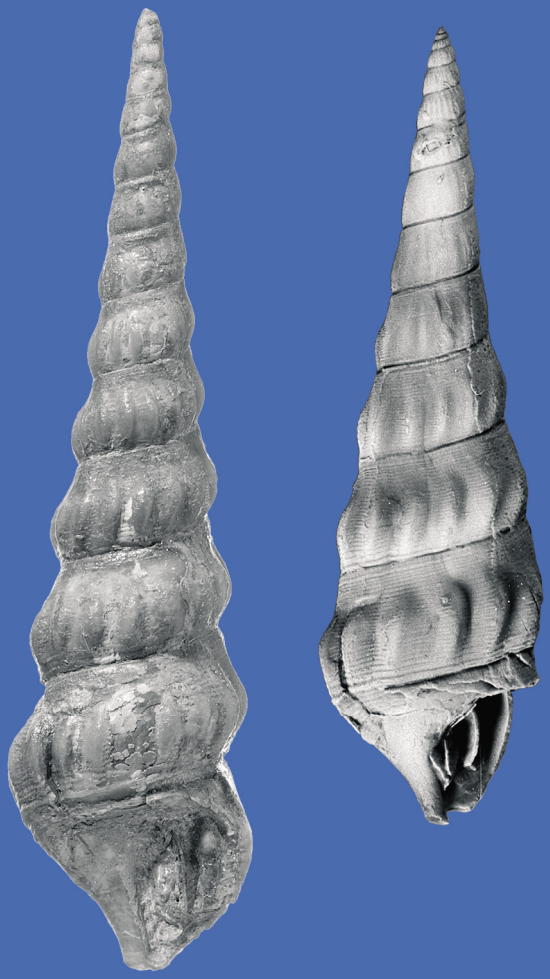

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Cover illustration: Snail *Pseudokatosira undulata* (BSPG 2007 XXII 1 and 2) from the Early Jurassic Amaltheenton of Franconia; this species is relatively rare and is the largest from the Amaltheenton (as large as 10 cm). For details see Nützel, A. & 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 caenogastropod genera from the Late Triassic Cassian Formation

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Abstract

Two new caenogastropod genera and one new species are reported from the Late Triassic (Early Carnian) Cassian Formation (N Italy): *Lamellox kittli* n. gen., nom. nov. pro *Turritella fasciata* Klipstein in Kittl, 1892 non Lamarck, 1804 and *Neorthonema simoni* n. gen., n. sp. *Turritella fasciata* Klipstein in Kittl, 1892 is a homonym and is replaced with *Lamellox kittli* n. gen., nom. nov. Both new taxa have preserved protoconchs (larval shells) and had planktotrophic larval development. The new genus *Neorthonema* seems to represent a Mesozoic descendant of the Palaeozoic cerithioids (families Orthonematidae and Goniasmatidae). *Lamellox* is probably a member of the Zygopleuroidea which is highly diverse in the Late Palaeozoic and Early Mesozoic.

Key words: Gastropoda, Caenogastropoda, Carnian, Triassic, Cassian Formation, New Taxa

Kurzfassung

Zwei neue Gattungen der Caenogastropoda und eine neue Art werden aus der obertriassischen (unteres Karn) Cassian Formation (N Italien) beschrieben: *Lamellox kittli* n. gen., nom. nov. pro *Turritella fasciata* Klipstein in Kittl, 1892 non Lamarck, 1804 und *Neorthonema simoni* n. gen., n. sp. *Turritella fasciata* Klipstein in Kittl, 1892 ist ein Homonym und wird durch *Lamellox kittli* n. gen., nom. nov. ersetzt. Beide neuen Taxa haben erhaltene Protoconche (Larvalschalen) und durchliefen ein planktotrophes Larvalstadium. Die neue Gattung *Neorthonema* scheint ein Abkömmling der paläozoischen Cerithioidea (Familien Orthonematidae und Goniasmatidae) zu sein. *Lamellox* gehört vermutlich den Zygopleuroidea an, die im späten Paläozoikum und frühen Mesozoikum hoch divers waren.

