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Revision of the gastropod family Cancellariidae from the Paleocene of Nuussuaq, West Greenland

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The very rich mollusc fauna from the Paleocene deposits on the Nuussuaq peninsula (Greenland) contains 22 species of the gastropod family Cancellariidae. Seventeen new species are established, viz: *Beuaphera nuussuaqensis* n. gen et n. sp., *Merica rosenkrantzi* n. sp., *Admetula kollmanni* n. sp., *Admetula eivindi* n. sp., *Admetula skoui* n. sp., *Admetula nuussuaqensis* n. sp., *Kroisbachia peeli* n. sp., *Bonellitia birgitteae* n. sp., *Sveltella loevstroemi* n. sp., *Sveltella tobiasseni* n. sp., *Brocchinia pederseni* n. sp., *Babylonella erikseni* n. sp., *Babylonella laurseni* n. sp., *Coptostoma kaimi* n. sp., *Coptostoma dineseni* n. sp., *Unitas florisi* n. sp. and *Massyla maxwelli* n. sp. Five species are described, but not named. A species referred to *Admete* Krøyer, 1842 by Kollmann & Peel (1983) is excluded from the Cancellariidae and described as *Eocantharus sonjae* n. sp. in the family Buccinidae Rafinesque, 1815.

KEY WORDS: Mollusca, Gastropoda, Cancellariidae, Danian, Selandian, Paleocene, Nuussuaq, West Greenland, new species.

Introduction

Rosenkrantz (1970) studied the molluscs from the Paleocene and Danian of Nuussuaq (Greenland) and established several species. He stated that although the gastropods from Nuussuaq were related to the gastropods from the Selandian of Denmark there were no species in common. He compared several species of Cancellariidae with species described by Von Koenen (1885) and Ravn (1939). Kollmann & Peel (1983) made an inventory of the gastropods from the Paleocene of Nuussuaq, West Greenland. They recorded 257 species, with a few exceptions all in open nomenclature. A revision of this rich gastropod fauna was started by Pacaud & Schnetler (1999) and Pacaud (2003). Schnetler (2001) studied the Selandian (middle Paleocene) molluscs from the harbour of Copenhagen and Schnetler & Petit (2006) revised the Cancellariidae from the Danian (Early Paleocene) of Fakse, Denmark. These revisions emphasized the need of a revision of the highly diverse family Cancellariidae from Nuussuaq.

Geological setting and stratigraphy

The geological setting of the West Greenland continental margin has been described by Dam & Sønderholm (1994), Nøhr-Hansen & Dam (1997), Dam *et al.* (1998), Dam (2002) and Nøhr-Hansen *et al.* (2002). The margin was developed in connection with the extensional opening of the Labrador Sea during the late Mesozoic to early Cenozoic. Exposures from Cretaceous (Albian) to Paleocene (?Selandian) outcrop onshore from Baffin Island and in the Nuussuaq basin, where they are overlain by Palaeogene basalts (Clarke & Pedersen, 1976; Henderson *et al.*, 1976; Burden & Langille, 1990). The exposed succession of the Nuussuaq Basin consists of 2.5 km Albian to Paleocene sediments overlain by 3-5 km of Paleocene and Early Eocene hyaloclastites and basalts (Dam *et al.*, 1998). From the Late Albian, siliciclastic sandstones and shales were deposited in fluvial and deltaic settings in eastern Disko and central Nuussuaq, whereas the delta fanned into deeper marine, partly turbidic, environments towards the western and northern Nuussuaq. The Nuussuaq basin underwent major rifting from the Albian to early Paleocene. At least three phases of rifting, major uplift and erosion and infilling of subaerial valleys and submarine canyons resulted in basin-wide unconformities in the late Maastrichtian to early Paleocene interval (Dam *et al.*, 1998; Dam & Sønderholm, 1998). The deposition of marine sediments of the Kangilia Formation was recorded by the first of these rifting events. The younger tectonic phases gave rise to the mudstone dominated Eqalulik and Agatdal Formations in deeper marine settings towards the Northwest and the fluviatile incised valley fills of the Quikavsak Formation in the southern part of the basin (Dam, 2002). The deposition of the marine sediments was followed by the extrusion of a

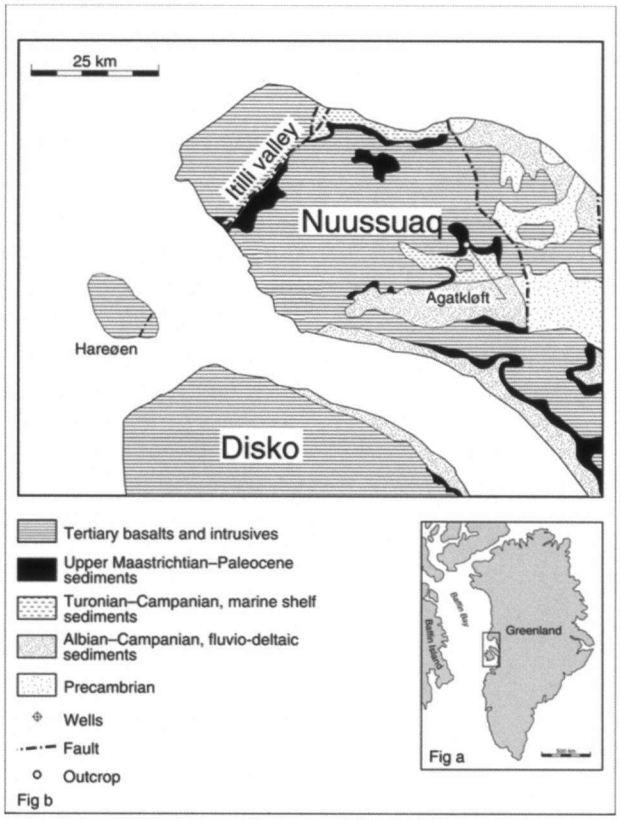


Figure 1a. Map of Greenland, showing the Nuussuaq area in the western part. **Figure 1b.** Geological map of the Nuussuaq Bassin with the Agatkløft locality marked. Modified after Sheldon (2003) and based on GEUS maps.

thick succession of volcanic rocks of the Vaigat and Maligât formations (Pedersen *et al.*, 2006).

On Figures 1a-b the geological setting is shown.

Biostratigraphy

Rosenkrantz (1970) referred the Agatdal Formation to the Upper Danian. Hansen (1970) studied the foraminiferans from Nuussuaq and referred the Kangilia and Agatdal Formations to the Danian. The dinoflagellate cysts from the pre-volcanic Paleocene mudstone succession and the intrabasaltic Paleocene sediments at Nuussuaq were studied by Hansen (1980), Piasecki *et al.* (1992), Nøhr-Hansen (1996, 1997a, 1997b), Nøhr-Hansen & Dam (1997) and Nøhr-Hansen & Heilmann-Clausen (2000). Nannoplankton assemblages have been studied by Perch-Nielsen (1973), Jürgensen & Mikkelsen (1974) and Nøhr-Hansen & Sheldon (2000).

Perch-Nielsen (1973) dated samples from the Sonja Lens Outcrop of the Sonja Member at Agatkløft as upper Zone NP3 based on nannofossils. Jürgensen & Mikkelsen (1974) dated samples from Maarrat Kitdlit on the south-west coast of Nuussuaq and Kangilia on the north coast and placed them into Zone NP3, while Nøhr-Hansen & Sheldon (2000) referred the Equalik and Kangilia Formations to the upper NP3 to lower NP4 zones. Recently, Sheldon (2003) recorded an assemblage containing *Neochiastozygus perfectus* from the Eqalulik Formation of the GANE#1 and GANW1 wells of western Nuussuaq, indicating correlation with the upper NP4 (Danian) or NP5 (Selandian) zones.

Hansen (1980) dated the lower and upper part of the Paleocene mudstone succession at Nuussuaq as early and middle Paleocene, based upon dinoflagellate cysts, and correlated the lower part with nannoplankton zones NP3-NP4 and the upper part with NP5-NP6 (Martini, 1971). Jürgensen & Mikkelsen (1974), however, dated the upper part of the Kangilia Formation (now Eqalulik Formation) to NP3 (late Danian). Piasecki *et al.* (1992) suggested late Danian to Thanetian age (NP zones 4-8). Nøhr-Hansen (1997a, 1997b) and Christiansen *et al.* (1997) dated dinoflagellate cyst assemblages from the Paleocene sediments in four wells and suggested a Selandian age (NP5-NP6) for the upper part of the succession. Nøhr-Hansen & Dam (1997) suggested an early Danian age (NP1-NP3?) for the oldest Paleocene on Nuussuaq.

However, palaeomagnetic studies (Riisager & Abrahamsen, 1999) correlated the lowermost volcanic Anaanaa Member with the late Danian. The correlation with NP5-NP6 suggested by Piasecki *et al.* (1992), Nøhr-Hansen (1997a, b) and Christiansen *et al.* (1997) was based on the presence of a dinoflagellate cyst species similar to the Selandian marker species *Isabelidinium viborgense*, previously only recorded from NP5 and NP6 in Denmark (Heilmann-Clausen, 1985). Later examination, however, proved this species to be previously undescribed (Nøhr-Hansen & Heilmann-Clausen, 2000), and its first occurrence was correlated with NP3 (mid Danian).

Nøhr-Hansen *et al.* (2002) established a detailed zonation of the lower Paleocene succession in the Nuussuaq Basin, based on dinoflagellate cyst and nannofossil data. They referred the Kangilia Formation in Central Nuussuaq to Danian (NP1-NP4) and the overlying Eqalulik Formation to NP4-NP5? Thus, the age of the Agatdal Formation is late Danian to ?early Selandian (Figure 2).

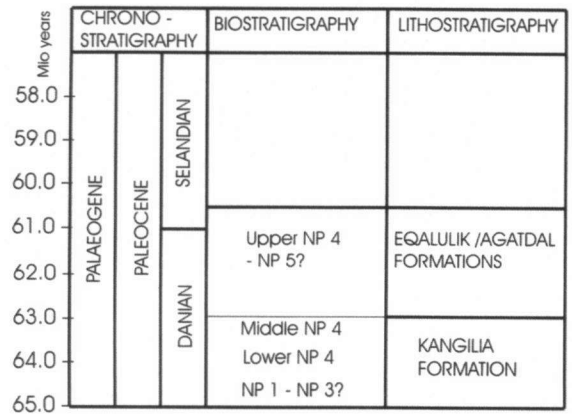


Figure 2. Stratigraphic scheme of the Early Paleocene in central Nuussuaq. The scheme is mainly based on Nøhr-Hansen *et al.* (2002).

Previous work

The material from the Nuussuaq peninsula was collected by the late professor Alfred Rosenkrantz and his co-workers in the years between 1938 and 1968 (Kollmann & Peel, 1983). In 1948 Sonja Hansen found fossiliferous sandstone in a river bed in Agatdalen (Fig. 3) and four years later this rock type was found *in situ*.

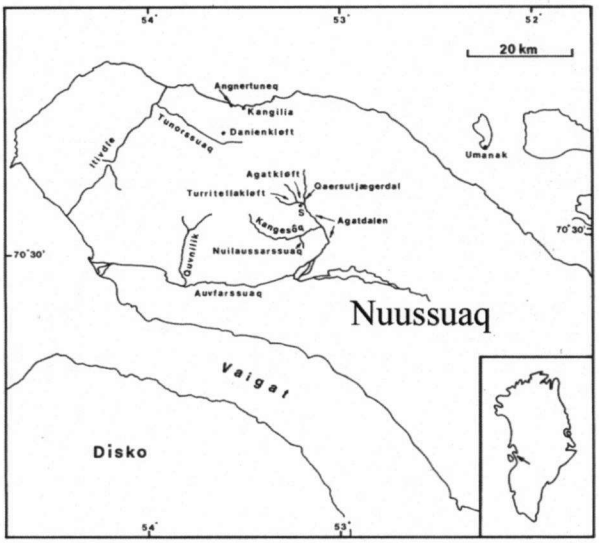


Figure 3. Localities with Paleocene molluscs on the Nuussuaq peninsula. Slightly modified from Kollmann & Peel (1983, p.7, fig. 1).

