A Palaeocene (Selandian) molluscan fauna from boulders of Kerteminde Marl in the gravel-pit at Gundstrup, Fyn, Denmark

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A rich molluscan fauna from boulders of Kerteminde Marl, collected in the gravel-pit at Gundstrup, Fyn, Denmark was studied. A total of 133 taxa are listed. Of these, 83 are new for the Kerteminde Marl and 48 are new for the Selandian of Denmark. The molluscan fauna is described and the following 27 new species are introduced, *viz. Modiolus mortenseni* nov. sp., *Pteria thomseni* nov. sp., ?*Atrina rosenkrantzi* nov. sp., *Cuspidaria heilmannclauseni* nov. sp., *Cuspidaria anderseni* nov. sp., *Scurria rieae* nov. sp., *Orthochetus darraghi* nov. sp., *Trachytriton eliseae* nov. sp., *Quadrinervus wienekei* nov. sp., *Kangilioptera gundstrupensis* nov. sp., ?*Epetrium pernilleae* nov. sp., ?*Epetrium flemmingi* nov. sp., *Cerithiopsis emilieae* nov. sp., *Cerithiopsis andreae* nov. sp., ?*Cerithiopsis luiseae* nov. sp., *Cerithiopsis boanderseni* nov. sp., *Cerithiella salmae* nov. sp., *Cerithiella malakae* nov. sp., *Siphonalia morteni* nov. sp., *Truncaria benjamini* nov. sp., *Levifusus metteae* nov. sp., *Exilia frejae* nov. sp., *Athleta nikolaji* nov. sp., *Pyropsis jakobseni* nov. sp., *Pyropsis pacaudi* nov. sp., *Turricula vibekeae* nov. sp. and ?*Mangelia stoutjesdijki* nov. sp. The molluscan fauna has been compared with other Palaeocene faunas and palaeoecological and palaeogeographical interpretations are suggested. Water depth during deposition is suggested to have been middle to lower shelf, probably 100-150 m, in a presumed subtropical climate. The palaeoenvironment is interpreted as being in the frame of the transgression of the Selandian Sea including the erosion of the underlying Danian sediments. The near-shore environment in the early Selandian was followed by gradually increasing water depth, resulting in deposits of fine-grained Kerteminde Marl and finally clay of the Ælbelø Formation.

Key words: Denmark, Middle Palaeocene, Selandian, Gundstrup, molluscs, new taxa, palaeoecology.

Introduction

The molluscan fauna of the Kerteminde Marl is not very well-known, since the state of preservation of the molluscs is generally poor. The most diverse fauna known was described by Grönwall & Harder (1907), and Ødum (1926) recorded lists of molluscs from Hvalløs and Svejstrup. The Kerteminde Marl has been encountered at several other localities, especially on the Djursland peninsula (Fig. 1), and at the type locality Lundsgårds Klint near Kerteminde, but in all cases the number of mollusc species encountered is low. Boulders of Kerteminde Marl are generally not rich in molluscs. However, in the gravel-pit at Gundstrup, north of Odense, boulders with external impressions of molluscs are rather abundant, and as the boulders are rather fine-grained and consolidated they allow the making of excellent casts. The molluscan fauna of these boulders is the subject of the present study, which demonstrated a rich molluscan fauna with rather large species and specimens. When compared to the Danish Selandian faunas the fauna from Gundstrup has a distinct affinity to the Kerteminde Marl faunas from Rugård and Hvalløs, but less affinity to the faunas from the Lellinge Greensand in the Copenhagen area and at Klintebjerg. Some similarities with faunas from Poland, Ukraine and Russia suggest a sea connection to the South-East. Some species suggest affinities to the fauna from the Palaeocene of Nuussuaq, Greenland. The study led to the recognition of 27 new species.

Abbreviations

DK: Acronym for specimens housed in the Danekræ collection, Geological Museum, Copenhagen.
GEUS: Material housed in the collection of the Geological Survey of Greenland and Denmark, Copenhagen, Denmark.
ISL: Material housed in the collection of the senior author.
MGUH: Geological Museum, type collection, Copenhagen, Denmark.
MNO: Material housed in the collection of the junior author.

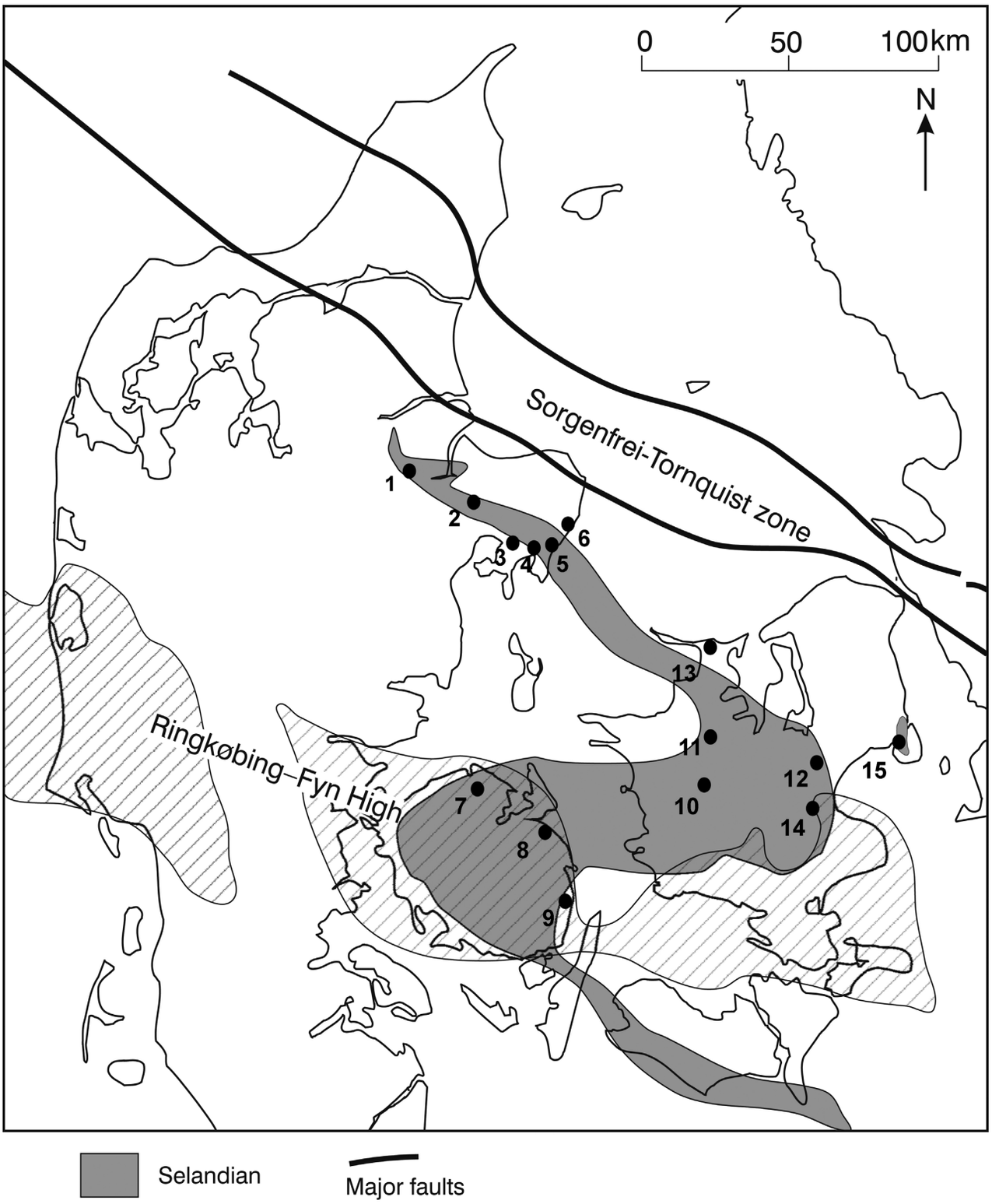

Figure 1. Danish Selandian localities. 1. Svejstrup (marl pit). 2. Hvalløs (marl pit). 3. Basballe (marl pit). 4. Egsmark (marl pit). 5. Holme (marl pit). 6. Rugård (coastal cliff). 7. Gundstrup (gravel pit). 8. Lundsgårds Klint (coastal cliff). 9. Klintholm (chalk pit). 10. Stenlille 1 (borehole). 11. Hanerup (marl pit). 12. Havdrup (borehole). 13. Klintebjerg (boulders of Lellinge Greensand in the glacial moraine). 14. Lellinge (exposures in Lellinge Å). 15. Copenhagen area (excavations). On the map the Ringkøbing-Fyn High and the Sorgenfrei-Tornquist zone are shown and the Selandian deposits are indicated with a gray colour. The map is based on Clemmensen & Thomsen 2005, fig. 1.

Geological setting

The Danish Basin is limited to the North by the Sorgenfrei-Tornquist Zone and to the South by the Ringkøbing-Fyn High (Fig. 1). The Danian and Selandian deposits are thin over this high and thick in the Danish Basin (Sorgenfrei & Buch, 1964; Clausen & Huuse, 2002; Clemmensen & Thomsen, 2005) and have a maximum thickness of more than 350 m and 150 m, respectively (Gry, 1935; Thomsen, 1995). The Selandian depocentre is located on West Sjælland close to the Storebælt (Fig. 1). The Danian deposits consist of carbonates, while the Selandian deposits are mainly clastic (Gry, 1935; Heilmann-Clausen, 1985, 1995; Clemmensen & Thomsen, 2005). Three facies groups are recognised in the Danish Basin: the Lellinge Greensand, Kerteminde Marl and Ælbelø Formations (Fig. 2). The Lellinge Greensand is a strongly calcareous, glauconitic deposit, which is known from Sjælland and the margins of the Ringkøbing-Fyn High (Gry, 1935; Foged *et al*., 1995; Clemmensen & Thomsen, 2005). The thickness is less than 10 m and it was presumably deposited in an inner shelf environment (Gry, 1935; Schnetler, 2001). Laterally towards the depocentre and upwards, the Lellinge Greensand grades into the fine-grained Kerteminde Marl Formation (Clemmensen & Thomsen, 2005). The maximum thickness of this unit seems to have been more than 100 m but is controlled by Quaternary erosion. The Kerteminde Marl was presumably deposited in middle to outer neritic environment (King, 1994, 2015). The calcium carbonate content of the Lellinge Greensand and the Kerteminde Marl varies between 50 % and 70 % (Gry, 1935; Foged *et al*., 1995) and is composed of calcareous nannofossils. The overlying, slightly to non-calcareous Ælbelø Formation was apparently deposited in the bathyal depth zone (King, 1994, 2015).

Previous work

The Kerteminde Marl was investigated first by Johnstrup in 1886 (see Ussing, 1899, p. 119; 1904, p. 334). Ussing (1899) introduced the formation under the name 'Kerteminde Clay', but later (Ussing, 1904) emended the name to Kerteminde Marl. Gry (1935) described this formation from a large number of localities in Jylland, on Fyn and on Sjælland. Lundsgårds Klint, south of Kerteminde on Fyn, is used as the type locality (Heilmann-Clausen, 1995, p. 78; Fig. 1). Furthermore, the formation has been found in several boreholes (Gry, 1935; Andersen, 1944; Thomsen, 1995). The typical rock type is monotonous, light grey silty marl, sometimes with slightly silicified layers. The marl contains pyrite and has been homogenised by strong bioturbation (Heilmann-Clausen, 1995). At localities in Jylland (Hvalløs, Svejstrup), on Fyn (Klintholm) and on Sjælland (Fig. 1) sandy, glauconitic layers occur, forming the basal conglomerate with reworked Danian fossils, for which reason these layers have been compared to the basal part of the Lellinge Greensand (Ødum, 1926; Rasmussen, 1967; Heilmann-Clausen, 1995; King, 2015). Layers of dark marl have been encountered at the localities Holme (Fig. 1; Gry, 1935), Basballe and Egsmark (Fig. 1; Dinesen *et al*., 1977) and these layers have been compared to the dark clay from the Copenhagen area (Rasmussen, 1967; Dinesen *et al*., 1977). Gry (1935), however, in his description of the sequence at Holme stated that the dark marl has high pyrite content but contains only few fossils. Schnetler (2001) concluded that the dark clay from the Copenhagen area is part of the Lellinge Greensand, whereas the dark marl from Holme, Basballe and Egsmark is dissimilar to the Lellinge Greensand. The chalk content of the Kerteminde Marl is about 50 %, consisting mainly of reworked nannofossils, presumably derived from Cretaceous deposits on the Fennoscandian Shield and in the Fennoscandian Border Zone because of the inversion during the late Danian to early Selandian time (Heilmann-Clausen, 1995; Thomsen, 1995; Clemmensen & Thomsen, 2005). The Selandian depocentre is near the borehole Stenlille 1 and the maximum thickness seems to exceed 100 m. The palaeoenvironment was probably middle to outer neritic with a water depth of probably around 100-150 m (King, 1994, 2015; Clemmensen & Thomsen, 2005). The Kerteminde Marl is generally interpreted as a deep-water deposit that is contemporaneous or a little younger than the Lellinge Greensand. Schnetler (2001) provided a monograph of the molluscan fauna of the Selandian of Sundkrogen, Copenhagen and compared it with the molluscan fauna from the Kerteminde Marl.

Lithostratigraphical and biostratigraphical correlations

In Fig. 2 the lithostratigraphical and biostratigraphical correlations are shown. The Kerteminde Marl falls within the dinoflagellate zone 2 *sensu* Nøhr-Hansen & Heilmann-Clausen (2000). Heilmann-Clausen studied a sample from a boulder and concluded that the dinoflagellate assemblage indicated dinoflagellate zone 2. The age is early Selandian and the dinoflagellates indicate an open marine environment (Heilmann-Clausen, pers. comm., 2003). Heilmann-Clausen (2006, p. 195) stated that the silicified boulders from Gundstrup are coarser than the typical Kerteminde Marl and have a higher content of bentic fossils. Thomsen analysed the calcareous nannofossils in five samples from displaced Palaeocene boulders retrieved from Quaternary deposits in the gravel pit at Gundstrup, north Fyn and the analysis gave this result (Thomsen, pers. comm., 2016): The calcareous nannofossils were analysed in smear slides using light microscopy at magnifications of x 400 and x 1000. All samples contain a moderately to well-preserved flora. The floras of the five samples are very similar to each other and they will therefore be treated as a single sample. The flora consists of *in situ* Palaeocene forms with only a few reworked Late Cretaceous specimens. The flora is dominated by *Placozygus sigmoides* (Bramlette & Sullivan, 1961), *Prinsius dimorphosus* (Perch-Nielsen, 1969), *Prinsius martinii* (Perch-Nielsen, 1969) and *Prinsius bisulcus* (Stradner, 1963) Hay & Mohler, 1967. *Chi-*

asmolithus edentulous van Heck and Prins, 1987 is also abundant, whereas *Cruciplacolithus frequens* Perch-Nielsen, 1977 and *Braarudosphaera bigelowii* Gran & Braarud, 1935 are relatively rare. A few specimens of *Neochiastozygus perfectus* Perch-Nielsen, 1971 occur in all samples. They possess a relatively symmetrical cross and have a size that is typical for deposits of Palaeocene age (see Clemmensen & Thomsen, 2005). The presence of *N. perfectus*, common *P. dimorphosus* and common *C. edentulus* together with rare *C. frequens* and a low frequency of reworked Cretaceous forms place the Gundstrup boulders in the lowermost Selandian immediately above the Danian-Selandian boundary (Thomsen, 1994; Clemmensen & Thomsen, 2005) (Fig. 1).

Thus, the samples can be correlated with the lower part of the Lellinge Greensand and the lowermost part of the Kerteminde Marl, and these formations occur in the Storebælt area (Fig. 2) (Clemmensen & Thomsen, 2005).

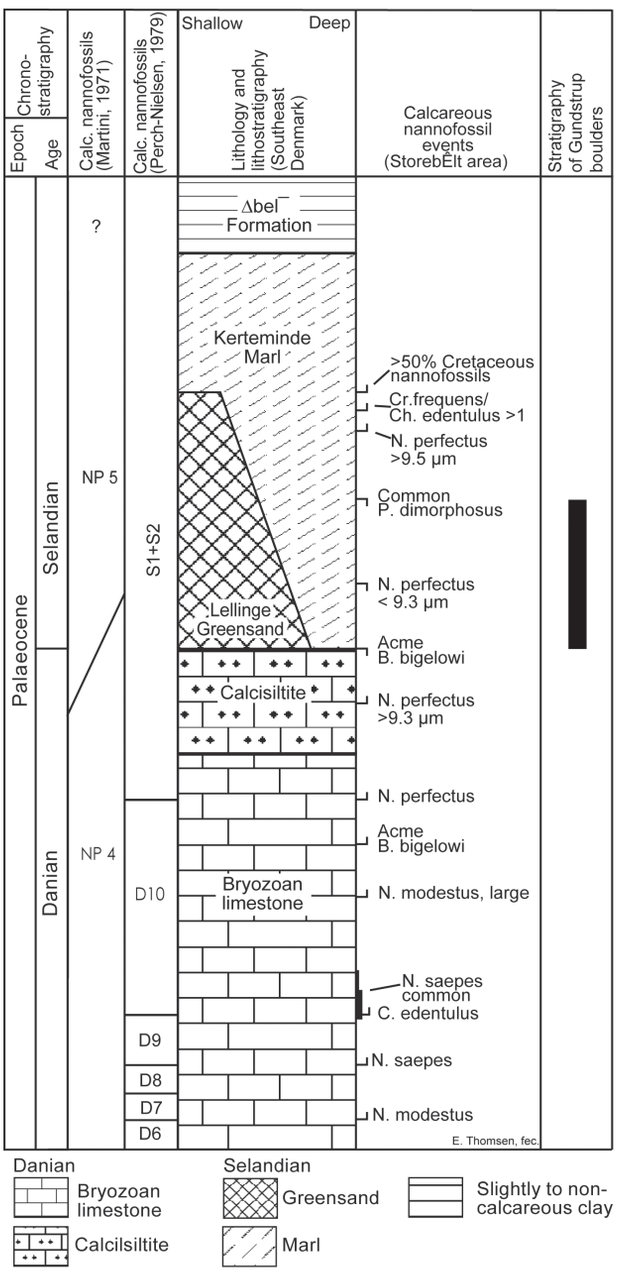

Figure 2. Stratigraphic correlations. Position of upper Danian and lower Selandian calcareous nannofossil events shown on a generalised lithostratigraphic section for southeastern Denmark, and correlated with the calcareous nannofossil zonations of Martini (1971) and Perch-Nielsen (1979). The stratigraphic position of the Gundstrup boulders is indicated by a black bar to the right. Modified from Clemmensen & Thomsen (2005).

Locality

The gravel-pit of Alex Andersen A/S is situated near the village Gundstrup, *c.* 20 km north of Odense on Fyn (Figs 3 & 4) and is remarkable by its very high content of glacially transported Palaeocene boulders. Almost all boul-

Figure 3. The Gundstrup locality is indicated with an arrow on the map of Denmark. The gravel-pit is situated on both sides of the road between Gundstrup and Vellinge.

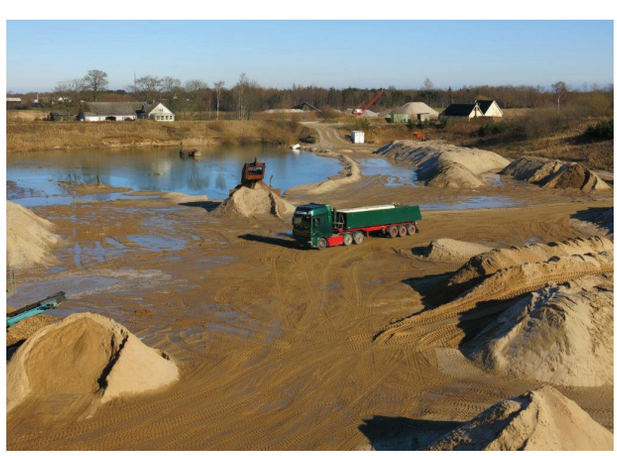

Figure 4. The gravel-pit of Alex Andersen A/S seen from the south.

ders found are consolidated Kerteminde Marl and they are supposed to have been transported from the North and the East because the Kerteminde Marl is known from the northern and eastern part of Fyn, *e.g.* from Lundsgårds Klint (type locality of the Kerteminde Marl) and the western part of Sjælland. Similar boulders have been retrieved from the bottom of the Kattegat, near the northern mouth of the Odense Fjord, and they have been transported to a gravel pit at Seest, near Kolding. The boulders have also been transported to Lindø near Munkebo, to the harbour of Odense and to the gravelpit near Gundstrup. The consolidated boulders of Kerteminde Marl are light or dark grey and often contain fossils, which are more or less well preserved.

Material and methods

The material has been obtained by more than 20 years of collecting in the gravel-pit by the junior author and Peter Tang Mortensen. The fossils are found by splitting the boulders and in many cases, there are impressions of both sides of more or less disintegrated whitish shells. Molluscs are generally poorly preserved, as in most cases the original aragonitic shell material has been dissolved. Calcitic shells, *e.g.* of *Pycnodonte* and *Limaria*, are generally well preserved. However, internal moulds and impressions are frequently found in the consolidated boulders, thus allowing the making of good silicone latex casts. In a few cases casts of complete specimens could be made. In order to produce casts of high quality, it is necessary to remove loose shell material from the impression and to consolidate it before making a cast, as in many cases the matrix is only slightly consolidated. The silicone latex used is SILASTIC® 9161 RTV Silicone Elastomer (product information sheet in the references). Before making the cast, the impression is demarcated by wax. As the cast is white it is coated with fine-grained ochre before photos are made. Due to compaction of the sediment many specimens are more or less deformed, most commonly slightly flattened, which results in inaccurate measurements causing inaccurate height/width ratios. In some cases, the identifications are not completely ascertained, as several species are represented only by incomplete or poorly preserved specimens, which lack important characters of taxonomic value. Especially the identification of some bivalve species has been difficult, as they are preserved as flattened specimens with the shell more or less preserved. The interior of the valves could not be studied and these specimens could not be identified, not even to family level. The type material of each species, consisting of both latex cast and impression, is housed in the type collection of the Geological Museum of Copenhagen (MGUH). Additional latex casts of all types are kept in the private collections of the authors. Almost all impressions and casts of additional specimens are kept in the collection of the junior author (MNO). Some impressions and many casts are kept in the collection of the senior author (ISL).

Remarks on the fauna and palaeogeographical implications

A list of molluscs from the Kerteminde Marl of Grundstrup is given in table 1.

The genus *Orthochetus* Cossmann, 1889 (Cerithiidae) is represented by large specimens of three (two of these very common) species in the Gundstrup fauna. Wenz (1940) stated that the genus had a range from the Late Cretaceous to the Eocene of Europe and Iran. Darragh (2011) established a new species of *Orthochetus* from the Eocene of Australia and stated that the oldest records of the genus are from the Maastrichtian of the Netherlands, Iran and Madagascar. He suggested that the genus was well established in the Tethys Realm during that time and reached the Boreal Realm in the early Tertiary. In the Eocene, *Orthochetus* was well represented in the Central European Realm and also reached Australia. The youngest record is from the early Oligocene of Germany (von Koenen, 1891).

The genus *Pyropsis* Conrad, 1860 (Pyropsidae) is represented by two species. Squires (2011) gave a critical review of the global report of the genus and concluded that it had an amphitropical distribution and lived in warm to temperate waters adjacent to a broad tropical realm. Species of the genus are rare to uncommon wherever found and the genus has a geologic range from the middle Cenomanian to probably the earliest Palaeocene. It was moderately widespread before the Maastrichtian but was predominantly restricted to the New World during the Maastrichtian. From the European Cretaceous the species *Pyropsis quadricarinata* (J. Müller, 1859) from the early Campanian of Germany and *Pyropsis filamentosa* (Binkhorst, 1861) from the Maastrichtian of the Netherlands have been described. None of these species are closely related to the two Danish species, which are the youngest known representatives of an almost exclusively Cretaceous genus. *Siphonalia* sp. from the Palaeocene of Nuussuaq, West Greenland (Kollmann & Peel 1983, p. 71, figs. 149A, B) seems to be a *Pyropsis* closely related to *Pyropsis pacaudi* nov. sp., described herein.

Until now the genus *Trachytriton* Meek, 1864 (Ranellidae) has been known from the late Cretaceous to the Eocene of the USA (Wenz, 1941, p. 1057) and from the Cretaceous of Sachalin, Russia (Schmidt, 1873). Furthermore, the genus has been recorded from Antarctica (Zinsmeister *et al.*, 1989, http://gbif.org/species/4610791). The occurrence of the genus in the Danish Palaeocene may suggest a migration from the Boreal Realm.

The genus *Boreocomitas* Hickman, 1976 (Turridae) has been recorded from the Eocene of Oregon, USA and the Eocene of Kamchatka (Sinelnikova *et al*., 1991). The genus seems to be present in the Palaeocene of Japan (Amano, pers. comm., 2017). The palaeogeographical distribution of the genus may suggest an origin of the genus in the Boreal Realm.

The genus *Nonactaeonina* Meek & Hayden, 1856 (Acteonidae) was until now only known from the Cretaceous of the USA, the Cretaceous of Chile (Bandel & Stinnes-

Species	Specimens
Nucula densistria von Koenen, 1885	13/2
Nuculana biarata (von Koenen, 1885)	14/2
Nuculana symmetrica (von Koenen, 1885)	1/2
Nuculana ovoides (von Koenen, 1885)	1/1, 2/2
Modiolus mortenseni nov. sp.	4/1, 24/2
?*Lithophaga* sp.	1/1
Arcopsis limopsis (von Koenen, 1885)	3/2
Pteria thomseni nov. sp.	30/2
Pinna sp.	2/1, 3/2
?*Atrina rosenkrantzi* nov. sp.	10/1, 1/2, 1 fr.
Pycnodonte (Phygraea) vesicularis Lamarck, 1805	14/2
Propeamussium (Parvamussium) bisculptum (von Koenen, 1885)	3/2
Delectopecten palaeocaenicus (Staesche *in* Roedel, 1937)	12/2
Limaria geinitzi (von Hagenow, 1842)	7/1, 26/2
Phacoides (s. lat.) *lepis* von Koenen, 1885	2/2
Parvilucina planistria (von Koenen, 1885)	1/1, 3/2
Parathyasira regularis (Grönwall & Harder, 1907)	4/2
Protocardia semidecussata (von Koenen, 1885)	9/1, 14/2
Astartidae, gen. et sp. indet.	2/2
?*Anisodonta* sp.	3/2
?*Diplodonta* sp.	2/2
?*Netastoma* sp.	2/2
Teredinidae, gen. et sp. indet.	numerous
Lyonsia baltica Roedel, 1935	1/2
Pholadomya (Bucardiomya) ?*margaritacea* Sowerby, 1823	24/1
Periploma ravni (Schnetler, 2001)	8/1, 9/2
Cuspidaria heilmannclauseni n. sp.	8/1, 10/2
Cuspidaria anderseni n. sp.	1/1, 11/2
Bivalvia, gen. et sp. indet. 1	1/2
Bivalvia, gen. et sp. indet. 2	1/2
Bivalvia, gen. et sp. indet. 3	2/2
Bivalvia, gen. et sp. indet. 4	1/2
Antalis rugifera (von Koenen, 1885)	3
Antalis undifera (von Koenen, 1885)	26
Siphonodentalium intumescens (von Koenen, 1885)	4
Scurria rieae nov. sp.	13
*Lepeta poulseni (*Ravn, 1939)	1
Cidarina johnstrupi (Grönwall & Harder, 1907)	28
Eucycloscala crassilabris (von Koenen, 1885)	4
Emarginula sp.	1
Metacerithium hauniense (von Koenen, 1885)	9
Orthochetus zigzag (Grönwall & Harder, 1907)	14
Orthochetus grewingki (von Koenen, 1885)	27
Orthochetus darraghi nov. sp.	1
?*Orthochetus* sp.	2
Turritella suessi von Koenen, 1885	1
Capulus sp.	1
Coniscala johnstrupi (Mörch, 1874)	12
Acirsa (Hemiacirsa) elatior (von Koenen, 1885)	6
Acirsa sp.	1
Clathroscala gryi (Ravn, 1939)	3
Clathroscala bruennichi (Ravn, 1939)	2
Opaliopsis sp.	1
Euspira detracta (von Koenen, 1885)	7
Euspira detrita (von Koenen, 1885)	1
Tectonatica lindstroemi (von Koenen, 1885)	2
?*Epetrium pernilleae* nov. sp.	2
?*Epetrium flemmingi* nov. sp.	3
Triphoridae, gen. et sp. indet.	1
Cerithiopsis emilieae nov. sp.	1
Cerithiopsis andreae nov. sp.	50
Cerithiopsis luiseae nov. sp.	1
Cerithiopsis boanderseni nov. sp.	1
Cerithiopsis sp.	1
Variseila monbergi (Ravn, 1939)	6
Cerithiella salmaea nov. sp.	2
Cerithiella malakae nov. sp.	1
Ataxocerithium cingulatum (Grönwall & Harder, 1907)	7
?*Ataxocerithium exsculptum* (Grönwall & Harder, 1907)	1
Eulima solidula von Koenen, 1885	1
Eocypraea sp.	1
Palaeocypraea cf. *suecica* Schilder, 1928	1
Priscoficus sp.	1
Aporrhais gracilis (von Koenen, 1885)	24
Drepanocheilus (Drepanocheilus) koeneni (Grönwall & Harder, 1907)	5
Quadrinervus wienekei nov. sp.	34
Kangilioptera gundstrupensis nov. sp.	39
Galeodea elongata (von Koenen, 1885)	10
Trachytriton eliseae n. sp.	1
*Sassia bjerringi (*Ravn, 1939)	18
Xenophora sp.	2
Volutoderma flexiplicata (von Koenen, 1885)	7
Pyropsis jakobseni nov. sp.	1
Pyropsis pacaudi nov. sp.	8
Athleta (Volutocorbis) nodifera (von Koenen, 1885)	2
Athleta nikolaji nov. sp.	6
Euroscaphella crenistria (von Koenen, 1885)	2
?Cancellariidae indet.	3
Siphonalia ariejansseni Schnetler, 2001	5
Siphonalia morteni nov. sp.	2
Truncaria benjamini nov. sp.	1
?*Astyris* sp.	1
Clavilithes hauniensis (Ravn, 1939)	4
Falsifusus danicus (von Koenen, 1885)	8
Latirulus lemchei (Schnetler, 2001)	24
Levifusus moerchi (von Koenen, 1885)	2
Levifusus metteae nov. sp.	2
Urosalpinx pyruloides (von Koenen, 1885)	8
Muricidae, gen. et sp. indet.	2
Vexillum aequicostatum (von Koenen, 1885)	2
Exilia crassistria (von Koenen, 1885)	18
Exilia frejae nov. sp.	3
Ancilla flexuosa (von Koenen, 1885)	10
Belophos steenstrupi (von Koenen, 1885)	3
Borsonia binodosa von Koenen, 1885	18
Turricula hauniensis (von Koenen, 1885)	6
Turricula johnstrupi (von Koenen, 1885)	3
Turricula rosenkrantzi (Ravn, 1939)	6
Turricula torelli (von Koenen, 1885)	3
Turricula laeviuscula (von Koenen, 1885)	1
Turricula fissicosta (von Koenen, 1885)	2
Turricula vibekeae nov. sp.	3
Pseudocochlespira koeneni (Arkhanguelsky, 1904)	7
Pseodocochlespira boeggildi (Ravn, 1939)	4
?*Pseudocochlespira* sp.	1
?*Mangelia stoutjesdijki* nov. sp.	1
Hemipleurotoma gryi (Ravn, 1939)	12
Hemipleurotoma danica (von Koenen, 1885)	6
Eopleurotoma selandica (von Koenen, 1885)	2
Pseudotoma inconspicua (von Koenen, 1885)	1
Boreocomitas brevior (von Koenen, 1885)	1
Pseudomalaxis pingelii (Mörch, 1874)	2
Pseudomalaxis groenwalli Ravn, 1939	1
Neamphitomaria sp.	1
Mathilda fenestrata (Grönwall & Harder, 1907)	1
Mathilda cf. *carinata* (Ravn, 1939)	1
Ravniella regularis (von Koenen, 1885)	15
Nonactaeonina elata (von Koenen, 1885)	7
Gilbertia ultima (von Koenen, 1885)	1
Cylichna discifera (von Koenen, 1885)	6
Roxania clausa (von Koenen, 1885)	1
Gastropoda, incertae cedis	1
Cimomia sp.	6

Table 1. List of mollusc species with frequencies indicated, /1 = complete specimen(s), /2 = valve(s), fr. = fragment(s).

beck, 2000) and the Palaeocene of Nuussuaq, Greenland (Kollmann & Peel, 1983).
The genus *Kangilioptera* Rosenkrantz, 1970 (Aporrhaidae) was until now only known from the Palaeocene of West Greenland (Kollmann & Peel, 1983) and from the Palaeocene of Japan (Amano & Jenkins, 2014). This suggests that *Kangilioptera* is restricted to the Boreal Realm.
During the late Cretaceous the genus *Drepanocheilus* (Meek, 1864) (Aporrhaidae) had a wide distribution in the USA. It has also been recorded from the Cretaceous of Austria, Russia, Angola and Egypt (Wieneke, 2016a) and Japan (Amano & Jenkins, 2014). One species was recorded from the Palaeocene of the USA by Stanton (1920). Kollmann & Peel (1983) recorded a species from the Palaeocene of West Greenland. The palaeogeographical distribution of the genus may suggest an origin in the Tethys and during the Cretaceous migration and diversification to and within North America.
The genus *Quadrinervus* Cossmann, 1904 (Aporrhaidae) has been recorded from the Jurassic and Cretaceous of Europe, especially from the Jurassic of France. Furthermore, it has been reported from the Jurassic of Germany and Great Britain as well as from the Cretaceous of Austria, France and Poland (Wieneke, 2016b). The occurrence in the Danish Palaeocene suggests a connection to the Tethys.
Until now the genus *Belophos* Cossmann, 1901 (Conidae) has been known from the late Cretaceous (Senonian) to Oligocene of South America and Australia (Wenz, 1943, p. 1463). The occurrence in the Danish Palaeocene is the first record from Europe and suggests an origin of the genus in the Tethys.