Schlüsselwörter: Gastropoda, Caenogastropoda, Karn, Trias, Cassian Formation, Neue Taxa

1. Introduction

Caenogastropods are a major component of the famous gastropod fauna from the Cassian Formation (Late Triassic, Early Carnian, north Italian Dolomites). Despite intensive taxonomic work for about 170 years, this formation continues to produce new gastropod taxa. It is in fact the richest pre-Cretaceous gastropod occurrence and represents a unique window which offers a view on a diverse tropical gastropod fauna of the early Mesozoic. This contribution is about two new caenogastropod genera and a new species which are documented including larval shell morphology. The Cassian Formation is one of the few Triassic formations which yield specimens with well-preserved larval shells. This improves taxonomic assignments as well as phylogenetic considerations.

2. Repository

The material is housed in the Bayerische Staatssammlung für Paläontologie und Geologie (BSPG) in Munich, in the Natural History Museum (NHM) in London, the Naturhistorisches Museum Wien (NHMW) in Vienna, and in the collection of the Palaeontological Institute of the Tübingen University.

3. Systematic Palaeontology

Subclass Caenogastropoda Cox, 1959
Superfamily Zygopleuroidea Wenz, 1938
Family Protorculidae Bandel, 1991

Lamellox n. gen.

Type species: *Lamellox kittli* nom. nov. pro *Turritella fasciata* Klipstein in Kittl, 1892 non Lamarck 1804; early Carnian, Cassian Formation.

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Etymology: *Lamel-* Latin, for the lamellar axial ornament; *-lox* Greek, for the curvature of the axial threads.

Diagnosis: High-spired, slender caenogastropod with numerous whorls; shell sides straight; whorl sides concave; teleoconch whorls ornamented with densely spaced collabral, opisthocyrt to parasigmoidal axial lamellae, some of which may be strengthened, leaf–like; in addition, fine spiral striae may be present; protoconch with a planktotrophic larval shell with deep sinusigera and faint ornament of curving axial ribs.

Discussion: *Lamellox* is a caenogastropod as is indicated by its orthostrophic larval shell. The family assignment is somewhat more problematic. There are basically three families to which this genus could be assigned: Zygopleuridae Wenz, 1938, Protorculidae Bandel, 1991, or Polygyrinidae Bandel, 1993. All have a high-spired shell and parasigmoidal ("loxonematoid") growth line pattern. Zygopleuridae normally have a teleoconch ornament of wavy axial ribs and a larval shell with subsutural nodes (e.g., Nützel 1998). The shape of the larval shell of *Polygyrina* (family Polygyrinidae) resembles that of *Lamellox* but the ornament is different. *Protorcula* has concave whorls as is the case in *Lamellox*. Protorculids normally have acute larval shells with sharp axial ribs (Bandel 1991; Nützel 1998) which differ from the weakly ornamented, heliciform larval shell of *Lamellox*. However, concave whorl sides, parasigmoidal growth line pattern, fine spiral striation as well as the faint axial ornament on the larval shell suggest a close relationship with *Protorcula*. Therefore, *Lamellox* is placed in Protorculidae.

Lamellox kittli nom. nov.
pro *Turritella fasciata* Klipstein in Kittl,
1892 non Lamarck, 1804
Plate 1

Non 1804 *Turritella fasciata* n. sp. – Lamarck: 122.
*1892 *Turritella fasciata* n. sp. Klipstein – Kittl: 118 (55), pl. 9 (12), figs 12–14 non Lamarck.
1978 *Turritella fasciata* (Klipstein) – Zardini: 39, pl. 24, figs 9–10.
1980 *Turritella fasciata* Klipstein f. giovanile – Zardini: 8, pl. 4, figs 6–7.
1980 *Turritella fasciata* Klipstein – Zardini: 8, pl. 4, fig. 8.
1985 *Turritella fasciata* Klipstein – Zardini: 11, pl. 4, fig. 1.
1994 *Alexiella fasciata* (Klipstein 1842) – Bandel: pl. 5, fig. 11.