It was a sand lens of loose sand only seven meters in length and 70 centimeters thick according to Rosenkrantz (1970). Stratigraphically, the lens is part of the Sonja Member at the base of the Agatdal Formation. The sand lens had a very high content of fossils, especially gastropods, which could be washed and sieved out of the sand. The locality seems to be the only one from West Greenland with Cenozoic aragonitic fossils preserved. Rosenkrantz (1970) gave an account of the molluscs from the Sonja Lens. He prepared a treatment of the molluscs and arranged the gastropods into species with working numbers in a series from 1 to 340. His notes and illustrations were arranged following Wenz (1938–44). In his the notes there were a few details and discussion of related species, but no complete systematic descriptions. In the folders these gastropods were arranged together with gastropods from the Danian of Fakse and gastropods from the Selandian (Lellinge Greensand) of Copenhagen. Rosenkrantz obviously intended a treatment of all these gastropods and we use the name the Rosenkrantz manuscript (MS) herein for his notes and illustrations. The drawings for the illustrations of the species were made in the 1960s by the artists Betty Engholm, Gunni Jørgensen and Erna Nordmannn. Kollmann & Peel (1983) gave an inventory of the gastropod genera and illustrated 257 species in open nomenclature. They also studied partly curated collections (with the accession number prefix 1977), but some material was not studied in detail. The material came from the localities Turritellakløft, Agatkløft, Quaersutjægerdal, Angnertuneq (today spelled Annertuneq), Danienkløft, Kangilia, Kangesoq, Nuilarssarssuaq, Quvnilik and Tunorssuaq (Figure 3). Of these localities, Sonja Lens in Agatdalen yielded the richest gastropod fauna (228 species). They concluded that Rosenkrantz had used a too narrow species concept. For their paper they selected numerous drawings from the Rosenkrantz files of drawings and arranged them in two folders. On the Rosenkrantz sheets Kollmann marked drawings, suitable for an illustration, with "OK Ko", while drawings not suitable were marked "NOT Ko". Kollmann & Peel (1983) also discussed the gastropod fauna in detail and stated that the fauna of the Kangilia Formation was derived from a single environment, whereas the fauna of the overlying Agatdal Formation originated from a mixture of environments. Many specimens demonstrate signs of transport and the composition of the gastropods indicate that they originate from different ecological niches. Kollmann & Peel (1983) concluded that the gastropods in the Agatdal Formation were transported to their present juxtaposition from different biocoenoses into a deeper part of the basin. Pacaud & Schnetler (1999) revised the gastropod family Pseudolividae and Pacaud (2003) described a new species of the family Harpidae. Pacaud (2004) revised Danian molluscs from the Paris Basin and assigned two species from the Nuussuaq fauna to species from the Paris Basin. The otoliths were mentioned by Rosenkrantz (1970) and described by Schwarzhans (2004).

State of preservation

The specimens found are all more or less worn on the surface, resulting in relatively poor preservation of the microsculpture. The matrix in the shells consists of more or less sharp-edged sand (quartz) with a grain-size of about 1mm. Many shells have been coated with transparent lacquer to stabilize the rather fragile and worn shells, making the microsculpture indistinct, especially on the protoconchs.

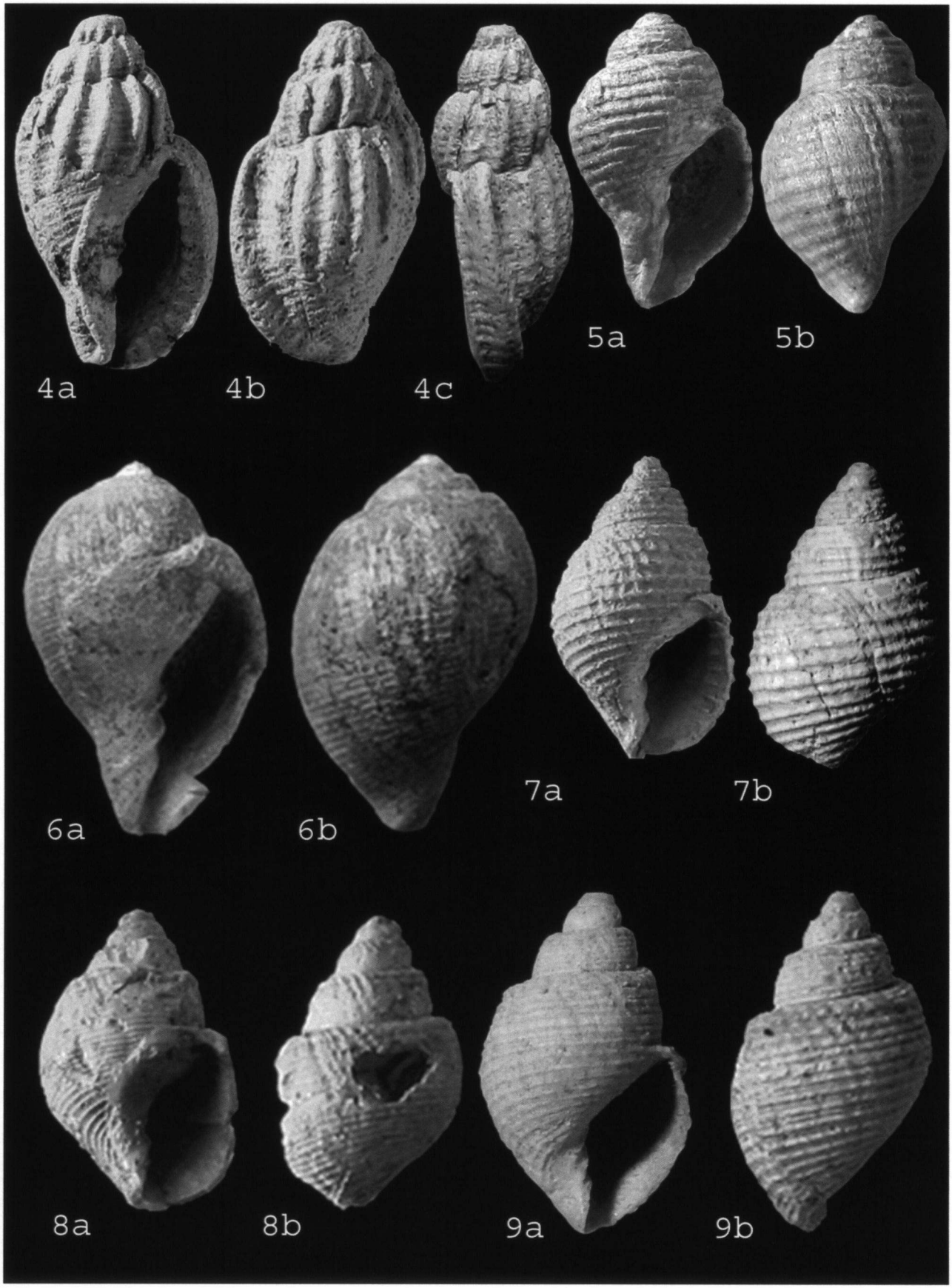
Abbreviations

GM: The prefix for registered material in the collections of the Geological Museum, the University of Copenhagen.

MGUH: The prefix of specimens in the type collection of the Geological Museum, the University of Copenhagen.

Systematic palaeontology

Class Gastropoda Cuvier, 1797
Order Neogastropoda Wenz, 1938
Superfamily Cancellarioidea Forbes & Hanley, 1851
Family Cancellariidae Forbes & Hanley, 1851
Subfamily Plesiotritoninae Beu & Maxwell, 1987



Figures 4-9.

Genus *Beuaphera* n. gen.

Diagnosis – A Plesiotritoninae with an overall shell shape like that of the volutid genus *Lyria*.

The narrow aperture has a short siphonal canal, which is not produced or recurved. The non-collabral axial ribs are opisthocline, but become more orthocline in the final growth-period between the penultimate and the terminal whorl. The outer lip is prosocline with varices at an interval of 180°.

Derivation of name – This species is named after Dr A.G. Beu, New Zealand. The terminal *–aphera* has been used for several cancellariid genera.

Type species – *Beuaphera nuussuaqensis* n. gen. et n. sp.

Beuaphera nuussuaqensis n. gen. et n. sp.
Figures 4a–c

1983 New genus cf. *Plesiotriton* – Kollmann & Peel, p. 67, figs 139A, B
1987 *Turehua* (?) n. sp. B – Beu & Maxwell, p. 23, pl. 29 g, h

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after the type locality.

Holotype – Figures 4a–c, MGUH 15752.

Additional material – One questionable fragment (GM 1977.1286). This specimen could not be located in the Geological Museum of Copenhagen.

Diagnosis – As for the genus.

Measurements – The holotype has a height of 17.5 mm and a width of 9.5 mm.

Description – The shell is subfusiform and rather stout. The body whorl equals about 0.8 of the total shell-height, the aperture 0.6. The protoconch is not preserved. The holotype has about three convex whorls, which are separated by a distinct, undulating suture. The aperture is rather long and widened abapically, adapically it has a distinct posterior canal. Anteriorly there is a short, widely open canal. The labrum is thickened, slightly prosocline in lateral view and has a projecting outer margin. Internally the labrum has 12 knobs. The columella has two distinct plaits, of which the adapical is the strongest. This plait is less oblique than the abapical one. Under the abapical plait there is an oblique tubercle, which is not continuing internally. The inner lip has a well-defined callus, which forms a narrow collar. The spiral ornament consists of about eight bands, which are almost equal in strength and separated by narrow furrows. On the base and the neck of the canal there are about 16 spiral bands, which become weaker abapically. The spiral bands are visible on the radial ribs, but most prominent in the interspaces. In between the spirals weaker secondary spirals are inserted. The axial sculpture consists of 14 rather strong ribs, which are of almost the same strength as their interspaces. They are opisthocline on the whorl and on the base they gradually weaken and run towards the canal. Three old apertures are visible as weak varices with interstices of 180°.

Discussion – The short, inflated shape and the two columellar plaits differ from representatives of *Turehua*, described and illustrated by Beu & Maxwell (1987). They compared the species from West Greenland with *Turehua (?) dunkeri* (Holzapfel, 1888) from the Maastrichtian of Aachen, Germany. This species has a similar shape, but three prominent, narrow plaits and only a terminal varix (Beu & Maxwell, p. 19, pl. 29c–e). They suggested a phylogenetical relationship between these two species. Traub (1989, p. 93, pl. 2, figs 1a–b) compared a *Plesiotriton* sp. from the Paleocene of Haunsberg, Austria with the new species. The Austrian specimen is a rather badly preserved juvenile, thus preventing further comparison.

Subfamily Cancellariinae Forbes & Hanley, 1851

Genus *Merica* H. & A. Adams, 1854

Type species – *Cancellaria melanostoma* Sowerby, 1849, by subsequent designation of Cossmann, 1899.