Palaeoecological interpretation

In many cases the molluscs are found in smaller or larger concentrations, most likely caused by palaeocurrents. Remarkable are two slabs, one with *c.* 30 specimens of *Kangilioptera gundstrupensis* nov. sp. and one with *c.* 20 specimens of *Quadrinervus wienekei* nov. sp. Amano & Jenkins (2014) found concentrations of *Kangilioptera inouei* Amano & Jenkins, 2014 associated with sunken wood and presumably, the species fed on detritus derived from wood debris (Amano, pers. comm., 2017). Remains of wood, as well as concentrations of Teredinidae, are present in the boulders at Gundstrup, but the two slabs mentioned have no indications of such remains. The bivalve species *Pteria thomseni* nov. sp. and the gastropods *Metacerithium hauniense* (von Koenen, 1885) and especially *Cerithiopsis andreae* nov. sp. also occur with several specimens in one slab. In some cases, concentrations with several different species have been found (Plate 9). Bivalves are mainly representatives of the infauna (*e. g.* Nuculanidae, *Pholadomya (Bucardiomya) ?margaritacea* (Sowerby, 1821) and Cuspidariidae), and sessile (byssate or cementating) bivalves are less common and represented by *e. g.* pectinids and *Limaria geinitzi* (von Hagenow, 1842). Boring bivalves are Teredinidae, ?*Lithophaga* Röding, 1798 and ?*Netastoma* Carpenter, 1864. The dentalids are endobenthic. The gastropod fauna has only a few herbivores. All specimens of the gastropod *Scurria rieae* nov. sp. have been found associated with fossil wood, probably sunken driftwood, which clearly indicates transport. Almost all gastropod species are carnivores. The pelagic cephalopods indicate open marine conditions. The bottom was soft; the sea was deep (*c.* 100-150 m) and rich in food.
Clemmensen & Thomsen (2005, fig. 11) interpreted the palaeoenvironment in the Storebælt area as fully marine with moderately good oceanic connections, a water depth of 100-150 m and a very high sedimentation rate due to a high input of reworked chalk. The bottom water was well ventilated with low current activity. The planktonic production was low and the benthic food supply was reduced.
A rich and diverse fauna of non-molluscs has also been encountered, including foraminifera, sponges, anthozoans, annelids (*Serpula*), decapods, cirripedes (but no barnacles), bryozoans, brachiopods, asteroids, ophiuroids, crinoids, echinids, chelonids, ganoids (parts of skeleton, otoliths and scales in burrows), sharks (teeth) and birds (breastbone). This fauna supports the palaeoecological interpretion above.

Comparisons with other Palaeocene faunas

In table 2 the Grundstrup fauna is compared with other Palaeocene faunas.

Kerteminde Marl molluscan faunas from Rugård, Hvalløs, Svejstrup, Lundsgårds Klint and Hanerup

Grönwall & Harder (1907) described a fauna from a coastal cliff at Rugård, south of Grenå (Fig. 1). They recorded 57 species of molluscs, of which seven were recorded in open nomenclature. The molluscan fauna is listed in Table 2. It differs from the Gundstrup fauna but both faunas share 43 species (similarity index 70.5 %). Several species that are rather common in the Rugård fauna are absent in the Gundstrup fauna, *e. g. Turritella nana* von Koenen, 1885, *Turbonilla harderi* Grönwall & Harder, 1907, *Odontostomia undiferum* von Koenen, 1885 and *Odontostomia obtusum* von Koenen, 1885. As all these species are small, they may have been overlooked due to the way of collecting the material from Gundstrup. The Danian to Selandian transitions at Svejstrup and Hvalløs (Hvalløse in older literature) in Jylland (Fig. 1) have been studied by Ødum (1926) and Thomsen & Heilmann-Clausen (1985). The Selandian is represented by the Kerteminde Marl, which contains a rather poorly preserved molluscan fauna (Ødum, 1926). Material in the collection of the senior author has also been considered. Nine species of molluscs have been recorded from Svejstrup and 26 from Hvalløs. The Hvalløs fauna has a similarity index of 83.9 % with the Gundstrup fauna and the Svejstrup fauna has a similarity index of 100 %. As the state

Species	Gu	Ru	Hv	Sv	Ba	Kl	C A	Ro	Kr	Ar	Mo	Ma	NKM	NDS
Nucula densistria von Koenen, 1885	●	●	●	●	●	●	●	●	●					
Nuculana biarata (von Koenen, 1885)	●	●					●		●		●			
Nuculana symmetrica (von Koenen, 1885)	●						●	●	●		●		●	
Nuculana ovoides (von Koenen, 1885)	●	●	●	●		●	●	●	●	●				
Modiolula mortenseni nov. sp.	●	●											●	●
Arcopsis limopsis (von Koenen, 1885)	●	●	●			●	●	●	●		●			
?*Lithophaga* sp.	●												●	●
Pteria thomseni nov. sp.	●	●											●	●
Pinna sp.	●	●				●		●						
?*Atrina rosenkrantzi* nov. sp.	●					●							●	●
Pycnodonte (Phygraea) vesicularis Lamarck, 1805	●		●											
Propeamussium (Parvamussium) bisculptum (von Koenen, 1885)	●	●	●			●	●							
Delectopecten palaeocaenicus (Staesche *in* Roedel, 1937)	●	●					●							
Limaria geinitzi (von Hagenow, 1842)	●	●	●	●	●	●	●	●			●			
Phacoides (s. lat.) *lepis (*von Koenen, 1885)	●						●	●	●	●	●		●	
*Parvilucina planistria (*von Koenen, 1885)	●					●	●	●			●		●	
Parathyasira regularis (Grönwall & Harder, 1907)	●	●					●				●			
Protocardia semidecussata (von Koenen, 1885)	●						●		●	●	●		●	
Astartidae, gen. et sp. indet.	●										●		●	
?*Anisodonta* sp.	●												●	●
?*Diplodonta* sp.	●													
?*Netastoma* sp.	●	●											●	●
Teredinidae, gen. et sp. indet.	●	●				●	●				●			
Lyonsia baltica Roedel, 1935	●							●					●	
Pholadomya (Bucardiomya) ?*margaritacea* Sowerby, 1823	●	●	●			●	●	●						
Periploma ravni (Schnetler, 2001)	●						●						●	
Cuspidaria heilmannclauseni nov. sp.	●						●						●	●
Cuspidaria anderseni nov. sp.	●					●							●	●
Bivalvia, gen. et sp. indet. 1	●												●	●
Bivalvia, gen. et sp. indet. 2	●												●	●
Bivalvia, gen. et sp. indet. 3	●												●	●
Bivalvia, gen. et sp. indet. 4	●												●	●
*Antalis rugifera (*von Koenen, 1885)	●	●	●	●	●	●	●	●	●	●	●			
Antalis undifera von (Koenen, 1885)	●		●			●	●	●						
Siphonodentalium intumescens (von Koenen, 1885)	●	●	●			●	●							
Scurria rieae nov. sp.	●												●	●
*Lepeta poulseni (*Ravn, 1939)	●						●						●	
Cidarina johnstrupi (Grönwall & Harder, 1907)	●	●												
Eucycloscala crassilabris (von Koenen, 1885)	●		●	●		●	●	●	●	●	●			
Emarginula sp.	●													
Metacerithium hauniense (von Koenen, 1885)	●	●	●	●		●	●		●		●	●		
Orthochetus zigzag (Grönwall & Harder, 1907)	●	●							●					
Orthochetus grewingki (von Koenen, 1885)	●						●						●	
Orthochetus darraghi nov. sp.	●												●	●
?*Orthochetus* sp.	●													
Turritella suessi von Koenen, 1885	●						●						●	
Capulus sp.	●												●	●
Coniscala johnstrupi (Mörch, 1874)	●		●			●	●							
Acirsa (Hemiacirsa) elatior (von Koenen, 1885)	●	●					●		●			●		
Acirsa sp.	●													
*Clathroscala gryi (*Ravn, 1939)	●						●						●	
*Clathroscala bruennichi (*Ravn, 1939)	●						●						●	
Opaliopsis sp.	●													
Euspira detracta (von Koenen, 1885)	●	●	●			●	●	●						
Euspira detrita (von Koenen, 1885)	●	●		●		●	●	●	●	●				
Tectonatica lindstroemi (von Koenen, 1885)	●						●	●					●	
?*Epetrium pernilleae* nov. sp.	●						●						●	
?*Epetrium flemmingi* nov. sp.	●												●	●
Triphoridae, gen. et sp. indet.	●												●	●
Cerithiopsis emilieae nov. sp.	●												●	●
Cerithiopsis andreae nov. sp.	●												●	●
?*Cerithiopsis luiseae* nov. sp.	●												●	●
Cerithiopsis boanderseni nov. sp.	●												●	●
?*Cerithiopsis* sp.	●												●	●
Variseila monbergi (Ravn, 1939)	●												●	●
Cerithiella salmae nov. sp	●													
Cerithiella malakae nov. sp.	●													
Ataxocerithium cingulatum (Grönwall & Harder, 1907)	●												●	
?*Ataxocerithium exsculptum* (Grönwall & Harder, 1907)	●	●												
Eulima solidula von Koenen, 1885	●	●												
Eocypraea sp.	●						●							
Palaeocypraea cf. *suecica* Schilder, 1928	●													

Species	Gu	Ru	Hv	Sv	Ba	Kl	C A	Ro	Kr	Ar	Mo	Ma	NKM	NDS
Priscoficus sp.	●													
Aporrhais gracilis (von Koenen, 1885)	●					●	●		●				●	
Drepanocheilus (Drepanocheilus) koeneni (Grönwall & Harder, 1907)	●	●	●	●	●	●	●		●			●		
Quadrinervus wienekei nov. sp.	●	●					●							
Kangilioptera gundstrupensis nov. sp.	●													
Galeodea elongata (von Koenen, 1885)	●						●					●	●	
Trachytriton eliseae nov. sp.	●													
*Sassia bjerringi (*Ravn, 1939)	●												●	●
Xenophora sp.	●													
Volutoderma flexiplicata (von Koenen, 1885)	●												●	●
Pyropsis jakobseni nov. sp.	●													
Pyropsis pacaudi nov. sp.	●													
Athleta (Volutocorbis) nodifera (von Koenen, 1885)	●						●						●	
Athleta nikolaji n. sp.	●													
Euroscaphella crenistria (von Koenen, 1885)	●	●	●			●	●							
?Cancellariidae indet.	●													
Siphonalia ariejansseni Schnetler, 2001	●												●	●
Siphonalia morteni nov. sp.	●						●						●	
Truncaria benjamini nov. sp.	●												●	●
?*Astyris* sp.	●													
Clavilithes hauniensis (Ravn, 1939)	●												●	●
Falsifusus danicus (von Koenen, 1885)	●					●	●		●				●	
Latirulus lemchei (Schnetler, 2001)	●	●			●		●	●						
Levifusus moerchi (von Koenen, 1885)	●						●							
Levifusus metteae nov. sp.	●						●						●	
Urosalpinx pyruloides (von Koenen, 1885)	●												●	●
Muricidae, gen. et sp. indet.	●	●			●	●	●							
Vexillum aequicostatum (von Koenen, 1885)	●												●	●
Exilia crassistria (von Koenen, 1885)	●		●				●		●					
Exilia frejae nov. sp.	●													
Ancilla flexuosa (von Koenen, 1885)	●												●	●
Belophos steenstrupi (von Koenen, 1885)	●	●	●			●	●		●					
Borsonia binodosa von Koenen, 1885	●					●	●						●	
Turricula hauniensis (von Koenen, 1885)	●						●	●					●	
Turricula johnstrupi (von Koenen, 1885)	●		●				●	●					●	
Turricula rosenkrantzi (Ravn, 1939)	●	●				●	●	●			●			
Turricula torelli (von Koenen, 1885)	●		●				●	●	●		●			
Turricula laeviuscula (von Koenen, 1885)	●						●						●	
Turricula fissicosta (von Koenen, 1885)	●					●	●		●				●	
Turricula vibekeae nov. sp.	●						●						●	
Pseudocochlespira koeneni (Arkhanguelsky, 1904)	●						●	●					●	
Pseodocochlespira boeggildi (Ravn, 1939)	●												●	●
?*Pseudocochlespira* sp.	●		●				●		●	●		●		
?*Mangelia stoutjesdijki* nov. sp.	●												●	●
Hemipleurotoma gryi (Ravn, 1939)	●	●	●			●	●		●			●		
Hemipleurotoma danica (von Koenen, 1885)	●												●	●
Eopleurotoma selandica (von Koenen, 1885)	●						●		●				●	
Pseudotoma inconspicua (von Koenen, 1885)	●						●						●	
Boreocomitas brevior (von Koenen, 1885)	●	●					●	●						
Pseudomalaxis pingelii (Mörch, 1874)	●	●	●	●		●	●	●		●	●			
Pseudomalaxis groenwalli Ravn, 1939	●	●					●	●		●	●			
Neamphitomaria sp.	●	●				●	●	●						
Mathilda fenestrata (Grönwall & Harder, 1907)	●	●					●							
Mathilda cf. *carinata* (Ravn, 1939)	●	●					●							
Ravniella regularis (von Koenen, 1885)	●	●	●	●			●	●				●		
Nonactaeonina elata (von Koenen, 1885)	●						●	●					●	
Gilbertia ultima (von Koenen, 1885)	●		●										●	
Cylichna discifera (von Koenen, 1885)	●												●	●
Roxania clausa (von Koenen, 1885)	●	●												
Gastropoda, incertae cedis	●						●						●	
Cimomia sp.	●	●	●			●	●	●				●		
Total	**133**	**41**	**26**	**9**	**8**	**32**	**75**	**29**	**23**	**9**	**19**	**8**	**68**	**35**

Table 2. The Gundstrup fauna compared with other Palaeocene faunas. Gu: Gundstrup, boulders of Kerteminde Marl (this study); Ru: Rugård (Grönwall & Harder 1907); Hv: Hvalløs (Ødum 1926 and collection of the senior author); Sv: Svejstrup (Ødum 1926 and collection of the senior author); Ba: Basballe (collection of the senior author); Kl: Klintebjerg, Sealand, boulders of Lellinge Greensand (collection of the senior author); C A: Copenhagen area, Lellinge Greensand (von Koenen 1885, Ravn 1939, Schnetler 2001); Ro: Selandian boulders from North Germany (Roedel, 1935, 1937); Kr: Poland, Babica Clay (Krach 1969); Ukraine, Crimea (Ar: Arkhanguelsky 1904; Mo: Moroz, 1972; Ma: Makarenko 1969, 1976). New species for the Kerteminde Marl are indicated in column NKM. New species for the Danish Selandian are indicated in column NDS.

of preservation of the molluscan fauna in the Kerteminde Marl from Hvalløs and Svejstrup is generally poor, due to the absence of silicified layers, we may assume that the number of species is not accurate. A few mollusc specimens have been found at Basballe (collection of the senior author). Lundsgårds Klint, the type locality of the Kerteminde Marl, has only yielded *Antalis* species and a few bivalves and gastropods, all poorly preserved. Hansen (1930) described a glacial floe of Kerteminde Marl at Hanerup, Sjælland and gave a faunal list of six molluscs from silicified layers. Only *Antalis rugifera* (von Koenen, 1885) could be identified to species level. The list also contains *Nucula* sp., *Lucina* sp., *Modiola* sp., *Natica* sp. and ?*Cylichna* sp., all typical genera of the Danish Selandian faunas.

Selandian of Copenhagen

When compared to the previously described Selandian faunas from the Lellinge Greensand of Copenhagen (von Koenen, 1885; Ravn, 1939; Schnetler, 2001) it is obvious that there are many species in common, but the Gundstrup fauna contains considerably larger species and specimens, indicating favourable living conditions. The Selandian of the Copenhagen area was first studied by von Koenen (1885), who monographed the molluscs from Vestre Gasværk. Harder (1922) described the sediments and their different faunas in Sundkrogen. Later, Ravn (1939) and Schnetler (2001) studied the fauna. The fauna of the Lellinge Grønsand contains 206 species, of which 75 are also present in the Gundstrup fauna. The similarity index is 36.3 %. The number of species from the Gundstrup fauna, first described from the Lellinge Greensand of Copenhagen, is 46, but as the Copenhagen fauna is considerably more diverse there are many differences. The Copenhagen fauna is characterised by many small species and larger specimens are rare because of the state of preservation. The Lellinge Greensand, especially the dark clay, has been influenced by ice tectonics, resulting in crushed shells. The specimens from the Gundstrup fauna are preserved in marl and the shells have not been crushed, only more or less deformed due to compaction of the sediment. For this reason, this fauna contains considerably larger specimens of many species, *e. g.* representatives of the Turridae. The Copenhagen fauna has a high diversity of the family Cancellariidae, of which eight species are present, some of them very common. The Gundstrup fauna contains only one specimen of a questionable representative of the Cancellariidae. The byssate bivalve species *Barbatia praescabra* (von Koenen, 1885) is abundant in the Copenhagen fauna from the lower part of the Lellinge Greensand, but absent in the Gundstrup fauna. The abundant gastropod *Turritella nana* and common gastropod species like *Pseudoliva koeneni* Ravn, 1939 and *Acrocoelum gracilis* (von Koenen, 1885) are also absent from the Gundstrup fauna. The rather common occurrence of specimens of the genus *Orthochetus* Cossmann, 1889 in the Gundstrup fauna is remarkable. Only the species *Orthochetus grewingki* (von Koenen, 1885), previously assigned to the genus *Cerithiopsis* Forbes & Hanley, 1850, has been recorded from the Selandian of Copenhagen.

Selandian boulders

Fossiliferous Selandian boulders have been known for many years from the south-eastern part of Denmark and especially from Fyn, Langeland and Sjælland. Grönwall (1904) divided the blocks into a number of types. One type is 'grey Palaeocene rock-type' which is a glauconitic, fine grained greensand or marl containing a macrofaunal assemblage identical to that from the Lellinge Greensand at Vestre Gasværk in the Copenhagen area, while another boulder type was interpreted to be a lateral equivalent to the basal conglomerate from Vestre Gasværk. Roedel (1935, 1937) studied the molluscan fauna from Palaeocene boulders ('aschgraue Paläozän Geschiebe') of NE Germany. This fauna has 55 species in common with the Lellinge Greensand of Copenhagen but shares only 29 species with the Gundstrup fauna. At Klintebjerg in NW Sjælland boulders of Lellinge Greensand with a rather high content of molluscs and other fossils have been collected for many years. The molluscan fauna was listed by Jakobsen & Collins (1979) and Collins & Jakobsen (1995) and contains large specimens, *e.g. Volutilithes nodifera*, Naticidae, *Antalis rugifera* and *Nonactaeonina elata*. Remarkable are specimens of ?*Atrina rosenkrantzi* nov. sp. and *Cimomia* sp. The molluscan fauna shares 35 species with the Gundstrup fauna. Schnetler (2001) discussed the Selandian block types and concluded that the 'grey Paleocene rock-type' and the boulders from Klintebjerg contain a molluscan assemblage similar to the Selandian faunas from the Copenhagen area.
An unusual brown block type is known as 'brown Eocene rock-type' (Grönwall, 1904) or 'reddish brown *Turritella s*andstone' (Andersen & Heilmann-Clausen, 1984). Blocks of this type are widespread and known from Sweden, Denmark and northern Germany; a summary is given in Andersen & Heilmann-Clausen (1984). The 'reddish brown *Turritella s*andstone' contains a less diverse fauna than the other Selandian boulders and has no species in common with the Gundstrup fauna.

Palaeocene of Nuussuaq

Schnetler (2001, p. 27) suggested similarities of the Selandian Lellinge Greensand fauna with the Palaeocene fauna of Nuussuaq, West Greenland and mentioned as examples the *Kangilioptera* species, described herein as *Kangilioptera gundstrupensis* nov. sp. and the species herein described as *Scurria rieae* nov. sp. Kollmann & Peel (1983) suggested that the turrid species *Turricula torelli* (von Koenen, 1885), *Turricula hauniensis*, *Pseudotoma inconspicua* (von Koenen, 1885), *Boreocomitas brevior* (von Koenen, 1885), *Pseudocochlespira boeggildi* (Ravn, 1939), *Hemipleurotoma gryi* (Ravn, 1939) and *Eopleurotoma seelandica* (von Koenen, 1885) from

the Selandian of Copenhagen have related forms in the Nuussuaq fauna. They also suggested that *Pseudomalaxis groenwalli* (Ravn, 1939), *Metacerithium hauniense* (von Koenen, 1885), *Clathroscala bruennichi* (Ravn, 1939), *Exilia crassistria* (von Koenen, 1885), *Ancilla flexuosa* (von Koenen, 1885), *Ravniella regularis* (von Koenen, 1885), *Athleta (Volutocorbis) nodifera* (von Koenen, 1885) and *Cylichna discifera* (von Koenen, 1885) have related forms in the Nuussuaq fauna. All these species have been found in the Gundstrup fauna. The present study confirms these observations and furthermore adds two species to the list of related species in the Nuussuaq fauna and the Gundstrup fauna. Kollmann & Peel (1983, p. 71, figs 149A, B) illustrated *sub nomine* '*Siphonalia* sp.' a species, which seems to be closely related to *Pyropsis pacaudi* nov. sp. and furthermore, *Nonactaeonina elata* (von Koenen, 1885) is closely related to the *Nonactaeonina* species from Nuussuaq (Kollmann & Peel 1983, p. 106, fig. 245). Darragh (2011) mentioned a species of *Orthochetus sub nomine O.* sp., which is illustrated by Kollmann & Peel (1983, p. 49, fig. 93) as 'new genus cf. *Cerithiopsis*'. However, the correct illustration is p. 49, fig. 90 (Darragh, pers. comm., 2016). The Nuussuaq fauna has a high diversity of the family Cancellariidae, of which 22 species are present, some of them very common (Schnetler & Petit, 2010). The Gundstrup fauna contains only one specimen of a questionable cancellariid. Rosenkrantz (1970, p. 436, fig. 11) discussed species of *Atrina* (*sub nomine Stegoconcha*) from the Palaeocene of Nuussuaq, the middle Danian of Faxe, Denmark and the Lellinge Greensand (Selandian) at Klintebjerg, Denmark and found these three species closely related.

Palaeocene of Russia/Ukraine and Poland

Palaeocene faunas from Ukraine and Russia (Crimea) have been studied by Arkhanguelsky (1904) and later by *e. g.* Makarenko (1969, 1976) and Moroz (1972). Grönwall & Harder (1907, p. 71) discussed the affinities of the Danish Palaeocene molluscan fauna and concluded that the affinity with the Russian fauna was closer than with the Palaeocene faunas from Western Europe (1907, p. 71). Schnetler (2001) discussed the molluscan faunas from the Palaeocene of Ukraine, Crimea and Poland and made comparisons with the Selandian fauna of Copenhagen. Makarenko (1969) stated that 67 of the mollusc species were also found in the Danish Palaeocene. The high number of species in common suggests a connection between the North Sea Basin and the Ukrainian/Russian Basin during late Danian or early Selandian times. Arkhanguelsky (1904, p. 196) suggested such a connection and later studies of foraminiferal faunas in Poland by Pozaryski & Pozaryska (1960) and Pozaryska (1967) also supported this suggestion. However, Krach (1963, 1969) described the molluscan fauna of the Babica Clay from central Poland and concluded (1969, p. 17) that this fauna had a greater affinity to the fauna of the Montian of Belgium. A Palaeocene fauna from the middle Vistula River, central Poland was studied by Krach (1981). This fauna was correlated with the Lellinge Greensand in Denmark and contemporary sediments in central Poland, Ukraine and the Crimea and has 25 species in common with the Gundstrup fauna. Additional studies of Ukrainian, Russian and Polish faunas are necessary before further palaeobiogeographic interpretations can be made.

Systematic palaeontology

The systematic arrangement of the bivalves follows that of Moore (1960, 1969) and Bieler *et al.* (2010). The nomenclature of the bivalves is mainly based on Cox *et al. in* Moore (1969) and that of the gastropods follows Cox *in* Moore (1960). The gastropods are arranged in accordance with the family-level classification of Bouchet & Rocroi (2005) and Bouchet *et al.* (2017). Changes in taxonomy since the classification by Bouchet & Rocroi (2005) have also been considered, *e.g.* Bandel (2006), Fehse (2007) Williams, Karube & Ozawa (2008), Williams, Donald, Spencer & Nakano (2010), Squires (2011) and Geiger (2012). WoRMS Editorial Board (2014), World Register of Marine Species, has also been consulted.

For all illustrated specimens the key information including collection/sample number is given in the legends to the plates. Where additional specimens are available these are listed under *Other material*.

A list of mollusc species is given in Table 1. For rare and very rare species the repository and number of specimens are given. In the descriptions of the gastropod species size classification is based on Wenz (1938, p. vii) with the following meaning: 0-1 mm: extremely small; 1-5 mm: very small; 5-10 mm: small; 10-15 mm: rather small; 15-30 mm: moderately large; 30-50 mm: medium large; 50-70 mm: rather large; 70-100 mm: large; 100-200 mm: very large; >200 mm: unusually large.

Phylum Mollusca Linnaeus, 1758
Class Bivalvia Linnaeus, 1758
Subclass Protobranchia Pelseneer, 1889
[= Palaeotaxodonta Korobkov, 1954]
Order Nuculida Dall, 1889
Superfamily Nuculoidea Gray, 1824
Family Nuculidae Gray, 1824
Subfamily Nuculinae Gray, 1824
Genus *Nucula* Lamarck, 1799

Type species (by monotypy) – *Arca nucleus* Linnaeus, 1758.

Nucula densistria von Koenen, 1885

Plate 1, fig. 1

1885 *Nucula densistria* von Koenen, p. 91, pl. 4, fig. 15.
1897 *Nucula densistria* von Koenen – Grönwall, p. 68.
1907 *Nucula densistria* von Koenen – Grönwall & Harder, p. 31.

1920b *Nucula densistria* von Koenen – Rosenkrantz, p. 7.
1935 *Nucula densistria* von Koenen – Roedel, p. 2.
1939 *Nucula densistria* von Koenen – Ravn, p. 25.
1981 *Nucula densistria* Koenen, 1885 – Krach, p. 24, pl. 1, fig. 4; pl. 7, fig. 1.

Other material – 12 valves (impressions in MNO, casts ISL and MNO).

Discussion – The material shows some variation in outline. The length/height ratio varies from 1.3 to 1.8, the lunula is more or less well demarcated and furthermore, the radial ribs are more or less prominent. The material is insufficient for a subdivision into two species. *Nucula subaequilatera* von Koenen, 1885 (p. 92, pl. 4, figs 8a-b) has a glossy shell surface, an almost equilateral outline and a distinct lunula, demarcated by a wide depression and is not present in the material.

Order Nuculanida Carter, J.G., D.C. Campbell & M.R. Campbell, 2000
Superfamily Nuculanoidea H. Adams & A. Adams, 1858 (1854)
Family Nuculanidae H. Adams & A. Adams, 1858 (1854)
Genus *Nuculana* Link, 1807

Type species (by original designation) – *Arca rostrata* Bruguière, 1789.

***Nuculana biarata* (von Koenen, 1885)**
Plate 1, fig. 2

1885 *Leda biarata* von Koenen, p. 94; pl. 4, fig. 9.
1897 *Leda biarata* von Koenen – Grönwall, p. 68.
1904 *Leda biarata* von Koenen – Grönwall, p. 34.
1907 *Leda biarata* von Koenen – Grönwall & Harder, p. 31.
1935 *Leda biarata* von Koenen – Roedel, p. 5.
1939 *Leda biarata* von Koenen – Ravn, p. 26.
1969 *Leda biarata* Koenen – Krach, p. 24, pl. 1, fig. 5; pl. 6, figs 10, 13.
1972 *Leda biarata* Koenen, 1885 – Moroz, p. 23; pl. 1, figs 8a-b.
1981 *Nuculana biarata* (Koenen, 1885) – Krach, p. 25, pl. 1, fig. 9.

Other material – 13 valves (impressions MNO, casts MNO and ISL).

***Nuculana symmetrica* (von Koenen, 1885)**
Plate 1, fig. 3

1885 *Leda symmetrica* von Koenen, p. 92; pl. 4, fig. 14.
1897 *Leda symmetrica* von Koenen – Grönwall, p. 68.
1904 *Leda symmetrica* von Koenen – Grönwall, p. 34, 36.
1935 *Leda symmetrica* von Koenen – Roedel, p. 5.
1939 *Leda symmetrica* von Koenen – Ravn, p. 26.
1972 *Leda symmetrica* Koenen, 1885 – Moroz, p. 25; pl. 2, figs 1-2.
1981 *Nuculana symmetrica* (Koenen, 1885) – Krach, p. 26, pl. 7, fig. 4.

Material – Only the illustrated specimen is known.