Material: All specimens are from the Early Carnian Cassian Formation; one specimen from the Klipstein collection of the Natural History Museum, London (NHM 82939A); one specimen from the Paleontological Institute of the Tübingen University; one specimen from the locality Misurina (see Nützel & Geiger 2006), BSPG 2007 XXIII 1; six specimens from locality Campo near Cortina d'Ampezzo (see Zardini 1978), BSPG 2007 XXIII 2, XXIII 3; casts of Kittl's illustrated type material (three specimens, Naturhistorisches Museum Wien) were also studied:

NHMW, No. 1899/0005/0287a, Kittl 1892, pl. 9 fig. 12, cast BSPG 2007 XXIII 4, from Pescol;

NHMW, No. 1899/0005/0287b, Kittl 1892, pl. 9 fig. 13, 2 casts BSPG 2007 XXIII 5a, b; from Pescol (lectotype);

NHMW, No. 1899/0005/0288, Kittl 1892, pl. 9 fig. 14, cast BSPG 2007 XXIII 6; Stuoreswiesen.

Designation of lectotype: Kittl (1892: pl. 12 [9], figs 12–14) illustrated three specimens of *Turritella fasciata* Klipstein in Kittl 1892 non Lamarck 1804 (=*Lamellox kittli* nom. nov.) from the Cassian Formation. Of those, I am selecting the specimen illustrated in fig. 13 as lectotype (Naturhistorisches Museum Wien, NHMW, No. 1899/0005/0287b); of this specimen two artificial casts were studied and are stored under the numbers BSPG 2007 XXIII 5a and b; (Pl. 1, Fig. 6).

Description: Shell high-spired, slender with numerous whorls; a juvenile specimen (Pl. 1, Figs 2a, b) with intact apex has 13 whorls, is 3.5 mm high and 1.1 mm wide; according to the teleoconch fragments illustrated by Kittl (1892) (and herein), mature shells are as wide as somewhat more than 10 mm and could have reached a height of several centimetres; whorl sides straight to somewhat concave; sutures flat; teleoconch whorls ornamented with densely spaced collabral, opisthocyrt to parasigmoidal axial threads, some of which may be strengthened (leaf–like) especially in mature whorls; zenith of lamellae close to adapical suture; in addition faint ornament of numerous spiral threads may be present; base flatly conical; angular edge between base and whorl face;

Plate 1: *Lamellox kittli* nom. nov., n. gen.) (=*Turritella fasciata* Klipstein in Kittl 1892 non Lamarck 1804).

Figs 1: Juvenile specimen with larval shell BSPG 2007 XXIII 1. **a:** Lateral view; transition form larval shell to teleoconch with deep sinusigera; height 0.5 mm; **b:** Apical view; width 0.33 mm; **c:** Lateral view; faint axial ornament on larval shell; lamellar ornament on early teleoconch (last whorl); height 0.5 mm; **d:** Detail as previous; width 0.36 mm.