Figures 4a–c. *Beuaphera nuussuaqensis* n. gen. et n. sp. Holotype, MGUH 15752. Height 17.5 mm. This and all other illustrated specimens are from the Paleocene Sonja Bed, Turritellakloft, Nuussuaq Peninsula, Greenland.
Figures 5a–b. *Massyla maxwelli* n. sp. Holotype, MGUH 15813. Height 19.1 mm.
Figures 6a–b. *Merica rosenkrantzi* n. sp. Holotype, MGUH 15825. Height 19.1 mm.
Figures 7a–b. *Admetula kollmanni* n. sp. Holotype, MGUH 15826. Height 10.9 mm.
Figures 8a–b. *Kroisbachia peeli* n. sp. Holotype, MGUH 15827. Height 9.3 mm.
Figures 9a–b. *Admetula eivindi* n. sp. Holotype, MGUH 15828. Height 8.6 mm.

Merica rosenkrantzi n. sp.
Figures 6a–b

1983 *Merica* sp. – Kollmann & Peel, p. 89, figs 200A, B.

Type locality – Agatkløft, Nuussuaq peninsula.

Type stratum – Agatdal Formation, Paleocene.

Derivation of name – This species is named after Professor Dr Alfred Rosenkrantz.

Holotype – Figures 6a–b, MGUH 15825 (Kollmann & Peel, fig. 200A).

Paratype – MGUH 15824. Locality: Qaersutjægerdal. (Kollmann & Peel, fig. 200B).

Diagnosis – A rather large ovoid-pyriform *Merica* with 10 spiral cords and weak axial sculpture, consisting of numerous prosocline folds.

Measurements – The holotype has a height of 19.1 mm and a width of 14.0 mm.

Description – The shell is rather large, thick-walled and ovoid-pyriform with a height/width ratio of 1.4. The body whorl equals 0.8 of the total shell-height, the aperture 0.6. The protoconch is worn on both specimens available. It consists of about 2½ convex whorls, which are separated by a deep suture. The nucleus is small and the first protoconch whorl is planispiral. The transition into the teleoconch is gradual and indicated by the occurrence of the primary spirals. The largest specimen has three teleoconch whorls, which are convex and separated by a deep suture. The aperture is almost rhomboid, the labrum is broken and the columella is straight with two strong folds. A third weak fold demarcates the margin of the canal. The spiral ornament consists of 10 cords, which are strongest abapically; they are separated by interspaces of almost the same strength. On the body whorl the spirals become wider than the interspaces. The axial sculpture consists of numerous prosocline folds.

Discussion – In general shape and sculpture the species more closely matches species of *Merica* than species of any other named genus. The type species of *Merica* was described and illustrated by Wenz (1943, p. 1357, fig. 3839). In the Recent fauna *Merica* is represented only in the Indo-Pacific area where numerous species occur. Placement of this Paleocene species in *Merica* is deemed preferable at this point to introducing yet another genus into the family.

Genus *Admetula* Cossmann, 1889

Type species – *Cancellaria evulsa* (Solander, 1766) (= *Buccinum evulsa* Solander, 1766), by original designation.

Admetula kollmanni n. sp.
Figures 7a, 7b, 26, 27

1983 *Aneurystoma* sp. 1 – Kollmann & Peel, p. 89, Fig. 201.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Dr H.A. Kollmann, Vienna.

Holotype – Figures 7a, 7b, MGUH 15826.

Paratypes – Figure 26, MGUH 29028, ex GM 1977.1180; Figure 27, MGUH 29029, ex. GM 1977.812.

Additional material – According to Kollmann & Peel two specimens are present in sample GM 1977.1180. A study of this sample showed that only one specimen could be referred to their *Aneurystoma* sp. 1. The other specimen is referred to *Bonellitia birgitteae* n. sp., described below. In the sample GM 1977.1054, one specimen and one dubious specimen were found. Furthermore, GM 1977.1181, one specimen and GM 1977.841, five specimens.

Diagnosis – An *Admetula* with six primary spirals, no axial ribs and a narrow subsutural ramp.

Measurements – The holotype has a height of 10.9 mm and a width of 7.5 mm. Kollmann & Peel erroneously stated that their figure 201 had a magnification of 3, indicating a height of 20 mm.

Description – The shell is rather small and ovoid-conical. Height/width ratio is 1.5. The last whorl equals 0.8 of the total shell-height, the aperture 0.6. The holotype has a worn protoconch, but the two juvenile specimens have a well-preserved protoconch. The protoconch consists of 2¾ convex whorls, which are separated by a distinct suture. The nucleus is small and the first protoconch whorl is planispiral. The two first protoconch whorls are slowly and regularly increasing in diameter and the terminal three quarter whorl is quickly increasing in diameter. On the terminal protoconch whorl six very weak spiral ribs are visible and at the same time very weak prosocline ribs appear. The transition into the teleoconch is gradual. The largest specimen provides a little more than three teleoconch whorls, which are slightly convex and separated by a deep, slightly canaliculate suture. There is a narrow subsutural ramp. The aperture is ovate and wide. The labrum is thickened and with internal lirae, columella slightly concave with three strong folds, of which the abapical one demarcates the short canal, which is slightly deflected to the left. The callus is weak, but well-defined. The spiral ornament consists of six primary spiral cords, which are

the continuations of the weak spirals on the terminal half whorl of the protoconch, separated by slightly narrower interspaces. After a quarter teleoconch whorl a seventh cord occurs under the adapical suture. Of the six spiral cords numbers two, three and four counted in abapical direction are a little stronger than the other. The abapical spiral cord is covered by the following whorl. On the convex base eight further spiral bands are present. On the body whorl the spirals become more widely spaced. The only axial sculpture is rather distinct prosocline growth lines, which are visible on and in between the spiral bands.

Discussion – Rosenkrantz (MS) referred the species to *Bonellitia* with a query, while Kollmann & Peel considered the species to be an *Aneurystoma*. They stated that *Cancellaria propinqua* Kaunhowen from the Maastrichtian was closely related.

Admetula eivindi n. sp.
Figures 9a, 9b, 29

1983 *Aneurystoma* sp. 3 – Kollmann & Peel, p. 90 [*partim*], figs 203A–B, [*non* fig. 203C].

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Eivind Palm, Føllenslev.

Holotype – Figures 9a, 9b, MGUH 15828.

Paratype – Figure 29, MGUH 29031, ex GM 1977.812.

Additional material – According to Kollmann & Peel numerous specimens were present (GM 1977.841, 1977.1200, 1977.1201, 1977.1238). A study of these lots and other lots with cancellariids gave these results:
GM 1977.812: three specimens; GM 1977.828: one specimen; GM 1977.841: 23 specimens; GM 1977.1201: seven specimens;
GM 1977.1054: seven specimens; 1977.1181: two specimens.

Diagnosis – An *Admetula* with seven primary spirals, strong growth-lines and a distinct subsutural band.

Measurements – The holotype has a height of 8.6 mm and a width of 4.7 mm.

Description – The shell is ovoid-conical with a height/width ratio of 1.8. The body whorl equals 0.7 of the total shell-height, the aperture about 0.5. The protoconch provides 2¼ convex whorls, which are separated by a distinct suture. The nucleus is small and the first protoconch whorl is planispiral. The terminal protoconch whorl is quickly increasing in diameter and the transition into the teleoconch is gradual. The largest specimen comprises about two convex whorls, which are separated by a deep suture. There is a distinct subsutural ramp. The aperture is ovate and wide and labrum is only slightly thickened. The columella is slightly concave and has three folds, of which the two adapical are very obliquely placed and the abapical fold is slightly projecting, forming the boundary to the canal, which is only slightly deflected to the left. The spiral ornament consists of seven primary bands, separated by narrower grooves. Of these bands the adapical is stronger than the other and demarcates the flat ramp, which has two weak and two rather distinct spirals. The other spiral bands are of almost the same strength. Axial sculpture consists of distinct growth-lines, meeting the suture at an angle of approximately 45°. The growth lines cause oblong granules on the spiral bands.

Discussion – Rosenkrantz (MS) suggested a relationship with *Cancellaria conoidea* (Koenen, 1885 from the Selandian of Copenhagen. Rosenkrantz (MS) also tentatively suggested that the species was conspecific with *Aneurystoma* sp. 2 and furthermore noted that the samples of *Aneurystoma* sp. 2 and sp. 3 (*sensu* Kollmann & Peel, 1983) presumably were not completely sorted out. Kollmann & Peel stated that the species, like their *Aneurystoma* sp. 2, was closely related to *Cancellaria conoidea*. The new species, however, differs by having stronger spiral ornamentation, a more distinct subsutural ramp and a more slender protoconch.

Admetula skoui n. sp.
Figures 14a–c, 24

cf 1983 *Bonellitia* sp. – Kollmann & Peel, p. 93, figs 210A–B.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

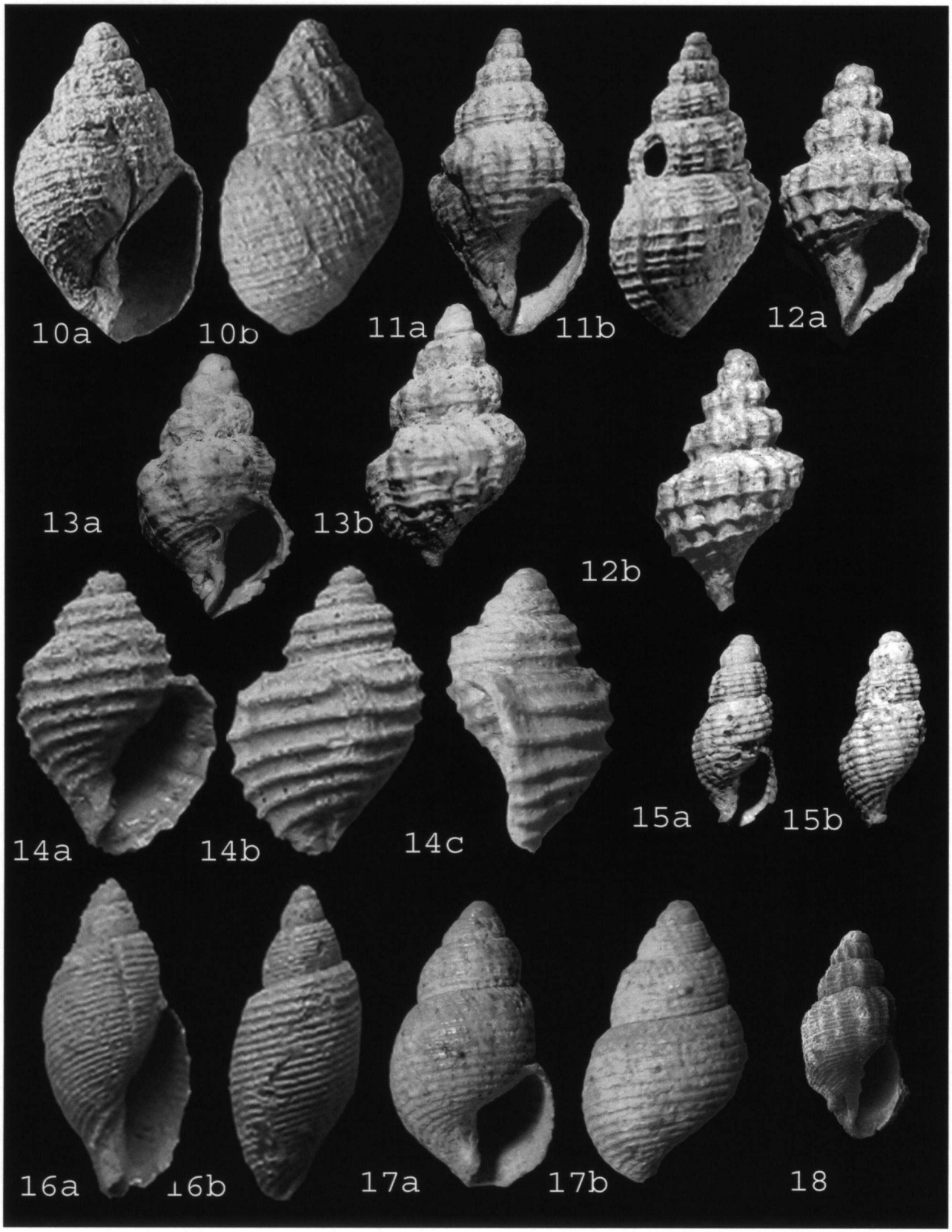
Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after the late conservator Kristian Skou, who prepared the material from Nuussuaq.