***Nuculana ovoides* (von Koenen, 1885)**
Plate 1, fig. 4

1885 *Leda ovoides* von Koenen, p. 92; pl. 4, figs 11a-b.
1897 *Leda ovoides* von Koenen – Grönwall, p. 68.
1904 *Leda ovoides* von Koenen – Grönwall, p. 34.
1904 *Leda ovoides* von Koenen – Arkhanguelsky, p. 79; pl. 11, figs 13-14.
1907 *Leda ovoides* von Koenen – Grönwall & Harder, p. 31, 64.
1920b *Leda ovoides* von Koenen – Rosenkrantz, p. 7.
1920a *Leda ovoides* von Koenen – Rosenkrantz, p. 38.
1924 *Leda ovoides* von Koenen – Rosenkrantz, p. 25.
1935 *Leda ovoides* von Koenen – Roedel, p. 5.
1939 *Leda ovoides* von Koenen – Ravn, p. 27.
1981 *Nuculana ovoides* (Koenen, 1885) – Krach, p. 25, pl. 1, fig. 6.

Material – Only the illustrated double valved specimen is known.

Remarks – The valves of the illustrated double valved specimen are preserved as an impression of the exterior of a left valve and the hinge margin of the right valve, which is somewhat depressed. In outline and sculpture the specimen matches the description and illustration by von Koenen (1885).

Subclass Pteriomorphia Beurlen, 1944
Order Mytiloida Férussac, 1822
Superfamily Mytiloidea Rafinesque, 1815
Family Mytilidae Rafinesque, 1815
Genus *Modiolus* Lamarck, 1799

Type species (by monotypy) – *Mytilus modiolus* Linnaeus, 1758.

***Modiolus mortenseni* nov. sp.**
Plate 1, fig. 6

Type material – Holotype Pl. 1, fig. 6, MGUH 31863.

Other material – Three double valved specimens and 24 valves (MNO).

Etymology – This species is named after Peter Tang Mortensen, who has collected almost all the material, alone or together with the junior author, during more than 25 years.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large elongate, irregular trapeziform *Modiolus* with a smooth exterior, except for fine radial striae. Umbo situated perpendicularly to the anterior of the valve.

Description – The valve is thin-shelled and large. It is elongate, irregularly trapeziform and compressed. The umbo is small and situated perpendicularly to the anterior end of the shell. The dorsal margin is slightly convex and passes gradually into the long regularly posterior margin. The ventral margin is long and only slightly convex, passing gradually into the posterior margin. The valve has its largest convexity from the umbo to the transition from the ventral margin to the posterior margin and is rather flat between the dorsal margin and the convex part of the valve. The exterior of the valve is smooth, except for fine growth lines. Fine radial striae are visible, especially on the convex part of the shell.

Discussion – The new species is related to *Modiolus depressa* (J. Sowerby, 1812) (see Wood, 1864, p. 63, pl. 12, fig. 4). This species, however, is considerably more elongated and has a straighter dorsal margin and a slightly concave ventral margin. *Modiola hauniensis* Rosenkrantz, 1920a from the Crania Limestone (upper Danian) of the South Harbour of Copenhagen (see Rosenkrantz, 1920a, p. 37, pl. 2, fig. 15) has a more elongated outline and a straight dorsal margin, which meets the slightly convex posterior margin. Further, the ventral margin is straight and is connected with the posterior margin by a short arc.

Genus *Lithophaga* Röding, 1798

Type species (by monotypy) – *Lithophaga mytuloides* Röding, 1798 accepted as *Lithophaga lithophaga* (Linnaeus, 1758).

?*Lithophaga* sp.
Plate 1, fig. 7

Material – One double valved specimen.

Description – The specimen shows the valves in oblique lateral view. The valves are preserved as internal moulds with small parts of the shell preserved. The valves are inequilateral with the umbo situated close to the anterior end. The anterior end is rounded tapering, the posterior end tapering and acute. The dorsal margin is long and convex, the anterior margin is rounded tapering, and the ventral margin is almost straight, meeting the posterior margin in an angle of *c.* 150º. The posterior margin meets the dorsal margin at an angle of *c.* 45º. No internal characters are visible.

Discussion – The rather poor state of preservation excludes a final identification. In general outline, the specimen resembles *Lithophaga*.

Order Arcoida Gray, 1854
Superfamily Arcoidea Lamarck, 1809
Family Noetiidae Stewart, 1930
Genus *Arcopsis* von Koenen, 1885

Type species (by original designation) – *Arca limopsis* von Koenen, 1885.

***Arcopsis limopsis* (von Koenen, 1885)**
Plate 1, fig. 5

1885	*Arca (Arcopsis) limopsis* von Koenen, p. 85; pl. 4, fig. 12.
1897	*Arca limopsis* von Koenen – Grönwall, p. 66.
1904	*Arca limopsis* von Koenen – Grönwall, p. 34.
1907	*Arca limopsis* von Koenen – Grönwall & Harder, p. 32, 64.
1920b	*Arca limopsis* von Koenen – Rosenkrantz, p. 7.
1935	*Arca limopsis* von Koenen – Roedel, p. 5.
1939	*Arcopsis limopsis* (von Koenen) – Ravn, p. 28.
1972	*Arcopsis limopsis* (Koenen, 1885) – Moroz, p. 29; pl. 2, figs 8a-b.
1981	*Arcopsis* cf. *limopsis* (Koenen, 1885) – Krach, p. 27, pl. 1, fig. 15.

Other material – Two valves (MNO).

Superfamily Pteroidea Gray, 1847 (1820)
Family Pteriidae Gray, 1847 (1820)
Genus *Pteria* Scopoli, 1777

Type species (by subsequent designation) – *Mytilus hirundo* Linnaeus, 1758.

***Pteria thomseni* nov. sp.**
Plate 1, figs 12-13; Plate 9, fig. 7

1907	*Avicula* sp. indet. – Grönwall & Harder, p. 24, pl. 1, fig. 1.

Type material – Holotype Plate 1, fig. 12, MGUH 31869; paratype Plate 1, fig. 13, MGUH 31870; 3 paratypes Plate 9, fig. 7, MGUH 32021.

Other material – 23 valves (MNO), two valves (ISL).

Etymology – This species is named after Erik Thomsen, Department of Earth Sciences, University of Aarhus.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A smooth, subequivalve, inequilateral and slightly convex *Pteria*. The umbo is situated at about one third of the hinge line from the anterior end. The anterior projection is rather small and meets the convex part of the valve at an angle of *c.* 70°. A narrow byssal notch is suggested beneath it. The posterior projection is unsharply demarcated from the convex part of the valve and meets it in an angle of *c.* 30°. The posterior projection has a shallow sinus and meets the hinge line in an angle of *c.* 110°.

Description – All specimens have the shell preserved. The valves are ovate in outline and have a straight hinge line with triangular projections at each end of the hinge line. The valves are subequivalve, inequilateral and slightly convex. The umbo is situated at about one third of the hinge line from the anterior end. The anterior projection is rather small and meets the convex part of the valve at an angle of *c.* 70°. A narrow byssal notch is present beneath it. The posterior projection is unsharply demarcated from the convex part of the valve and meets it at an angle of *c.* 30°. The posterior projection has a shallow sinus and meets the hinge line at an angle of *c.* 110°. The valves are smooth, except for concentric growth lines; on a few valves very fine radial lines are present. The interior of the valves is nacreous, but no specimen allows a study of the interior characters.

Discussion – Grönwall & Harder (1907, p. 24, pl. 1, fig. 1) described and illustrated a juvenile left valve of an '*Avicula* sp. indet.' from the Kerteminde Marl at Rugård. Judging from the illustration the shell is a right valve and it seems to be conspecific with the new species. *Pteria media* (J. Sowerby, 1812) (see Wood, 1864, p. 53, pl. 11, figs 1a-d) from the British Eocene has a similar outline, but has more numerous concentric growth lines, which are lamellate and irregular. Furthermore, the anterior projection is longer.

Superfamily Pinnoidea Leach, 1819
Family Pinnidae Leach, 1819
Genus *Pinna* Linnaeus, 1758

Type species (by subsequent designation) – *Pinna rudis* Linnaeus, 1758.

***Pinna* sp.**
Plate 1, fig. 9

Other material – One double valved defect specimen and three valves (MNO).

Description – The illustrated double valved specimen has a length of the right valve of 96 mm and a height of 33 mm. It is wedge-shaped with an almost straight ventral margin and a sculpture of numerous fine radial ribs. The internal characters could not be studied.

Genus *Atrina* Gray, 1842

Type species (by subsequent monotypy) – *Pinna nigra* Dillwyn, 1817 (= *Pinna vexillum* Born, 1778).

?*Atrina rosenkrantzi* nov. sp.
Plate 1, fig. 8

1970 *Stegoconcha* sp. n. (aff. *faxensis* (Ravn)) – Rosenkrantz, p. 436, fig. 11.2.

Type material – Holotype Plate 1, fig. 7, MGUH 31865. The holotype has a length of 130 mm and a height of 100 mm. Paratype MGUH 10803 (Rosenkrantz 1970, p. 436, fig. 11.2) has a length of 120 mm and a height of 80 mm.

Other material – Two double valved specimens, eight defective double valved specimens, two valves and a fragment from Gundstrup (MNO); one double valved specimen from Klintebjerg (Lellinge Greensand) (ISL).

Etymology – This species is named after the late Professor Alfred Rosenkrantz, who first recognised the taxon as being a new species, but never established it.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – An *Atrina* with an elongated, ham-shaped outline and *c.* 15 radial ribs, running from the uppermost point of the dorsal margin to the convex ventral margin; the ribs are most prominent on the dorsal side of the ridge. The posterior part of the valve is almost smooth.

Description – The valve is large, equivalve and ham-shaped. The dorsal hinge margin is long and anteriorly slightly convex, posteriorly almost straight. The dorsal margin meets the long and regularly curved posterior margin at a rounded obtuse angle of c. 135º. The posterior margin meets the convex ventral margin at an angle of *c.* 100º. The anterior part of the ventral margin is evenly convex. There is a large flattened and rounded ridge extending from the umbo to the posteroventral corner. The valve has a small part of the outer sculpture preserved, visible as *c.* 15 radial ribs, running from the uppermost point of the dorsal margin to the convex ventral margin and most prominent on the dorsal side of the ridge. Fine concentric growth-lines are visible on the inner layer of one specimen. It can not be determined whether the internal nacre is divided into two lobes or not, for which

reason the assignment to *Atrina* is not firm.

Discussion – Rosenkrantz (1970, p. 436) assigned similar specimens from Selandian boulders (Lellinge Greensand) from Klintebjerg and related specimens from the Danian of Faxe and Nuussuaq (West Greenland) to the genus *Stegoconcha* Böhm,1807. This Mesozoic genus has, however, a greater height than length and an ornament of radial ribs or threads, and an assignment to this genus is not possible. ?*Atrina rosenkrantzi* nov. sp. matches *Pinna granulata* J. Sowerby, 1822, the type species of the genus *Atrina*, with regard to the outline and the rounded ridge from the umbo to the posteroventral corner. *Pinna granulata* has fine radial ribs on the dorsal side of the ridge.

Rosenkrantz stated that *Avicula faxensis* Ravn, 1902a from the Danian of Faxe has *c*. 10 rather weak radial ribs, '*Stegoconcha'* sp. n. aff. *faxensis* (Ravn, 1902a) from Nuussuaq has some more radial ribs and the '*Stegoconcha'* species from Klintebjerg has even more radial ribs and furthermore a more elongated outline. These observations could be confirmed by comparisons of the mentioned species. The specimens from Gundstrup match Rosenkrantz's drawing of the specimen from Klintebjerg (Lellinge Greensand) rather well and and they could also be compared with a specimen in Coll. ISL (leg. Søren Bo Andersen and labelled by Rosenkrantz 1970).

Order Ostreida Férussac, 1822
Superfamily Ostreoida Férussac, 1822
Family Gryphaeidae Vialov, 1936
Subfamily Pycnodonteinae Stenzel, 1959
Genus *Pycnodonte* Fischer von Waldheim, 1835

Type species (by original designation) – *Pycnodonte radiata* Fischer von Waldheim, 1835.

Subgenus *Phygraea* Vyalov, 1936

Type species (by original designation) – *Gryphaea (Gryphaea)* sec. *Phygraea frauscheri* Vyalov, 1936.

***Pycnodonte (Phygraea) vesicularis* (Lamarck, 1806)**
Plate 1, figs 10-11

1806 *Ostrea vesicularis* Lamarck, p. 160.
1902a *Gryphaea vesicularis* Lamarck – Ravn, p. 116.
1933 *Gryphaea vesicularis* Lamarck – Ravn, p. 22.

Other material – 12 valves (MNO).

Discussion – The species is assigned to *Pycnodonte* (*Phygraea*) because of the outline and and the rather smooth exterior of the left valve, which match the description and illustration in Cox *et al*., 1971 (p. N1107, fig. J83, 1a-g) well. The genus *Gryphaea* Lamarck, 1801 is a Triassic-Jurassic species and has no vesicular shell structure (Cox, 1971, p. 1097).

Remarks – This large species is one of the most common species in the Maastrichtian and Danian deposits of Denmark. The material from Gundstrup includes both right and left valves and matches material from Danian localities and descriptions in literature well. The specimens are found in the boulders, and until now the species was not known from the Danish Selandian.

Order Pectinida Gray, 1854
Superfamily Pectinoidea Rafinesque, 1815
Family Propeamussiidae Abbott, 1954
Genus *Propeamussium* de Gregorio, 1884

Type species (by original designation) – *Pecten cecilia* de Gregorio, 1884.

***Propeamussium (Propeamussium) bisculptum* (von Koenen, 1885)**
Plate 1, fig. 15

1885 *Pecten bisculptus* von Koenen, p. 83; pl. 4, fig. 5.
1897 *Pecten bisculptus* von Koenen – Grönwall, p. 67.
1907 *Pecten bisculptus* von Koenen – Grönwall & Harder, p. 27, 64; pl. 1, fig. 6.
1935 *Pecten bisculptus* von Koenen – Roedel, p. 41.
1939 *Propeamussium bisculptum* (von Koenen) – Ravn, p. 42.
1981 *Variamussium bisculptum* (Koenen, 1885) – Krach, p. 32, pl. 2, fig. 10.

Other material – Two valves (MNO and ISL).

Remarks – The illustrated specimen is preserved as an impression of the inner shell and lacks the posterior projection. Eight prominent interior radial ribs are visible, which do not reach the ventral margin. For this reason, the species is assigned to *Propeamussium* s. str. In the subgenus *Parvamusium* Sacco, 1897 (type species *Pecten duodecimlamellatus* Bronn, 1832) they reach the ventral margin.

Subfamily Camptonectinae Habe, 1977
Genus *Delectopecten* Stewart, 1930

Type species (by original designation) – *Pecten (Pseudamussium) vancouverensis* Whiteaves, 1893.

***Delectopecten palaeocaenicus* (Staesche *in* Roedel, 1937)**
Plate 1, figs 16, 17

1885 *Lima bisculpta* von Koenen, p. 84; pl. 4, fig. 3.
1897 *Lima bisculpta* von Koenen – Grönwall, p. 67.
1907 *Pecten sericeus* Grönwall & Harder, p. 28; pl. 1,

figs 7-10.
1920a *Pecten (Camptonectes?) sericeus* Grönwall – Rosenkrantz, p. 33, 59.
1920b *Pecten sericeus* Grönwall – Rosenkrantz, p. 6.
1925 *Pecten sericeus* Grönwall – Ravn, p. 35.
1933 *Chlamys sericeus* (Grönwall) – Ravn, p. 19.
1935 *Pecten sericeus* Grönwall – Roedel, p. 40 [*non* Murchison, Verneul & Keyserling, 1845].
1937 *Pecten palaeocaenicus* Staesche, p. 185.
1939 *Pecten palaeocaenicus* Staesche *in* Roedel, 1937 – Ravn, p. 43.

Other material – 12 valves (MGUH, MNO and ISL).

Description – Length of the largest specimen 4.0 mm, height 4.2 mm. The valve is subcircular and rather inflated and the hinge line is straight, with the umbo placed posterior from the middle of the valve. On the right valve the anterior auricle is wedge shaped, somewhat convex and rounded anteriorly. The byssal notch is deep. No micro sculpture preserved. The anterior auricle is flat and not distinctly demarcated from the main part of the valve. On the left valve, the anterior auricle is triangular and flat, meeting the hinge line at an angle of *c.* 90°; it is distinctly demarcated from the main part of the valve. The posterior auricle is smaller and not distinctly demarcated. One of the studied specimens shows numerous fine radial lines on the anterior auricle of the left valve. The specimen is preserved as an impression of the interior of the shell and lacks the anterior projection. The valves are smooth with traces of micro sculpture. The interior of the valves is smooth.

Discussion – In outline and sculpture the specimens match the descriptions and illustrations by von Koenen (1885) and Grönwall & Harder (1907). The smooth interior excludes an assignment to the genus *Propeamussium*. In general outline and sculpture the valves match the genus *Delectopecten*. As pointed out by Staesche (1937, p. 185) the species name *Pecten sericeus* Grönwall & Harder, 1907 is preoccupied by a Jurassic pectinid species from Russia, for which reason he proposed the name *palaeocaenicus*.

Order Limoida Waller, 1978
Superfamily Limoidea Rafinesque, 1815
Family Limidae Rafinesque, 1815
Genus *Limaria* Link, 1807

Type species (by subsequent designation) – *Lima inflata* Link, 1807 accepted as *Limaria tuberculata* (Olivi, 1792).

***Limaria geinitzi* (von Hagenow, 1842)**
Plate 1, fig. 14

1842 *Lima Geinitzi* von Hagenow, p. 556; pl. 9, fig. 13.
1907 *Lima testis* Grönwall Grönwall & Harder, p. 24, 64; pl. 1, figs 2-5.
1920b *Lima testis* Grönwall – Rosenkrantz, p. 7.
1935 *Lima testis* Grönwall – Roedel, p. 5.
1939 *Lima (Limea) Geinitzi* von Hagenow? – Ravn, p. 42.
1972 *Limatella geinitzi* (Hagenow, 1842) – Moroz, p. 42; pl. 6, fig. 8.

Other material – Six double valved specimens and 21 valves (MNO and ISL).

Discussion – The species is referred to *Limaria* because of the ovate subequal valves with small auricles. The valves are somewhat oblique and rather strongly inflated and have an ornament of narrow radial riblets.

Subclass Heterodonta Neumayr, 1884
Superorder Heteroconchia Gray, 1854
Order Lucinoida Gray, 1854
Superfamily Lucinoidea J. Fleming, 1828
Family Lucinidae J. Fleming, 1828
Subfamily Lucininae J. Fleming, 1828

Genus *Phacoides* Agassiz, 1846

Type species (by monotypy) – *Lucina jamaicensis* Lamarck, 1801 accepted as *Phacoides pectinatus* (Gmelin, 1791).

***Phacoides* (s. lat.) *lepis* (von Koenen, 1885)**
Plate 1, fig. 18

1885 *Lucina lepis* von Koenen, p. 97; pl. 4, fig. 18.
1897 *Lucina lepis* von Koenen – Grönwall, p. 68.
?1904 *Lucina* cf. *lepis* von Koenen – Grönwall, p. 34.
1920 *Lucina lepis* von Koenen – Arkhanguelsky, p. 83; pl. 2, figs 17-18.
1935 *Lucina lepis* von Koenen – Roedel, p. 25.
1939 *Lucina lepis* von Koenen – Ravn, p. 35.
1972 *Lucina lepis* Koenen, 1885 – Moroz, p. 60; pl. 14, figs 6-7.
1981 *Lucina lepis* (Koenen, 1885) – Krach, p. 39, pl. 5, fig. 7.

Other material – One valve (MNO).

Description – The shell is thin-walled, smooth and glossy, with a rounded ovate outline and fine growth lines. The umbo is only slightly projecting and there is a slight depression on the posterior part of the shell. The interior of the shell is not visible. In outline and sculpture the specimens match the description and illustration by von Koenen (1885).

Discussion – The species is assigned to *Phacoides* (s. lat.), because the outline and sculpture match the decription in Cox, 1969 (p. N492, fig. E2, 6) rather well. The interior could not be studied.

Genus *Parvilucina* Dall, 1901

Type species (by original designation) – *Lucina tenuisculpta* Carpenter, 1864 accepted as *Parvilucina tenuisculpta* (Carpenter, 1864).

***Parvilucina planistria* (von Koenen, 1885)**
Plate 1, fig. 19

1885 *Lucina planistria* von Koenen, p. 97; pl. 4, fig. 17.
1897 *Lucina planistria* von Koenen – Grönwall, p. 68.
1904 *Lucina planistria* von Koenen – Grönwall, p. 34.
1935 *Lucina planistria* von Koenen – Roedel, p. 24.
1939 *Lucina (Phacoides) planistria* von Koenen – Ravn, p. 35.
1972 *Phacoides planistria* Koenen, 1885 – Moroz, p. 64; pl. 14, fig. 8.

Other material – Two valves and a double valved specimen with the valves detached. All specimens have the shell preserved (MNO).

Discussion – In outline and sculpture the species matches the genus *Parvilucina* (see Cox, 1969 p. N498). The species differs from *Phacoides lepis* by having a more projecting umbo and concentric sculpture, consisting of numerous flat folds. In outline and sculpture it matches the description and illustration by von Koenen (1885).

Superfamily Thyasiroidea Dall, 1900 (1895)
Family Thyasiridae Dall, 1900 (1895)
Genus *Parathyasira* Iredale, 1930

Type species (by original designation) – *Parathyasira resupina* Iredale, 1930.

***Parathyasira regularis* (Grönwall & Harder, 1907)**
Plate 1, fig. 20

1907 *Axinus regularis* Grönwall & Harder p. 34, pl. 1, fig. 13.
1972 *Thyasira regularis* (Grönwall & Harder, 1907) – Moroz, p. 67; pl. 16, fig. 5.

Other material – Three valves (MNO).

Description – The shell material is partly preserved. The valve is rounded trigonal and inaequilateral and has a shallow double angulation posteriorly. The anterior margin is concave and runs gradually into the ventral margin. The posterior margin is convex and meets the ventral margin in a regular curvature. Two weak folds run from the umbo to the posterior margin. The anterior hinge margin is convex. The shell is smooth, except for fine growth lines.

Discussion – The specimens are slightly deformed but match the description and illustration of the genus *Parathyasira* (Cox 1969, p. 510, fig. E14, 13a-c), especially with regards to the shallow double angulation, as well as the description and illustration by Grönwall & Harder (1907).

Order Carditida Dall, 1889
Superfamily Carditoidea Lamarck, 1809
Family Cardiidae Lamarck, 1809
Subfamily Protocardiinae Bronn, 1849
Genus *Protocardia* Beyrich, 1845

Type species (by subsequent designation) – *Cardium hillanum* J. Sowerby, 1813.

***Protocardia semidecussata* (von Koenen, 1885)**
Plate 2, fig. 1

1885 *Cardium semidecussatum* von Koenen, p. 96; pl. 4, fig. 16.
1897 *Cardium semidecussatum* von Koenen – Grönwall, p. 68.
1904 *Protocardium semidecussatum* von Koenen – Arkhuangelsky, p. 101, pl. 3, figs 10, 13-14.
1907 *Cardium semidecussatum* von Koenen – Grönwall & Harder, p. 64.
1939 *Protocardia semidecussata* von Koenen – Ravn, p. 36.
1981 *Nemocardium semidecussatum* (Koenen, 1885) – Krach, p. 41, pl. 5, figs 12-14.

Other material – Nine complete specimens and 16 valves (impressions and casts MNO, casts ISL).

Discussion – The species is assigned to *Protocardia* because of the well-developed anterior concentric and posterior radial ribs.

Superfamily Crassatelloidea Férussac, 1822
Family Astartidae d'Orbigny, 1844

Astartidae, gen. et sp. indet.
Plate 2, figs 2, 3

Material – Two valves.

Description – The juvenile shell is subelliptical and the larger shell is more triangular in outline. Both shells have a sculpture of concentric folds. The interior of the shells is not visible, but the valves resemble the descriptions and illustrations of *Astarte trigonula* von Koenen, 1885 by von Koenen (1885) and Ravn (1939).

Superfamily Galeommatoidea J.E. Gray, 1840
Family Basterotiidae Cossmann, 1899

Genus *Anisodonta* Deshayes, 1857

Type species (by monotypy) – *Anisodonta complanatum* Deshayes, 1857.

?*Anisodonta* sp.
Plate 2, fig. 4

Other material – Two valves (MNO).

Description – The illustrated specimen is an internal mould with parts of the shell preserved. The valve is subovate and inequilateral with a short anterior part and a long posterior part. The short anterior dorsal margin grades into the highly convex anterior margin, which passes gradually into the long and almost straight ventral margin. The convex posterior margin passes gradually into the straight and long posterior dorsal margin. The umbo is slightly projecting over the dorsal margin. The exterior of the shell shows fine concentric growth lines and concentric folds. Internal characters not visible.

Discussion – The state of preservation excludes a proper identification.

Superfamily Ungulinoidea Gray, 1854
Family Ungulinidae Gray, 1854
Genus *Diplodonta* Bronn, 1831

?*Diplodonta* sp.
Pl. 2, figs 17, 18

Material – Two valves.

Description – The valve is preserved as an internal mould with the shell almost completely preserved. The interior of the valve could not be studied. The umbo is placed near the middle of the dorsal margin. The anterior dorsal margin is slightly convex and the posterior dorsal margin is distinctly concave, meeting the convex posterior margin in an angle of *c.* 120°. The posterior margin passes gradually into the convex ventral margin; also the anterior margin is convex. The anterior margin meets the anterior dorsal margin at an angle of *c.* 120°. The exterior is smooth, except for concentric growth lines. The two illustrated specimens differ slightly by their outline.

Discussion – The state of preservation excludes a proper identification.

Order Myida Stoliczka, 1870
Superfamily Pholadoidea Lamarck, 1809
Family Pholadidae Lamarck, 1809
Subfamily Jouannetiinae Tryon, 1862

Genus *Netastoma* Carpenter, 1864

Type species (by typification of replaced name) – *Pholas darwinii* G. B. Sowerby II, 1849, accepted as *Netastoma darwinii* (G. B. Sowerby II, 1849).

?*Netastoma* sp.
Plate 2, fig. 5

Other material – One valve (impression MNO, casts MNO and ISL).

Description – Only external characters of part of one valve could be observed. The external ornament on the anterior shell-lobe is not preserved, the umbonal-ventral sulcus is straight and sharp and the posterior shell lobe has *c.* 25 concentric ribs.

Remarks – *Nettastomella* Carpenter, 1865 is a junior synonym of *Netastoma* (see Sartori, 2013).

Family Teredinidae Rafinesque, 1815
Subfamily Teredininae Rafinesque, 1815

Teredininae, gen. et sp. indet.
Plate 2, fig. 6

Other material – Numerous teredinid tubes in three boulders, but no valves (MNO).

Discussion – As no pallets have been found, a generic assignment is not possible.

Superorder Anomalodesmata Dall, 1889
Superfamily Pandoroidea Rafinesque, 1815
Family Lyonsiidae P. Fischer, 1887
Genus *Lyonsia* Turton, 1822

Type species (by monotypy) – *Mya striata* Montagu, 1816.

***Lyonsia baltica* Roedel, 1935**
Plate 2, fig. 7

1935 *Lyonsia baltica* Roedel, p. 34, pl. 1, figs 14-15.

Material – Only the illustrated valve is known.

Remarks – The right valve has parts of the shell preserved on an internal mould. In outline and sculpture, it matches the illustration and description by Roedel (1935).

Order Anomalodesmata Dall, 1889
Superfamily Pholadomyoidea King, 1844
Family Pholadomyidae King, 1844
Genus *Pholadomya* G.B. Sowerby I, 1823

Type species (by subsequent designation) – *Pholadomya candida* G.B. Sowerby I, 1823.

Subgenus *Bucardiomya* Rollier *in* Cossmann, 1912

Type species (by subsequent designation) – *Pholadiomya bucardium* Agassiz, 1842.

***Pholadomya (Bucardiomya)* cf. *margaritacea* (Sowerby, 1821)**
Plate 2, fig. 8

?1821 *Cardita margaritacea* Sowerby, p. 175, pl. 297, figs 2-3.
?1846 *Pholadomya margaritacea* (Sowerby) – Sowerby, pl. 630, fig. 3.
1874 *Pholadomya margaritacea* (Sowerby) – Mörch, p. 280.
1885 *Pholadomya margaritacea* (Sowerby) – von Koenen, p. 103.
1897 *Pholadomya margaritacea* (Sowerby) – Grönwall, p. 68.
1907 *Pholadomya margaritacea* (Sowerby) – Grönwall & Harder, p. 64.
1939 *Pholadomya margaritacea* (Sowerby) – Ravn, p. 38.

Other material – 23 double valved specimens (MNO).

Description – All specimens are more or less deformed. The shell is large, rounded triangular, highly inequilateral and rather variable in outline. The posterior and anterior parts are rounded and the anterior is more narrowly acute. The opisthogyrate umbo is large and rounded and situated near the anterior end. The anterior part is highly convex, especially below the umbo. The convexity gradually decreases towards the posterior side. The anterior dorsal margin is very short and joins the convex anterior margin at an obtuse angle. The anterior margin is rather long and almost perpendicular and runs gradually into the short and slightly convex ventral margin. The posterior dorsal margin is long and distinctly concave, joining the slightly convex posterior margin at an obtuse angle. The sculpture consists of numerous concentric ribs or folds. These are crossed by more or less indistinct radial riblets. The area is large and lanceolate; the lunula is small and indistinctly demarcated.

Discussion – The specimens match *Pholadomya (Bucardiomya) margaritacea* rather well, but they differ from the descriptions mentioned by having a generally weaker radial ribbing and a lower number of concentric ribs. For these reasons the present authors are not certain about the identification.

Superfamily Thracioidea Stoliczka, 1870
Family Periplomatidae Dall, 1895
Genus *Periploma* Schumacher, 1817

Type species (by monotypy) – *Periploma inaequivalvis* (= *Corbula margaritacea* Lamarck, 1801).

***Periploma ravni* (Schnetler, 2001)**
Plate 2, fig. 9

1939 *Anatinidarum* sp. – Ravn, p. 39.
2001 *Laternula (Laternulina) ravni* Schnetler, 2001, p. 41, pl. 1, figs 4-6.

Other material – Eight double valved specimens and nine valves (MNO).

Discussion – The species was assigned to *Laternula* Röding, 1798, subgenus *Laternulina* Habe, 1952 by Schnetler (2001). However, the inequivalve, subovate outline and the ornament of more or less prominent concentric folds match *Periploma* better.

Clade Septibranchia (within Pholadomyida)
Superfamily Cuspidarioidea Dall, 1886
Family Cuspidariidae Dall, 1886
Genus *Cuspidaria* Nardo, 1840

Type species (by original designation) – *Cuspidaria typus* Nardo, 1840 = *Tellina cuspidata* Olivi, 1792.

***Cuspidaria heilmannclauseni* nov. sp.**
Plate 2, figs 10, 11

Type material – Holotype Plate 2, fig. 8, MGUH 31887. Paratype Plate 2, fig. 9, MGUH 31888.

Other material – Seven valves (MNO).

Etymology – This species is named after Claus Heilmann-Clausen, Department of Earth Sciences, University of Aarhus.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large, equivalve and relatively short *Cuspidaria* with a rounded triangular outline and a relatively short and rather wide rostrum, numerous commarginal densely spaced ribs, which interdigitate at the transition between shell body and rostrum. The rostrum lacks a keel.

Description – The holotype is a double valved specimen with the left valve only partly visible. The shells are large, inequilateral and equivalve. They have a rounded triangular outline and is moderately convex with a relatively short and rather wide rostrum. The opisthogyrate umbo-

nes project above the dorsal margins. The slightly convex anterior dorsal margin passes gradually into the convex anterior margin, which meets the ventral margin under a gradual curve. The anterior ventral margin is strongly convex and gradually constricts into the rostrum, which has an almost straight ventral margin. The dorsal margin of the rostrum is slightly concave and meets the posterior margin of the rostrum at an obtuse angle. The ornament consists of numerous commarginal, rather sharp ribs that are most prominent on the upper half of the valve and more numerous and weaker near the margins. The ribs are densely spaced and interdigitate at the transition between shell body and rostrum. The interior is unknown.