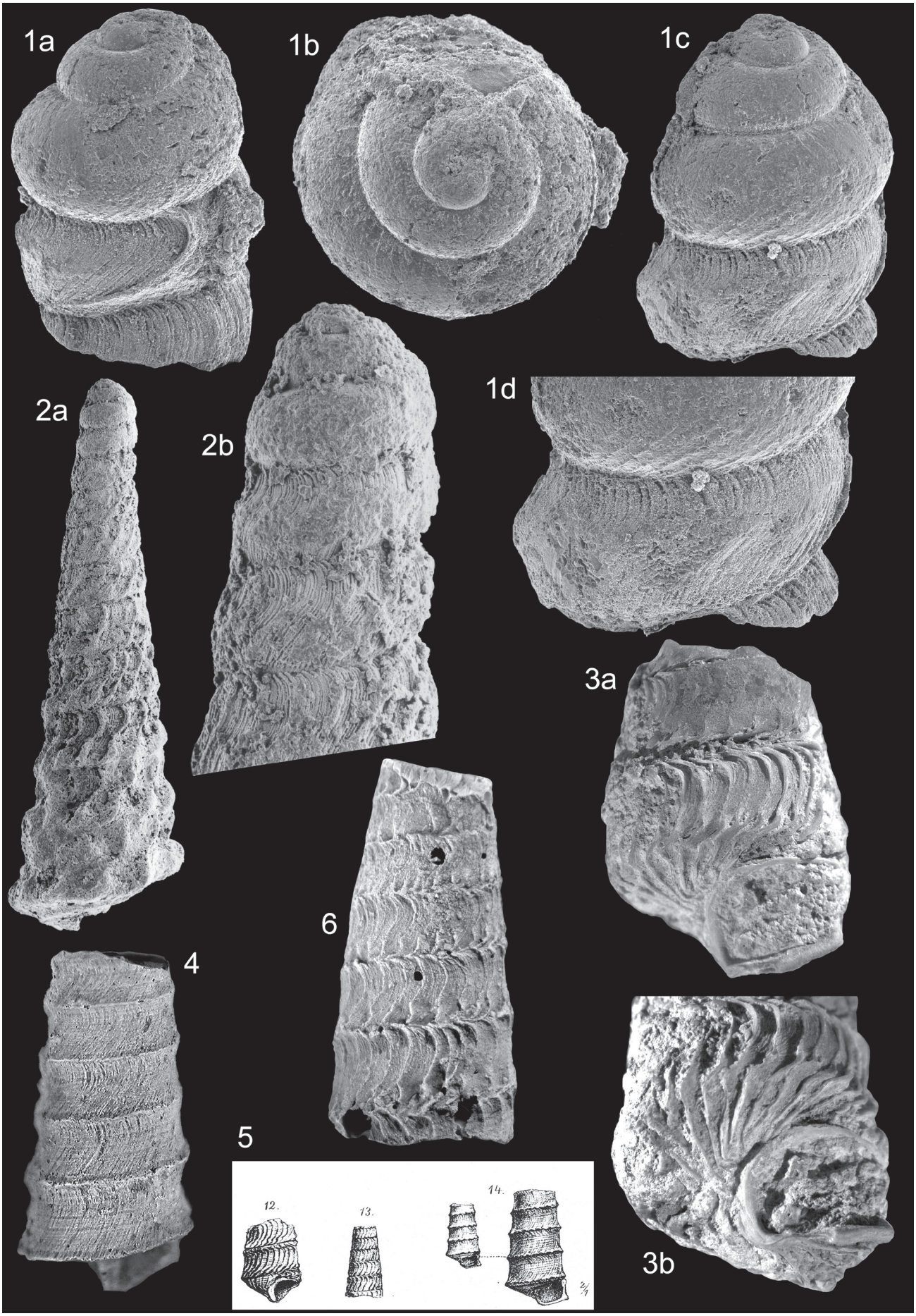
Fig. 2: Juvenile specimen with larval shell and several teleoconch whorls; BSPG 2007 XXIII 2. **a:** Lateral view, 3.5 mm high and 1.1 mm wide; **b:** Apex including larval shell in lateral view, height 0.9 mm.

Fig. 3: Relatively large teleoconch fragment (15 mm high, 10 mm wide) with strong axial lamellae and mature rectangular aperture; collection of the University of Tübingen. **a:** apertural view; **b:** oblique basal view.

Fig. 4: Specimen from the Klipstein collection of the Museum of Natural History, London (82939A); lateral view; specimen lacks very strong lamellae and shows fine spiral striae; 13.3 mm high, 6.6 mm wide.