Holotype – Figures 14a–c, MGUH 15836.

Paratype – Figure 24, MGUH 29026, ex GM 1977.1184.

Additional material – Kollmann & Peel recorded 22 specimens (GM 1977.1183, GM 1977.1184). An inspection showed that GM 1977.1184 contained 19 specimens of the new species and a specimen of *Fimbriatella* sp. (Kollmann & Peel, fig. 81A–B). GM 1977.1183 contained two specimens, which by Rosenkrantz were selected for



Figures 10-18.

drawings (numbers 230a and 230b). Thus only 21 additional specimens are present in the collections.

Diagnosis – An *Admetula* with two strong spirals and a thickened labrum with strong lirae internally.

Measurements – The holotype has a height of 8.5 mm and a width of 5.6 mm. The damaged specimen 230b has an estimated height of 11 mm.

Description – The shell is rather small, ovoid-conical and rather thick-walled, height/width ratio 1.5. Last whorl equals 0.8 of the total shell height, the aperture 0.6. The holotype is the only complete specimen and number 230b is the only other specimen with an almost complete labrum. All other specimens consist of the apex and are somewhat worn. The protoconch consists of 2½ convex whorls, which are separated by a distinct suture. The protoconch is naticoid, with a small nucleus. The first 1½ whorls are increasing slowly and regularly in diameter, whereas the last protoconch whorl is increasing quickly in diameter. On the last ¼ whorl of the protoconch three weak spirals, distributed regularly around the middle of the whorl, occur. Before the gradual transition into the teleoconch the adapical spiral has changed its position to immediately above the abapical suture and the two adapical spirals are placed on the middle of the whorl. The holotype consists of the protoconch and 2½ teleoconch whorls. The whorls are highly convex in outline and have two very distinct keel-like spirals. The whorls are separated by a deep suture. The aperture is wide and ovate; the thickened labrum meets the columella in a regular curvation, with a small spout near the columella. The labrum has seven lirae internally, corresponding to the spirals and projecting continuations of the spirals. The columella is s-shaped and has two strong oblique folds, of which the adapical one is very oblique. The callus is very thin and the spirals are visible on the parietal wall and on the columella. The spiral ornament consists of three primary spirals, which are the continuations of the protoconch spirals. A fourth weak spiral occurs on the medium whorls, but never reaches the strength of the two strong primary spirals, which are strong and projecting. The abapical spiral is weak and placed immediately above the suture. The primary spirals divide the whorl into an almost flat adapical part and concave interspaces between the three spirals. On the slightly concave base six further spirals, decreasing abapically in strength, are present. The only axial element is prosocline growthlines and varices, at intervals of ¼ whorl.

Discussion – Rosenkrantz (MS) noted on the drawing that the species was rather similar to "Ex. 11" in his material from the Danian of Fakse. This specimen is GM 1977.1375. Schnetler & Petit (2006) established *Admetula faksensis* and included the Fakse specimen therein. *Admetula skoui* differs from *A. faksensis* by having only two primary spirals and prominent internal lirae on the labrum.

Admetula nuussuaqensis n. sp.
Figures 21, 38, 39

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after the type locality.

Holotype – Figure 21, MGUH 29024, 2x GM 1977.813.

Paratypes – Figures 38, MGUH 29040 and 39, MGUH 29041, both ex GM 1977.813.

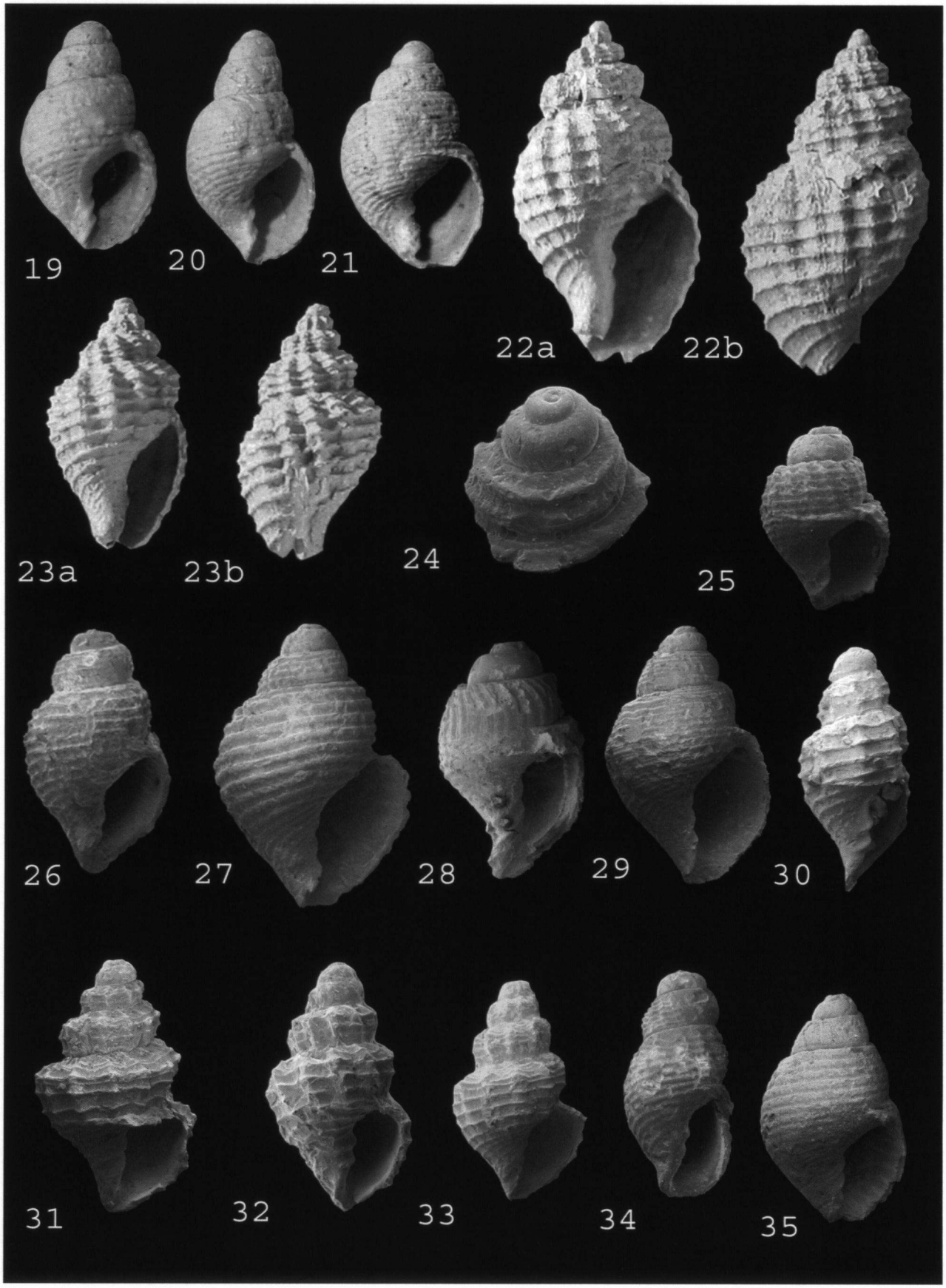
Additional material – Four specimens (GM 1977.813). one specimen, GM 1977.828. One specimen, GM 1977.841. One dubious specimen, GM 1977.1181.

Diagnosis – A small *Admetula* with eight primary spirals and a fine granulation of the spirals. There are no internal lirae.

Measurements – The holotype has a height of 6.0 mm.

Description – The shell is small and ovoid-conical. The last whorl equals 0.7 of the total shell height, the aperture a little less than 0.5. The protoconch consists of 2¼ convex whorls, which are separated by a deep suture. The nucleus is small and the first whorl is planispiral. The last quarter protoconch whorl has numerous extremely fine spiral grooves and extremely fine prosocline axial riblets. The transition into the teleoconch is indicated by the sudden appearance of the spiral ornament. The largest specimen has 2¼ teleoconch whorls, which are medium convex and separated by a deep, canaliculate suture. The aperture is subovate and rather wide. It has a short, spout-like aperture, which is slightly deflected to the left.

Figures 10a–b. *Bonellitia birgitteae* n. sp. Holotype, MGUH 15829. Height 11.0 mm.
Figures 11a–b. *Sveltella loevstroemi* n. sp. Holotype, MGUH 15830. Height 8.3 mm.
Figures 12a–b. *Babylonella erikseni* n. sp. Holotype, MGUH 15833. Height 6.0 mm.
Figures 13a–b. *Babylonella laurseni* n. sp. Holotype, MGUH 15834. Height 4.8 mm.
Figures 14a–c. *Admetula skoui* n. sp. Holotype MGUH 15836. Height 8.5 mm.
Figures 15a–b. *Brocchinia pederseni* n. sp. Holotype, MGUH 15832. Height 5.9 mm.
Figures 16a–b. *Coptostoma kaimi* n. sp. Holotype, MGUH 15837. Height 10.0 mm.
Figures 17a–b. *Coptostoma dineseni* n. sp. Holotype, MGUH 15839. Height 8.0 mm.
Figure 18. *Sveltella tobiasseni* n. sp. Holotype, MGUH 29021. Height 5.5 mm.



Figures 19-35.

The labrum is damaged on all specimens, but seems not to have been thickened. There are no signs of internal lirae or tubercles. The columella is slightly concave and the end of the canal is slightly bent abaxially. The columella has three folds, of which the weak abapical is the boundary to the canal. The spiral ornament consists of eight primary spirals, separated by narrower interspaces. Spirals number two and three are stronger than the other and separated by a wider interspace. On the base there are 10 further spirals. The only axial sculpture is numerous slightly prosocline growth lines, which are visible in between the spirals. On the spirals they cause characteristic fine granulations.

Remarks – Rosenkrantz (MS) referred the species to *Bonellitia* and suggested similarity with his number 69 (= *Admetula eivindi* n. sp.). It differs from this species by the lack of a subsutural ramp and axial sculpture. Kollmann & Peel included the species in cf. *Coptostoma*. They obviously intended to illustrate the species, since the page with the drawing in the Rosenkrantz files of drawings was marked "145 C OK Ko". Drawings used in Kollmann & Peel (1983) were marked in this way. Number145 is the number for their *Parvisipho* sp. 1 (Kollmann & Peel, 1983, figs. 145A, 145B). In fact, this buccinid species has a similar spiral ornament and no axial sculpture, but it is fusiform with a distinct, longer canal and the columella has no folds. *Admetula nuussuaqensis* differs from the other *Admetula* species described in this paper by the characteristic fine granulation of the spirals and the absence of a subsutural ramp.

Admetula sp. 1
Figure 41

Material – One juvenile specimen, MGUH 29043, ex GM 1977.1054, and one damaged juvenile specimen, GM 1977.841.

