

# A new *Pseudocochlespira* species (Gastropoda, Conoidea, Cochlespiridae) from the Gram Clay Formation (late Miocene, Tortonian) of Gram, Denmark

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From the stratotype of the Gram Formation *Pseudocochlespira gramensis* n. sp. is introduced. The genus *Pseudocochlespira* Schnetler, 2001 was previously only known from the Selandian (middle Paleocene) and from the Branden Formation (late Oligocene), both of Denmark. The affinities of the new species are discussed.

KEY WORDS: Mollusca, Gastropoda, Cochlespiridae, Gram Formation, late Miocene, Gram, Denmark, new species.

## Introduction

The mollusc fauna of the late Miocene Gram Clay Formation has been studied by von Koenen (1872, 1886), Ravn (1907), L.B. Rasmussen (1956, 1966, 1968) and Schnetler (2005). Currently 128 mollusc species are known from the Gram Clay among which gastropods are dominating. Of the 80 gastropod species more than half are very rare (Schnetler 2005).

## Geological setting and stratigraphy

L.B. Rasmussen (1956) introduced and defined the Gram Formation and a redefinition was given by E.S. Rasmussen *et al.* (2010). L.B. Rasmussen recognized three members in his original description, *viz.* the Glauconite Clay, Gram Clay and Gram Sand members, whereas E.S. Rasmussen *et al.* (2010) upgraded and renamed the Glauconitic Clay to Ørnhøj Formation and the Gram Sand to Marbæk Formation. Thus, the redefined Gram Formation equates the Gram Clay Member of L.B. Rasmussen (1956). The regional Gramian stage is correlated with the international stage Tortonian (late Miocene).

## Material examined

The single available specimen was collected in 2004 from the Gram Clay exposed in the clay pit at Gram Museum (the former clay pit of Gram Brickworks) by the junior author.

## Systematical part

Class Gastropoda Cuvier, 1797  
Clade Neogastropoda Wenz, 1938  
Superfamily Conoidea Fleming, 1822  
Family Cochlespiridae Powell, 1942  
Genus *Pseudocochlespira* Schnetler, 2001

*Type species* – *Surcula* (*Cochlespira*) *boeggildi* Ravn, 1939, by original designation.

### *Pseudocochlespira gramensis* n. sp.

Figure 1a-c

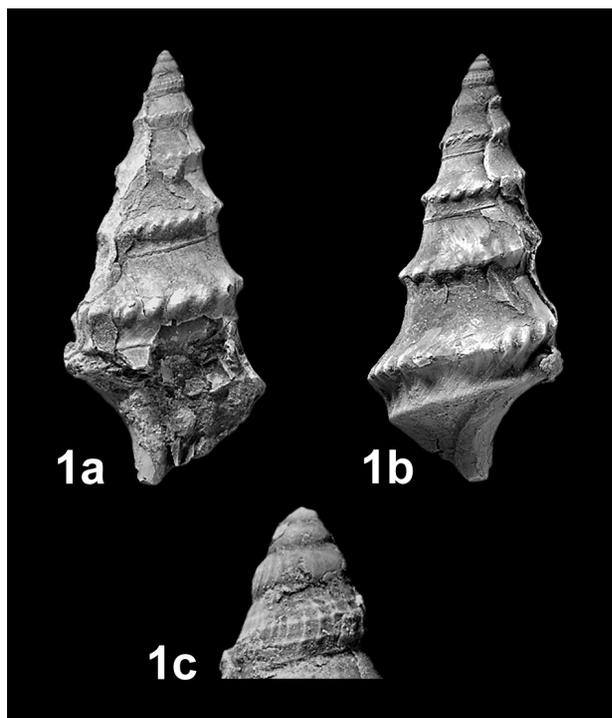
*Type locality* – Gram (Denmark, Jylland), clay pit of Gram Museum (former clay pit of Gram Brickworks).

*Type stratum* – Gram Clay Formation (late Miocene, Tortonian).

*Etymology* – The species is named after the type locality.

*Holotype* – Damaged specimen, Fig. 1, MGUH 30890, leg. Andreas Grant 2004. The specimen is housed in the Type Collection of the Geological Museum of the University of Copenhagen (MGUH).

*Diagnosis* – A *Pseudocochlespira* species with a beaded carina, situated below mid-whorl, consisting of two very fine spirals, one further spiral is present below the carina.



**Figure 1.** *Pseudocochlespira gramensis* n. sp., **holotype**, registration number MGUH 30890; actual height 18.0 mm, width 8.5 mm, but terminal  $\frac{1}{4}$  whorl broken; 1a: apertural view; 1b: dorsal view; 1c: protoconch, height 2.2 mm.

There are about 30 tubercles per whorl. The terminal protoconch whorl has axial riblets increasing in strength adaperturally, crossed by five fine spirals.

*Measurements* – Actual height of the holotype 18.0 mm, width 8.5 mm.

*Description* – The only available specimen is incomplete, as the aperture and canal are only partly preserved and furthermore, part of the shell is covered by a layer of calcite, but the remaining characteristics allow recognition of the specimen as an as yet undescribed species.

The shell is slender fusiform. Its estimated height/width ratio is *c.* 3.0 (when complete). The last whorl equals 60% of the estimated shell height, the aperture and canal about 40%.