Fig. 5: Reproduction of Kittl's (1892: pl. 12 [9], figs 12–14) original figures of *Turitella fasciata* Klipstein in Kittl 1892 non Lamarck 1804 (=*Lamellox kittli* nom. nov.); the specimen illustrated in fig. 13 is selected here as lectotype (see also Pl. 1 Fig. 6).

Fig. 6: Artificial cast of the lectotype (BSPG 2007 XXIII 5a); original specimen Naturhistorisches Museum Wien, NHMW, No. 1899/0005/0287b.


1a
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axial lamellae continue onto base and curve sharply forward (adapertural) at basal edge and backward at columella; aperture subrectangular, wider than high, seemingly without pronounced notch or canal; protoconch helicoidal, turbiniform with about three whorls and somewhat flattened apex; protoconch 0.42 mm high and 0.33 mm wide; diameter of the first whorl c. 0.12 mm; protoconch whorls smooth except faint collabral, opisthocyrt ribs visible on last whorl and seemingly with small tubercles; protoconch ends abruptly with deep sinusigera.

Discussion: *Turritella fasciata* Klipstein in Kittl 1892 is a junior homonym of *Turritella fasciata* Lamarck, 1804 (= *Sigmesalia fasciata* (Lamarck 1804), Eocene, Europe) and is therefore replaced here by *Lamellox kittli* nom. nov. Bandel (1994: pl. 5, fig. 11) illustrated *Lamellox kittli* as *Alexiella fasciata* (Klipstein) but the genus *Alexiella* is not mentioned in this paper except the plate caption and was to my knowledge never validly introduced. Kittl (1892) illustrated three specimens (teleoconch fragments) of which I select the specimen illustrated in plate 12 [9], figure 13 as lectotype (Pl. 1, Fig. 5). Kittl's type specimens display a considerable intraspecific variability, especially in the strength and course of the axial lamellae. This variability can also be recognized in the specimens illustrated here. Nevertheless, following Kittl (1892), I interpret this as result of intraspecific variability. *Lamellox kittli* is a very characteristic species especially because of its concave teleoconch whorls with the lamellar ornament. The protoconch is undoubtedly the product of a planktotrophic veliger larva as is indicated by the number of whorls, its dimensions and the distinct sinusigera. This is the first report of the protoconch of *Lamellox kittli*. The protoconch shows clearly that *Lamellox* is a caenogastropod.

Superfamily Cerithioidea
? Family Orthonematidae Nützel & Bandel, 2000

Neorthonema n. gen.
Type species: *Neorthonema simoni* n. sp.

Etymology: Because of a possible relationship with the Palaeozoic genus *Orthonema* (*Neo*-, new).

Diagnosis: Broadly turbiniform caenogastropod; teleoconch whorls convex with ornament of spiral ribs which are relatively distant to each other in the peripheral region; spirals above and below this zone densely spaced; larval shell heliciform, bulbous, with mesh-work ornament of round pits.

Discussion: *Neorthonema* resembles some spirally ornamented vetigastropods (e.g., *Homalopoma*, *Yunnania*) but it has a typical caenogastropod-type larval shell. *Spirocyclus* Wenz, 1938 (replacement name for *Spirocyclina* Kittl, 1894) is a high-spired to fusiform, siphonate caenogastropod with spiral ornament that resembles *Neorthonema*. However, *Spirocyclus* has fewer and equally spaced spiral ribs. Even the early ontogenetic shell of *Spirocyclus* differs markedly from that of *Neorthonema* (see Bandel 1993: pl. 11, fig. 6). The larval shell of monospecific genus *Cassianozyga* Bandel, 1991 (type species *C. seelandica*) from the Cassian Formation is similar to that of *Neorthonema* (Bandel 1991). However, this species lacks spiral teleoconch ornament and has axial ornament on the larval shell. *Neorthonema* resembles Carboniferous cerithioid species of the genus *Orthonema* (family Orthonematidae Nützel & Bandel, 2000) and the related Goniasmatidae Nützel & Bandel, 2000. Especially the heliciform larval shell with the mesh-work ornament is similar (see Bandel et al. 2002).