Discussion – The specimens show some variation in length of the rostrum, but their ornament is similar. *Cuspidaria bentzonii* Heinberg, 1979 from the Maastrichtian of Stevns Klint has a somewhat similar ornamentation at the base of the rostrum, but the commarginal ribs are weaker and more close-set. *Cuspidaria inflata* (J.D.C. Sowerby, 1827) from the Eocene Lillebaelt Clay Formation (see Schnetler & Heilmann-Clausen, 2011) has a relatively longer rostrum, a less prominent commarginal ornamentation consisting of obsolete folds, and more convex valves.

***Cuspidaria anderseni* nov. sp.**
Plate 2, fig. 12

Type material – Holotype Plate 2, fig. 12, MGUH 31889.

Other material – One double valved specimen, five right valves and five left valves (impressions MNO, casts ISL). Lellinge Greensand at Klintebjerg, one left valve (ISL).

Etymology – This species is named after Alex Andersen, the owner of the Gundstrup gravel-pit.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A *Cuspidaria* with a rather long and slender rostrum, numerous fine commarginal striae, a keel extending from from below the umbo to the posteroventral and posterodorsal corner of the rostrum respectively. The triangular area between the keel and the dorsal margin of the rostrum has irregular dorsoventrally oriented riblets which are continuations of the commarginal striae.

Description – The shell is rather long relative to its height, and the medium convex shell body has a subtriangular outline. The rostrum is rather long and slender and set off from the shell body by a rather deep ventral sulcus. The dorsal margin of the rostrum is straight to slightly concave; the ventral margin convex. The umbo is slightly prosogyrous. The shell appears to be equivalve. The outer surface is ornamented with numerous thin commarginal, narrowly spaced striae. On the rostrum this ornamentation is cut by a keel, extending from below the umbo to the posteroventral and posterodorsal corner of the rostrum respectively. The triangular area between the keel and the dorsal margin of the rostrum has irregular dorsoventrally oriented riblets which are continuations of the commarginal striae.

Discussion – The specimens differ from *C. heilmann-clauseni* nov. sp. by having a longer and narrower rostrum and a very weak commarginal ornament. In general outline *C. anderseni* is similar to *Cuspidaria* ?*caudata* (Nilsson, 1827) (see Heinberg, 1979, p. 39, fig. 1), but that species has commarginal lamellae.

Incertae sedis

Bivalvia, gen. et sp. indet. 1
Plate 2, fig. 13

Material – One valve.

Description – The valve is suborbicular and inequilateral with a straight dorsal margin and the umbo situated posterior to the middle of the dorsal margin. The posterior dorsal margin is straight and meets the posterior margin at an angle of 120°. The posterior margin is slightly convex and long and goes gradually into the convex ventral margin, which goes gradually into the very convex anterior margin, which meets the anterior dorsal margin at an angle of *c.* 150°. The umbo projects over the dorsal margin. The exterior of the shell has fine concentric growth lines.

Discussion – The state of preservation excludes identification.

Bivalvia, gen. et sp. indet. 2
Plate 2, fig. 14

Material – Only the illustrated specimen is known.

Description – The specimen has the greater part of the valve preserved and only the smooth exterior is visible. In general outline the specimen could be a species of the Anomiidae, but the state of preservation and the interior covered with sediment prevent further identification.

Bivalvia, gen. et sp. indet. 3
Plate 2, fig. 15

Material – Only the two illustrated specimens are known.

Description – The valves are elongate and smooth, but as no internal characters are visible, identification is not possible.

Bivalvia, gen. et sp. indet. 4
Plate 2, fig. 16

Material – Only the illustrated specimen is known.

Description – The only specimen found has the left valve preserved. Only the exterior is visible. The shell is subovate, slightly inequilateral with the umbo only a little projecting over the dorsal margin. The anterior dorsal margin is convex and gradually passes into the convex anterior margin. The ventral margin is convex and gradually passes into the convex posterior margin. The posterior dorsal margin is short and slightly concave. The valve is only slightly convex and a weak carina runs from the umbo to the posterior corner. The exterior is smooth and glossy, except for concentric growth-lines.

Discussion – The outline and the exterior of the valve are reminiscent of the Tellinidae Blainville, 1814, but as no internal characters could be studied identification is not possible.

Class Scaphopoda Bronn, 1862
Order Dentaliida Starobogatov, 1974
Family Dentaliidae Children, 1834
Genus *Antalis* H. & A. Adams, 1854

Type species (by subsequent designation) – *Dentalium antalis* Linnaeus, 1758.

***Antalis rugifera* (von Koenen, 1885)**
Plate 2, fig. 19

1885 *Dentalium rugiferum* von Koenen, p. 71, pl. 3, figs 18a-g.
1897 *Dentalium rugiferum* von Koenen – Grönwall, p. 67.
1904 *Dentalium rugiferum* von Koenen – Arkhanguelsky, p. 133, pl. 9, figs 3, 16.
1907 *Dentalium rugiferum* von Koenen – Grönwall & Harder, p. 35.
1907 *Dentalium gracile* n. sp. – Grönwall & Harder, p. 36, plate 1, fig. 19. [non *Dentalium gracile* Hall & Meek, 1856].
1920b *Dentalium rugiferum* von Koenen – Rosenkrantz, p. 7.
1937 *Dentalium rugiferum* von Koenen – Roedel, p. 218.
1939 *Dentalium rugiferum* von Koenen – Ravn, p. 45, pl. 1, fig. 16.
1972 *Dentalium rugiferum* Koenen, 1885 – Moroz, p. 85, pl. 20, figs 4-7, 9-10.
?1975 *Dentalium* cf. *rugiferum* Koenen, 1885 – Anderson, p. 141, pl. 13, fig. 1.
1977 *Dentalium rugiferum* Koenen, 1885 – Anderson, p. 199.
1981 *Dentalium rugiferum* Koenen, 1885 – Krach, p. 67, pl. 18, figs 13, 14.
2001 *Dentalium rugiferum* von Koenen, 1885 – Schnetler, p. 42; pl. 1, figs 7, 8.

Other material – Three specimens (MNO and ISL).

Discussion – This and the following species are assigned to *Antalis* because of the weak radial ribs.

***Antalis undifera* (von Koenen, 1885)**
Plate 2, fig. 20

1885 *Dentalium undiferum* von Koenen, p. 72, pl. 3, figs 17a-b.
1897 *Dentalium undiferum* von Koenen – Grönwall, p. 67.
1904 *Dentalium undiferum* von Koenen – Grönwall, p. 34.
1907 *Dentalium undiferum* von Koenen – Grönwall & Harder, p. 36.
1920b *Dentalium undiferum* von Koenen – Rosenkrantz, p. 7.
1937 *Dentalium undiferum* von Koenen – Roedel, p. 219.
1939 *Dentalium undiferum* von Koenen – Ravn, p. 47.

Other material – 25 specimens, in several cases with the shell partly preserved (MNO).

Order Gadilida Starobogatov, 1974
Suborder Gadilimorpha
Family Gadilidae Steiner, 1992
Genus *Siphonodentalium* M. Sars, 1859

Type species (by original designation) – *Siphonodentalium vitreum* Sars, 1859 (redescribed 1861).

***Siphonodentalium intumescens* (von Koenen, 1885)**
Plate 2, fig. 21

1885 *Gadus intumescens* von Koenen, p. 72; pl. 3, fig. 16.
1897 *Gadus intumescens* von Koenen – Grönwall, p. 67.
1907 *Gadila intumescens* von Koenen – Grönwall & Harder, p. 36.
1920b *Gadila intumescens* von Koenen – Rosenkrantz, p. 7.
1939 *Siphonodentalium intumescens* (von Koenen) – Ravn, p. 48, pl. 1, figs 17a-b.

Other material – Three specimens (MNO and ISL).

Class Gastropoda Cuvier, 1795
Subclass Patellogastropoda Lindberg, 1986
Order Patellida
Superfamily Lottioidea Gray, 1840

Family Lottiidae Gray, 1840
Tribi Lottini Gray, 1840
Genus *Scurria* Gray, 1847

Type species (by subsequent designation) – *Patella scurra* Lesson, 1831.

***Scurria rieae* nov. sp.**
Plate 3, figs 2a-b

?1977 *Acmaea* sp. – Anderson, p. 199, fig. 5.

Holotype – Plate 3, fig. 2, MGUH 31900.

Other material – Twelve specimens (impressions and casts MNO, casts ISL).

Etymology – This species is named after Anne-Marie Nielsen, the wife of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – An almost smooth *Scurria* with concentric growth-lines and numerous almost invisible radial riblets. The highly elevated apex is situated at about one third of the largest diameter of the aperture from the anterior margin. In lateral view the anterior outline of the shell is slightly concave, the posterior is convex.

Description – The shell is rather small and cap-shaped with a highly elevated apex, which is situated anteriorly, almost straight above the anterior margin. The aperture is almost regularly ovate with a length of 10 mm and a width of 7 mm. The apex of the shell is somewhat worn, but the small nucleus is button-shaped. The growth-lines indicate that the juvenile shell was low with an elliptical aperture. In lateral view the anterior and posterior outlines are almost straight. On the adult shell the anterior outline is slightly concave, whereas the posterior outline is convex. The outlines become almost straight again near the apertural margin. In anterior (or posterior) view the outline of the shell is almost straight, and the lateral parts of the shell are steep. The shell has no concentric sculpture, but the growth-lines are rather prominent and somewhat unequal in strength. Laterally the growth-lines have a shallow curvation upwards, and thus the outline of the aperture (in lateral view) is not straight. The shell surface has numerous extremely delicate radial riblets, which are most prominent on the anterior and posterior parts of the shell. As only external impressions of the species are known, the internal features of the shell are unknown.

Discussion – The assignment to the genus *Scurria* is based on the general outline of the shell and the similarity with *Scurria* sp. 2 (Kollmann & Peel, 1983: p. 22, figs 16a-b) from the Palaeocene of Nuussuaq. That species is closely related but differs by having a straight anterior outline (in lateral view) and no radial sculpture. *Acmaea* sp. (Anderson, 1977: p. 199, fig. 5) is tentavely attributed to the new species.

Family Lepetidae Gray, 1850
Genus *Lepeta* Gray, 1847

Type species (by subsequent designation) – *Patella caeca* O. F. Müller, 1776 accepted as *Lepeta caeca* (O. F. Müller, 1776).

***Lepeta poulseni* (Ravn, 1939)**
Plate 3, figs 3a-b

1939 *Acmaea Poulseni* Ravn, p. 53, pl. 1, figs 25a-b.

Material – Only the illustrated specimen is known.

Description – The shell is patelliform with an elongated lengthened subelliptical outline. The specimen has a length of 13 mm, a width of 9 mm and a height of 3.9 mm. The shell is almost smooth. The apex is situated near the middle of the shell. In lateral view the anterior and posterior outline of the shell are slightly convex.

Remarks – The specimen obtains a larger size than the material from Sundkrogen (Ravn, 1939). The outline and the smooth shell match the genus *Lepeta* better than *Acmaea* Eschscholtz, 1833.

Subclass Vetigastropoda
Order Seguenziida
Superfamily Seguenzioidea Verrill, 1884
Family Eucyclidae Koken, 1896
Genus *Cidarina* Dall, 1909

Type species (by original designation) – *Margarita cidaris* Carpenter, 1864, accepted as *Cidarina cidaris* (Carpenter, 1864).

***Cidarina johnstrupi* (Grönwall & Harder, 1907)**
Plate 3, figs 4, 5, 6; Plate 9, fig. 6

1907 *Turbo Johnstrupi* Grönwall & Harder, p. 37, pl. 1, fig. 20.

Other material – 24 specimens (impressions MNO, casts MNO and ISL).

Description – The shell is conical. The largest specimen has a height of 15 mm and a width of 11 mm. The height/width ratio is 1.4 and the body whorl equals 0.5 of the total shell height, the aperture 0.3. The largest specimen

has *c.* 1 ½ worn protoconch whorls and five teleoconch whorls, which are medium convex with three prominent spiral cords and separated by a distinct suture. A fourth spiral cord demarcates the convex base, which has four further spiral cords and a narrow umbilicus. The aperture is subcircular and the columella is concave. The adapical spiral cord is the weakest and situated at about 1/4 of the whorl height under the suture, the second spiral cord is situated on the middle of the whorl and the abapical spiral cord with equal distances to the second spiral cord and the abapical suture. Between the spiral cords the whorl is concave. The prosocline axial ribs are not very prominent and especially visible as rounded knobs on the spiral cords. On the adapical spiral cord, they are pointed and rather small, on the second spiral cord they are larger and coarse. The number of knobs on these two spiral cords is *c.* 35 on the penultimate whorl. On the abapical spiral cord there are numerous very small knobs (*c.* 70) and fine axial riblets are visible between this spiral cord and the abapical suture. On the spiral cord demarcating the base and the four spiral cords on the base there are knobs and in between the spiral cords fine axial riblets are visible.

Remarks – The specimens described by Grönwall & Harder (1907) are all missing the outer shell layer and are preserved as internal moulds with the nacreous layer preserved. Thus, the description by Grönwall & Harder lacks details of the ornament. Furthermore, the best-preserved specimen from Rugård has a height of only 4.5 mm. Thus, the material from Gundstrup allows an emendation of the original description. Grönwall & Harder presumed that the species is present in the Lellinge Greensand, which the present authors agree to, but all specimens from the locality Lellinge are rather poorly preserved.

Discussion – With some hesitation, Grönwall & Harder assigned the species to the genus *Turbo* Linnaeus, 1758. We assign the species to the genus *Cidarina* because of the trochiform outline and the rather elevated spire with convex whorls. Furthermore, the aperture is subcircular and slightly oblique and a narrow umbilicus is partly covered by a thin columellar callus. The nodose spiral cords also match the genus *Cidarina*. *Cidarina cidaris* (Carpenter, 1864), the type species of the genus *Cidarina*, has less convex whorls and a narrower umbilicus. It is a Recent species. *Cidarina antiqua* Squires & Goedert, 1995, established from the Eocene of Washington, USA, has closely spaced spiral cords of equal strength and almost flat whorls. *Cidarina lenyaniyeuensis* Del Rio, 2012 from the Danian of Patagonia has six faintly nodose spiral cords on the last whorl and up to nine narrower and closer spaced cords on the base. *Cidarina cretacea* Squires & Saul, 2003b from the late Cretaceous of California has flat spire whorls with four to five nodose spiral cords and a convex body whorl. *Cidarina beta* Squires & Saul, 2003b from the late Cretaceous of California has convex whorls and an evenly rounded body whorl with widely spaced and beaded spiral threads, six on the penultimate whorl.

Family Eucycloscalidae Gründel, 2007
Genus *Eucycloscala* Cossmann, 1895

Type species (by subsequent designation) – *Trochus binodosus* Münster, 1841.

***Eucycloscala crassilabris* (von Koenen, 1885)**
Pl. 3, fig. 7

1885	*Scalaria crassilabris* von Koenen, p. 66, pl. 3, fig. 2.
1897	*Scalaria crassilabris* von Koenen – Grönwall, p. 67.
1904	*Scalaria crassilabris* von Koenen – Arkhanguelsky, p. 138, pl. 9, figs 11-12.
1912	*Mathildia (Fimbriatella)*? *crassilabris* von Koenen – Cossmann, p. 12.
1913	*Scalaria kopenhaguensis* de Boury, p. 89.
1920b	*Scalaria crassilabris* von Koenen – Rosenkrantz, p. 7.
1922	*Scalaria? crassilabris* von Koenen – Harder, p. 30, 90.
1939	*Eucycloscala*? *crassilabris* (von Koenen) – Ravn, p. 58, pl. 2, figs 1a-c.
1972	*Eucycloscala* (?) *crassilabris* (Koenen, 1885) – Moroz, p. 92, pl. 21, figs 2-5.
1981	*Eucycloscala crassilabris* (Koenen, 1885) – Krach, p. 53, pl. 11, fig. 2.

Other material – Three specimens (MNO).

Remarks – The rather badly preserved specimens match in outline and sculpture the descriptions and illustrations by von Koenen (1885) and Ravn (1939).

Superfamily Fissurelloidea Fleming, 1822
Family Fissurellidae Fleming, 1822
Subfamily Emarginulinae Children, 1834
Genus *Emarginula* Lamarck, 1801

Type species (by monotypy) – *Emarginula conica* Lamarck, 1801.

***Emarginula* sp.**
Plate 3, fig. 1

Material – Only the illustrated specimen is known.

Description – The only specimen is preserved as an external impression and has a length of 3.1 mm, a width of 1.8 mm and a height of 1.6 mm. The shell is small, patelliform, convex and oval-elongated. The apex is strongly recurved and almost reaches the position of the posterior margin. The anterior margin has a slit, which continues as a groove-like selenizone that terminates close to the apex. The sculpture consists of *c.* 20 radial ribs, which bear small knobs.

Discussion – Because of the rather poor preservation a safe identification is not possible. The present specimen differs from *Emarginula coralliora* Lundgren, 1867 from the Faxe Formation by having a less convex posterior part in lateral view. Furthermore, *E. coralliora* has the apex situated above the posterior margin and a higher number of radial ribs.

Subclass Caenogastropoda Cox, 1960
Subcohort Campanilimorpha
Superfamily Campaniloidea Douvillé, 1904
Family Metacerithiidae Cossmann, 1906
Subfamily Metacerithiinae Cossmann, 1906
Genus *Metacerithium* Cossmann, 1906

Type species (by subsequent designation) – *Cerithium trimonile* Michelin, 1838.

***Metacerithium hauniense* (von Koenen, 1885)**
Plate 3, figs 8, 9; Plate 9, fig. 8

1885 *Cerithium Hauniense* von Koenen p. 55, pl. 2, fig. 21.
1897 *Cerithium Hauniense* von Koenen – Grönwall, p. 67.
1907 *Cerithium cimbricum* Grönwall & Harder p. 47, pl. 1, figs 31-34.
1939 *Metacerithium hauniense* (von Koenen) – Ravn, p. 69, pl. 2, figs 23a-b, 24.
1972 *Metacerithium hauniense* (Koenen, 1885) – Moroz, p. 98, pl. 22, fig. 2.
1976 *Metacerithium hauniense* (Koenen, 1885) – Makarenko, p. 89, pl. 6, figs 10-13.
1981 *Metacerithium hauniense* (Koenen, 1885) – Krach, p. 51, pl. 9, figs 5-7, 11, 12.

Material – Nine specimens (impressions MNO, casts MNO and ISL).

Description – The shell is rather large and turriculate with straight whorls, separated by a distinct suture. Between the spirals the whorls are slightly concave. There are three spirals with knobs, the adapical of which is situated close to the suture. This spiral has the smallest knobs and is separated from the next spiral by a flat area with fine spiral ribs. Two rows of knobs occupy the abapical half of the whorl. They are considerably more prominent with larger knobs.

Remarks – Grönwall & Harder (1907) suggested that *Metacerithium cimbricum* (Grönwall & Harder, 1907) might be conspecific with *M. hauniense* and Ravn (1939) stated that the two species could not be separated. The present material confirms this assignment.

Subcohort Cerithiimorpha
Superfamily Cerithioidea Fleming, 1822
Family Cerithiidae Fleming, 1822
Genus *Orthochetus* Cossmann, 1889

Type species (by subsequent designation) – *Cerithium leufroyi* Michelin, 1825.

Remarks – Darragh (2011) characterised this genus as an elongate turreted or pagodiform shell with a fenestrate sculpture of fine to coarse well-spaced axial costae and four spiral lirae on the whorls. Most species have one of the lira forming a prominent keel. Small tubercles occur at the intersections of the spiral and axial elements. The aperture has a prominent columellar plate, a prominent plait at the beginning of the canal, which is short and straight. He also emphasised that a firm assignment to the genus requires presence of protoconch and complete aperture.
Darragh (2011) illustrated and discussed several species of *Orthochetus*, *e. g. O. leufroyi* and *O. pagoda* (Chapman & Crespin, 1934) and both species show a rather large variation. The *Orthochetus* material from Gundstrup includes several specimens, which we have allocated to three species, one of which is new.
Darragh (2011) considered the assignment of *Orthochetus* to the Cerithiidae doubtful but retained it in the absence of any reasoned argument for its placement elsewhere. Wenz (1940) and Makarenko (1976) assigned the genus to the Cerithiopsidae, but this assignment was rejected by Marshall (1978) in his revision of the Cerithiopsidae.

***Orthochetus zigzag* (Grönwall & Harder, 1907)**
Plate 3, figs 10-13; Plate 9, figs 6, 8

1907 *Cerithium zigzag* Grönwall & Harder, p. 46, pl. 1, figs 29, 30 [*non* Eudes-Deslongschamps, 1843].
1981 *Metacerithium hauniense* (Koenen, 1885) – Krach, p. 52, pl. 11, figs 14-16.
2011 *Orthochetus zigzag* (Grönwall & Harder, 1907) – Darragh, p. 38, figs 1D, 1G.

Other material – 14 specimens (impressions MNO, casts MNO and ISL).

Discussion – The studied specimens show some variation in outline and number of axial ribs, but all are within the range of variation as described by Grönwall & Harder (1907). Most specimens have a more or less pagodiform outline, whereas there is some variation in number of axial ribs and distance between the spiral ribs. Plate 3 fig. 12 illustrates a specimen with a depression between the two adapical spiral ribs. A few specimens have a more turriculate outline and a higher number of axial ribs (Plate 3 fig. 13) as in Grönwall & Harder's fig. 29.
Cerithium zigzag Eudes-Deslongchamps, 1843 was originally spelled *C. ziczac*, but later authors have misspelled it (*e.g.* Cossmann, 1912; Guzhov, 2007), and thus *C. zigzag* is not a homonym. *Cerithium ziczac* is the type species of *Clathrobaculus* Cossmann, 1912.

***Orthochetus darraghi* nov. sp.**
Plate 3, fig. 14

Holotype – Plate 3, fig. 16, MGUH 31911.

Material – Only the holotype is known.

Etymology – This species is named after Thomas A. Darragh, Victoria, Australia.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large *Orthochetus* with three spiral ribs, which are weaker than their interspaces. Spiral ribs number one and two are of almost equal strength and situated on the adapical third of the concave part of the whorl, whereas spiral rib number three is much stronger and forms the carina, which bears three fine spiral threads. There are 16-18 opisthocyrt axial ribs on the first teleoconch whorls, increasing to *c.* 25 on the body whorl.

Description – The shell is slender turriculate with a H/W ratio of 2.9. The protoconch lacks the nucleus and part of the first whorl, which seems to be smooth. The shell has *c.* 17 teleoconch whorls preserved, which are angular divided by a carina into a slightly concave adapical part and a straight abapical part that is strongly constricted into the suture. The suture is rather indistinct and slightly undulating. There are three primary spiral ribs, of which the adapical two are of almost equal strength and situated on the adapical third of the concave part of the whorl, whereas spiral rib number three is much stronger and situated slightly above the abapical suture. This spiral rib forms the carina; on the body whorl it bears three fine spiral threads. Only on the body whorl a fourth spiral rib is visible, demarcating the base. On the neck of the canal *c.* 10 fine spiral threads are visible. There are 16-18 axial ribs, which are opisthocyrt. On the first teleoconch whorls they are weaker than their interspaces. On the body whorl their number increases to *c.* 25 and they become more close-set. At the intersections with the spirals rounded knobs occur. The columella is slightly concave and the aperture is not completely preserved. It seems to have been rounded rectangular with a short canal, which is slightly turned to the left.

Discussion – *Orthochetus darraghi* differs from *O. leufroyi* Michelin, 1825 from the French Lutetian especially by its coarser spiral sculpture and shorter canal. *O. elongatus* Wrigley, 1940 from the Eocene of England has three spiral ribs of almost the same strength. *O. saxonicus* (von Koenen, 1891) from the Early Oligocene of Germany has almost straight whorls, a higher number of axial ribs and the medium spiral rib is weaker than the adapical and abapical spiral ribs. *O. tectiformis* (Binkhorst, 1861) from the Maastrichtian of the Netherlands has a rather similar outline, but a considerably higher number of prosocline axial ribs. Finally, *Orthochetus darraghi* differs from *O. zigzag* (Grönwall & Harder, 1907) by its coarser sculpture and by the two more narrowly spaced adapical spiral ribs.

***Orthochetus grewingki* (von Koenen, 1885)**
Plate 3, figs 15-18

1885 *Cerithium Grewingki* von Koenen, p. 56, pl. 3, fig. 15.
1897 *Cerithium Grewingki* von Koenen – Grönwall, p. 67.
1920b *Cerithium Grewingki* von Koenen – Rosenkrantz, p. 8.
1937 *Cerithium Grewingki* von Koenen – Roedel, p. 195.
1939 *Cerithiopsis Grewingki* (von Koenen) – Ravn, p. 69, pl. 2, figs 25, 26.

Other material – 23 specimens (impressions MNO, casts MNO and ISL).

Description – The shell is slender turriculate with a H/W ratio of 3.5. In all specimens the protoconch is worn or missing. From the aperture only the slightly concave columella and the canal are preserved. The columella has a fold and the canal is short, narrow and turned to the left. The largest specimen has 12 teleoconch whorls preserved. They are almost straight above the carina and constricted below the carina and separated by a distinct suture. There are three almost equally spaced primary spirals, the adapical of which is situated close to the suture, spiral number two a little above the middle of the whorl and spiral number three about one fourth of the whorl height above the abapical suture. The abapical spiral is projecting as a carina; below it the whorl is strongly constricted towards the suture. A fourth spiral demarcating the base is only visible on the body whorl. There are no secondary spirals. The axial ribs are slightly prosocyrt to prosocline and narrower than their interspaces. Their number is 14 on the first teleoconch whorls, increasing to about 16 on the body whorl. Rounded knobs occur at the intersections with the spirals. They are most prominent on the carina. The columella is slightly concave and in one specimen the neck of the canal has about 10 fine spirals. The spiral demarcating the slightly convex and smooth base is rather distinct and has no knobs.

Discussion – The specimens show some variation. The specimens of Plate 3 figs. 16 and 17 have two fine spiral ribs below the suture, but all specimens have slightly convex whorls, three equidistant spiral ribs and a regular fenestrate sculpture. Ravn (1939) assigned this species to the genus *Cerithiopsis* Forbes & Hanley, 1850. Darragh (pers. comm., 2010) suggested an assignment to the genus *Orthochetus*. The species differs from *O. zigzag* especially by the arrangement of the spirals. In *O. zigzag* the interspace between spirals 1 and 2 is twice a wide

as the other interspaces. *O. grewingki* has three almost equally spaced spirals.

?*Orthochetus* sp.
Pl. 3, figs 19-20

Material – Only the two illustrated specimens are known.

Description – The larger specimen has a height of 14.5 mm and width of 7.1 mm, H/W ratio 2.1. The specimen was deformed during compaction; it is incomplete and lacks the protoconch and the aperture. The specimen has five teleoconch whorls that are strongly carinated and separated by a deep suture. There are three primary spirals, the adapical of which is situated close to the suture, spiral number two on the middle of the whorl and spiral number three above the abapical suture. The spirals are narrower than their interspaces and divide the whorl into a wide concave part between spirals number one and two, a narrower concave part between spirals number two and three and a narraow concave part between spiral number three and the suture. A fourth weak spiral situated within the suture is only visible on the base of the body whorl. Two weaker secondary spirals are inserted above and below spiral number one. Spiral number two and especially number three are carina-like. On the base two further spirals are visible. There are *c.* 12 almost orthocline axial ribs on the first teleoconch whorl, increasing to *c.* 20 on the body whorl. The ribs are considerably weaker than their interspaces and cause knobs on the primary spirals, especially on spirals number two and three. Fine growth lines are visible between the axial ribs. The other specimen has the last 2 3/4 whorls preserved and has the same coarse sculpture. The base is almost flat and has four spirals below the fourth spiral on the teleoconch. The columella is concave; the labrum is not preserved.

Discussion – Based on the carinated whorls with three spirals the species is tentatively assigned to *Orthochetus*.

Family Turritellidae Lovén, 1847
Subfamily Turritellinae Lovén, 1847
Genus *Turritella* Lamarck, 1799

Type species (by subsequent designation) – *Turbo terebra* Linnaeus, 1758.

***Turritella suessi* von Koenen, 1885**
Plate 3, fig. 21

1885 *Turritella Suessi* von Koenen p. 62, pl. 3, fig. 5.
1897 *Turritella Suessi* von Koenen – Grönwall, p. 67.
1904 *Turritella Suessi* von Koenen – Grönwall, p. 34.
1939 *Turritella (Haustator) Suessi* von Koenen – Ravn, p. 64.

Material – Only the illustrated specimen is known.

Description – The shell is slender turriculate with a height/width ratio of 3.3. There are 12 teleoconch whorls preserved, the labrum is broken and the protoconch not preserved. The whorls are slightly convex and carinated by the spirals. There are five primary spirals, of which the adapical is very weak and the three following are increasing in strength. The abapical spiral is more or less hidden by the following whorl. The spirals are separated by wider interspaces. On the first teleoconch whorls spirals number two, three and four are almost equal in strength, but on the following whorls spirals number two and especially number three increase in strength and become carina-like. Finer secondary spirals are inserted. The base is flat and has two weak spirals below the demarcating spiral. Numerous weak growth lines are visible that are strongly opisthocline.

Discussion – In his description von Koenen (1885) mentioned only four spirals and stated that the third spiral was the most prominent. As the adapical spiral is very weak, he might have overlooked it on his only specimen. Otherwise, the specimen matches von Koenen's description and illustration.

Subcohort Hypsogastropoda
Superfamily Capuloidea Fleming, 1822
Family Capulidae Fleming, 1822
Genus *Capulus* Montfort, 1810

Type species (by subsequent designation) – *Patella ungarica* Linnaeus, 1758.

***Capulus* sp.**
Plate 4, fig. 1

Material – Only the illustrated specimen is known.

Description – The specimen shows the rear side. The aperture and the apex could not be observed. The shell is strongly convex with numerous fine undulating growthlines and very fine radial striae.

Discussion – Because of the state of preservation a further identification is not possible.

Superfamily Epitonioidea Berry, 1910
Family Epitoniidae Berry, 1910 (1812)
Genus *Coniscala* de Boury, 1887

Type species (by subsequent designation) – *Scalaria angarensis* Ryckholt, 1852.

***Coniscala johnstrupi* (Mörch, 1874)**
Plate 4, fig. 13

1874 *Scala (Opalia) Johnstrupi* Mörch, p. 280, 297.

1885 *Scalaria Johnstrupi* Mörch – von Koenen, p. 63, pl. 3, fig. 1.
1897 *Scalaria Johnstrupi* Mörch – Grönwall, p. 67.
1904 *Scalaria Johnstrupi* Mörch – Arkhanguelsky, p. 139, pl. 10, fig.2.
1920b *Scalaria Johnstrupi* Mörch – Rosenkrantz, p. 7.
1924 *Scalaria Johnstrupi* Mörch – Rosenkrantz, p. 30.
1933 *Coniscala Johnstrupi* Mörch – Ravn, p. 38.
1939 *Coniscala Johnstrupi* Mörch – Ravn, p. 57, pl. 2, fig. 5.
1972 *Coniscala Johnstrupi* (Mörch, 1874) – Moroz, p. 106, pl. 23, figs 6a-b.
1976 *Cavoscala Johnstrupi* Mörch, 1874 – Makarenko, p. 99, pl. 9, figs 1-3.
1981 *Coniscala Johnstrupi* (Mörch, 1874) – Krach, p. 54, pl. 12, figs 3-4.

Other material – Eleven specimens (impressions MNO, casts MNO and ISL).