The protoconch is well preserved and consists of  $4\frac{1}{4}$  convex whorls, separated by a distinct suture. The somewhat depressed nucleus is small and deviates slightly from the shell's vertical axis. The initial two protoconch whorls increase slowly in diameter, whereas the terminal  $1\frac{1}{4}$  whorls increase more rapidly. The protoconch whorls are smooth, except for the terminal  $1\frac{1}{2}$  whorls, which have about 25 weak axial riblets, adaperturally slowly and gradually increasing in strength, opisthocline and meeting the abapical suture at an angle of *c.* 60°. On the terminal half whorl the riblets are strong and change to almost orthocline, and crossed by five weak spirals. Of these spirals the middle one is situated mid-whorl, the lowermost two spirals are strongest. At the intersections of spirals

and axial riblets fine knobs are seen. On the terminal part of the protoconch the mid spiral moves to a lower position, meeting the one below it, together continuing as the teleoconch carina. The transition into the teleoconch is marked by the appearance of the carina and at the same time the two upper protoconch spirals disappear. On the adapical part of the whorl 7 very fine and very close-set opisthocyrt axial riblets occur.

There are  $4\frac{1}{2}$  carinated teleoconch whorls, separated by a distinct suture. On the first teleoconch whorl the carina is situated slightly below mid-whorl, but gradually lowering adaperturally. The carina divides the whorl into an adapical strongly concave part and an abapical flat to slightly concave part. The lowermost part of the canal and the labrum are broken, but presumably the aperture is ovate and the canal rather long and narrow. The columella is smooth and somewhat excavated as a result of resorption of calcareous matter.

Further spiral ornament consists of one spiral below the carina, lying at about one third of the distance between carina and abapical suture. The carina proper carries two very weak spirals. The adapical part of the whorls is smooth. Also the base and the neck of the canal are unornamented.

Axial sculpture is only indicated by the presence of fine to adaperturally increasingly coarser, oblique tubercles on the carina. Their number is *c.* 15 on the first teleoconch whorl, increasing to *c.* 30 on the last. Growth lines are rather inconspicuous, with a deep sinus slightly below the middle of the concave adapical whorl part. Below the carina growth lines are strongly opisthocline meeting the lower suture line at in an angle of *c.* 45°.

*Discussion* – Schnetler (2001) established the genus *Pseudocochlespira* for small to medium-sized cochlespirids, more or less pagodiform in shape, with a conical multispiral protoconch of  $3\frac{1}{2}$  to  $4\frac{3}{4}$  whorls. The terminal protoconch whorl carries axial riblets and spiral ornamentation, or only axial riblets. The present new species matches this diagnosis completely. The genus has as yet only been encountered in the Paleogene of the North Sea Basin and there are no related forms in the European Neogene, including the Neogene of the Paratethys and Mediterranean basins.

*Pseudocochlespira koeneni* (Arkhangelsky, 1904) (see Schnetler, 2001, pl. 6, fig. 7) from the Selandian (Paleocene) of Denmark has an almost smooth teleoconch and the terminal protoconch whorl is strongly convex with opisthocline axial ribs. Its carina is situated below mid-whorl, the abapical part of the whorl lacks spirals. The base of the shell bears a single rather strong spiral.

*Pseudocochlespira rosenkrantzi* Schnetler (2001, p. 62, pl. 4, figs 4-5; pl. 6, fig. 5) from the Selandian of Denmark has spiral ornament on the whorls, and its carina is situated below mid-whorl.

*Pseudocochlespira boeggildi* (Ravn, 1939) (see Schnetler, 2001, pl. 6, fig. 6) from the Selandian of Denmark is a smaller species with equally strong spirals on the adapical part of the whorl.

*Pseudocochlespira schwarzhansi* Schnetler & Palm, 2008 from the Branden Formation (late Oligocene) of Denmark

the carina has three weak spirals, two spirals are present below it and the base has about 12 further spirals. The carina is situated at mid-whorl. Its terminal protoconch whorl has about 13 axial riblets and a weak spiral rib below the adapical suture line.

*Cochlespira volgeri* (Philippi, 1847) (see Speyer, 1867, p. 193, pl. 19, figs 12, 12a-b) from the late Oligocene of Denmark and Germany superficially resembles *Pseudocochlespira* species, but differs markedly by its smaller protoconch, carinated on the two terminal whorls, and there are no axial riblets on the terminal whorl. The carina is much sharper and considerably stronger projecting. Below the carina the whorl is concave. Its carina is situated below mid-whorl. On the base there is a single strong spiral. Finally, the tubercles on the carina are very fine.

*Surcula perspirata* von Koenen, 1890 (p. 323, pl. 30, fig. 10) from the 'Lattorfian' of Germany has a conical protoconch with two keels and no axial ornament. Its carina is situated slightly above mid-whorl. The base of the shell carries two rather strong spirals and further 10 spirals are present on the neck of the canal. This species was assigned to *Cochlespira* by R. Janssen (1979: 313).

Bouchet *et al.* (2005) ranged cochlespirid species in the subfamily Cochlespirinae Powell, 1942 of the family Turridae H. & A. Adams, 1853, but Bouchet *et al.* (2011) resolved the polyphyletic family Turridae into 13 monophyletic families and Cochlespirinae was raised to family level.

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