Neorthonema simoni n. sp.
Plate 2

Diagnosis: So far, as in monotypic genus.

Etymology: After the author's son, Simon.

Material: Only the holotype, BSPG 2007 XXIII 7.

Stratum typicum: Late Triassic, Early Carnian.

Locus typicus: Locality Misurina near Cortina d'Ampezzo, Italian Dolomites (see Zardini 1978 and Nützel & Geiger 2006).

Description: The holotype (the only shell at hand) comprises about three protoconch and 2.5 teleoconch whorls; it is 1.2 mm high and 0.9 mm wide; teleoconch whorls round, convex; sutures distinctly impressed; teleoconch whorls with spiral ornament; spiral ribs round; spirals at periphery widely spaced forming a broad smooth band somewhat above suture; four to six spiral ribs above periphery; distance between these spiral ribs equals approximately width of ribs; whorls embrace somewhat below periphery; base evenly rounded, convex, covered with numerous spiral ribs of equal strength; distance between these spiral ribs equals approximately width of ribs; protoconch heliciform, consists of about three whorls, is 0.35 mm high and wide; protoconch whorls rapidly increasing with bulbous last whorl and last part of last whorl somewhat constricted; initial whorl without visible ornament and a diameter of 0.12 mm; larval whorls with a mesh-work ornament of small circular pits.

Discussion: The present specimen is also illustrated in Ponder et al. (2008, figs 14, 13) where it is treated in open nomenclature.

4. Conclusions

The description and revision of the new caenogastropod taxa *Lamellox kittli* and *Neorthonema simoni* complement our knowledge about the important gastropod fauna from St. Cassian. The ongoing revision of caenogastropods from this important fauna (Bandel 1991, 1992, 1993; Nützel 1998, 2002) is crucial for unravelling the evolutionary history of that group which forms the most diverse subclass of the Recent gastropods (see Ponder et al. 2008, for a review). The excellent preservation including larval shells helps to exclude convergence with