Measurements – Height 6.2 mm, width 3.8 mm.
Description – The shell is small and ovoid-conical. The height/width ratio is 1.6. The protoconch consists of two smooth whorls. The nucleus is small and the first protoconch whorl is planispiral, only slowly increasing in diameter. The terminal protoconch whorl is convex, slightly shouldered and quickly increasing in diameter. The transition into the teleoconch is gradual. There are two teleoconch whorls, which are medium convex and separated by a slightly canaliculate suture. The last whorl equals 0.75 of the total shell height, the aperture a little more than half the shell height. The aperture is rounded triangular and relatively wide. The labrum is broken off and the columella is distinctly concave, with two folds. The aperture has a spout-like canal, which is slightly deflected to the left. The callus is thin on the parietal wall, but well defined on the columella. The spiral ornament consists of nine spiral bands, separated by narrower furrows. The two adapical bands are narrower than the other bands. Growth-lines are slightly prosocline, but not very distinct.

Discussion – The specimens differ from the *Admetula* species described in this paper by the higher number of spirals and especially by the concave columella. Furthermore, axial sculpture is absent.

Admetula sp. 2
Figures 36, 37

Material – Two juvenile specimens, MGUH 29038, ex GM 1977.1201 and MGUH 29039, ex GM 1977.812.

Measurements – The heights are 3.5 and 5.3 mm respectively.

Description – The shell is small and ovoid-conical. The height/width ratio is about 1.5. There are 2½ protoconch smooth whorls. The nucleus is small and depressed and the first whorl is planispiral and only slowly increasing in diameter, whereas the terminal 1½ whorls are highly convex and quickly increasing in diameter.

Figure 19. *Unitas florisi* n. sp. Holotype, MGUH 29022. Height 6.1 mm.
Figure 20. *Unitas florisi* n. sp. Paratype, MGUH 29023. Height 6.2 mm.
Figure 21. *Admetula nuussuaqensis* n. sp. Holotype, MGUH 29024. Height 6.0 mm.
Figures 22a–b. *Eocantharus sonjae* n. sp. Holotype, MGUH 15835. Height 20.7 mm.
Figures 23a–b. *Eocantharus sonjae* n. sp. Paratype, MGUH 29025. Height 11.5 mm.
Figure 24. *Admetula skoui* n. sp. Paratype MGUH 29026. Height 2.1 mm.
Figure 25. *Bonellitia birgitteae* n. sp. Paratype, MGUH 29027. Height 3.4 mm.
Figure 26. *Admetula kollmanni* n. sp. Paratype, MGUH 29028. Height 3.6 mm.
Figure 27. *Admetula kollmanni* n. sp. Paratype, MGUH 29029. Height 5.8 mm.
Figure 28. *Kroisbachia peeli* n. sp. Paratype, MGUH 29030. Height 3.6 mm.
Figure 29. *Admetula eivindi* n. sp. Paratype, MGUH 29031. Height 6.7 mm.
Figure 30. *Sveltella loevstroemi* n. sp. Paratype, MGUH 29032. Height 4.5 mm.
Figure 31. *Babylonella erikseni* n. sp. Paratype, MGUH 29033. Height 5.6 mm.
Figure 32. *Babylonella erikseni* n. sp. Paratype, MGUH 29034. Height 4.8 mm.
Figure 33. *Babylonella laurseni* n. sp. Paratype, MGUH 29035. Height 4.4 mm.
Figure 34. *Brocchinia peterseni* n. sp. Paratype, MGUH 29036. Height 4.3 mm.
Figure 35. *Coptostoma dineseni* n. sp. Paratype, MGUH 29037. Height 5.6 mm.

The terminal half protoconch whorl has some very fine spiral furrows and a few fine prosocline ribs. The transition into the teleoconch is badly preserved, but seems to be gradual. There are almost two teleoconch whorls on the largest specimen. They are medium convex and separated by a distinct, slightly canaliculate suture. The aperture is ovate and rather wide, the labrum is broken off and the straight columella has two strong folds. The callus is thin. The canal is short and spout-like, slightly deflected to the left. Last whorl equals 0.8 of the total shell height, the aperture about half the total shell height. There are 5-6 primary spirals, which are separated by fine furrows. The growth lines are prosocline.

Discussion – These specimens differ from the other *Admetula* species by the flat spirals and the lack of axial sculpture. It seems to be related to *Admetula kollmanni* n. sp.

Genus *Kroisbachia* Traub, 1989

Type species – *Kroisbachia haunsbergensis* Traub, 1989, by original designation.

Kroisbachia peeli n. sp.
Figures 8a–b, 28

1983 *Aneurystoma* sp. 2 – Kollmann & Peel, p. 90, figs 202A–B.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after J.S. Peel.

Holotype – Figures 8a–b, MGUH 15827.

Paratype – Figure 28, MGUH 29030, ex GM 1977.1181.

Additional material – GM 1977.812, 22 specimens; GM 1977.841, two specimens; GM 1977.1181, one specimen.

Diagnosis – A *Kroisbachia* with six primary spirals and a distinct subsutural band.

Measurements – The holotype has a height of 9.3 mm and a width of 7.2 mm.

Description – The shell is rather small and ovoid-conical with a height/width ratio of 1.3. Last whorl equals 0.8 of the total shell-height, the aperture about 0.5. The protoconch consists of about 2 convex whorls, separated by a deep suture. The nucleus is small. On the terminal half protoconch whorl six spirals occur. The transition into the teleoconch is gradual. The largest specimen contains 2¼ teleoconch whorls, which are slightly convex and separated by a deep suture. There is a narrow subsutural ramp. The aperture is ovate and rather wide. The labrum is broken and the almost straight columella has three folds, of which the middle is the strongest. The short canal is slightly deflected to the left. Spiral ornament consists of six primary spiral bands, which are the continuations of the spirals on the protoconch. Secondary spirals are inserted and on the penultimate whorl there are 10 spiral bands. The adapical spiral band is stronger than the other and separated from the next band by a somewhat wider interspace than the other spiral bands. On the ramp there are weak spirals. The convex base has further 14 spiral bands. The only axial sculpture is rather prominent, prosocline growth lines, which create weak knobs on the adapical spiral band.

Discussion – Rosenkrantz (MS) suggested a close relationship to *Bonellitia?* cf. *conoidea* from the Selandian of Copenhagen, listed by Schnetler (2001) as *Kroisbachia conoidea*. The genus *Kroisbachia* was established, on the basis of two juvenile specimens, as a subgenus of *Cancellaria* by Traub (1989). The new species differs from *Kroisbachia conoidea* by having a stronger subsutural spiral band. Furthermore, the numbers of spirals and axial folds are lower.

Genus *Bonellitia* Jousseaume, 1887

Type species – *Cancellaria bonellii* Bellardi, 1841, by original designation.

Bonellitia birgitteae n. sp.
Figures 10a–b, 25

1983 *Aneurystoma* sp. 3 – Kollmann & Peel, p. 90 [*partim*], fig. 203C.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Mrs Birgitte Palm, Føllenslev, Denmark.

Holotype – Figures 10a–b, MGUH 15829.

Paratype – Figure 25, MGUH 29027, ex GM 1977.1201.

Additional material – GM 1977.828, one specimen; GM 1977.841, one specimen; GM 1977.1180, one specimen; GM 1977.1181, three specimens; GM 1977.1200, two specimens; GM 1977.1201, 34 specimens.

Diagnosis – A *Bonellitia* with six or seven primary spirals.

Measurements – The holotype has a height of 11.0 mm and a width of 6.0 mm.

Description – The shell is rather small, ovoid-conical with a height/width ratio of 1.8. The body whorl equals 0.8 of the total shell-height, the aperture about 0.6. The protoconch consists of 2½ - 3 convex whorls, which are separated by a deep suture. The nucleus is small and the terminal whorl is quickly increasing in diameter. Before the gradual transition into the teleoconch weak spirals occur. The largest shell has two medium convex teleoconch whorls, which are separated by a deep, slightly canaliculated suture. The aperture is ovate and wide. The labrum is thickened and has 10 lirae internally, of which the abapical are more diverging than the others. The labrum runs into the columella in a gradual curvation, with a spout-like canal, which is deflected to the left. The columella is straight and has three folds, of which the adapical one is the most oblique. The abapical fold is the boundary to the canal. The callus is well-defined, covering the parietal wall and the columella. There is a narrow umbilicus. The spiral ornament consists of 6-7 primary bands, which are of almost the same strength as their interspaces. On the body whorl weaker secondary spirals are inserted. The convex base has eight further spiral bands, which are decreasing in strength abapically. The axial sculpture consists of prosocline folds of varying strength, about 12 on each whorl. On the last whorl they gradually weaken.

Discussion – Rosenkrantz (MS) referred the species to *Bonellitia.* According to his serial numbers he obviously considered this species not to be conspecific with *Aneurystoma* sp. 3 (*sensu* Kollmann & Peel, 1983). The species was, however, included by the latter authors in their *Aneurystoma* sp. 3. It differs, however, by having no ramp and no subsutural spiral band. It has axial folds and the folds on the columella are different. On *Aneurystoma* sp. 3 the two adapical folds have the same direction, whereas the adapical fold is more oblique on *Bonellitia birgitteae*, which, in addition, has a well-defined callus.

Genus *Sveltella* Cossmann, 1889

Type species – *Cancellaria quantula* Deshayes, 1864, by original designation.

Sveltella loevstroemi n. sp.
Figures 11a–b, 30

1983 *Sveltella* sp. 1 – Kollmann & Peel, p. 91, fig. 204.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after the Greenlander Abraham Løvstrøm, who assisted Rosenkrantz in Greenland for 30 years.

Holotype – Figures 11a–b, MGUH 15830.

Paratype – Figure 30, MGUH 29032, ex GM 1977.845.

Additional material – One specimen (1977.1231).

Diagnosis – A slender *Sveltella* with six primary spirals.

Measurements – The holotype has a height of 8.3 mm and a width of 4.3 mm.

Description – The shell is small and subfusiform, height/width ratio 1.9. Last whorl equals 0.6 of the total shell-height, the aperture about 0.4. The protoconch consists of 2¼ convex whorls, which are slowly and gradually increasing in diameter. The nucleus is small. On the last half protoconch whorl axial ribs occur and the transition into the teleoconch is gradual. The largest specimen consists of about 3½ convex whorls, which are separated by a deep suture. The aperture is relatively wide and ovate; the labrum is broken and passing into the small spout-like canal in a regular curvation. The columella is slightly s-shaped and has two oblique and rather weak folds on the middle. The callus is thin and rather well defined, covering the columella only. The spiral ornament consists of six primary spirals, which are separated by much wider interspaces. Spirals number 3-5 (counted in abapical direction) are stronger than the other spirals and spiral number six is situated immediately above the suture. Under the adapical suture a seventh weak spiral is inserted. On the convex base there are about nine spirals. Axial sculpture consists of about 15 folds on each whorl. On the first teleoconch whorl they are almost orthocline, on the following they are prosocline. Weak growth lines are visible in between the ribs. The spirals run undulating across the axial folds.

Discussion – Rosenkrantz (MS) referred the species to *Sveltella* with a query. Kollmann & Peel compared the species with *Sveltella curta* (Koenen, 1885) and *Sveltella multistriata* Ravn, 1939 from the Paleocene of Copenhagen. However, *Sveltella multistriata* has a higher number of spirals and a lower spire. *Sveltella curta* has broad spiral bands, separated by narrow furrows and an obliquely placed nucleus.

Sveltella tobiasseni n. sp.
Figure 18

1983 *Sveltella* sp. 2 – Kollmann & Peel, p. 92, fig. 205.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after the Greenlander Andreas Tobiassen, who assisted Rosenkrantz in Greenland for 30 years.