Genus *Acirsa* Mörch, 1857

Type species (type by monotypy) – *Scalaria borealis* Lyell, 1841.

***Acirsa elatior* (von Koenen, 1885)**
Plate 4, fig. 14

1885 *Scalaria elatior* von Koenen, p. 67, pl. 3, fig. 3.
1897 *Scalaria? elatior* von Koenen – Grönwall, p. 67
1907 *Scalaria elatior* von Koenen – Grönwall & Harder, p. 41.
1912 *Acirsa (Hemiacirsa?) danensis* Cossmann, p. 98.
1913 *Scalaria danensis* Cossmann – de Boury, p. 80.
1920b *Scalaria elatior* von Koenen – Rosenkrantz, p. 7.
1937 *Scalaria? elatior* von Koenen – Roedel, p. 191.
1939 *Acirsa (Hemiacirsa) elatior* von Koenen – Ravn, p. 61, pl. 2, figs 14a-b.
1976 *Acirsa elatior* Koenen, 1885 – Makarenko, p. 98, pl. 10, figs 6-7.
1981 *Acirsa elatior* Koenen, 1885 – Krach, p. 54, pl. 11, fig. 8.

Other material – Five specimens (impressions MNO, casts MNO and ISL).

***Acirsa* sp.**
Plate 4, fig. 15

Material – Only the illustrated specimen is known.

Description – The shell has a height/with ratio of 5.4. The shell is very slender turriculate and consists of 14 moderately convex whorls, which are separated by a distinct suture. Neither the protoconch nor the aperture are preserved. There are 7 fine spirals, which are separated by wider interspaces and most prominent abapically. Weaker secondary spirals are inserted. The base is demarcated by a distinct spiral and has two weaker spirals visible. There are 10 slightly opisthocline to orthocline axial ribs, which are narrower than their interspaces.

Discussion – The specimen allows no further assignment.

Genus *Clathroscala* de Boury, 1890

Type species (by original designation) – *Turbo cancellatus* Brocchi, 1814, accepted as *Clathroscala cancellata* (Brocchi, 1814).

***Clathroscala gryi* (Ravn, 1939)**
Plate 4, fig. 16

1939 *Acrilla Gryi* Ravn, p. 60, pl. 2, figs 8a-c.

Other material – Two specimens (impression MNO, casts MNO and ISL).

Description – The shell is moderately large and slender turriculate with a height/width ratio of 2.2. 11 teleoconch whorls are preserved; protoconch and aperture are missing. The whorls are strongly convex and separated by a deep suture. There are six primary spiral ribs, which are separated by wider interspaces and finer secondary spirals are inserted. The abapical spirals are more prominent and close-set. The flat base is demarcated by a distinct spiral rib. There are *c.* 20 fine axial ribs on the first teleoconch whorls, increasing to *c.* 40 on the body whorl. The axial ribs are prosocline and separated by wider interspaces.

Discussion – Ravn (1939) assigned this and the following species to *Acrilla* H. Adams, 1860. However, especially based on the fine spiral ribs we assign these two species to *Clathroscala*.

***Clathroscala bruennichi* (Ravn, 1939)**
Plate 4, fig. 17

1939 *Acrilla Brünnichi* Ravn, p. 59, pl. 2, figs 3a-c, 7.

Other material – One specimen (impression MNO, casts MNO and ISL).

Description – The shell is moderately large and slender turriculate with a height/width ratio of 3.5. There are 10 teleoconch whorls preserved and the protoconch is missing. The whorls are highly convex and separated by a deep suture. There are numerous fine spiral ribs, which are separated by narrower interspaces and finer secondary spiral ribs are inserted. On the penultimate whorl, there are *c.* 30 spiral ribs. The adapical spiral ribs are very fine. There are *c.* 20 fine axial ribs on the first teleo-

conch whorls, increasing to *c.* 30 on the body whorl. The axial ribs are prosocline and separated by interspaces of almost the same width.

Discussion – The specimens are considerably larger than Ravn's holotype (1939) but match his description and illustrations well with regards to outline and sculpture.

Genus *Opaliopsis* Thiele, 1928

Type species (by original designation) – *Scala elata* Thiele, 1925, accepted as *Opaliopsis elata* (Thiele, 1925).

***Opaliopsis* sp.**
Plate 4, fig. 18

Material – Only the illustrated specimen is known.

Description – The only specimen is preserved as impressions of both sides. As the shell material could not be removed from the impressions, the casts only show the sculpture of the internal mould. Because of the thin shell the silicone cast shows the sculpture and ornament of the shell rather well. There is a little more than one protoconch whorl preserved. There are 10 convex teleoconch whorls, separated by a deep suture. The last preserved whorl equals 0.3 of the total shell height, the aperture 0.15. The aperture is subcircular. Due to the state of preservation the spiral ornament is not fully visible, but there are *c.* 20 fine spiral ribs separated by wider interspaces. The concave base is demarcated by a strong spiral rib. There are 12-14 almost orthocline axial ribs, separated by wider interspaces. They fade out on the demarcating spiral rib.

Discussion – The state of preservation allows no further assignment. The species is assigned to *Opaliopsis* because of the turriculate outline and the strong axial ribs, which fade out on the spiral rib, demarcating the basal disc.

Superfamily Naticoidea Guilding, 1834
Family Naticidae Guilding, 1834
Subfamily Naticinae Guilding, 1834
Genus *Euspira* Agassiz, 1837

Type species (by subsequent designation) – *Natica glaucinoides* J. Sowerby, 1812 accepted as *Euspira glaucinoides* (J. Sowerby, 1812).

***Euspira detrita* (von Koenen, 1885)**
Plate 4, fig. 5

1885 *Natica detrita* von Koenen, p. 47, pl. 2, fig. 19.
1897 *Natica detrita* von Koenen – Grönwall, p. 66.
?1904 *Natica* cf. *detrita* von Koenen – Arkhanguelsky, p. 149, pl. 10, fig. 6.
1904 *Natica detrita* von Koenen – Grönwall, p. 34 and p. 36.
1907 *Natica detrita* von Koenen – Grönwall & Harder, p. 39.
1920b *Natica detrita* von Koenen – Rosenkrantz, p. 7.
1925 *Natica (Lunatia) detrita* von Koenen – Cossmann, p. 135.
1937 *Natica detrita* von Koenen – Roedel, p. 183.
1939 *Natica (Lunatia) detrita* (von Koenen) – Ravn, p. 54.
1977 *Euspira detrita* (Koenen, 1885) – Anderson, p. 199, Abb. 6.
1981 *Euspira detrita* (Koenen, 1885) – Krach, p. 56, pl. 13, figs 3, 4.

Material – One specimen.

***Euspira detracta* (von Koenen, 1885)**
Plate 4, fig. 6

1885 *Natica detracta* von Koenen, p. 45, pl. 2, figs 18a-d.
1897 *Natica detracta* von Koenen – Grönwall, p. 66.
1904 *Natica detracta* von Koenen – Grönwall, p. 36.
1907 *Natica detracta* von Koenen – Grönwall & Harder, p. 39.
1920b *Natica detracta* von Koenen – Rosenkrantz, p. 7.
1937 *Natica detracta* von Koenen – Roedel, p. 183.
1939 *Natica (Lunatia) detracta* von Koenen – Ravn, p. 54.

Other material – Six specimens (impressions MNO, casts MNO and ISL).

Remarks – The species has a higher apex than *Euspira detrita* and a straight inner lip.

Genus *Tectonatica* Sacco, 1890

Type species (by subsequent designation) – *Natica tectula* Sacco, 1890.

***Tectonatica lindstroemi* (von Koenen, 1885)**
Plate 4, fig. 7

1885 *Natica Lindströmi* von Koenen, p. 49, pl. 2, fig. 17.
1897 *Natica Lindströmi* von Koenen – Grönwall, p. 67.
1920b *Natica Lindströmi* von Koenen – Rosenkrantz, p. 7.
1925 *Natica (Tectonatica) Lindströmi* von Koenen – Cossmann, p. 120.
1937 *Natica Lindströmi* von Koenen – Roedel, p. 190.
1939 *Natica (Tectonatica) Lindströmi* von Koenen – Ravn, p. 55.

Other material – One specimen (casts MNO and ISL).

Discussion – The shell has a thickened inner lip and an umbilicus completely covered by callus and matches the diagnosis of *Tectonatica* by Wenz (1940, pp. 1040-1041), as well as the description and illustration by von Koenen (1885).

Superfamily Triphoroidea Gray, 1847
Family Triphoridae Gray, 1847
Subfamily Triphorinae Gray, 1847
Genus *Epetrium* Harris & Burrows, 1891

Type species (by subsequent designation) – *Triforis grignonensis* Deshayes, 1866.

?*Epetrium pernilleae* nov. sp.
Plate 5, fig. 9

Type material – Holotype Plate 5, fig. 9, MGUH 31946.

Other material – One specimen (impression MNO, casts MNO and ISL).

Etymology – This species is named after Pernille Stentoft Rasmussen, the daughter of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large ?*Epetrium* with flat whorls, five spirals, of which number two and three are close-set. Spiral number four is the strongest, and 16-18 slightly opisthocline to orthocline axial ribs. There are two rows of coarse knobs on the two strongest spirals.

Description – The shell is sinistral, highly turriculate and slender. The height is 32.5 mm and the width 6.0 mm, the height/width ratio 5.4. The protoconch is not preserved and the aperture is not visible. The neck of the canal indicates that the canal was bent. There are 24 whorls visible; they are flat and separated by an indistinct suture. There are five spiral ribs, of which the adapical is very weak and situated near the suture. A little above the middle of the whorl there are two close-set spiral ribs and a rather wide depression is situated below these spiral ribs. The fourth spiral rib is the most prominent and situated a little above the abapical suture. A fifth spiral rib demarcates the base but is only visible on the base of the body whorl. The base has two almost equal spiral ribs and is almost flat. There are 16-18 axial ribs, which are slightly opisthocline to orthocline and a little wider than their interspaces. There are two rows of knobs formed by the intersection of the axial ribs with the two strong spirals.

Discussion – This species and the following differ from the species of ?*Epetrium* from the Faxe Formation described and illustrated by Lauridsen & Schnetler (2014). Nützel (1998, p. 126) stated that the protoconch of *Triforis grignonensis* Deshayes, 1866, the type species of *Epetrium*, is unknown and that several species differing from the type species have been assigned to *Epetrium*. He also stated that *?Epetrium cretacea* has only two knob-bearing spiral ribs and ?*E. faxensis* (= *Triphora (Ogivia) faxensis*)) has a different teleoconch sculpture. Based on these observations, *E. crassigranulata* and *E. cretacea* were only tentatively referred to the genus *Epetrium*. For the same reasons, this species and the following are referred to *Epetrium* with a query.

Remarks – The two specimens have no tubes for the anterior and posterior canals preserved, but we presume that this species, like the following species, had such tubes.

?*Epetrium flemmingi* nov. sp.
Plate 5, fig. 10

Holotype – Plate 5, fig. 9, MGUH 31947.

Other material – Two specimens (impression MNO, casts MNO and ISL).

Etymology – This species is named after Flemming Rasmussen, the son-in-law of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large ?*Epetrium* with flat whorls and two strong spirals and *c.* 20 very opisthocline axial ribs. There are two rows of coarse knobs on the two strong spirals.

Description – The shell is sinistral, highly turriculate and slender. The height is 30.1 mm and the width 4.5 mm, the height/width ratio 6.7. The protoconch is not preserved. 20 whorls are visible; they are flat and separated by an indistinct suture. The necks of the anterior and posterior canals are completely preserved. The anterior canal is turned to the left; the posterior canal has an oblique tube and is situated near the adapical suture. There are two strong spiral ribs, of which the adapical is situated near the suture and the abapical is situated above the suture. There is a rather wide depression in the middle of the whorl between the spiral ribs. The spiral ribs are of almost equal strength. A third spiral rib demarcates the base but is only visible on the base of the body whorl. There are about 20 axial ribs, which are strongly opisthocline and stronger than their interspaces; they are prominent on the spirals where they form two rows of oblique knobs. These knobs are united by the axial ribs.

Discussion – The species differs from ?*Epetrium pernilleae* nov. sp. by being slenderer and having a coarser

sculpture. Furthermore, the spiral ornamentation is different and the axial ribs are very opisthocline.

Triphoridae, gen. et sp. indet.
Plate 5, fig. 11

Material – Only the illustrated specimen is known.

Description – The shell is sinistral, highly turriculate and slender. The height of the incomplete shell is 22 mm (estimated height of the complete shell 27 mm) and the width 4.8 mm, the height/width ratio 5.6. The protoconch and the first intermediate whorls are not preserved. Five whorls are visible; they are flat and separated by a distinct suture. The aperture and the anterior canal are completely preserved. The anterior canal is straight and long and the aperture is subovate with an acute anterior end. There are two strong spiral ribs, of which the adapical is situated near the middle of the whorl and the abapical at about one quarter of the whorl height above the suture. A third weak spiral rib is situated near the abapical suture. There is a concave depression between the two spiral ribs. On the base there are three additional spiral ribs of decreasing strength. There are 10 to 12 axial ribs that are markedly prosocline and stronger than their interspaces; they form two rows of prominent oblique elongated knobs at the intersections with the spirals. The knobs are indistinctly demarcated, especially on the abapical strong spiral. The third spiral has no knobs.

Discussion – The species differs from the two ?*Epetrium* species described above by its long canal, the spiral ornament, the lower number of axial ribs and the distinct suture. The very long anterior sipho is unusual for Triphoridae, but the angle of the sipho justifies inclusion in this family (it is clearly not a sinistrorsal fasciolariid). The canal and the peculiar teleoconch ornament make a generic assignment difficult – it probably represents a new genus.

Family Cerithiopsidae H. &. A. Adams, 1853
Subfamily Cerithiopsinae H. &. A. Adams, 1853
Genus *Cerithiopsis* Forbes & Hanley, 1850

Type species (by monotypy) – *Murex tubercularis* Montagu, 1803, accepted as *Cerithiopsis tubercularis* (Montagu, 1803).

***Cerithiopsis emilieae* nov. sp.**
Plate 5, fig. 12

Type material – Holotype Plate 5, fig. 12, MGUH 31949.

Material – Only the holotype is known.

Etymology – This species is named after Emilie Stentoft Rasmussen, granddaughter of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A rather large *Cerithiopsis* with two knob-bearing spiral ribs, two weak spiral ribs below the knob-bearing spiral ribs and moderately convex whorls. The number of knobs increases from 15 on the first teleoconch whorl to 20 on the last preserved whorl.

Description – The only specimen found has 18 teleconch whorls preserved and a height of 19.8 mm and a width of 4.0 mm, thus a height/width ratio of *c.* 5. The protoconch is missing and the aperture is only partly preserved. The shell is slender turriculate with almost flat whorls, which are separated by a distinct suture. The aperture seems to have been rounded rectangular with a straight columella. The short canal is turned to the left. There are two spiral ribs, which are wider than their interspaces. They have *c.* 15 rounded knobs on the first teleoconch whorls. The knobs on the abapical whorl are the strongest. The axial ribs are opisthocline. Above the abapical knobs two fine spiral ribs occur, one between the two knob-bearing spiral ribs and one between the abapical knob-bearing rib and the suture. The number of knobs increases to 20 on the last preserved whorl.

Discussion – The outline, sculpture and apertural characters suggest that this species should be referred to the genus *Cerithiopsis*. The species differs from *Cerithiopsis unisulcata* Ravn, 1933 (see Lauridsen & Schnetler 2014, p. 76, figs 102A-B) by having larger knobs on the abapical spiral, more convex whorls and a spiral between the two knob-bearing spirals.

***Cerithiopsis andreae* nov. sp.**
Plate 5, fig. 13

?1975 *Cerithiopsis (Metaxia)* sp. – Anderson, p. 151; pl. 15, fig. 3.

Type material – Holotype Plate 5, fig. 11, MGUH 31950. The height is 16.5 mm and the width 5.5 mm.

Other material – *c.* 50 specimens and 2 fragments (impressions MNO and ISL, casts MNO and ISL).

Etymology – This species is named after Andrea Stentoft Rasmussen, granddaughter of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A rather large *Cerithiopsis* with three knob-

bearing spiral ribs, of which the adapical is weaker than the other spiral ribs and moderately convex whorls. The number of knobs is 16-18.

Description – The most complete specimen has 14 whorls preserved. Protoconch and aperture are not preserved. The largest specimen has an estimated height of 25 mm and a width of 8 mm. The height/width ratio is 3.0. The shell is highly turriculate with flat to slightly convex whorls, which are separated by a distinct suture. On the first teleoconch whorl there are two spiral ribs situated on each side of the middle of the whorl and soon a weaker spiral rib occurs below the adapical suture. A fourth weak spiral rib is situated immediately above the abapical suture. The adapical spiral rib remains weaker than the other two spiral ribs. Finer secondary ribs are inserted between the four spiral ribs. The adapical ribs are slightly opisthocline to opisthocyrt and only visible at the intersections with the spirals, where pointed circular knobs occur in a number of 16-18 on each whorl. On the flat base, there is a rather strong spiral rib and between this and the demarcating spiral rib there are two very fine spiral ribs. Adaxially the base has further *c.* 10 very fine spiral ribs. Numerous fine growth lines are visible and cause a denticulation of the demarcating spiral rib.

Discussion – Anderson (1975, p. 151; pl. 15, fig. 3) described and illustrated a specimen from the North German Palaeocene (Hückelhover Schichten) in Sophia Jacoba 6 as *Cerithiopsis (Metaxia)* sp. Judging from this his description and illustration this specimen might be conspecific with the Danish species. Recent *Metaxia* species have 5 spiral ribs and more convex whorls.

?*Cerithiopsis luiseae* nov. sp.
Plate 5, fig. 14

Holotype – Holotype Plate 5, fig. 12, MGUH 31951.

Material – Only the holotype is known.

Etymology – This species is named after Luise Stentoft Rasmussen, granddaughter of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large *Cerithiopsis* with flat whorls, three spiral ribs, of which the abapical is the strongest and slightly projecting as a carina. The spiral ribs are weaker than their interspaces. Axial sculpture consists of 12-14 ribs, which are weaker than their interspaces. The spiral ribs and axial ribs form a fenestrate pattern.

Description – The specimen lacks the protoconch and aperture. It has a height of 34 mm and a width of 5 mm, thus a height/width ratio of almost 7. The shell is highly turriculate with almost flat whorls, which are separated by a distinct suture. The shell has three spiral ribs which are weaker than their interspaces. The adapical spiral rib is situated somewhat below the suture, the second on the middle of the whorl and the abapical spiral rib at about one third of the whorl height above the abapical suture. This spiral rib is the strongest and slightly projecting as a carina, which separates the whorl in an adapical slightly concave part and an abapical straight narrow part, which is constricted towards the suture. A fourth smooth and weak spiral rib demarcates the base. There are 12-14 axial ribs, which are slightly prosocline to orthocline and weaker than their interspaces. Rounded knobs occur at the intersections of axial ribs and spirals. Axial ribs and spiral ribs are of almost equal strength and form a fenestrate pattern.

Discussion – The spiral ornament and the axial sculpture as well as the general outline suggest an assignment to *Cerithiopsis*. However, this species is considerably slenderer and larger than species of *Cerithiopsis* with a similar ornament, *e.g. Cerithiopsis vogeli* Janssen, 1967, *C. vandermarki* Janssen, 1967 and *C. andersoni* Janssen, 1967, all from the German Miocene. We establish *C. luiseae* as a new species because of the characteristic very slender outline and the sculpture of axial and spiral ribs of almost equal strength, resulting in a fenestrate pattern.

***Cerithiopsis boanderseni* nov. sp.**
Plate 5, fig. 16

Type material – Holotype, Plate 5, fig. 16, MGUH 31953.

Material – Only the holotype is known.

Etymology – This species is named after Søren Bo Andersen, Aarhus.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A rather large *Cerithiopsis* with four knob-bearing spiral ribs, *c.* 20 almost orthocline to slightly opisthocline axial ribs, which are weaker than their interspaces.

Description – The shell is slender turriculate with a height/width ratio of 3.3. Almost 13 teleoconch whorls are preserved (apex missing); the whorls are almost flat and separated by an indistinct suture. The protoconch and first intermediate whorls are not preserved. On the first preserved teleoconch whorl, there are three spiral ribs, of which the adapical is the weakest and situated in a shallow depression below the suture. From the first pre-

served teleoconch whorl onward, a secondary spiral rib is inserted between the two abapical stronger spiral ribs. This spiral rib reaches the strength of the other spiral ribs on the last preserved whorls. On the mature teleoconch there are four almost equally spaced spiral ribs, of which the abapical increases in strength and project as a rather weak carina on the last preserved teleoconch whorls. The spiral ribs are much weaker than their interspaces. A fifth spiral rib is visible on the base of the body whorl but covered by the following whorl on the intermediate whorls. The slightly deformed base is convex and has *c.* 10 fine spiral ribs, the columella is slightly concave and the labrum is not preserved. There are *c.* 14 axial ribs, separated by wider interspaces and almost orthocline to slightly opisthocline and the number increases to *c.* 20 on the penultimate whorl. At the intersections with the spiral ribs fine rounded knobs occur.

Discussion – The species differs from most other *Cerithiopsis* species by having four spiral ribs on the teleoconch whorls. *Cerithiopsis (Zaclys) ronquerollensis* Gougerot & Le Renard, 1981 from the Eocene of the Basin of Paris has four spiral ribs, but the whorls are convex with the two medium spiral ribs stronger than the spiral ribs at the sutures. Furthermore, this species is less slender and considerably smaller.

?*Cerithiopsis* sp.
Plate 5, fig. 17

Material – Only the illustrated specimen is known.

Description – The shell is slender turriculate with a height/width ratio of 4.7. The fragmentary specimen consists of almost 11 teleoconch whorls, which are angulated and separated by a distinct suture. There are four spiral ribs, of which the adapical is smooth and forms a subsutural band. Below this spiral rib there is a depression. Spiral ribs number two and three are narrower than their interspaces and almost equally spaced. Spiral rib number three is situated at one third of the whorl above the abapical suture and is projecting as a rather sharp carina. Below this carina the whorl is constricted and almost straight. A fourth spiral rib is only partly visible at the suture. There are *c.* 12 orthocline to slightly prosocline axial ribs per whorl, which are separated by wider interspaces. At the intersections with the spiral ribs number two and three fine rounded knobs occur.

Discussion – The protoconch and aperture are not preserved. The species differs from the other *Cerithiopsis* species in the fauna by the angulated whorls, the lower number of axial ribs and the subsutural band.

Genus *Variseila* Dockery, 1993

Type species (by original designation) – *Cerithiopsis meeki* Wade, 1926.

***Variseila monbergi* (Ravn, 1939)**
Plate 5, fig. 20

1939 *Newtoniella monbergi* Ravn, p. 71, pl. 2, figs 21a-c, 22.

Other material – Four specimens (impressions MNO, casts MNO and ISL).

Description – The largest specimen has a height of 8.7 mm and a width of 2.5 mm. It comprises 16 whorls. Protoconch and first teleoconch whorls are missing. The shell is slender turriculate with a height/width ratio of 3.5. The whorls are almost flat and separated by an indistinct suture. There are three spiral ribs, of which the middle is situated on the middle of the whorl and the two other spirals are situated near the sutures. The two adapical spiral ribs are closer to each other than spiral ribs number two and three. The adapical spiral rib is the strongest and the middle spiral rib the weakest. The spiral ribs are of almost the same strength as their interspaces. A fourth weak spiral rib demarcates the base, which is flat with visible growth lines. The only axial sculpture consists of fine opisthocyrth growth lines, visible between the spiral ribs. The aperture is rounded rectangular and the canal is turned to the left. A weak columellar fold is present.

Discussion – The teleoconch of the specimens matches Ravn's description and illustrations of *Newtoniella monbergi* well, but the protoconch of the present material is lacking. According to Ravn (1939) it consists of 6 whorls, of which the 1½ are smooth and the following have fine close-set axial ribs. The species is assigned to *Variseila* because of the protoconch type, which matches the diagnosis for the protoconch of *Variseila* well (see Nützel, 1998, p. 105). *Variseila meeki* (Wade, 1926) from the Campanian of Missisippi, USA, the type species of *Variseila*, has a rather similar spiral ornament, but the columellar fold is stronger (see Nützel, 1998, pl.17 F, G).

Family Newtoniellidae Korobkov, 1955
Subfamily Newtoniellinae Korobkov, 1955
Genus *Cerithiella* Verrill, 1882

Type species (type by typification of replaced name) – *Cerithium metula* Lovén, 1846.

***Cerithiella salmae* nov. sp.**
Plate 5, fig. 21

Holotype – Plate 5, fig. 21, MGUH 31958.

Other material – One specimen (impression MNO, casts MNO and ISL).

Etymology – This species is named after Salma A. A. Osman, granddaughter of the senior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A rather large *Cerithiella* with three spiral ribs, which are narrower than their interspaces and moderately convex whorls. There are 14-16 orthocline axial ribs, which are narrower than their interspaces. The knobs are rounded, having their largest dimension towards the spirals.

Description – The shell is slender turriculate with a height/width ratio of 3.5. The holotype has 13 teleoconch whorls preserved and lacks the protoconch. The teleoconch whorls are slightly convex and separated by a distinct suture. The columella is slightly concave and the aperture is rounded rectangular. The posterior margin of the canal forms a columellar fold. The spiral ornament consists of three primary spiral ribs, which are narrower than their interspaces. On the first teleoconch whorls the adapical spiral rib is weaker than the two other spiral ribs, but it increases in strength and has the same strength as spiral rib number two on the younger teleoconch whorls. Spiral rib number three is the strongest and projects more than the other spiral ribs. The spiral ribs are equally spaced and in lateral view separated by concave furrows. A fourth spiral rib is only visible on the last preserved whorl, demarcating the flat base, where a further weak spiral rib is situated close to it. The axial sculpture consists of 14-16 almost orthocline ribs per whorl, which are narrower than their interspaces. Rounded ovate knobs occur at the intersections with the spiral ribs.

Discussion – The aperture and the columellar fold, formed by the posterior margin of the canal, as well as the outline and spiral ornament, match the genus *Cerithiella*. The species *Cerithiella genei* (Bellardi & Michelotti, 1840) from the Reinbekian and Vierlandian (Miocene) of the North Sea Basin has a rather similar ornament, but differs by having a longer canal, a higher number of axial ribs and a considerably smaller size. *Cerithiella bitorquata* (Philippi, 1843) from the the Late Oligocene of the North Sea Basin has almost flat whorls and a higher number of axial ribs and a considerably smaller size.

***Cerithiella malakae* nov. sp.**
Plate 5, fig. 22

Holotype – Plate 5, fig. 20, MGUH 31959.

Material – Only the holotype is known.

Etymology – This species is named after Malak A. A. Osman, granddaughter of the senior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large *Cerithiella* with four knob-bearing spiral cords and *c.* 24 axial ribs.

Description – The shell is highly turriculate with a height/width ratio of 4.4. The aperture and the protoconch are poorly preserved. The shell has 17 teleoconch whorls, which are flat with a slight depression on the middle and separated by an indistinct suture. The depression may be misidentified as suture because of the indistinct suture. However, the arrangement of the knobs on the spiral cords clearly indicates that there are four knob-bearing spiral cords on the whorls. These spiral cords are of almost equal strength, and fine secondary spirals are inserted. The axial ribs are slightly opisthocline and cause rounded knobs (*c.* 24 per whorl) on the spiral cords. The base is flat and demarcated by a smooth spiral. Adaxially the base has one weaker spiral rib. The aperture is small and presumeably rounded rectangular. The posterior margin of the canal forms a columellar fold and the canal is short and turned to the left.

Discussion – The aperture and the columellar fold, formed by the posterior margin of the canal, match the genus *Cerithiella*, but no similar species are known. *Cerithiella suturofunata* (Cossmann, 1896) from the Eocene of the Paris Basin also has four knob-bearing spiral cords, but those cords are much weaker, and the axial ribs are also weaker.

Subfamily Ataxocerithiinae Ludbrook, 1957
Genus *Ataxocerithium* Tate, 1894

Type species (by original designation) – *Cerithium serotinum* A. Adams, 1855.

***Ataxocerithium cingulatum* (Grönwall & Harder, 1907)**
Plate 5, fig. 18

1907 *Cerithium cingulatum* Grönwall & Harder, p. 45, pl. 1, fig. 34.

Other material – Six specimens (impressions MNO, casts MNO and ISL).

Description – The specimens are more or less defective. The illustrated specimen is broken into two parts. One of these fragments consists of the apex including the well-preserved protoconch and several teleoconch whorls; the other fragment comprises *c.* 4 teleoconch whorls. The height of the apex is 21.0 mm and the width 7.3 mm, the height of the other fragment is 20.2 mm, the width 9.2 mm. The material suggests a total height of *c.* 40 mm and a width of *c.* 10 mm. Grönwall & Harder based their species on two incomplete specimens without the

protoconch and the material from Gundstrup allows an amended description. The protoconch consists of *c*. five convex whorls, separated by a deep suture. On the two last whorls, there are about 15 slightly opisthocline axial riblets and weak spiral ribs above the abapical suture. The transition into the teleoconch is gradual and indicated by the appearence of distinct spiral ribs. There are four primary spiral ribs, of which the spiral ribs number one and four are the weakest. Spiral ribs number two and three are more widely spaced. A fifth spiral rib is more or less covered by the following whorl. The spiral ribs are wider than their interspaces on the first teleoconch whorl, later of almost the same width as their interspaces. On the fourth teleoconch whorl a weaker secondary spiral rib is inserted between spiral ribs number two and three, and on the following whorls secondary spiral ribs are inserted between all spiral ribs. The spiral ribs and interspaces are of varying width and strength on the last whorls. The number of axial ribs is *c.* 15 and increases to 20 on the last whorls. The ribs are opisthocline and narrower than their interspaces. Rounded knobs occur at the intersections with the spiral ribs. On the last teleoconch whorls the axial ribs are disintegrated into rows of knobs, which are strongest in spiral direction. The axial ribs run from the adapical suture onward and are absent below the fourth primary spiral rib. The aperture is not completely preserved and the canal is short and turned to the left. The columella has a weak fold.

Discussion – We assign the species to *Ataxocerithium* because of the protoconch, which matches the description by Nützel (1998, p. 18). The protoconch and first teleoconch whorls are close to *Ataxocerithium* sp. 1 from the Danian of Faxe (Lauridsen & Schnetler 2014, p. 46, fig. 28). This species has more prominent axial ribs and a subsutural band, but the protoconch is rather similar. The two species seem to be closely related.

?*Ataxocerithium exsculptum* (Grönwall & Harder, 1907)
Plate 5, fig. 19

1907 *Cerithium exsculptum* Grönwall & Harder, p. 45, pl. 1, fig. 34

Description – The only specimen has 11 teleoconch whorls preserved. The shell is slender turriculate with a height/width ratio of 2.5. The protoconch is worn and consists of *c.* three convex whorls, separated by a deep suture. The teleoconch whorls are slightly convex and separated by a deep, slightly undulating suture. The columella and aperture are only partly preserved. The columella is straight and has a weak fold, and the aperture seems to have been rather small and rounded rectangular. The spiral ornament consists of three primary spiral ribs, which are much narrower than their interspaces. The two abapical spiral ribs are stronger than the adapical spiral rib, which is situated below the adapical suture. The adapical of the two stronger spiral ribs is situated at almost mid-whorl. The spiral ribs are situated in almost equal distances. After two medium whorls secondary spiral ribs are inserted between the two adapical spiral ribs and between the adapical spiral rib and the abapical suture. The adapical strong spiral rib projects a little more that the other spiral ribs and forms a carina. A weak spiral rib demarcating the base is only visible on last whorl. The base is not well preserved; it is slightly convex and bears two indistinct spirals. The axial sculpture consists of *c.* 20 ribs, which are almost orthocline and much narrower than their interspaces. On the body whorl their number increases to 25 and the ribs become slightly opisthocyrt. Small rounded knobs occur at the intersections with the spirals. The axial ribs and the spiral ornament are of almost the same strength and form a reticulate pattern of rectangles.