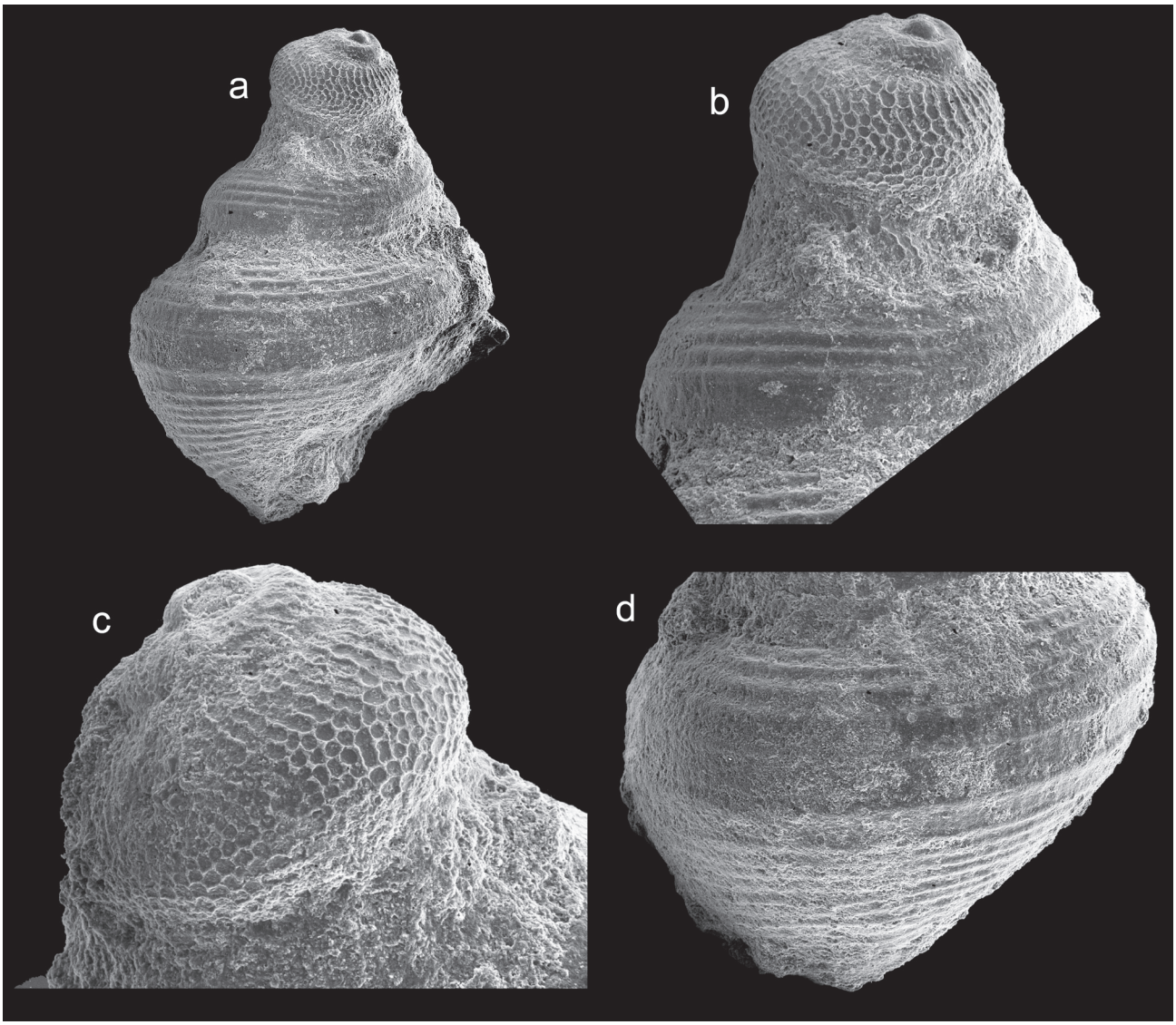

Plate 2: *Neorthonema simoni* n. gen., n. sp., holotype, BSPG 2007 XXIII 7
Fig. 1: **a:** Lateral view; 1.2 mm high; **b:** Protoconch; 0.6 mm high; **c:** Protoconch; 0.35 mm high; **d:** Teleoconch detail; 0.9 mm wide.

other gastropod clades, especially with heterobranchs which commonly have a teleoconch morphology which is similar to that of caenogastropods. Moreover, the larval shell morphology represents an important source of characters for an improved taxomony and phylogenetic analyses. It is remarkable that all caenogastropods with known protoconch of the Cassian Formation have planktotrophic larval development as is indicated by small initial whorls, the presence of more than two larval whorls and an abrupt transition to the teleoconch (see also Nützel 1998). Even in modern tropical environments, planktotrophic species are dominant. However, there is also a considerable amount of non-planktotrophic species in these environments. For some reason, this seems not to be the case in the Cassian fauna. The new genus *Neorthonema* seems to represent a Mesozoic descendant of the Palaeozoic cerithioids (families Orthonematidae and Goniasmatidae). *Lamellox* is probably a member of the Zygopleuroidea which is highly diverse in the Late Palaeozoic and Early Mesozoic. Its unusual teleoconch morphology is to my knowledge not present in modern caenogastropods.

5. Acknowledgements

I thank J. Gründel (Freie Universität Berlin) for his review and A. Kroh (Naturhistorisches Museum Wien) for producing casts of the type material of "*Turritella fasciata*". I thank Steve Tracey (London) for giving access to the collection, and the Deutsche Forschungsgemeinschaft is acknowledged for financial support (project NU 96/6-1, 6-2)

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