Holotype – Figure 18, MGUH 29021, ex GM 1977.1238.

Paratype – MGUH 15831 (Kollmann & Peel, fig. 205).

Additional material – Two specimens in sample GM 1977.1238, according to Kollmann & Peel. However, this sample contained only one specimen and a juvenile *Admetula eivindi* n. sp. Another specimen, also with the accession number GM 1977.1238, was labelled *Aneurystoma* sp. 3, probably by Kollmann & Peel.

Diagnosis – A small *Sveltella* with five primary spirals and strong varices.

Measurements – The holotype has a height of 5.5 mm and a width of 3.1 mm. The paratype has a height of 4.2 mm and a width of 2.2 mm.

Description – The shell is small and subfusiform with a height/width ratio of 1.9. Last whorl equals 0.7 of the total shell height, the aperture 0.4. The protoconch consists of 2¾ convex whorls, which are separated by a deep suture. The nucleus is small and slightly depressed; the terminal whorl is increasing quickly in diameter. The terminal half protoconch whorl has weak axial folds, which increase in strength towards the gradual transition into the teleoconch. The latter transition is indicated by the gradual appearance of the spiral ornament. The largest specimen has 3 teleoconch whorls, which are convex and separated by a deep, undulating suture. The aperture is ovate and rather narrow, abapically constricted into a short canal, which is deflected to the left. The labrum is damaged on both specimens available, but judging from several rather strong varices it is thickened with internal lirae. The columella has two strong oblique folds. The callus is well-defined, but partly broken and thin on the parietal wall. There is a narrow umbilicus. The spiral ornament begins with five primary spirals, which are separated by narrower furrows. From the first teleoconch whorl secondary weaker spirals are inserted. On the last whorl there are 15 spirals and the secondary spirals are almost as strong as the primary spirals. The axial sculpture consists of 14 prosocline folds, a little weaker than their interspaces. There are several strong varices. In between the ribs slightly prosocline growth lines are visible.

Discussion – Rosenkrantz (MS) referred the species to *Sveltella*. Kollmann & Peel mentioned *S. multistriata* Ravn as closely related. The new species differs from *S. multistriata* by having stronger varices, a shorter canal and a lower height/width ratio.

Genus *Brocchinia* Jousseaume, 1887

Type species – *Brocchinia mitraeformis* (Brocchi, 1814) (= *Voluta mitraeformis* Brocchi, 1814, *non* Lamarck, 1811) ? = *B. parvula tauroparva* Sacco 1894.

Brocchinia pederseni n. sp.
Figures 15a–b, 34

1983 *Sveltella* sp. 3 – Kollmann & Peel, p. 92, figs 206A–B.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after K. Raunsgaard Pedersen, who led two expeditions to West Greenland together with Søren Floris.

Holotype – Figures 15a–b, MGUH 15832.

Paratype – Figure 34, MGUH 29036, ex GM 1313.

Additional material – Three specimens (GM 1977.1313). A further specimen was found in GM 1977.1238.

Diagnosis – A small and slender *Brocchinia* with six primary spiral bands.

Measurements – The holotype has a height of 5.9 mm and a width of 2.7 mm.

Description – The shell is small and subfusiform with a height/width ratio of 2.2. The last whorl equals 0.7 of the total shell height, the aperture less than 0.5. The protoconch consists of 2½ convex whorls, which are separated by a deep suture. The nucleus is small and the whorls are increasing slowly and regularly in diameter. The last protoconch whorl has a few weak prosocline ribs before the transition into the teleoconch, which is sharp. The transition is indicated by a sharp prosocline rib, which is the labrum of the protoconch. The largest specimen has 2½ teleoconch whorls, which are separated by a deep suture. The aperture is rather small, ovate and going into the short canal in a regular curvation. The canal is deflected to the left. The labrum is not thickened. It has internal lirae and small tubercles, corresponding to the spiral cords. The columella is slightly s-shaped with two strong oblique folds. The callus is thin and not sharply demarcated. The spiral ornament consists of seven broad bands, separated by narrower furrows. The abapical spiral is partly covered by the following whorl. On the convex base nine further bands are present. The axial sculpture consists of slightly prosocline, indistinct folds, which vary in strength. On the first teleoconch whorl there are 14 folds, on the last whorl 16. The folds gradually weaken on the last whorl.

Discussion – Rosenkrantz (MS) compared the species with

Sveltella aff. *curta* from the Selandian of Copenhagen. This species has more convex whorls and a lower height/width ratio, but is closely related.

Genus *Babylonella* Conrad, 1865

Type species – *Cancellaria elevata* Lea, 1833, by subsequent designation of Cossmann 1889.

Babylonella erikseni n. sp.
Figures 12a–b, 31, 32

1983 *Cancelrana* sp. 1 – Kollmann & Peel, p. 92, figs 207A–B.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Knud Eriksen, who explored the Agatdal series together with Dan Laursen and Rosenkrantz.

Holotype – Figures 12a–b, MGUH 15833.

Paratypes – Figures 31, 32, MGUH 29033, ex GM 1977.843 and MGUH 29034, ex GM 1977.845.

Additional material – According to Kollmann & Peel numerous specimens from Sonja Lens (GM 1977.842–845). Turritellakløft, one specimen (GM 1977.846).
A study of these samples gave these results:
GM 1977.842, one specimen; GM 1977.843, 20 specimens and two dubious specimens); GM 1977.844, not located; GM 1977.845, three specimens, 17 dubious specimens, two dubious *Babylonella laurseni* n. sp., two indetermined cancellariids, three specimens (no cancellariids) and two specimens of *Buvignieria* (Kollmann & Peel, figs 56A–D). The specimen GM 1977.846 could be referred to *Eocantharus sonjae* n. sp. (= *Admete* sp. in Kollmann & Peel).

Diagnosis – A small *Babylonella* with angular whorls, three primary spirals and a narrow umbilicus.

Measurements – The holotype has a height of 6.0 mm and a width of 3.0 mm.

Description – The shell is small and subfusiform. The height/width ratio is 2.0. The last whorl equals 0.6 of the total shell height, the aperture 0.4. The protoconch consists of 2½ convex whorls, separated by a deep suture. The nucleus is small and the first whorl is planispiral. The terminal whorl is quickly increasing in diameter. The last half protoconch whorl has fine, almost orthocline axial ribs, which increase in strength until the appearance of the spiral ornament, which indicates the transition into the teleoconch. The largest specimen comprises about three highly convex and more or less carinated whorls, which are separated by a deep, slightly undulating, suture. The aperture is rounded triangular and rather small, constricted into a narrow canal of almost the same length. The canal is deflected to the left. On a few specimens there is a very narrow umbilicus. The spiral ornament consists of three primary spirals, which are much weaker than their interspaces. The adapical spiral demarcates a flat ramp on the younger whorls and is situated at about one third from the adapical suture; the second is situated a little below the middle of the whorl and the abapical immediately above the suture. Weaker secondary spirals are quickly inserted on the adapical part of the whorl. On the ramp there are two or three weak spiral ribs. On the convex base there are five further spirals. A few specimens have a distinct adapical spiral and a weaker spiral number two in abapical direction. The axial sculpture consists of 12–14 slightly prosocline ribs, which are narrower than their interspaces. At the intersections with the spirals tubercles occur. These have their longest dimension in direction of the spirals.

Discussion – Rosenkrantz (MS) considered the species to be closely related to *Sveltella angulifera* (Koenen, 1885) from the Selandian of Copenhagen. Kollmann & Peel (1983) referred this species to *Cancelrana* Palmer. However, that genus has a distinct keel on the middle of the whorl. The assignment to this genus by Kollmann & Peel was most likely due to the carinated nature of the specimens in the material, which display a rather wide variation. They also stated that *C. koeneni* Glibert, 1960 (= *S. angulifera* Koenen, 1885) was a related species. The species is closely related to *Babylonella ravni* (Glibert, 1960) from the Selandian of Copenhagen, a highly variable species. According to Ravn (1939) some specimens have three equal spiral cords, some have a fourth weaker spiral cord adapically and others have the abapical third spiral situated closer to the second spiral than to the abapical suture.

Babylonella laurseni n. sp.
Figures 13a–b, 33

1983 *Cancelrana* sp. 2 – Kollmann & Peel, p. 92, figs 208A–B.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Dan Laursen, who explored the Agatdal series together with Knud Eriksen and Rosenkrantz.

Holotype – Figures 13a–b, MGUH 15834.

Paratype – Figure 33, MGUH 29035, ex GM 1977.845.
Additional material – Three specimens (GM 1977.1202).

Diagnosis – A small *Babylonella* with three low primary spirals, secondary spirals from the first teleoconch whorls and five or six spiral ribs on the subsutural part of the whorl. Furthermore, the umbilicus and the aperture are rather wide

Measurements – The holotype has a height of 4.8 mm.

Description – The species is small and subfusiform, with a height/width ratio of 1.6. The last whorl equals 0.6 of the total shell height, the aperture 0.3. The protoconch consists of 2¾ convex whorls, which are separated by a deep suture. The nucleus is small and the first protoconch whorl is planispiral. There are a few axial ribs before the gradual transition into the teleoconch. The largest specimen has three teleoconch whorls, which are highly convex and separated by a deep suture. The aperture is ovate to subcircular and constricted into the rather short canal, which is slightly deflected to the left. The labrum is broken, but seems to be thickened; the columella is almost straight and has two oblique folds. The callus is broken, but partly covering a rather wide umbilicus. The spiral ornament consists of three low primary spirals, which are much weaker than their interspaces. The adapical spiral demarcates a flat to slightly concave area, which has about six spiral cords. Weaker secondary spirals are soon inserted between all primary spirals. On the base there are about 12 spirals. The axial sculpture consists of about 12 slightly prosocline ribs, which are much weaker than their interspaces. At the intersections with the spirals more or less prominent tubercles occur.

Discussion – Rosenkrantz (MS) compared this species with *Sveltella* cf. *multispirata* Ravn, 1939 from the Selandian of Copenhagen. *Babylonella laurseni* differs from the above described *B. erikseni* by having a lower and wider aperture, a shorter canal and a weaker spiral ornament. The secondary spirals are inserted between all primary spirals and on the adapical part of the whorl there are six spirals instead of two. The umbilicus is wider. The species is also related to *Babylonella ravni* (Glibert, 1960).

Babylonella sp. 1
Figure 43

Material – One juvenile specimen, MGUH 29045, ex GM 1977.845.

Measurements – The height is 3.3 mm, the width 2.1 mm.

Description – The shell is small and subfusiform, height/width ratio 1.6. The protoconch is worn and has 2½ whorls. The nucleus is small and the first protoconch whorl is planispiral, whereas the terminal is convex and quickly increasing in diameter. Transition into the teleoconch is gradual. There are 2½ teleoconch whorls, which are highly convex and angular. Last whorl equals 0.75 of the total shell height, the aperture 0.5. The aperture is ovate, with a short canal, which is deflected to the left. The columella has two weak folds and there is a small umbilicus. The spiral ornament consists of four strong spirals, of which the adapical one demarcates a flat ramp. There are 12 strong axial ribs, which together with the spiral form small knobs.

Discussion – This is probably an extreme form of *Babylonella erikseni* n. sp.