Discussion – Grönwall & Harder (1907) based their description and illustration on an incomplete specimen, consisting of four medium whorls. However, the present specimen matches the description of the general outline and sculpture well. The assignment to *Ataxocerithium* is a little tentative because the protoconch and aperture are not well preserved. *Ataxocerithium faxensis* (Ravn, 1933) from the Danian of Faxe (Lauridsen & Schnetler 2014, p. 46, figs 27A, B) seems to be related, but has coarser axial ribs and spirals.

Superfamily Vanikoroidea Gray, 1840
Family Eulimidae Philippi, 1853
Genus *Eulima* Risso, 1826

Type species (by subsequent designation) – *Turbo subulatus* Donovan, 1804, accepted as *Eulima glabra* (da Costa, 1778).

***Eulima solidula* von Koenen, 1885**
Plate 4, fig. 19

1885 *Eulima solidula* von Koenen, p. 54, pl. 3, figs 6a-b.
1897 *Eulima solidula* von Koenen – Grönwall, p. 67.
1904 *Eulima solidula* von Koenen – Grönwall, p. 34.
1939 *Eulima solidula* von Koenen – Ravn, p. 66, pl. 2, figs 12a-b.

Material – Only the illustrated specimen is known.

Description – The illustrated incomplete specimen has eight whorls preserved but lacks the aperture. The shell is highly turriculate and slender with slightly convex to almost flat whorls separated by a distinct suture. Below the suture there is a weak subsutural band and a slight depression. There is no further spiral ornament. The shell is smooth, except for weak growth lines, which are prosocline under the suture, almost orthocline across the depression and opisthocline abapically.

Discussion – The rather poorly preserved specimen

matches the descriptions and illustrations by von Koenen (1885) and Ravn (1939) rather well with regards to outline, the weak subsutural band and the slight depression.

Superorder Latrogastropoda
Superfamily Cypraeoidea Rafinesque, 1815
Family Cypraeidae Rafinesque, 1815
Subfamily Gisortiinae Schilder, 1927
Genus *Palaeocypraea* Schilder, 1928

Type species (by subsequent designation) – *Cypraeacites spirata* von Schlotheim, 1820.

***Palaeocypraea* cf. *suecica* Schilder, 1928**
Plate 4, fig. 3

1928 *Palaeocypraea suecica* Schilder, p. 22; figs 16-18.
1933 *Palaeocypraea suecica* Schilder – Ravn, p. 58.

Material – Only the illustrated specimen is known. It is preserved as an impression of the apertural side, which facilitated the production of a silicone rubber cast.

Description – The shell is stretched pyriform with a height of 21.6 mm and a width of 18.4 mm. The base is smooth and the aperture is long, narrow and curved. At the columellar side of the anterior end the terminal ridge and three anterior columellar teeth are preserved, and on the anterior end of the labrum *c.* 10 teeth are visible, of which the four anterior ones continue on the labrum. On the posterior end of the labrum five weak teeth are visible. The middle part of the labrum has no teeth. On the posterior end of the base three weak folds are visible.

Remarks – Schilder (1928) based his species on internal moulds only.

Family Ovulidae Fleming, 1822
Subfamily Ovulinae Fleming, 1822
Subfamily Eocypraeinae Schilder, 1924
Genus *Eocypraea* Cossmann, 1903

Type species (by original designation) – *Cypraea inflata* Lamarck, 1802.

***Eocypraea* sp.**
Plate 4, figs 2a-b

Material – Only the illustrated specimen is known. It is preserved as internal mould and the impression of the apertural side, of which a silicone rubber cast was made.

Description – The shell is subglobular with a height of 20.2 mm and a width of 15.1 mm. The shell is involute and the aperture is narrow in the middle part, but widenes to the anterior and posterior. Especially the posterior margin of the aperture is projecting. The cast shows faint suggestions of teeth on the labrum. The base has about 16 very fine spirals and weaker secondary spirals inserted, which together with the fine axial ribs result in a cancellate pattern.

Discussion – In general outline the specimen matches *Eocypraea*. Fehse (pers. comm., 2016) suggested a relationship to the species *Eocypraea zsigmondgyana* (Pethö, 1906) from the Maastrichtian (Upper Cretaceous) of Slovenia.

Superfamily Ficoidea Meek, 1864
Family Ficidae Meek, 1864
Genus *Priscoficus* Conrad, 1866

Type species (by subsequent designation) – *Ficus (Priscoficus) intermedius* Melleville, 1843.

***Priscoficus* sp.**
Plate 4, fig. 4

Material – Only one specimen is known. It consists of the impression of one side of two teleoconch whorls.

Description – The incomplete specimen has two teleoconch whorls, of which the first is slightly convex, while the second is strongly convex and angulated by three knob-bearing spiral ribs. The whorls are separated by a deep suture. The spiral ornament consists of numerous fine spiral ribs, separated by narrower interspaces. There are three prominent keels, of which the adapical demarcates a flat subsutural ramp. Between this spiral keel and the following spiral keel the whorl face is flat to slightly concave and parallel to the shell axis. The third spiral is weaker, bears no knobs and demarcates the flat base. The axial ribs are considerably wider than their interspaces and run from the adapical spiral keel to the abapical spiral keel. There are 12 slightly opisthocline axial ribs on each whorl that are particularly prominent on the adapical spiral keel and in between the two strong spiral keels.

Discussion – The incomplete specimen is assigned to the genus *Priscoficus* because of the apparently rather projecting apex and the coarse knobs on the spirals. In his study of the English Eocene Ficidae Wrigley (1929, p. 249) discussed the proposed generic and subgeneric names for fossil representatives of the Ficidae but used the genus *Ficus* throughout in his paper. Wenz (1940, p. 1079-1080) considered *Priscoficus* a subgenus of *Ficus* Röding, 1798 and *Fulguroficus* Sacco, 1890 a subgenus of *Ficopsis* Conrad, 1866. In his treatment of the Ficidae Squires (2014) stated that *Ficopsis* is a junior synonym of *Ficus* and *Fulguroficus* a junior synonym of *Priscoficus*. In his study, he discussed the two genera *Urosyca* Gabb, 1869 and *Priscoficus*, which are the only Palaeocene representatives of the Ficidae. *Urosyca* is known from the middle to late Palaeocene of California, northern Baja

California, Mexico and Australia. *Priscoficus* is a widespread genus with a stratigraphical range from the late early Palaeocene to the late Eocene, with an early Miocene species as relict in Western Europe (Squires, 2014).

Superfamily Stromboidea Rafinesque, 1815
Family Aporrhaidae Gray, 1850
Subfamily Aporrhainae Gray, 1850
Genus *Aporrhais* da Costa, 1778

Type species (by monotypy) – *Aporrhais quadrifidus* da Costa, 1778 accepted as *Aporrhais pespelecani* (Linnaeus, 1758).

***Aporrhais gracilis* von Koenen, 1885**
Plate 5, figs 1-2

1885 *Aporrhais gracilis* von Koenen, p. 59, pl. 2, fig. 20.
1897 *Aporrhais gracilis* von Koenen – Grönwall, p. 67.
1904 *Aporrhais gracilis* von Koenen – Grönwall, p. 34.
1904 *Chenopus? gracilis* (von Koenen, 1885) – Cossmann, p. 55.
1907 *Aporrhais gracilis* (von Koenen, 1885) – Grönwall & Harder, p. 50, 64, pl. 1, fig. 36.
1920b *Aporrhais gracilis* (von Koenen, 1885) – Rosenkrantz, p. 8.
1937 *Chenopus gracilis* (von Koenen) – Roedel, p. 197, pl. 1, fig. 5.
1939 *Chenopus gracilis* (von Koenen, 1885) – Ravn, p. 72, pl. 2, figs 30a-b, 31a-b.
1963 *Arrhoges montensis* Vincent – Krach, p. 100, pl. 9, fig. 9; pl. 21, figs 14, 15.
1977 *Aporrhais gracilis* (Koenen, 1885) – Anderson, p. 200, Abb. 7.
1981 *Arrhoges gracilis* (Koenen, 1885) – Krach, p. 55, pl. 13, figs 11-13.

Other material – 21 specimens (impressions MNO, casts MNO and ISL).

Description – The specimens match the descriptions by von Koenen and Ravn. One specimen has the digitation rather well preserved. It is extended to the middle of the penultimate whorl and is rather short. The height of largest specimen is 14.2 mm, the width 9.5 mm (width the digitation). The species is abundant in the Selandian Lellinge Greensand of Copenhagen, but all specimens are incomplete.

Remarks – According to Bouchet (2015) *Chenopus* Philippi, 1836 is a junior synonym of *Aporrhais* da Costa, 1778.

Genus *Drepanocheilus* Meek, 1864

Type species (by original designation) – *Rostellaria americanum* Evans & Shumard, 1857.

Subgenus *Drepanocheilus* Meek, 1864

***Drepanocheilus (Drepanocheilus) koeneni* (Grönwall & Harder, 1907)**
Plate 5, figs 5a-b

1885 *Aporrhais* aff. *Sowerbyi* Mant.? – von Koenen, p. 59 [*partim*].
1907 *Aporrhais Koeneni* Grönwall & Harder, p. 51, pl. 1, fig. 37.
1937 *Chenopus koeneni* (Grönwall) – Roedel, p. 199, pl. 1, fig. 6.
1939 *Chenopus koeneni* (Grönwall) – Ravn, p. 73.

Other material – Four specimens (impressions MNO, casts MNO and ISL).

Description – The shell has a highly turriculate apex and convex whorls with an ornament of numerous spirals. On the penultimate whorl, there is a rather weak spiral keel, and on the rear side of the digitation there are two distinct keels, the adapical of which continues as the finger. There are *c.* 25 opisthocline axial ribs of almost the same width as their interspaces; they disappear on the rear side of the digitation. The adapical process has an internal canal. The aperture is rather wide and the rostrum is short and straight.

Discussion – This species is rather similar to the type species of *Drepanocheilus* and differs mainly by having a weak angulation on the penultimate whorl. *Drepanocheilus* is represented by several Cretaceous species. The common Oligocene species *Aporrhais speciosa* (von Schlotheim, 1820) has often been referred to this genus (*e.g.* R. Janssen, 1978). According to Wieneke (pers. comm., 2016) *Drepanocheilus* has a simple digitation with only one finger, whereas the Oligocene *speciosa* has two fingers with a ventral canal and thus should be assigned to *Aporrhais*. *Drepanocheilus koeneni* from the Danish Palaeocene is the first European record for the genus.

Remarks – In von Koenen's description of *Aporrhais* aff. *sowerbyi* (1885) he mentioned some fragments of a smaller form but did not separate them from that species. Grönwall & Harder (1907), Roedel (1937) and Ravn (1939) interpreted von Koenen's material of *Aporrhais* aff. *sowerbyi* as representing two species.

Genus *Quadrinervus* Cossmann, 1904

Type species (by subsequent designation) – *Pterocera ornata* Buvignier, 1852 from the Late Jurassic of France (Cossmann, 1904: pl. 5, fig. 11).

***Qudarinervus wienekei* nov. sp.**
Plate 5, figs 3-4; Plate 9, fig. 3

1885 *Aporrhais* aff. *Sowerbyi* Mant.? – von Koenen, p. 59 [*partim*], p. 58, pl. 3, fig. 13a-b.
1897 *Aporrhais* aff. *Sowerbyi* Mant.? – Grönwall, p. 67.
1939 *Chenopus?* aff. *Sowerbyi* Mant.? – Ravn, p. 73.

Type material – Holotype Plate 5, fig. 4, MGUH 31941. Paratypes Plate 5, fig. 3, MGUH 31940; Plate 9, fig. 3, MGUH 32018.

Other material – 30 specimens (impressions MNO, casts MNO and ISL).

Etymology – This species is named after Ulrich Wieneke, Murnau, Germany.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A *Quadrinervus* with *c.* 12 coarse knobs on the first spiral rib of the penultimate whorl. On the rear side of the body whorl two further knob-bearing spiral rib ribs are situated below this rib. The posterior spine is attached to the apex and the two adapical knob-bearing spiral ribs continue as the second and third spines. The fourth spine is indistinct. The rostrum is short and slightly turned to the right.

Description – The illustrated specimen has six teleoconch whorls and a poorly preserved protoconch. The whorls are medium convex and separated by a distinct suture. There are *c.* 10 spiral ribs on the first teleoconch whorl and secondary weaker spiral ribs are inserted. There are *c.* 12 axial folds and on the penultimate whorl, and weak oblong knobs occur on the middle of the whorl. On the body whorl the number of knobs decreases to *c.* 10 and they increase considerably in strength. There are four spiral ribs in decreasing strength adapically on the rear side of the digitation. The adapical process is attached to the entire spire. Spiral rib number two with the strongest knobs continues as the second process, which is the most prominent, and spiral rib number three continues as the third process, which is weaker than the second process. Spiral rib number four is indistinct but is presumed to continue as the fourth process. Between the processes there are numerous fine spirals. The rostrum is short, slightly turned to the right and not projecting anteriorly. A specimen with the shell partly preserved (Plate 9, fig. 3) shows the aperture and the interior of the digitation. The two medium fingers have a canal on the interior side and between the fingers there are numerous fine spiral threads.

Discussion – The material, described and illustrated by von Koenen (1885), consists of incomplete specimens. The new species is assigned to *Quadrinervus* because of the three knob-bearing spiral ribs, which continue as carinas on the digitation. The continuation of the abapical spiral rib on the digitation is indistinct. The new species differs from most species of *Quadrinervus* by the coarse knobs on the spirals. *'Aporrhais' limburgensis* (Binkhorst, 1861) from the Maastrichtian of Limburg has three rows of weak knobs on the spiral ribs and is probably a *Quadrinervus* (Wieneke, pers. comm., 2016). *Quadrinervus carinatus* (Delpey, 1939) from the Late Cretaceous of Austria has rather coarse knobs on the rear side of the body whorl, but the digitations have an acute projecting end. The new species is the first post-Mesozoic record of *Quadrinervus*.

Subfamily Anchurinae Kollmann, 2009
Genus *Kangilioptera* Rosenkrantz, 1970

Type species (by original designation) – *Anchura (Kangilioptera) ravni* Rosenkrantz, 1970.

***Kangilioptera gundstrupensis* nov. sp.**
Plate 5, figs 6a-b, 7

Type material – Holotype Plate 5, figs 6a-b, MGUH 31943. Paratypes Plate 5, fig. 7, MGUH 31944; Plate 9, fig. 4, MGUH 32063.

Other material – 35 specimens (impressions MNO, casts MNO and ISL); two specimens (internal mould and impression ISL).

Etymology – This species is named after the type locality.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A *Kangilioptera* with one distinct spiral rib under the keel, which is sharp, projecting and bearing very fine knobs. The rostrum is rather short when compared with the type species of the genus.

Description – The best specimen (holotype) has the protoconch and six teleoconch whorls preserved. The protoconch is naticoid and consists of *c.* two convex whorls, which are separated by a distinct suture. The teleoconch whorls are moderately to rather strongly convex and separated by a distinct suture. A carina is present on the penultimate and the body whorl, dividing the whorl in an adapical slightly convex to slightly concave ramp and an almost straight abapical part. The spiral ornament consists of numerous fine spiral ribs of varying strength with finer secondary spiral ribs inserted. On the third teleoconch whorl there are *c.* 12 fine spiral ribs, and on the penultimate whorl there are *c.* 20, including the secondary spiral ribs. On the penultimate whorl a sharp and projecting carina appears on the middle of the whorl and it continues onto the body whorl as the posterior edge of

the digitation, which is sharp and slender and projecting upwards. At the same time the spiral ribs become slightly weaker. One further rather sharp spiral rib is situated below the carina. Between the carina and this spiral rib there are *c.* 10 fine spiral ribs. The neck of the canal has *c.* 12 fine spiral ribs of varying strength. The axial sculpture consists of opisthocline ribs, separated by narrower interspaces. They terminate at the middle of the adapical part of the whole face. Their number is *c.* 40 on the third teleoconch whorl and on the penultimate whorl the number decreases to *c.* 20. They fade out and are completely absent on the body whorl and the neck of the wing. The aperture is rather narrow and ovate, about one fourth of the total height. The outer lip bears one digitation, which is the continuation of the carina, strongly incurved and pointed upwards. There is a deep furrow on the inner side of the wing. The anterior edge forms a thick, prominent lobe that is broken off all specimens except the two paratypes.

Discussion – *Kangilioptera* is characterized by one posterior labral digitation extending from the uppermost keel of the body whorl, a lobe at the anterior edge of the wing, three keels on the body whorl and many axial ribs on the spire whorls. *Drepanocheilus* Meek, 1864 is rather similar to this genus, but differs from *Kangilioptera* in having no projection at the anterior edge of the wing (see Kiel & Bandel, 2002). *Anchura* Conrad, 1860 is another genus similar to *Kangilioptera* that differs by having only one keel, some axial ribs on the body whorl and no anterior lobe on the wing. *Struthioptera* Finlay & Marwick, 1937, belonging to Struthiopterinae Zinsmeister & Griffin, 1995, is somewhat similar to *Kangilioptera* in having one wing, some axial ribs and many fine spiral striations. However, *Struthioptera* differs from *Kangilioptera* by having two keels, some axial ribs on the body whorl and no anterior lobe on the wing (see also Stilwell, 1993). Rosenkrantz (1970, p. 431) established *Kangilioptera* as a subgenus to *Anchura* Conrad, 1860, with *Kangilioptera ravni* (Rosenkrantz, 1970) as the type species. The new species differs from the type species by having only one distinct spiral under the keel, while the type species has two. The keel on the new species has very fine knobs, whereas the type species has coarser knobs. Furthermore, the new species has a much sharper and more projecting keel. The new species has a higher number of axial ribs (*c.* 40 instead of *c.* 30). *Kangilioptera ravni* furthermore has a slenderer apex and a longer rostrum. Amano & Jenkins (2014) established *Kangilioptera inouei* from the Palaeocene Katsuhira Formation in Urahoro Town, eastern Hokkaido, Japan. This species differs from *Kangilioptera gundstrupensis* nov. sp. by having more opisthocline axial ribs, a deeper sinus of the growth lines above the adapical keel and a stronger anterior keel.

Superfamily Tonnoidea Suter, 1913 (1825)
Family Cassidae Latreille, 1825
Genus *Galeodea* Link, 1807

Type species (by subsequent designation) – *Buccinum echinophorum* Linnaeus, 1758.

***Galeodea elongata* (von Koenen, 1885)**
Plate 4, figs 11-12

1885	*Cassidaria? elongata* von Koenen, p. 22, pl. 1, fig. 21.
1897	*Cassidaria elongata* von Koenen – Grönwall, p. 66.
1907	*Cassidaria elongata* von Koenen – Grönwall & Harder, p. 64.
1920b	*Cassidaria elongata* von Koenen – Rosenkrantz, p. 8.
1939	*Cassidaria elongata* von Koenen – Ravn, p. 74.
1981	*Cassidaria elongata* Koenen, 1885 – Krach, p. 57, pl. 21, figs 5-6.

Other material – Eight specimens (impressions MNO, casts MNO and ISL).

Remarks – According to Bouchet (2011a) *Cassidaria* Lamarck, 1816 is a junior objective synonym of *Galeodea*.

Family Ranellidae Gray, 1854
Subfamily Ranellinae Gray, 1854
Genus *Trachytriton* Meek, 1864

Type species (by subsequent designation) – *Buccinum vinculum* Hall & Meek, 1856.

***Trachytriton eliseae* nov. sp.**
Plate 4, figs 8a-b

Type material – Holotype Plate 4, figs 8a-b, MGUH 31926.

Material – Only the holotype is known.

Etymology – This species is named after Elise Kofoed Schnetler, granddaughter of the senior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large *Trachytriton* with moderately convex whorls and five primary spiral ribs. The number of spiral ribs on the penultimate whorl is *c.* 25. The primary spiral ribs remain the strongest throughout the teleoconch. There are *c.* 30 axial ribs per whorl that are orthocline to slightly prosocline. The axial ribs gradually fade out on the body whorl. There are weak varices at varying distances from each other.

Description – The shell is fusiform and large with an es-

timated height of *c.* 50 mm and a width of 25 mm. The body whorl equals more than two third of the estimated height. The whorls are medium convex and separated by a distinct suture. About five whorls and the main part of the body whorl are preserved. The protoconch and the first teleoconch whorl are worn. There are five primary spirals ribs, which are weaker than their interspaces. Secondary spiral ribs are inserted from the second teleoconch whorl onward and later a next generation of intermediate spiral ribs. Thus, the number of spiral ribs on the penultimate whorl is *c.* 25; the primary spiral ribs remain the strongest. The body whorl and the neck of the canal have a similar spiral ornament. There are *c.* 30 axial ribs that are orthocline to slightly prosocline. They are stronger than their interspaces and cause knobs on the spirals, especially on the primary ones. The knobs are elongate along the spirals. The axial ribs gradually fade out on the body whorl. There are weak varices at varying distances from each other. The aperture is not preserved but judging from the preserved part of the body whorl it was rather large and narrow. The end of the short siphonal canal is preserved, but labrum and columella could not be studied.

Discussion – In general outline and sculpture the new species is rather similar to *Trachytriton vinculum* (Hall & Meek, 1856), the type species of the genus, from the late Campanian-early Maastrichtian of Colorado, Montana, South Dakota and Wyoming, USA (Wenz 1941, p. 1057, fig. 3021). This species, however, has higher whorls with coarser spirals and slightly opisthocline axial ribs.

A presumed representative of *Trachytriton* has been encountered in the Maastrichtian of Rørdal, Aalborg, Jylland. This specimen is housed in the Danekræ Collection as DK 908. The specimen is incomplete, but the general outline, the spiral ornament and the axial sculpture suggest that the species from the Danish Maastrichtian and *Trachytriton eliseae* nov. sp. are closely related.

Family Cymatiidae Iredale, 1913 (1854)
Subfamily Cymatiinae Iredale, 1913 (1854)
Genus *Sassia* Bellardi, 1873

Type species (by subsequent designation) – *Triton apenninicum* Sassi, 1827, accepted as *Sassia apenninnica* (Sassi, 1827).

***Sassia bjerringi* (Ravn, 1939)**
Plate 4, figs 9-10; Plate 9, fig. 8

1939 *Tritonium (Sassia) Bjerringi* Ravn, p. 74, pl. 3, figs 1a-b.

Other material – 16 specimens (impressions MNO, casts MNO and ISL).

Discussion – The specimens show some variation, especially in being more or less slender, but they all match the description given by Ravn (1939) with regard to protoconch, spiral ornament, axial ribs and apertural characters.

Family Xenophoridae Troschel, 1852 (1840)
Genus *Xenophora* Fischer von Waldheim, 1807

Type species (by original designation) – *Xenophora laevigata* Fischer von Waldheim, 1807.

***Xenophora* sp.**
Plate 5, figs 8a-c

Other material – One specimen (impression MNO, casts MNO and ISL).

Description – The illustrated specimen has a height of 12 mm and a width of 23.5 mm. The height/width ratio is 0.5 and the apical angle is *c.* 90°. The shell is slightly deformed and has impressions of fragments of bivalve shells on the whorls. There are opisthocyrt growth-lines on the slightly concave base.

Remarks – The rather poor specimens exclude a further identification.

Clade Neogastropoda Wenz, 1938
Superfamily Pholidotomoidea Cossmann, 1896
Family Pholidotomidae Cossmann, 1896
Subfamily Volutodermatinae Pilsbry & Olsson, 1954
Genus *Volutoderma* Gabb, 1877

Type species (by subsequent designation) – *Fusus averillii* Gabb, 1864 accepted as *Volutoderma averillii* (Gabb, 1864).

***Volutoderma flexiplicata* (von Koenen, 1885)**
Plate 6, figs 16-17

1885 *Voluta flexiplicata* von Koenen, p. 42, pl. 2, fig. 12.

Other material – Five specimens (impressions MNO, casts MNO and ISL).

Discussion – The present authors assign this species to *Volutoderma* because of the general outline and sculpture, which come close to *Volutoderma bronni* (Zekeli, 1852) from the upper Cretaceous of Gosau (see Wenz, p. 1313, fig. 3738). The species was not mentioned by Ravn (1939). The illustrated specimens differ by the number and fading out of the axial ribs (fig. 16). However, the specimen on fig. 17 is much flattened due to compaction, causing a greater width and a higher number of axial ribs. The outline and sculpture match the description and illustrations by von Koenen (1885).

Family Sarganidae Stephenson, 1923
Superfamily Pyrifusoidea Bandel & Dockery, 2001
Family Pyropsidae Stephenson, 1941
Genus *Pyropsis* Conrad, 1860

Type species (by original designation) – *Tudicla (Pyropsis) perlata* Conrad, 1860.

Remarks – Squires (2011) gave a critical review of the global record of the genus *Pyropsis* and concluded that the genus had an amphitropical distribution in warm temperate waters adjacent to a broad tropical realm. Wherever found it is rare to uncommon and has a geologic range from the middle Cenomanian to probably the earliest Palaeocene. It was moderately widespread before the Maastrichtian but during the Maastrichtian it was predominantly restricted to the New World. From the European Cretaceous the species *Pyropsis quadricarinata* (J. Müller, 1859) (early Campanian, Germany) and *Pyropsis filamentosa* (Binkhorst, 1861) (Maastrichtian, The Netherlands) have been described. Neither of these are closely related to the two Danish species, which thus are the youngest known European representatives of an almost exclusively Cretaceous genus.

***Pyropsis jakobseni* nov. sp.**
Plate 7, figs 6a-b

Holotype – Plate 7, figs 6a-b, MGUH 31985.

Material – Only the holotype is known.

Etymology – This species is named after Sten Lennart Jakobsen, Geological Museum of Copenhagen.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A *Pyropsis* with a slightly elevated spire, convex whorls without nodular angulations, spiral ribs and axial sculpture gradually fading out and a presumably long and narrow canal.

Description – The only specimen is incomplete and has well-preserved protoconch, teleoconch whorls and aperture. The anterior part of the siphonal canal is broken off. The shell is large and pyriform with a heigth of 17.5 mm (estimated height *c.* 28 mm) and a width of 16.1 mm. The protoconch consists of *c.* 1.5 smooth and convex whorls that rapidly increase in diameter and are separated by a distinct suture. The nucleus is small. The transition to the teleoconch is gradual, marked by the appearance of the spiral ornament. Almost four teleoconch whorls are present, which are slightly to moderately convex, separated by a deep to slightly canaliculated suture. The body whorl equals 0.8 of the estimated total shell height, the aperture and canal *c.* 0.7. The body whorl is slightly deformed by compaction. The anterior part of the canal is broken off. The aperture is broadly ovate and constricted into the narrow canal. The basal constriction into the canal is abrupt. The labrum is thickened and prosocline in lateral view and the columella is almost straight and covered by a thick and well-defined callus, which is separated from the umbilical wall by a narrow and deep furrow. The canal is slightly turned to the left. The spiral ornament consists of nine fine primary spiral ribs, which are of almost equal strength and separated by interspaces of the same width. On the last two whorls, the spiral ornament gradually weakens and secondary spiral ribs are inserted. Weak spiral ribs are visible on the base and the neck of the canal. On the first teleoconch whorl there are *c.* 24 slightly prosocline axial folds, but on the following whorls they gradually fade out.

Discussion – The new species differs from other species of *Pyropsis* by having a relatively higher spire and weak spiral ornamentation and axial sculpture. The aperture and canal characters, however, match the genus *Pyropsis*. No known species closely resembles *Pyropsis jakobseni*.

***Pyropsis pacaudi* nov. sp.**
Plate 7, figs 7a-b

Holotype – Plate 7, figs 7a-b, MGUH 31986.

Etymology – This species is named after Jean-Michel Pacaud, Paris.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A large *Pyropsis* with tricarinate body whorl, rather distinct spiral ribs and a slightly elevated spire. Weak subsutural welt and slightly convex to straight ramp. Narrow furrow between callus and columella.

Other material – Seven specimens (impressions MNO, casts MNO and ISL).

Description – The shell is large (a fragment suggests an estimated height up to 70 mm) and pyriform. The spire is slightly elevated and conical; apical angle *c.* 80°. The protoconch has 1.5 smooth whorls and a large nucleus. The transition to the teleoconch is gradual and indicated by the appearance of six fine spirals, the adapical of which demarcates a narrow ramp. On the holotype the teleoconch consists of *c.* 2.5 whorls. The whorls are convex, carinated and separated by a distinct, slightly canaliculated suture with moderately weak subsutural welt. The body whorl is tricarinate and equals 0.75 of the total shell height. The aperture is ovate and wide and gradually constricted into a moderately long canal, which is slightly

turned to the left. The outer lip is angulated at the carinate shoulder. The inner lip has a callus. The callus on the parietal lip extends over the sculpture on the adjacent part of the last whorl. The columella is smooth, and the umbilical furrow is narrow. The spiral ornament consists of six primary spiral ribs, the abapical three being the strongest. From the third teleoconch whorl onward, spiral number four (counted in abapical direction) is strongest and forms a carina. It is situated near the middle of the whorl. On the ramp, spiral ribs number two and three are the strongest. Weaker secondary spiral ribs are inserted. On the penultimate whorl there are eight or nine moderately weak spiral ribs on the ramp and five secondary spiral ribs below the carina. The spiral ribs run undulating across the axial ribs. The base and the neck of the canal are covered with numerous spiral ribs. There are *c*. 20 fold-like axial ribs per whorls. The ribs are slightly prosocline on the adapical part of the whorl and orthocline on the abapical part. At the intersections with the spirals there are oblong knobs with a spiral orientation. On the intermediate whorls only two knob-bearing spiral ribs are visible. On the body whorl and the base there are three rows of knobs. Growth lines are almost invisible. Varices are visible with an interval of about half a whorl.

Discussion – The new species differs from *P. californica* Squires, 2011 from the Cretaceous (Coniacian) of northern California by having a very weak welt below the suture and a smaller apical angle of the spire. *Pyropsis zinsmeisteri* Stilwell, 1993 from the early Palaeocene (Wangaloa Formation) of New Zealand has only two rows of knobs on the body whorl and only 15 knobs on each whorl. *Siphonalia* sp. from the Palaeocene of Nuussuaq, West Greenland (Kollmann & Peel, 1983, p. 71, figs 149A, B) seems to be a *Pyropsis* that is closely related to *Pyropsis pacaudi* nov. sp. It differs mainly by having a lower number of knobs and a more distinct demarcation of the callus on the inner lip.

Superfamily Volutoidea Rafinesque, 1815
Family Volutidae Rafinesque, 1815
Subfamily Athletinae Pilsbry & Olsson, 1954
Genus *Athleta* Conrad, 1853

Type species (by subsequent designation) – *Voluta rarispina* Lamarck, 1811.

Subgenus *Volutocorbis* Dall, 1890

Type species (by original designation) – *Volutilithes limopsis* Conrad, 1860.

***Athleta (Volutocorbis) nodifera* (von Koenen, 1885)**
Plate 6, fig. 18

1885 *Voluta nodifera* von Koenen, p. 40, pl. 2, fig. 10.
1897 *Voluta nodifera* von Koenen – Grönwall, p. 66.
1899 *Volutilithes nodifera* (von Koenen) – Cossmann, p. 137.
1904 *Voluta nodifera* von Koenen – Grönwall, p. 34.
1920b *Voluta nodifera* von Koenen – Rosenkrantz, p. 8.
1938 *Volutilithes nodifera* (von Koenen) – Traub, p. 91, pl. 8, figs 2a-b.
1939 *Volutilithes nodifera* (von Koenen) – Ravn, p. 83.
1972 *Athleta nodifera* (Koenen, 1885) – Anderson, p. 152, pl. 1, figs 10-12.
1975 *Volutocorbis (Volutocorbis) nodifera* (Koenen, 1885) – Anderson, p. 153.