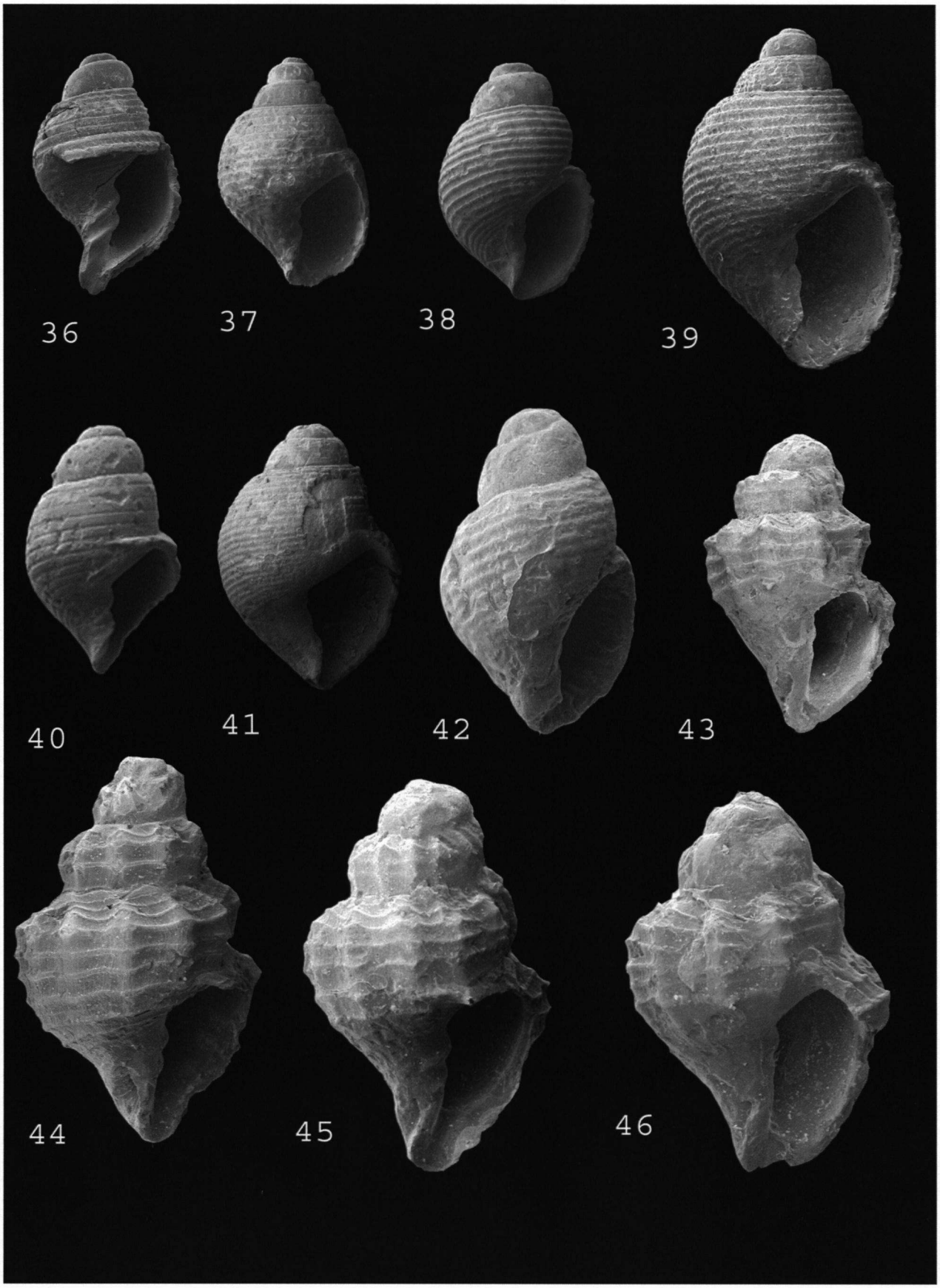
Babylonella sp. 2
Figures 44, 45

Material – Two juvenile specimens, MGUH 29046 and 29047, ex GM 1977.845.

Measurements – The height of the illustrated specimens is 3.7 mm and 3.1 mm respectively.

Description – The shell is small and subfusiform. The height/width ratio is 0.5. The protoconch is worn on both specimens, but seems to consist of 2½ convex and smooth whorls, separated by a distinct suture. The nucleus is obliquely placed and the first protoconch whorl is planispiral. The largest specimen consists of 2½ teleoconch whorls, which are highly convex and separated by a deep suture. The last whorl equals 0.7 of the total shell height, the aperture 0.4. The aperture is rather narrow and subtriangular and the columella is deflected to the left.

Figure 36. *Admetula* sp. 2. MGUH 29038. Height 6.2 mm.
Figure 37. *Admetula* sp. 2. MGUH 29039. Height 3.8 mm.
Figure 38. *Admetula nuussuaqensis* n. sp. Paratype. MGUH 29040. Height 2.8 mm.
Figure 39. *Admetula nuussuaqensis* n. sp. Paratype. MGUH 29041. Height 6.1 mm.
Figure 40. *Unitas florisi* n. sp. Paratype, MGUH 29042. Height 3.3 mm.
Figure 41. *Admetula* sp. 1. MGUH 29043. Height 6.2 mm.
Figure 42. Cancellariidae indet. MGUH 29044. Height 3.1 mm.
Figure 43. *Babylonella* sp. 1. MGUH 29045. Height 3.3 mm.
Figure 44. *Babylonella* sp. 2. MGUH 29046. Height 3.7 mm.
Figure 45. *Babylonella* sp. 2. MGUH 29047. Height 3.1 mm.
Figure 46. *Babylonella* sp. 3. MGUH 29048. Height 3.5 mm.



Figures 36-46.

The columella has two weak folds. The canal is short and deflected to the left. The callus is rather thin and there is a narrow umbilicus. There are two or three strong spirals, separated by interspaces of almost the same width, and on the plane subsutural ramp there are two spirals, which run undulating across the axial ribs. There are 10–12 strong axial ribs, which are almost orthocline.

Discussion – This is probably also an extreme form of *Babylonella erikseni* n. sp.

Babylonella sp. 3
Figure 46

Material – One juvenile specimen, MGUH 29048, ex GM 1977.845.

Measurements – The height is 3.5 mm and the width is 2.1 mm.

Description – The only specimen found is small and subfusiform. The height/width ratio is 1.7. The protoconch is worn. There are almost two teleoconch whorls, which are highly convex and separated by a deep, undulating suture. The last whorl equals 0.7 of the total shell height, the aperture almost 0.5. The aperture is ovate and rather narrow, the labrum is broken and the almost straight columella has two folds. There are five spiral ribs, separated by wider interspaces. Spiral number three is the strongest. There are 10 axial ribs, which are slightly wider than their interspaces.

Discussion – This is probably also an extreme form of *Babylonella erikseni* n. sp.

Genus *Coptostoma* Cossmann, 1899

Type species – *Cancellaria quadrata* Sowerby, 1822, by original designation.

Coptostoma kaimi n. sp.
Figures 16a–b

1983 *Coptostoma* sp. – Kollmann & Peel, p. 93, figs 211A–B.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Dr Andrzej Kaim, Warszawa.

Holotype – Figures 16a–b, MGUH 15837.

Additional material – Kollmann & Peel reported 8 specimens (GM 1977.828). In this sample also two specimens, marked "not" (probably by Kollmann & Peel) were found. They are referred to *Admetula eivindi* n. sp. and *Bonellitia birgitteae* n. sp. In the sample also a specimen of a *Nonactaeocina* sp. and one further *Bonellitia birgitteae* n. sp. were found. The total number of additional specimens of *Coptostoma kaimi* n. sp. in the sample is thus only five.

Diagnosis – A slender *Coptostoma* with 10 spiral bands.

Measurements – The holotype has a height of 10.0 mm and a width of 4.0 mm.

Description – The shell is rather small, slender and subcylindrical. The height/width ratio is 2.5. The last whorl equals 0.8 of the total shell height, the aperture 0.5. The protoconch consists of a little more than two convex whorls, which are separated by a deep suture. The nucleus is small and the whorls are increasing regularly in diameter. The transition into the teleoconch is rather sharp, indicated by an opisthocline protoconch labrum and the appearance of the spiral ornament. The largest specimen consists of 2½ slightly convex whorls, which are separated by a deep suture. There is a narrow subsutural ramp. The aperture is ovate, long and rather narrow, with an acute angle adapically. The canal is short. The labrum is not thickened. The columella is straight and has three folds, of which the two adapical are strong and oblique. The abapical is the demarcation of the canal. The spiral ornament consists of about 10 bands, which are separated by narrow furrows and decreasing in strength abapically. The adapical three spirals are stronger and separated by slightly wider interspaces than the other spirals. On the last whorl the furrows become wider and the two adapical bands become stronger than the other. There is no axial sculpture, except for prosocline growth lines. An old aperture is visible three-quarter whorl before the aperture.

Discussion – The species is a typical *Coptostoma.* It differs from the type species *Coptostoma quadratum* by the more lengthened outline and a higher number of spirals.

Coptostoma dineseni n. sp.
Figures 17a–b, 35

1983 cf. *Coptostoma* sp. – Kollmann & Peel, p. 94, figs 212A–B, C.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Arne Dinesen, who found the fossiliferous unconsolidated sandstone (known as the Sonja Lens) *in situ* in 1951.

Holotype – Figures 17a–b, MGUH 15839.

Paratypes – Figure 35, MGUH 29037, ex GM 1977.1181; MGUH 15838 (Kollmann & Peel, 1983, figures 212A, 212B).

Additional material – According to Kollmann & Peel numerous specimens from Sonja Lens (GM 1977.806, 807, 813, 1054, 1164, 1181). Turritellakløft, one specimen (GM 1977.808). A study of these samples gave as result that only the sample GM 1977.1054 contains 42 specimens conspecific with MGUH 15839.

Diagnosis – A low spired *Coptostoma* with six primary spirals.

Measurements – The holotype has a height of 8.0 mm and a width of 4.3 mm.

Description – (MGUH 15839). The shell is small and ovoid with a height/width ratio of 1.9. The last whorl equals 0.7 of the total shell height, the aperture 0.4. The protoconch consists of 2½ convex whorls, separated by a distinct suture. The very small nucleus is slightly depressed and the first whorl is only slowly, the last whorl quickly increasing in diameter. The transition into the teleoconch is gradual. The largest specimen consists of a little more than three teleoconch whorls, which are medium convex and separated by a deep suture. The aperture is ovate, going into a short canal, which is deflected to the left. The labrum is not thickened and has weak internal lirae. The labrum meets the canal in a regular curvation. The columella is straight and has three oblique folds, of which the adapical is the most oblique. The abapical fold is the border of the canal. The callus is thin and indistinct, covering only part of the columella. The spiral ornament consists of six primary bands, separated by narrower furrows. The adapical band is the strongest. On the convex base there are eight further spiral bands. The only axial sculpture is weak, prosocline growth lines.

Discussion – The juvenile specimen illustrated by Kollmann & Peel (1983: figs 212A, B) is conspecific. Kollmann & Peel questioned the reference to *Coptostoma* because of the stout outline. However, *Coptostoma breve* Wrigley, 1935 from the British Eocene has a rather similar outline and furthermore *Coptostoma quadratum* has a rather wide range of variety in H/W ratio. Kollmann & Peel also stated that a subdivision of what they named cf. *Coptostoma* into six species, as suggested by Rosenkrantz in his MS, was not possible. This study, however, has resulted in a subdivision of the material referred to cf. *Coptostoma* and furthermore in recognizing some incorrect identifications. Rosenkrantz obviously had not completely sorted all samples.

Genus *Unitas* Palmer, 1947 (= *Uxia* Jousseaume, 1887, *non* Walker, 1866)

Type species – *Cancellaria costulata* Lamarck, 1803, by original designation of *Uxia* Joussaume, 1887 [*non* Walker, 1866].

Unitas florisi n. sp.
Figures 19, 20, 40

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Søren Floris, who led two expeditions to Greenland together with K. Raunsgaard Pedersen.

Holotype – Figure 19, MGUH.29022, ex GM 1977.807.

Paratype – Figure 20, MGUH.29023, ex GM 1977.806, Figure 40, MGUH.29042, ex GM 1977.807.

Additional material – 17 specimens (GM 1977.806); 118 specimens (GM 1977.807); one specimen, (GM 1977.808).

Diagnosis – A small and low spired *Unitas* with six primary spiral bands. The spiral bands are low and separated by very fine spiral grooves. Axial sculpture is absent.

Measurements – The holotype has a height of 6.1 mm and a width of 3.7 mm.

Description – The shell is small and subfusiform with a height/width ratio of 1.7. The body whorl equals 0.6 of the total shell-height, the aperture 0.4. The protoconch consists of about 2¾ convex whorls, which are separated by a deep suture. The nucleus is small and the first whorl is planispiral. The terminal protoconch whorl is quickly increasing in diameter. Transition into the teleoconch is indicated by a prosocline rib, which is the aperture of the protoconch. The largest specimen consists of 2¾ teleoconch whorls, which are medium convex and separated by a deep, slightly canaliculate suture. The aperture is subovate and the canal is short, slightly deflected to the left. Labrum is slightly thickened with 10 tubercles internal and weak lirae and the columella is slightly concave. There are three folds, of which the two adapical are strong, while the third fold is the border to the canal. The callus is thin and well-defined on the columella, absent on the parietal wall. The spiral ornament consists of six bands, which are separated of narrow grooves. Of these, the abapical band is partly covered by the suture. The adapical band is stronger than the other bands and separated from the following and by a somewhat wider groove. The spiral grooves are most distinct on the abapical part of the whorl. On the convex base nine further spiral bands are present.

Discussion – Rosenkrantz (MS) referred this species to

Bonellitia. Kollmann & Peel included it in cf. *Coptostoma.* However, the abundant specimens differ from *Coptostoma* by the lower number of spiral bands and by the concave columella. The species differs from most *Unitas* by the lack of varices.

Genus *Massyla* H. & A. Adams, 1854

Type species – *Cancellaria corrugata* Hinds, 1843, by monotypy.

Massyla maxwelli n. sp.
Figures 5a–b

1983 *Strepsidura* sp. - Kollmann & Peel, p. 86, figs 192A–B.

Type locality – Turritellakløft, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after the late P.A. Maxwell, New Zealand.

Holotype – Figures 5a–b, MGUH 15813.

Additional material – One fragment, Sonja Lens (GM 1977.432).

Diagnosis – A *Massyla* with four strong spiral bands and rather strong folds on the columella.

Measurements – The holotype has a height of 19.1 mm and a width of 11.7 mm.

Description – The holotype is subfusiform with a large last whorl, comprising about 0.8 of the total shell height, the aperture about 0.6. The height/width ratio is 1.6. The shell is rather thick-walled. The protoconch consists of two convex whorls, which are separated by a deep suture. The surface is somewhat worn. The nucleus is small and the first whorl increases slowly in diameter, whereas the terminal protoconch whorl increases quickly in diameter. The transition into the teleoconch is gradual. There are three teleoconch whorls, which are highly convex and separated by a deep suture. The aperture is ovate and wide, going into the rather short and wide canal, which is slightly deflected to the left. The labrum is broken, but apparently not thickened; the columella is slightly concave and has two strong folds. The adapical fold has an angle of 45° to the axis of the shell, the abapical more than 60°. The relatively thin callus is spread over the parietal wall and all spirals here are visible. On the columella the callus is well-defined, but partly broken. There is a narrow umbilicus. Spiral ornament consists of four prominent spiral bands, separated by somewhat narrower interspaces. On the almost flat base there are eight further spiral bands, which weaken towards the umbilicus. An axial sculpture is absent, but prosocline growth-lines are rather distinct.

Discussion – The species is referred to *Massyla* H. & A. Adams, 1854 because of the general outline, the folds, the sculpture and the aperture.
The paciphile genus *Massyla* is known in the Recent fauna only from the Panamic-Pacific fauna where it is represented by the type species and two other species, all uncommon. Paciphile genera are those that lived in both the western Atlantic and eastern Pacific during the Neogene but now live only in the eastern Pacific (Woodring, 1966, p. 428).
A number of species occur in the later Tertiary of the southeastern United States. The Pliocene *Massyla venusta* (Tuomey & Holmes, 1856) from the Carolinas and Florida is strikingly similar to *M. maxwelli. Massyla venusta* differs from *M. maxwelli* most in having its spiral cords crenulated by rib-like growth lines but the overall shell shape is the same.

Cancellariidae indet.
Figure 42

Material – One juvenile specimen, MGUH 29044, ex GM 1977.1238.

Measurements – The height is 3.1 mm and the width 1.9 mm.

Description – The only specimen is ovoid-conical, height/width ratio is 1.6. The protoconch consists of 2¼ whorls, which are smooth and only slowly increasing in diameter. The transition into the teleoconch is gradual. There is a little more than one teleoconch whorl, which is medium convex and separated by a deep suture. The last whorl equals 0.8 of the total shell height, the aperture 0.5. The aperture is ovate and rather narrow. The columella is slightly concave with two weak folds and the labrum has 11 lirae internally. There are seven spirals, separated by narrower furrows. There is a rather weak and indistinct varix three quarter whorl before the aperture.

Discussion – This specimen differs from the other cancellariids by its more slender outline, the more slender protoconch, the presence of varices and the rather strong internal lirae.

Family Buccinidae Rafinesque, 1815

Genus *Eocantharus* Clark, 1938

Type species – *Cantharus (Eocantharus) cowlitzensis* Clark, 1938, by original designation.

Eocantharus sonjae n. sp.
Figures 22a–b, 23a–b

1983 *Admete* sp. – Kollmann & Peel, p. 93, fig. 209.

Type locality – Sonja Lens, Agatdalen, Nuussuaq peninsula.

Type stratum – Sonja Member of the Agatdal Formation, Paleocene.

Derivation of name – This species is named after Sonja Alfred Hansen, who first found the fossilferous unconsolidated sandstone 1948. Later the *in situ* occurrence was named Sonja Lens.

Holotype – Figures 22a–b, MGUH 15835.

Paratype – Figures 23a–b, MGUH 29025 (GM 1977.1206).

Additional material – The specimen GM 1977.846 from Turritellakløft, by Kollmann & Peel listed in the material of *Cancelrana* sp. 1 could also be referred to this species.

Diagnosis – An *Eocantharus* with four primary spirals and two strong folds on the columella.

Measurements – The holotype has a height of 20.7 mm and a width of 13.7 mm.

Description – The shell is rather large and subfusiform, height/width ratio 1.5. Last whorl equals 0.8 of the shell height, the aperture 0.6. The protoconch has almost 3¼ convex whorls, which are separated by a deep suture. The small nucleus is slightly depressed and the first whorl is planispiral and lying deeper that the following whorls. The last whorl is quickly increasing in diameter. On the terminal ¼ whorl 10 very fine spirals are present and five slightly prosocline axial ribs are increasing in strength towards the transition into the teleoconch. The transition into the teleoconch is indicated by disappearance of the fine spirals and occurrence of the primary spirals. The largest specimen provides 2¾ teleoconch whorls, which are highly convex and separated by a deep and undulating suture. The aperture is ovate, acute posteriorly and anteriorly gradually constricted into a rather narrow canal of almost equal length. The end of the canal is broken on both specimens available. The labrum is slightly thickened; the columella is s-shaped with two strong folds posteriorly and one weak anteriorly. The callus is thin. The spiral ornament consists of four primary spirals, of which the three abapical are stronger than the adapical one. The spirals are weaker than their interspaces. A fifth spiral is covered by the following whorl. On the younger whorls a weak spiral is inserted on the adapical part of the whorl. On the convex base 10 spirals in strength decreasing abapically are present. The axial sculpture consists of 14–16 strong ribs, which are orthocline to prosocline and separated by narrower interspaces. The axial sculpture gradually weakens on the last whorl. In between these ribs fine growth lines are visible.

Discussion – Kollmann & Peel (1983) referred the species to the genus *Admete* Krøyer *in* Møller, 1842 because of the twisted columella. In general outline, length of the canal, lack of adult outer varix and a parietal tooth and columellar folds the species comes close to the genus *Eocantharus* Clark, 1938. Vermeij (2001, 2006) discussed the *Cantharus* group. Vermeij & Bouchet (1998) and Vermeij (2006) restricted *Cantharus* to Pliocene to Recent. In the Nuussuaq fauna two species and one dubious are referred to the genus *Pollia* Gray *in* Sowerby, 1834, often considered a subgenus of *Cantharus*. The genus *Janiopsis* Rovereto, 1899 is represented by one species in the Nuussuaq fauna. This genus has a concave columella, 1-2 columellar plaits and a parietal fold. The callus is thin and often detached anteriorly.

Cancellariidae in other Paleocene faunas

The cancellariids of the Danian (Early Paleocene) of Fakse, Denmark have recently been studied (Schnetler & Petit, 2006). The rich gastropod fauna of Fakse contains eight cancellariids of the genera *Unitas*, *Plesiotriton*, *Semitriton*, *Tatara* and *Admetula*. Of these genera, only *Admetula* and *Unitas* are represented in the Nuussuaq fauna. The molluscan fauna of the Selandian (Paleocene) of Copenhagen has recently been studied by Schnetler (2001). This fauna contains eight cancellariids of the genera *Admetula*, *Kroisbachia*, *Sveltella*, *Babylonella*, *Cancellaria s.l.*, *Brocchinia* and *Admete*. Thus this fauna comes closer to the Nuussuaq fauna than the Fakse fauna. From the Danian and Montian of Belgium, Glibert (1973) mentioned five species, all established by Briart & Cornet (1877) and all referred to the genus *Unitas* Palmer, 1947. Traub (1979) mentioned two rare species of Cancellariidae from the Paleocene of Haunsberg, Austria.

Palaeogeographical considerations

Schwarzhans (2004) discussed the relations of the otolith fauna with the faunas from Alabama, U.S.A., Ellesmere Island, Denmark and NE Germany and Bavaria and Austria. He stated that the faunas of Nuussuaq and Denmark share 15 species and quoted Rosenkrantz (1970) for the affinities of the molluscan faunas from Nuussuaq and Denmark (Fakse and Copenhagen). Rosenkrantz (1970) concluded that the two faunas have no mollusc species in common, but several species are closely related. Kollmann & Peel (1983) stated that several gastropods of the Nuussuaq fauna are related to either Danian species from Fakse of Selandian species from Copenhagen. They found that several cancellariids from Nuussuaq are closely related to Selandian species described from Copenhagen by Koenen (1885) or Ravn (1939). Schnetler (2001) stated that the several species of gastropods in the faunas from Nuussuaq and the Selandian of Copenhagen were closely related. The present study confirms that statement. The closely related species indicate a previous connection between the North Sea Basin and the Nuussuaq Area.

Conclusions

The cancellariid fauna from Nuussuaq contains 22 species and is the most diverse Paleocene cancellariid fauna known. The assemblage of genera in the fauna reminds much of the Selandian fauna from Copenhagen and thus indicates a colder climate than the Fakse fauna from the Danian. Further detailed studies by specialists of other gastropod families are necessary for a final interpretation of the Nuussuaq fauna.

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