Other material – One specimen and a fragment (impressions MNO, casts MNO and ISL).

Discussion – In general outline and sculpture the species matches the subgenus *Volutocorbis* (Wenz, 1943, p. 1318, fig. 3748) better than the genus *Volutilithes* Swainson, 1829 (see Wenz, 1943, p. 1328, fig. 3772).

***Athleta nikolaji* nov. sp.**
Plate 6, figs 19-20

Type material – Holotype Plate 6, fig. 17, MGUH 31978. Paratype Plate 6, fig. 18, MGUH 31979.

Other material – Four specimens (impressions MNO, casts MNO and ISL).

Etymology – This species is named after Nikolaj Stentoft Guldager, grandson of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A rather large and slender *Athleta* with three oblique folds on the columella, a subsutural band and 16 axial folds on the first teleoconch whorl, increasing to about 40 on the last whorl. The aperture is about half of the total shell-height.

Description – The shell is large and subfusiform. The height equals 2.4-2.7 times the width, the body whorl equals 2/3 of the total shell-height. The aperture and the canal equal almost half the total shell-height. On all specimens available the protoconch is poorly preserved. It is conical with about three convex whorls. The transition to the teleoconch appears to be gradual. The holotype, the largest specimen known, consists of six teleoconch whorls, which are moderately convex and separated by deep, almost canaliculate sutures. The adapical spiral rib is developed as a subsutural band. On the initial teleoconch whorls the spiral ornamentation consists of three primary ribs, which are almost hair-like. In a depression below the adapical suture a further spiral rib soon occurs, and this rib is separated from the following rib by

a deeper spiral furrow. It soon becomes more prominent than the other spiral ribs and forms a subsutural band. On the following teleoconch whorls the number of spiral ribs increases to five. A further spiral rib is situated immediately above the abapical suture. The strength of the spirals and the width of their interspaces decrease abapically. The base and the neck of the canal have a similar ornamentation. On the abapical part of the neck of the canal the spiral ribs gradually disappear. The axial sculpture consists of orthocline to opisthocyrt folds, which are of almost the same strength as their interspaces. On the first teleoconch whorl 16 axial folds are present, and on the body whorl the number increases to about 40. At the intersections between the axial sculpture and the spiral ornamentation small knobs occur, most prominently on the adapical spiral and decreasing in strength abapically. On the base the axial sculpture gradually disappears, and thus the abapical weak spiral ribs have no knobs. The specimens available allow no detailed description of the aperture and labrum. The aperture is long (about half of the total shell-height) and narrow. The columella is straight and bears three oblique folds situated at about half of the height of the aperture. The callus is thin, and the canal is slightly turned to the left.

Discussion – *Athleta (Volutocorbis)nodifera* (von Koenen, 1885) has a less slender outline and a much stronger sculpture. The number of spiral ribs is four on the intermediate whorls, and these spiral ribs are much stronger. The number of axial ribs is only 20 on the last whorl, and because these ribs are also strong, the knobs at the intersections between the axial sculpture and the spirals are much coarser. Several species from the Eocene of the Paris Basin are superficially similar to the new species. *Volutocorbis digitalina* (Lamarck, 1810) has a lower apex and a shorter canal and is less slender (height/width ratio *c.* 2), with only two stronger spiral ribs on the intermediate whorls. This species also has a lower number of radial ribs. *Volutocorbis crenulifera* (Bayan, 1870) has a lower apex, a lower number of spiral ribs on the intermediate whorls (four) and is less slender (height/width ratio 1.8). *Volutocorbis elevata* (Sowerby, 1840) is less slender (height/width ratio 2.0) and has six spirals on the intermediate whorls, but only 14 axial ribs on the last whorl, whereas the columella only has one fold.

Subfamily Scaphellinae Gray, 1857
Genus *Euroscaphella* Van Dingenen, Ceulemans & Landau, 2014

Type species (by original designation) – *Voluta lamberti* J. Sowerby, 1816.

***Euroscaphella crenistria* (von Koenen, 1885)**
Plate 7, fig. 1

1885 *Voluta crenistria* von Koenen, p. 39, pl. 2, fig. 11.
1897 *Voluta crenistria* von Koenen – Grönwall, p. 66.
1899 *Scaphella crenistria* (von Koenen) – Cossmann, p. 177.
1904 *Voluta crenistria* von Koenen – Grönwall, p. 34.
1920b *Voluta crenistria* von Koenen – Rosenkrantz, p. 8.
1939 *Scaphella crenistria* (von Koenen) – Ravn, p. 83.
?1963 *Voluta crenistria* Koen. – Krach, p. 105, pl. 10, fig. 7.
1981 *Scaphella crenistria* (Koenen, 1885) – Krach, p. 62, pl 16, figs 1, 2.

Material – Only the illustrated juvenile specimen and a fragment have been found (casts MNO and ISL).

Superfamily Cancellarioidea Forbes & Hanley, 1851
Family Cancellariidae Forbes & Hanley, 1851

?Cancellariidae, gen. et sp. indet.
Plate 8, fig. 9

Other material – Two rather badly preserved specimens (casts MNO and ISL).

Description – The illustrated specimen is subfusiform and has four teleoconch whorls preserved. The teleoconch whorls are strongly convex and separated by a deep, undulating suture. The body whorl is angular and constricted into a short canal, which is turned to the left. The aperture is not preserved and the columella has no visible folds preserved. There are four primary spiral ribs, which are separated by wider interspaces. Spiral number two forms a weak carina on the body whorl. There are *c.* 16 axial ribs on each whorl and they are separated by wider interspaces. They are orthocline to slightly opisthocline. The axial ribs and the spiral ribs are of almost equal strength and form a cancellate pattern of rectangles, having their largest dimension in the direction of the spiral ribs.

Discussion – The specimen is tentatively assigned to the Cancellariidae because of the general outline and the cancellate sculpture. This assignment is unsure because the columellar folds are not preserved.

Superfamily Buccinoidea Rafinesque, 1815
Family Buccinidae Rafinesque, 1815
Subfamily Siphonaliinae Finlay, 1928
Genus *Siphonalia* A. Adams, 1863

Type species (by original designation) – *Buccinum cassidariaeformis* Reeve, 1846.

***Siphonalia ariejansseni* Schnetler, 2001**
Plate 6, figs 3a-b

2001 *Siphonalia ariejansseni* Schnetler, p. 56; pl. 5, figs 7-10.

Other material – Four specimens (impressions MNO, casts MNO and ISL).

Discussion – The specimen has a height of 38.3 mm and a width of 14.6 mm and is thus considerably larger than the type specimen and the juvenile specimens in the material studied by Schnetler (2001). The shell is slighly deformed by compaction, but the protoconch, spiral ornament and axial sculpture of opisthocline ribs match the description of the species, as well as the canal, which is turned to the left. *Clavilithes hauniensis* (Ravn, 1939) has a protoconch consisting of 5-6 whorls and orthocline to slightly prosocline axial ribs, which are sharper.

***Siphonalia morteni* nov. sp.**
Plate 6, figs 1a-b, 2

Type material – Holotype Plate 6, fig. 2, MGUH 31961. Paratype Plate 6, figs 1a-b, MGUH 31960.

Other material – Only the type material is known.

Etymology – This species is named after Morten Stentoft Guldager, son of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A medium sized *Siphonalia* with slightly angular whorls and five primary spirals. 12-14 almost orthocline ribs per whorl, a little wider than their interspaces. Fine knobs occur at the intersections with spirals three and four.

Description – The shell is subfusiform with a height/width ratio of 2.2. It consists of four teleoconch whorls and the protoconch. The body whorl equals 0.7 of the total shell height, the aperture and canal 0.6. The protoconch consists of *c.* 2½ convex and smooth whorls, separated by a deep suture. The transition to the teleoconch is gradual and indicated by the appearence of axial ribs. The teleoconch whorls are moderately to strongly convex with a slightly concave part below the adapical suture and separated by a deep suture. The aperture is lengthened ovate and passing into a rather narrow canal, which is shorter than the aperture. The labrum is sharp and smooth and the smooth columella is slightly concave. The spiral ornament begins with five spiral ribs on the first teleoconch whorl. The adapical spiral rib is very weak, spiral rib number two is weak and spiral ribs number three and four are prominent, especially spiral rib number three, which is situated on the middle of the whorl and keel-like, dividing the whorl in a slightly concave adapical part and a slightly convex abapical part. The spiral ribs are weak and separated by wider interspaces. There are five spiral ribs on the base which decrease in strength abapically. The neck of the canal has *c.* 10 weak spiral ribs. The axial sculpture consists of 12-14 almost orthocline ribs, a little wider than their interspaces. At the intersections with spirals number three and four fine knobs occur.

Discussion – The new species reminds of *Pseudoneptunea sindonata* Wrigley, 1953 from the Eocene of England. That species, however, has a lower number of stronger spiral ribs and more unsharp axial ribs. Moreover, it has lirae on the internal part of the labrum.

Genus *Truncaria* A. Adams & Reeve, 1850

Type species (by monotypy) – *Buccinum filosum* A. Adams & Reeve, 1850.

***Truncaria benjamini* nov. sp.**
Plate 5, figs 15a-b

Holotype – Plate 5, figs 15a-b, MGUH 31952.

Other material – Only the holotype is known.

Etymology – This species is named after Benjamin Stentoft Guldager, grandson of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A medium sized *Truncaria* with moderately convex whorls and a spiral ornament consisting of *c.* 15 fine spiral ribs with finer secondary spiral ribs inserted later. There are 12 opisthocline to orthocline axial ribs per whorl, which are of almost the same strength as their interspaces.

Description – The shell is subfusiform with a height/width ratio of 2.2 and has five teleoconch whorls and the protoconch preserved. The body whorl equals 0.6 of the total shell height, the aperture and canal 0.4. The protoconch consists of *c.* 1½ convex and smooth whorls and has a rather large nucleus. The whorls are moderately convex and separated by a deep, slightly undulating suture. The body whorl has a convex base without a distinct neck of the canal, which is truncated abapically and turned to the left. The aperture is rather wide and lengthened ovate. The labrum is very convex and slightly thickened, meeting the parietal wall in an obtuse angle. The columella is straight and truncated. The spiral ornament consists of *c.* 15 fine spiral ribs with finer secondary spiral ribs inserted later. The axial sculpture consists of 12 opisthocline to orthocline ribs per whorl, which are of almost the same strength as their interspaces. On the base, the axial ribs gradually become weaker.

Discussion – The new species differs from the recent type species for the genus, *Truncaria filosa* A. Adams & Reeve, 1850, especially by the labrum and aperture. In *T. filosa* the labrum meets the parietal wall in an acute angle and the aperture is narrow adapically. The new species matches the type species in general outline and the truncated columella and canal. *Truncaria truncata* (Deshayes, 1835) from the French Lutetian and Bartonian has almost flat whorls with a lower number of axial ribs and spiral ribs.

Family Columbellidae Swainson, 1840
Genus *Astyris* H. & A. Adams, 1853

Type species (by subsequent designation) – *Columbella rosacea* Gould, 1840.

?*Astyris* sp.
Plate 6, fig. 10

Material – Only the illustrated specimen is known.

Description – The specimen is fusiform and has *c.* six teleoconch whorls preserved. It lacks the protoconch and part of the aperture. The whorls are moderately convex and separated by a distinct suture. The spiral ornament consists of narrowly spaced, broad and flat spiral cords, *c.* 10 on the first teleoconch whorl. On the following whorls, their number increases to *c.* 18, as the spiral cords on the abapical half of the whorl become divided into two. The four adapical spiral cords are weaker than the other spiral cords, which are of almost equal strength. The base has a similar spiral ornament. There is no axial sculpture. The columella is almost straight and the aperture is ovate and rather small with a short and narrow canal. The labrum is broken off.

Discussion – The outline and ornament suggest a possible assignment to *Astyris* (or *Parvisipho* Cossmann, 1889).

Family Fasciolariidae Gray, 1853
Subfamily Fusininae Wrigley, 1927
Genus *Clavilithes* Swainson, 1840

Type species (by original designation) – *Fusus noae* Lamarck, 1803.

***Clavilithes hauniensis* (Ravn, 1939)**
Plate 6, fig. 5

1885 *Fusus* n. sp., cf. *rugosus* Lamarck – von Koenen, p. 14, pl. 1, fig. 11.
1897 *Fusus* n. sp., cf. *rugosus* Lamarck – Grönwall, p. 66.
1901 *Clavella* sp. (*non F. rugosus* Lamarck) – Cossmann, p. 20.
1904 *Fusus* cfr. *rugosus* Lamarck – Grönwall, p. 34.
1939 *Clavella hauniensis* Ravn, 1939, p. 80, pl. 3, fig. 8.
1981 *Clavilithes hauniensis* (Ravn, 1939) – Krach, p. 60, pl. 14, figs 7, 9; pl. 21, fig. 8.

Other material – Three specimens (impressions MNO, casts MNO and ISL).

Remarks – Von Koenen (1885) had only two fragments of large specimens and Ravn (1939) established the species on further fragmentary large specimens and several juvenile specimens. He referred the new species to the genus *Clavella* Swainson, 1835. This genus name, however, is a junior homonym of *Clavella* Oken, 1815, which is a Crustacea (Rice & Gentry, 1994). The specimens match the descriptions and illustrations by von Koenen (1885) and Ravn (1939) and the illustrated almost complete specimen (Plate 6, Fig. 5) is the best-preserved adult specimen known.

Genus *Falsifusus* Grabau, 1904
Type species (by original designation) – *Fusus ottonis* Aldrich, 1897.

***Falsifusus danicus* (von Koenen, 1885)**
Plate 6, fig. 4

1885 *Fusus danicus* von Koenen, p. 13, pl. 1, fig. 10.
1897 *Fusus danicus* von Koenen – Grönwall, p. 66.
1907 *Fusus danicus* von Koenen – Grönwall & Harder, p. 54 and 64.
1937 *Fusus danicus* von Koenen – Roedel, p. 201, pl. 1, fig. 7.
1939 *Fusus danicus* von Koenen – Ravn, p. 79.

Other material – Seven specimens (impressions MNO, casts MNO and ISL).

Remarks – The illustrated complete specimen has a height of 32.8 mm and a width of 10.2 mm. Von Koenen's material from Vestre Gasværk consisted of smaller and incomplete specimens. In outline and sculpture the specimens match the description and illustration by von Koenen (1885). Darragh (1969, p. 71) placed the species in the genus *Falsifusus* Grabau, 1904. Higo, Callomon & Goto (1999, p. 261) placed *Falsifusus* in the synonymy of *Fusinus*. Snyder (2003, p. 11) questioned that assignment. According to Wenz (1941, p. 1260) the protoconch of *Falsifusus* is conical and the transition into the teleoconch gradual.

Subfamily Peristerniinae Tryon, 1880
Genus *Latirulus* Cossmann, 1889

Type species (by original designation) – *Fusus subaffinis* d'Orbigny, 1850.

***Latirulus lemchei* (Schnetler, 2001)**
Plate 6, fig. 6; Plate 9, fig. 7

2001 *Streptolathyrus lemchei* Schnetler, p. 59, pl. 3, fig 12; pl. 6, fig. 3.

Other material – 23 specimens (impressions and casts MNO and ISL).

Discussion – The specimens show some variation, especially in the height/width ratio (from 2.6 to 3.5). The material matches the description and illustration by Schnetler (2001).

Remarks – According to Lozouet (2015) *Streptolathyrus* should be replaced by *Latirulus*.

Family Melongenidae Gill, 1871 (1854)
Genus *Levifusus* Conrad, 1865

Type species (by original designation) – *Fusus trabeatus* Conrad, 1858.

***Levifusus moerchi* (von Koenen, 1885)**
Plate 6, fig. 7

1885 *Fusus Mörchi* von Koenen, p. 18, pl. 1, fig. 13.
1897 *Fusus Mörchi* von Koenen – Grönwall, p. 66.
1901 *Fusus (Levifusus) Mörchi* von Koenen – Cossmann, p. 15.
1939 *Fusus (Levifusus) Mörchi* von Koenen – Ravn, p. 80.

Other material – One specimen (impression MNO, casts MNO and ISL).

Discussion – In outline and sculpture the specimens rather well match von Koenen's (1885) description and illustration, but they have a smaller apical angle and are slenderer.

***Levifusus metteae* nov. sp.**
Plate 6, figs 8, 9a-b

Type material – Holotype Plate 6, figs 9a-b, MGUH 31968. Paratype Plate 6, fig. 8, MGUH 31967.

Material – Only the illustrated type material has been found.

Etymology – This species is named after Mette Hofstedt, Haderslev, Denmark.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A *Levifusus* with rather strong spiral ornament, a carina on the middle of the whorl and a flat adapical ramp. The axial sculpture consists of indistinct prosocline folds, visible as knobs on the carina (15-20 per whorl).

Description – The protoconch and first intermediate whorls could be studied on the paratype (Plate 6, fig. 8), which has the protoconch and 3½ teleoconch whorls preserved. The shell is rather large and fusiform with a spiral keel on the middle of the whorls, separated by a distinct suture. The apex is not deformed and the apical angle is *c.* 75°. The protoconch is naticoid and has 2 ½ whorls, separated by a rather distinct suture and quickly increasing in diameter. The transition into the teleoconch is marked by a prosocline rib. On the first teleoconch whorl *c.* 10 fine spiral riblets occur. They are separated by narrower furrows. After 3/4 whorl three spiral ribs on the adapical part of the whorl become stronger than the other spiral ribs. Of these, the first is situated a little below the adapical suture, the third on the middle of the whorl and the second between the two other spiral ribs with the same distances between them. Below the third spiral rib there are three spiral ribs. On the following whorls, secondary spiral ribs are inserted and the third spiral rib becomes more prominent and divides the whorl face into an adapical almost flat ramp and a perpendicular flat abapical part. The two parts of the whorl meet at an angle of *c.* 140°. The axial sculpture consists of indistinct prosocline folds that are most visible as knobs on the third spiral (15-20 per whorl). The knobs are elongated in the direction of the spiral rib. The growth lines are almost invisible. The body whorl of the paratype is preserved as imprints of the adapical and abapical sides and due to diagenetic compression it is almost completely flattened. About 10 mm of the canal is preserved and has been pressed upwards into the whorl. The holotype has *c.* 4 medium whorls preserved and furthermore the base and the columella and the neck of the canal preserved in the same boulder but separated from the apex. The base has the same spiral ornament as the whorls and *c.* 20 indistinct axial folds per whorl. The columella is almost straight with a thin, partly free callus and the canal is of almost the same length and turned to the left. The aperture and the labrum are not preserved.

Discussion – The species differs from *Levifusus moerchi* (von Koenen, 1885) by having a larger apical angle and more prominent spiral ribs. Moreover, its adapical ramp is almost flat. Furthermore, *Levifusus moerchi* has the carina situated below the middle of the whorl and a rather strong spiral above the abapical suture. *Levifusus amplus* (Briart & Cornet, 1873) seems to be related, but has a lower number of knobs and stronger axial ribs.

Superfamily Muricoidea Rafinesque, 1815
Family Muricidae Rafinesque, 1815
Subfamily Ocinebrinae Cossmann, 1903

Genus *Urosalpinx* Stimpson, 1865

Type species (by original designation) – *Fusus cinereus* Say, 1822.

***Urosalpinx pyruloides* (von Koenen, 1885)**
Plate 6, figs 11a-b, 12

1885 *Murex pyruloides* von Koenen, p. 6, Plate 1, fig. 1; pl. 3, fig. 14.
1897 *Murex pyruloides* von Koenen – Grönwall, p. 66.
1907 *Murex pyruloides* von Koenen – Grönwall & Harder, p. 53, and p. 64.
1939 *Urosalpinx pyruloides* (von Koenen) – Ravn, p. 78, pl. 3, figs 9a-b, 10.

Other material – Six specimens (impressions MNO, casts MNO and ISL).

Description – The largest specimen is preserved as two impressions of a complete adult specimen, facilitating the production of a complete cast. As von Koenen's material consists of fragments of small and incomplete specimens, the specimen from Gundstrup allows a more complete description of the species. The shell is large and has a height of 32.5 mm and a width of 19.2 mm. It consists of the worn protoconch and four teleoconch whorls. The height of the body whorl is 0.8 of the total shell height, the aperture 0.7 of the total shell height. The whorls are slightly to moderately convex and separated by a distinct suture. The aperture is large and subovate, meeting the parietal wall at an acute angle, at the anterior going into a rather wide and short canal that is turned to the left. There are six primary spiral ribs, separated by much wider interspaces. They run across *c.* 24 axial ribs (per whorl) of almost the same width as their interspaces. The spirals undulate over the axial ribs. On the base, there are *c.* 12 much weaker spiral ribs. The neck of the canal has numerous fine spiral ribs. The columella is slightly concave and without knobs; the labrum is sharp.

Remarks – A juvenile specimen (Plate 6, fig. 12) is preserved as an impression of the rear side. The aperture is not visible. The specimens from Vestre Gasværk, mentioned by von Koenen, are smaller and all have defective last whorl.

Muricidae, gen. et sp. indet.
Plate 6, fig. 13; Plate 9, fig. 9

Material – Only the two illustrated specimens are known.

Description – The largest specimen has a height of 17.2 mm and a width of 15.6 mm. Both specimens lack the aperture and canal. The largest specimen has five teleoconch whorls preserved; protoconch and first intemediate whorl are worn. The whorls are angulated and separated by a distinct suture. There are numerous very fine spiral ribs, which are indistinct. There are 10 strongly prosocline axial ribs on each whorl, which form lamellate spines at mid-whorl.

Discussion – As both specimens are incomplete, a final identification is not possible. The specimens somewhat remind of the genera *Crassimurex* Merle, 1990 and *Eopaziella* Gürs, 2001.

Superfamily Turbinelloidea Rafinesque, 1815
Family Costellariidae MacDonald, 1860
Genus *Vexillum* Röding, 1798

Type species (type by subsequent designation) – *Vexillum plicatum* Röding, 1798, accepted as *Vexillum plicarium* (Linnaeus, 1758).

***Vexillum aequicostatum* (von Koenen, 1885)**
Plate 6, fig. 14

1885 *Mitra aequicostata* von Koenen, p. 43, pl. 2, fig. 13.
1897 *Mitra aequicostata* von Koenen – Grönwall, p. 66.
1899 *Turricula (Fusimitra)? aequicostata* (von Koenen) – Cossmann, p. 164.
1907 *Mitra aequicostata* von Koenen – Grönwall & Harder, p. 55.
1939 *Turricula (Fusimitra) aequicostata* (von Koenen) – Ravn, p. 83.
?1981 *Borsonia aequicostata* (Koenen, 1885) – Krach, p. 65, pl. 20, fig. 4.

Other material – One specimen (impression MNO, casts MNO and ISL).

Discussion – This species is assigned to the genus *Vexillum* because of the strong axial sculpture and the finer spiral ornament. The family Mitridae Swainson, 1829 has generally smooth whorls or spiral ornament.

Family Ptychatractidae Stimpson, 1865
Genus *Exilia* Conrad, 1860

Type species (by monotypy) – *Exilia pergracilis* Conrad, 1860.

***Exilia crassistria* (von Koenen, 1885)**
Plate 7, figs 3-5

1885 *Fusus crassistria* von Koenen, p. 16, pl. 1, fig. 12.
1897 *Fusus crassistria* von Koenen – Grönwall, p. 66.
1901 *Exilia? crassistria* von Koenen – Cossmann, p. 27.
1920b *Fusus crassistria* von Koenen – Rosenkrantz, p. 8.
1939 *Exilia crassistria* (von Koenen) – Ravn, p. 81, pl. 3, figs 3a-b.

?1976 *Exilia crassistria* (Koenen, 1885) – Makarenko, p. 128, pl. 11, figs 17-18.
1981 *Exilia crassistria* (Koenen, 1885) – Krach, p. 59, pl 24, fig. 2.

Other material – 15 specimens (impressions MNO, casts MNO and ISL).

Discussion – The species has a large variation in H/W ratio, spiral ornament and axial sculpture (see von Koenen 1885; Ravn 1939). A single specimen (Plate 7, fig. 5) differs by being slenderer (H/W ratio of 4.1, while the two other illustrated specimens of *E. crassistria* have a H/W ratio of 2.9 – 3.3). Furthermore, the axial sculpture is considerably sharper and there are only four spiral ribs below the subsutural spiral cord. The axial ribs are opisthocline instead of opisthocyrt and the whorls are less convex. The specimen is slightly deformed by compaction. Considering the rather wide range of variation for the species we include this specimen in *E. crassistria*. Also, the specimen illustrated by Makarenko (1976) differs by having flat whorls and a slenderer outline.
Kollmann & Peel (1983, p. 84, figs 186a-b) illustrated a rather similar *Exilia* species from Greenland, which is slenderer (height/width equals 3.9) and has a weaker sculpture. There is no subsutural band and the number of spirals is higher (10) than in *E. crassistria*. Traub (1980: p. 43, pl. 6, figs 7a-b) described and illustrated a representative from the Austrian Palaeocene *sub nomen Exili*a cf. *crassistria*. This species has a higher number of spirals (15) and a weak fold on the columella.
The position of the genus *Exilia* has been challenged. Powell (1966) expressed doubts to the usual placement of the genus in Turridae, whereas Kollmann & Peel (1983: p. 84) assigned the genus to the Buccinidae, subfamily Fusinae. Vaught (1989) considered the genus *Exilia* to be Recent and the genu*s Exilioidea* to be a fossil genus. The present authors follow Kantor *et al.* (2001) and MolluscaBase (2018) and place the genus *Exilia* in Ptychatractidae.

***Exilia frejaea* nov. sp.**
Plate 6, fig. 15

Holotype – Plate 6, fig. 15, MGUH 31974.

Other material – One specimen (impression MNO, casts MNO and ISL).

Etymology – This species is named after Freja Stentoft Guldager, granddaughter of the junior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A medium sized *Exilia* with a long and narrow canal, three columellar folds and a spiral ornament of five fine, close-set riblets in a slight adapical depression and five raised spiral ribs of equal strength, separated by much wider interspaces. Of the three columellar folds the two adapical are closer to each other.

Description – The shell is rather large and lengthened fusiform. The body whorl equals 0.7 of the total shell height, the aperture and canal 0.5. The holotype has the protoconch and three teleoconch whorls preserved. The protoconch is worn but seems to have been conical with *c.* three whorls. The teleoconch whorls are moderately convex with a slight subsutural depression and separated by a distinct suture. The aperture is long, narrow and constricted into a long and narrow canal. The columella is almost straight and shows resorption of calcareous matter. There are three distinct oblique columellar folds, of which the two adapical ones are the most close-set. Between the abapical folds a fourth weaker fold is visible. The spiral ornament consists of five fine, close-set riblets in the subsutural depression and five raised spirals of equal strength, separated by much wider interspaces. A further abapical spiral rib is covered by the following whorl, but visible on the convex base, which is covered with numerous close-set spirals. The neck of the canal has a similar ornament. There are 12-14 axial ribs, which are orthocline to slightly opisthocline and a little wider than their interspaces. The spirals are slightly undulating across the axial ribs.

Discussion – The present authors assign the new species to *Exilia*, because it in general outline, especially the narrow aperture and the long, straight and narrow canal and the distinct folds on the columella, has some resemblance to *Mesorhytis* Meek, 1876 (see Wenz, 1943 p. 1237, fig. 3665). Kantor *et al*. (2001) synoymized *Mesorhytis* with *Exilia* and concluded that the only constant morphological feature of *Exilia* is the slender outline with a high spire and a straight, long and narrow canal, whereas the number and strength of the columellar folds have less diagnostic value. The new species differs from *Exilia crassistria* by having three distinct columellar folds, a lower number of axial ribs and narrower spiral ribs.

Superfamily Olivoidea Latreille, 1825
Family Ancillariidae Swainson, 1840
Genus *Ancilla* Lamarck, 1799

Type species (by subsequent monotypy) – *Ancilla cinnamomea* Lamarck, 1801.

***Ancilla flexuosa* (von Koenen, 1885)**
Plate 7, fig. 2

1885 *Ancillaria flexuosa* von Koenen, p. 21, pl. 1, fig. 20.
1897 *Ancillaria flexuosa* von Koenen – Grönwall, p. 66.
1899 *Ancillaria (Sparella) flexuosa* von Koenen – Cossmann, p. 62.

1904 *Ancillaria flexuosa* von Koenen – Grönwall, p. 34.
1907 *Ancillaria flexuosa* von Koenen – Grönwall & Harder, p. 55.
1920b *Ancillaria flexuosa* von Koenen – Rosenkrantz, p. 8.
1938 *Ancilla flexuosa* (v. Koenen) – Traub, p. 93, pl. 8, figs 6a-f.
1939 *Ancilla (Sparella) flexuosa* (von Koenen) – Ravn, p. 89, pl. 3, figs 19a-b.
1975 *Ancilla (Baryspira) flexuosa* (von Koenen) – Anderson, p. 153, pl. 16, fig. 1
1976 *Ancilla flexuosa* (Koenen, 1885) – Makarenko, p. 136, pl. 16, figs 7-10.
1981 *Ancilla flexuosa* (Koenen, 1885) – Krach, p. 61, pl. 20, fig. 2.

Other material – Seven specimens (impressions MNO, casts MNO and ISL); two specimens with the shell preserved (MNO and ISL).

Superfamily Conoidea Fleming, 1822
Family Conidae Fleming, 1822
Genus *Belophos* Cossmann, 1901

Type species (by subsequent designation) – *Belophos cancellata* (Tenison-Woods, 1877).

***Belophos steenstrupi* (von Koenen, 1885)**
Plate 8, figs 6a-b

1885 *Pleurotoma steenstrupi* von Koenen, p. 36, pl. 2, fig. 8.
1897 *Pleurotoma steenstrupi* von Koenen – Grönwall, p. 66.
1937 *Pseudotoma steenstrupi* (von Koenen) – Roedel, p. 211.
1939 *Genotia steenstrupi* (von Koenen) – Ravn, p. 94, pl. 4, fig. 12.
1981 *Turricula steenstrupi* (Koenen, 1885) – Krach, p. 64, pl. 18, figs 1, 2.

Other material – One specimen.

Remarks – In outline and sculpture the specimens match the descriptions and illustrations by von Koenen (1885) and Ravn (1939). It could also be compared with von Koenen's type (1885, pl. 2, fig. 8; MGUH 839) and with specimens from Sundkrogen (coll. Harder 1920, GEUS).

Discussion – Von Koenen (1885) compared this species with *Pleurotoma intorta* (Brocchi, 1814) from the Pliocene of Italy and *Pleurotoma morreni* (Koninck, 1837) from the Rupelian of the Netherlands and found some similarities in the spiral ornament and the growth lines. However, the protoconch of *Belephos steenstrupi* differs from the protoconchs of *Pleurotoma intorta* and *Pleurotoma morreni* by having 3 ½ smooth whorls and ½ whorl with axial riblets, while those two species have a protoconch consisting of two smooth whorls followed by a whorl with *c.* 6 spirals and ¼ whorl with orthocyrt axial riblets which is why they are now assigned to *Pseudotoma* Bellardi, 1875. Roedel (1937) assigned *steenstrupi* to *Pseudotoma* Bellardi, 1875, by Wenz (1943, p. 1462) considered a subgenus of *Genota* H. & A. Adams, 1853. *Genotia* P. Fischer, 1883 is a junior synonym of *Genota*. The current species differs from *Genota* by being less slender and by having a wider aperture posteriorly. Furthermore, the protoconch of *Genota* has two smooth, shining whorls, the first planorbid and the second globose, with very faint spirals terminally (Powel 1966, p. 96). The current species comes closer to *Pseudotoma* with regards to outline and ornament but differs with regards to the protoconch.
The protoconch of *steenstrupi* is rather similar to the protoconch of *Belophos* Cossmann, 1901. It could be studied on von Koenen's type (1885, pl. 2, fig. 8) and on juvenile specimens from Sundkrogen (in the collection of Harder, see Schnetler, 2001). *B. steenstrupi* differs from *B. cancellata* (Tenison-Woods, 1877), the type species of the genus *Belophos*, by having more opisthocline axial ribs and two adapical spirals forming a subsutural band. Furthermore, the adapical ramp of the whorl is less concave and the end of the canal is not truncated. *Belophos woodsii* (Tate, 1888) is a junior synonym of *Belophos cancellata*. Wenz (1943, p. 1463) divided *Belophos* into the subgenera *Belophos* s. str. and *Austrotoma* Finlay, 1924. He stated that *Belophos* has a range from the upper Cretaceous (Senonian) to the Oligocene. It has been reported from South America and Australia. *Austrotoma* has been reported from the Danian to the Pliocene of New Zealand. Hickman (1976, p. 48) considered *Belophos* a subgenus of *Acamptogenotia* Rovereto, 1899 (now *Pseudotoma* Bellardi, 1875) and found *Belophos* s. str. and *Austrotoma* rather similar.

Remarks – Wenz (1943, p. 1463) assigned *Belophos* to the Cryptoconinae Cossmann, 1896. Taylor *et al.* (1993) considered this subfamily to represent a junior synonym of Conorbiinae de Gregorio, 1880. Beu (2011) assigned *Belophos* to the Conidae Fleming, 1822, while Marshall (2017) assigned *Belophos* to the Buccinidae. We agree with Beu (2011), because of the general outline, the sculpture and the anal sinus.

Family Borsoniidae Bellardi, 1875
Genus *Borsonia* Bellardi, 1839

Type species (by monotypy) – *Borsonia prima* Bellardi, 1839.

***Borsonia binodosa* von Koenen, 1885**
Plate 8, fig. 7; Plate 9, fig. 7

1885 *Borsonia binodosa* von Koenen, p. 37, pl. 2, fig. 9.
1897 *Borsonia binodosa* von Koenen – Grönwall, p. 66.
1904 *Borsonia binodosa* von Koenen – Grönwall, p. 34.

1907 *Borsonia binodosa* von Koenen – Grönwall & Harder, p. 56.
1920b *Borsonia binodosa* von Koenen – Rosenkrantz, p. 8.
1937 *Borsonia binodosa* von Koenen – Roedel, p. 212.
1939 *Borsonia (Cordieria) binodosa* von Koenen – Ravn, p. 95, pl. 4, figs 10a-b.
1981 *Borsonia binodosa* Koenen, 1885 – Krach, p. 65, pl. 20, fig. 3.

Other material – 16 specimens (impressions MNO, casts MNO and ISL).

Description – The shell is subfusiform, with a height/width ratio of 2.2. The largest shell consists of the protoconch and four teleoconch whorls. The protoconch is conical and consists of *c.* 3 whorls, of which the terminal half whorl has fine flexuous axial ribs. The whorls are convex, the suture distinct. The whorls have a thickened sutural band and an obtuse edge on the middle of the whorl. There is no spiral ornament. There are *c.* 20 slightly opisthocline axial folds per whorl. They have the same width as their interspaces. Two rows of knobs occur at the intersections of the folds with the subsutural band and the edge. The axial ribs get weaker abapically. The aperture is damaged; it has a short canal. Two strong folds are present on the columella.

Family Clavatulidae Gray, 1853
Genus *Turricula* Schumacher, 1817

Type species (by monotypy) – *Turricula flammea* Schumacher, 1817.

***Turricula hauniensis* (von Koenen, 1885)**
Plate 7, fig. 14

1885 *Pleurotoma hauniensis* von Koenen, p. 28, pl. 1, fig. 18.
1897 *Pleurotoma hauniensis* von Koenen – Grönwall, p. 66.
1907 *Pleurotoma hauniensis* von Koenen – Grönwall & Harder, p. 56.
1920b *Pleurotoma hauniensis* von Koenen – Rosenkrantz, p. 8.
1937 *Pleurotoma hauniensis* von Koenen – Roedel, p. 208.
1939 *Surcula hauniensis* (von Koenen) – Ravn, p. 90, pl. 4, figs 3a-b, 4, 5a-b.
1972 *Surcula hauniensis* (Koenen, 1885) – Moroz, p. 117, pl. 25, figs 9a-d, 10.

Other material – Five specimens (impressions MNO, casts MNO and ISL).

Remarks – According to Bouchet (2011b) *Surcula* H. & A. Adams, 1853 is a junior objective synonym of *Turricula*.

***Turricula johnstrupi* (von Koenen, 1885)**
Plate 7, fig. 15

1885 *Pleurotoma Johnstrupi* von Koenen, p. 29, pl. 1, fig. 19.
1896 *Pleurotoma Johnstrupi* von Koenen – Cossmann, p. 7.
1897 *Pleurotoma Johnstrupi* von Koenen – Grönwall, p. 66.
1937 *Pleurotoma Johnstrupi* von Koenen – Roedel, p. 212, pl. 1, fig. 17.
1939 *Surcula Johnstrupi* (von Koenen) – Ravn, p. 90, pl. 4, figs 7a-b.
1981 *Turricula johnstrupi* (Koenen, 1885) – Krach, p. 64, pl. 17, figs 5, 7.

Other material – Two specimens (impression MNO, casts MNO and ISL).

***Turricula rosenkrantzi* (Ravn, 1939)**
Plate 7, fig. 11

1939 *Surcula rosenkrantzi* Ravn, p. 91, pl. 4, figs 8a-b.

Other material – Four specimens (impression MNO, casts MNO and ISL).

***Turricula torelli* (von Koenen, 1885)**
Plate 7, fig. 10

1885 *Pleurotoma Torelli* von Koenen, p. 32, pl. 2, fig. 2.
1896 *Pleurotoma (Eupleurotoma) Torelli* von Koenen – Cossmann, p. 81.
1897 *Pleurotoma Torelli* von Koenen – Grönwall, p. 66.
1939 *Surcula Torelli* (von Koenen) – Ravn, p. 91, pl. 4, figs 6a-b, 13.
?1981 *Turricula torelli* (Koenen, 1885) – Krach, p. 64, pl. 18, figs 10-13.

Other material – Two specimens (impressions MNO, casts MNO and ISL).

***Turricula laeviuscula* (von Koenen, 1885)**
Plate 7, fig. 17

1885 *Pleurotoma laeviuscula* von Koenen, p. 33, pl. 2, fig. 1.

Material – Only the illustrated specimen is known.

Description – The incomplete specimen consists of the protoconch and six teleoconch whorls. The protoconch is poorly preserved but seems to be conical with *c.* three whorls. The teleoconch whorls are moderately to strongly convex and separated by a deep suture. There are about 10 spiral ribs of almost the same width as their interspaces. The two adapical spirals are increasing in strength

and form a subsutural band. A rather distinct spiral is situated above the abapical suture. There are 12–14 angulated axial ribs, which have their deepest point on the middle of the whorl. They are wider than their interspaces and most prominent on the middle of the whorl. The growth lines are not very distinct. They form a sinus with the deepest point at mid-whorl.

Discussion – The species is assigned to the genus *Turricula* because of the general outline and sculpture. Ravn (1939) did not mention this species. It is characterised by the angulated axial ribs. *Hemipleurotoma danica* also has angulated axial ribs, but in that species, they are sharper and less angulated.

***Turricula fissicosta* (von Koenen, 1885)**
Plate 7, fig. 16

1885 *Pleurotoma fissicosta* von Koenen, p. 30, pl. 2, fig. 3.
1897 *Pleurotoma fissicosta* von Koenen – Grönwall, p. 66.
1937 *Pleurotoma fissicosta* von Koenen – Roedel, p. 209, pl. 1, fig. 14.
1939 *Surcula fissicosta* (von Koenen) – Ravn, p. 92.

Other material – One specimen (impressions MNO, casts MNO and ISL).

***Turricula vibekeae* nov. sp.**
Plate 7, figs 18a-b

Type material – Holotype Plate 7, figs 18a-b, MGUH 31997(casts MNO and ISL).

Other material – Two specimens (impressions MNO, casts MNO and ISL).

Etymology – This species is named after Vibeke Kofoed Schnetler, the daughter-in-law of the senior author.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A *Turricula* with a strong subsutural band, a narrow depression and 12-14 almost orthocline axial ribs per whorl on the abapical part of the whorl.

Description – The shell is fusiform with a height/width ratio of 2.7. The height of the illustrated specimen is 27.2 mm, the width 10.2 mm. The height of the body whorl equals 0.7 of the total shell height, the aperture and canal 0.5. The specimen has five teleoconch whorls, which are moderately convex with a strong subsutural band and a rather deep and narrow depression on the adapical part of the whorl. The whorls are separated by a distinct suture. The aperture is oblong ovate and constricted into a narrow canal of almost the same length. The labrum is broken and the straight columella has a thin callus. The protoconch is slender conical and consists of *c.* 3.5 whorls, which are smooth and convex and separated by a distinct suture. A carina on the middle of the whorl indicates the transition to the teleoconch. Knobs occur almost immediately on the carina. The knobs are situated on the middle of the whorl. The spiral ornament consists of numerous spiral ribs. On later whorls secondary spirals are inserted. There is a strong subsutural band below the adapical suture, consisting of *c.* five spirals on the penultimate whorl. The growth lines cause fine knobs on this band (*c.* 30 per whorl). A deep and narrow sinus of the growth lines is located in a deep and narrow depression below the subsutural band. Below this depression there are four distinct spirals. On the penultimate whorl their number increases to six, with weaker secondary spirals inserted. The convex base and the neck of the canal have a similar ornament. The axial sculpture consists of 12–14 orthocline to slightly opisthocline ribs, which are stronger than their interspaces and only visible below the depression. They fade out on the last whorl. The rather distinct growth lines are prosocline above the sinus, but below it they are opisthocline and meet the abapical suture at an angle of *c.* 60°.

Discussion – The new species differs from the other *Turricula* species of the present fauna by having a strong subsutural band, a narrow depression and almost orthocline axial ribs on the abapical part of the whorl. Furthermore, it is less slender than the other *Turricula* species in this fauna.

Family Cochlespiridae Powell, 1942
Genus *Pseudocochlespira* Schnetler, 2001

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

***Pseudocochlespira koeneni* (Arkhanguelsky, 1904)**
Plate 8, fig. 1

1885 *Pleurotoma* aff. *Volgeri* Philippi – von Koenen, p. 34, pl. 2, fig. 7.
1896 *Surcula? (Ancistrosyrinx)* aff. *Volgeri* Philippi – Cossmann, p. 72.
1897 *Pleurotoma* aff. *Volgeri* Philippi – Grönwall, p. 66.
1904 *Pleurotoma koeneni* Arkhanguelsky, p. 162, pl. 11, fig. 3.
1907 *Pleurotoma* aff. *Volgeri* Philippi – Grönwall & Harder, p. 64.
1920b *Pleurotoma* aff. *Volgeri* Philippi – Rosenkrantz, p. 8.
1939 *Surcula (Cochlespira) koeneni* (Arkhanguelsky) –

Ravn, p. 92.
1976 *Cochlespira koeneni* (Arkhanguelsky, 1904) – Makarenko, p. 151, pl. 15, figs 7-8.
1981 *Cochlespira koeneni* (Arkhanguelsky, 1904) – Krach, p. 65, pl. 17, figs 3, 4.
2001 *Pseudocochlespira koeneni* (von Koenen, 1885) – Schnetler, pl. 6, fig. 7.

Other material – Six specimens (impressions MNO, casts MNO and ISL).

Remarks – The species is easily identified by its almost smooth whorls.

***Pseudocochlespira boeggildi* (Ravn, 1939)**
Plate 8, fig. 2

1939 *Surcula (Cochlespira) Böggildi* Ravn, p. 93, pl. 4, figs 9a-b [*non* fig. 14 = *Pseudocochlespira rosenkrantzi* Schnetler, 2001].
2001 *Pseudocochlespira boeggildi* (von Koenen, 1885) – Schnetler, pl. 6, fig. 6.

Other material – Three specimens (impressions MNO, casts MNO and ISL).

Discussion – Ravn (1939) included material representing *Pseudocochlespira rosenkrantzi* Schnetler, 2001 in his description and illustration of *P. boeggildi*. *Pseudocochlespira rosenkrantzi* is slenderer and has a weaker developed spiral ornament; the carina is situated below the middle of the whorl and lacks knobs. *Pseudocochlespira boeggildi* is easily distinguished from *P. koeneni* by having a rather distinct spiral ornament and a more concave adapical part of the whorl.

?*Pseudocochlespira* sp.
Plate 8, fig. 3

Material – Only the illustrated specimen is known.

Description – Height 26.8 mm, width 15.5 mm. A single fragment of a big specimen belongs most probably to the genus *Pseudocochlespira*. It consists of *c.* five penultimate whorls, which have a carina on the middle of the whorl. The carina divides the whorl into a plane to slightly concave adapical ramp and an almost plane abapical part. The protoconch and the aperture are not preserved. The whorls have four spirals. Above the carina there is a rather weak spiral and below it a rather strong one situated on the middle of the abapical part of the whorl. A weaker spiral is situated immediately above the abapical suture. On the preserved part of the base two further spirals are present. The growth lines are almost invisible but have the deepest point of the rather shallow sinus on the middle of the adapical part of the whorl. The carina and the adapical spiral have *c.* 30 weak knobs per whorl.

Discussion – The general outline (with a carina on the middle of the whorl) and size suggest that the specimen may be a *Pseudocochlespira*. It differs from the other species of this genus from the Danish Palaeocene by its ornament.

Family Mangeliidae P. Fischer, 1883
Genus *Mangelia* Risso, 1826

Type species (by subsequent designation) – *Mangelia striolata* Risso, 1826.

?*Mangelia stoutjesdijki* nov. sp.
Plate 8, fig. 8

Holotype – Plate 8, fig. 8, MGUH 32005.

Etymology – This species is named after Han Stoutjesdijk, The Netherlands.

Type locality – Gravel-pit at Gundstrup, north of Odense, Fyn, Denmark.

Type strata – Kerteminde Marl, Selandian, Middle Palaeocene.

Diagnosis – A rather small *Mangelia* with *c.* 20 fine spiral threads and 14 axial ribs on each whorl. There is a slight depression below the adapical suture which is especially prominent on the last whorl. The aperture is rather wide and oval.

Description – Only the illustrated specimen has been found. It has the protoconch and six teleoconch whorls preserved. The labrum is partly broken off, but otherwise the specimen is well preserved. The shell is moderately large and fusiform with a height/width ratio of 2.6. The body whorl equals 0.6 of the total shell height, the aperture *c.* 0.3 of the total shell height. The protoconch consists of *c.* 3 convex and smooth whorls, the terminal of which rapidly increases in diameter. The teleoconch has six whorls preserved. They are moderately convex and separated by a deep suture. The spiral ornament consists of *c.* 20 very fine threads that are very visible in between the axial ribs but continue faintly on the ribs. There is a slight depression below the adapical suture, especially prominent on the last whorl. There are *c.* 14 axial ribs on each whorl. They are opisthocline and meet the abapical suture at an angle of approximately 60°. The ribs are sharp and considerably narrower than their interspaces. They are weak in the depression and prominent on the other part of the whorl. They gradually fade out abapically on the body whorl. The aperture is almost rhomboidal, with the labrum meeting the parietal wall at an acute angle. There is a short, narrow canal, which is slightly turned to the left. The columella is straight and smooth.

Discussion – The species matches the genus *Mangelia* with regards to axial ribs and spiral ornament but has a wider aperture than typical *Mangelia* species. It has some resemblance with *Mangelia coplicata* (Pezant, 1905), illustrated as *Mangelia* (*Mangiliella*) *plicata* (Lamarck, 1804) by Gougerot & Le Renard (1980), but it differs by having a wider aperture and a slight depression below the adapical suture.

Remarks – According to Wenz (1943, p. 1435) the genus *Mangelia* is known from the Eocene and onward of Europe, Indochina, Sunda Islands, Taiwan, Japan, North and South America. It is represented by numerous species. The record of the genus in the Selandian of Denmark is thus the oldest for the genus.

Family Turridae H. & A. Adams, 1853 (1838)
Genus *Hemipleurotoma* Cossmann, 1889

Type species (by original designation) – *Pleurotoma archimedis* Bellardi, 1877.

***Hemipleurotoma gryi* (Ravn, 1939)**
Plate 7, figs 8-9

1885 *Pleurotoma* cf. *reticosa* Edw. – von Koenen, p. 24, pl. 1, fig. 17.
1897 *Pleurotoma* cf. *reticosa* Edw. – Grönwall, p. 66.
1939 *Pleurotoma (Hemipleurotoma) Gryi* Ravn, p. 88, pl. 3, figs 25a-b, 26.
1981 *Gemmula* aff. *gryi* (Ravn, 1939) – Krach, p. 63, pl. 16, fig. 11; pl. 21, fig. 7.

Other material – Ten specimens (impressions MNO, casts MNO and ISL).

Discussion – Ravn (1939, p. 88) noted that the specimens assigned to his new species have a wide range of variation, and thus might comprise two or three species. Yet a division of his material was not possible, as he found transitions between the different forms. He selected a specimen of the form described and illustrated by von Koenen (1885, p. 24; pl. 1, fig. 17), the most common form in his material, as holotype (Ravn, pl. 3, fig. 26). It has a rounded carina and numerous spiral ribs. In his fig. 25a-b Ravn illustrated a form with a lower number of spiral ribs and only two spirals on the carina. Both forms are present in the material from Gundstrup. On Plate 7, fig. 9 we illustrate the form with numerous spiral ribs and on Plate 7, fig. 8 the form selected a specimen of a lower number of spiral ribs and a more prominent carina.

***Hemipleurotoma danica* (von Koenen, 1885)**
Plate 7, fig. 12

1885 *Pleurotoma danica* von Koenen, p. 26.
1939 *Pleurotoma danica* von Koenen – Ravn, p. 89, pl. 4, figs 1a-b.

Other material – Five specimens (impressions MNO, casts MNO and ISL).

Genus *Eopleurotoma* Cossmann, 1889

Type species (by original designation) – *Pleurotoma multicostata* Deshayes, 1834.

***Eopleurotoma selandica* (von Koenen, 1885)**
Plate 7, figs 13a-b

1885 *Pleurotoma seelandica* von Koenen, p. 25, pl. 2, fig. 6.
1896 *Pleurotoma (Eopleurotoma) seelandica* von Koenen – Cossmann, p. 81.
1897 *Pleurotoma seelandica* von Koenen – Grönwall, p. 66.
1904 *Pleurotoma seelandica* von Koenen – Grönwall, p. 34.
1907 *Pleurotoma seelandica* von Koenen – Grönwall & Harder, p. 56.
1920b *Pleurotoma seelandica* von Koenen – Rosenkrantz, p. 8.
1937 *Pleurotoma seelandica* von Koenen – Roedel, p. 208; pl. 1, fig. 13.
1939 *Pleurotoma (Eopleurotoma) selandica* (von Koenen) – Ravn, p. 89, pl. 4, figs 2a-b.

Other material – One specimen (casts MNO and ISL).

Genus *Pseudotoma* Bellardi, 1875

Type species (by monotypy) – *Murex (Pleurotoma) intortus* Brocchi, 1814

***Pseudotoma inconspicua* (von Koenen, 1885)**
Plate 8, fig. 5

1885 *Pleurotoma inconspicua* von Koenen, p. 33, pl. 2, fig. 4.
1897 *Pleurotoma inconspicua* von Koenen – Grönwall, p. 66.
1939 *Genotia (Pseudotoma) inconspicua* (von Koenen) – Ravn, p. 94.
2001 *Pseudotoma inconspicua* (von Koenen, 1885) – Schnetler, p. 22, 26, 33.

Material – Only the illustrated specimen is known.

Description – The only specimen found has the protoconch and five whorls preserved. However, the protoconch is much worn and the aperture is not completely preserved. The material studied by von Koenen (1885) and Ravn (1939) is poorly preserved, as neither speci-

mens with protoconch nor complete specimens were found. So far, the specimen from Gundstrup is the most complete one known. The shell is rather large and fusiform with a height/width ratio of 2.6 and apical angle of 52º. The body whorl equals 0.6 of total shell height, the aperture and canal about 0.7. The whorls are separated by a distinct suture and the adapical half of the whorl has a shallow depression, while the abapical part of the whorl is moderately convex. The base is only slightly convex and regularly restricted into a rather long canal. The protoconch is much worn, so its sculpture and ornament could not be studied. The spiral ornament on the last medium whorl consists of *c.* 15 fine spiral ribs on the adapical part of the whorl, while the abapical part of the whorl has *c.* 8 somewhat stronger spiral ribs. The base and the neck of the canal have a similar ornament. On the first two penultimate whorls, the abapical half of the whorl has *c.* 16 weak opisthocline folds, which fade out on the following whorls. Flexuous growth lines are rather prominent, having the middle of a rather wide and flat sinus below the deepest point of the depression.

Discussion – The specimen matches von Koenen's description and illustration (1885). The species is very rare. Von Koenen (1885) mentioned only four defective specimens from Vestre Gasværk, Ravn (1939) mentioned only three fragments and Schnetler (2001) a single fragment from Sundkrogen. The holotype lacks the protoconch and the first teleoconch whorls.
The genus name *Acamptogenotia* Rovereto, 1899 is commonly used for rather similar species from the Oligocene, Miocene and Pliocene. Gerhard Stein (Lüneburg, Germany) commented (pers. comm. 2018) that *Pseudotoma* Bellardi, 1875 is a valid name and that *Acamptogenotia* consequently is a junior synonym.

Genus *Boreocomitas* Hickman, 1976

Type species (by original designation) – *Comitas (Boreocomitas) oregonensis* Hickman, 1976

***Boreocomitas brevior* (von Koenen, 1885)**
Plate 8, figs 4a-b

1885 *Pleurotoma (Pseudotoma) brevior* von Koenen, p. 35, pl. 2, figs 5a-c.
1897 *Pleurotoma brevior* von Koenen – Grönwall, p. 66.
1937 *Pseudotoma brevior* (von Koenen) – Roedel, p. 211.
1939 *Genotia brevior* (von Koenen) – Ravn, p. 93, pl. 4, figs 11a-b.
1981 *Gemmula brevior* (Koenen, 1885) – Krach, p. 64, pl. 16, fig. 15; pl. 18, fig. 9.

Material – Only the illustrated specimen is known.

Discussion – Von Koenen (1885, p. 35) based his description on four defective specimens. Compared to von Koenen's type (1885, pl. 2, figs 5a-b; MGUH 874) the rather defective specimen from Gundstrup lacks the protoconch and differs by having weaker and more indistinct nodes on the keel (which is wider and less sharp) and a narrower shoulder. However, the general outline, the situation of the keel and the spiral ornament on the base with two rather strong spiral ribs match the description and illustration by von Koenen.
The generic assignment of this species has been somewhat uncertain. Von Koenen (1885) compared it with *Pseudotoma* Bellardi, 1875. According to Powell (1966, p. 37) this genus has a protoconch of 4-4½ whorls, erect, dome-shaped, the tip flattened and planorbid, smooth except for the last whorl, which is strongly spirally ridged, but without axial ribs. Von Koenen (1885, p. 35) stated that the protoconch of *brevior* has 3½ smooth whorls and ¼ whorl with *c.* 6 fine axial riblets, and thus differs from the protoconch of *Pseudotoma*. Ravn (1939) assigned *brevior* to *Genotia* Fischer, 1883 (according to Powell (1966, p. 96) an invalid emendation of *Genota* H. & A. Adams, 1853). According to Powell (1966, p. 96) the protoconch of this genus has a small, erect and papillate protoconch of two smooth shining whorls, the first planorbid and the second globose, developing very faint spirals towards its close. An assignment to *Genota* is thus not possible. The Danish species resembles species of the genus *Boreocomitas* Hickman, 1976 with regards to general outline, the adapical sinus in the depression and the situation of the keel, for which reasons we assign *brevior* to this genus. Hickman kindly placed photos of *Boreocomitas biconica* Hickman, 1976 from the Eocene of Oregon at our disposal and agreed with the assignment of the Danish species to *Boreocomitas* (Hickman, pers. comm., 2017).

Heterobranchia
Grade "Lower Heterobranchia"
Superfamily Architectonicoidea Gray, 1850
Family Architectonicidae J.E. Gray *in* M. E. Gray, 1850
Genus *Pseudomalaxis* P. Fischer, 1885

Type species (by monotypy) – *Bifrontia zanclaea* Philippi, 1844.

***Pseudomalaxis pingelii* (Mörch, 1874)**
Plate 8, figs 12a-b

1874 *Bifrontia (Orbis) Pingelii* Mörch, p. 9, 24.
1897 *Bifrontia (Orbis) Pingelii* Mörch – Grönwall, p. 67.
1907 *Discohelix Pingelii* Mörch sp. – Grönwall & Harder, p. 38, pl. 1, figs 21, 22.
1920b *Discohelix Pingelii* Mörch sp. – Rosenkrantz, p. 7.
1939 *Discohelix Pingeli* (Mörch) – Ravn, p. 49, pl. 1, figs 21a-c.

Other material – Two specimens (MNO and ISL).

Discussion – The genera *Discohelix* Dunker, 1848 and *Pseudomalaxis* are both disc shaped with regards to outline and the rectangular cross section of the whorls. *Discohelix* species, however, are most commonly sinistral and their protoconch is not heterostroph. For these reasons we refer this and the following species to *Pseudomalaxis*.

***Pseudomalaxis groenwalli* (Ravn, 1939)**
Plate 8, figs 13a-b

1939 *Discohelix Grönwalli* Ravn, p. 50, pl. 1, figs 19a-c, 20a-c.

Other material – Two specimens (impressions MNO, casts MNO and ISL).

Family Amphitomariidae Bandel 1996
Genus *Neamphitomaria* Bandel [in Dockery], 1993

Type species (by subsequent designation) – *Pseudomalaxis stantoni* Sohl, 1960.

***Neamphitomaria* sp.**
Plate 8, fig. 14

Material – Only the illustrated specimen is known.

Description – The shell of this specimen is preserved, it is planispiral and small with a maximum diameter of 2.1 mm. Only the apical side could be studied. The shell has 3.5 whorls preserved, with a rather large nucleus. The whorls are separated by a distinct suture and have two rather weak spiral keels on the apical side.

Remarks – The shell is similar to *Neamphitomaria* sp. 1 from the Faxe Formation (Lauridsen & Schnetler 2014, fig. 177).

Superfamily Mathildoidea Dall, 1889
Family Mathildidae Dall, 1889
Genus *Mathilda* Semper, 1865

Type species (by subsequent designation) – *Turbo quadricarinatus* Brocchi, 1814.

***Mathilda fenestrata* Grönwall & Harder, 1907**
Plate 8, fig. 15

1907 *Mathildia? fenestrata* Grönwall & Harder, p. 41, pl. 1, fig. 25.

Other material – One specimen (impression MNO, casts MNO and ISL).

***Mathilda* cf. *carinata* Ravn, 1939**
Plate 8, fig. 16

1939 *Mathildia (Fimbriatella) carinata* Ravn p. 68, pl. 2, figs 20a-b.

Material – Only the illustrated specimen is known.

Description – The shell is rather small and turriculate, H/W ratio 2.6. There are nine teleoconch whorls and the heterostrophic rather large protoconch. The whorls are moderately convex with a carina on the middle of the whorl. The suture is deep. The body whorl equals *c.* 0.3 of the total shell height, the aperture less than 0.2. There are three primary spirals and on the following whorls secondary spirals are inserted. Of the primary spirals, the middle is the strongest and is situated on the middle of the whorl. On the penultimate whorl there are three spirals above the middle spiral and two below. A further spiral, covered by the following whorl on the teleoconch, is visible on the slightly convex base.

Discussion – The specimen matches the description and illustration of *Mathilda carinata* (Ravn, 1939, p. 68, pl. 2, figs 20a-b), except in its slenderer outline.

Infraclass Euthyneura
Cohort Acteonimorpha
Superfamily Acteonoidea d'Orbigny, 1843
Family Acteonidae d'Orbigny, 1843
Genus *Ravniella* Rosenkrantz, 1970

Type species (by original designation) – *Tornatellae regularis* (von Koenen, 1885).

***Ravniella regularis* (von Koenen, 1885)**
Plate 8, fig. 10

1885 *Tornatella regularis* von Koenen, p. 76, pl. 3, fig. 24.
1897 *Tornatella regularis* von Koenen – Grönwall, p. 67.
1904 *Actaeon regularis* (von Koenen) – Arkhanguelsky, p. 167, pl. 11, fig. 5.
1907 *Tornatella regularis* von Koenen – Grönwall & Harder, p. 57, 63, 64; pl. 1, fig. 41.
1920b *Tornatella regularis* von Koenen – Rosenkrantz, p. 8.
1922 *Tornatella regularis* von Koenen – Harder, p. 32.
1937 *Tornatella regularis* von Koenen – Roedel, p. 214.
?1938 *Tornatellae* aff. *regularis* (von Koenen) – Traub, p. 97, pl. 8, figs 12a-b.
1939 *Tornatellae regularis* (von Koenen) – Ravn, p. 96.
1970 *Tornatellae (Ravniella) regularis* (von Koenen) – Rosenkrantz, p. 431, fig. 10.4.
1972 *Tornatellae (Ravniella) regularis* (Koenen, 1885) – Moroz, p. 120, pl. 26, fig. 3.

Other material – 14 specimens (impressions MNO, casts MNO and ISL).

Genus *Nonactaeonina* Meek & Hayden, 1856

Type species (by original designation) – *Nonacteonina graphoides* Stephenson, 1941.

***Nonactaeonina elata* (von Koenen, 1885)**
Plate 8, fig. 11

1885 *Actaeonina elata* von Koenen, p. 77, pl. 3, fig. 20.
1895 *Actaeonidea elata* von Koenen – Cossmann, p. 53.
1897 *Actaeonina elata* von Koenen – Grönwall, p. 67.
1904 *Actaeonina elata* von Koenen – Grönwall, p. 34.
1907 *Actaeonina elata* von Koenen – Grönwall & Harder, p. 57, pl. 1, figs 40 and 63.
1937 *Actaeonina elata* von Koenen – Roedel, p. 213, pl. 1, fig. 18.
1939 *Actaeonidea (Crenilabium) elata* (von Koenen) – Ravn, p. 97, pl. 4, figs 16a-b.
1972 *Crenilabium elatum* (Koenen, 1885) – Moroz, p. 121, pl. 26, fig. 4.

Other material – Seven specimens (impressions MNO, casts MNO and ISL).

Discussion – We assign the species to *Nonactaeonina* because of the slender high spired shell and the elongated body whorl. The aperture is narrow posteriorly and rounded anteriorly and the callus is restricted to to a narrow band on the columellar lip. The smooth columellar edge is twisted, and the ornament consists of punctate spiral grooves. Von Koenen (1885) based his species on eight small and two larger, defective specimens. The illustrated specimen from Gundstrup is the largest and most complete specimen known so far; however, it lacks the protoconch. General outline and sculpture match the description and illustrations by von Koenen. *Nonactaeonina* sp. from the Palaeocene of Nuussuaq, West Greenland (Kollmann & Peel 1983, p. 106, fig 245) is closely related and differs mainly by the absence of a subsutural band.

Remarks – Until now the genus *Nonactaeonina* was only known from the upper Cretaceous of the Gulf Coast of the United States (Meek & Hayden, 1856), the upper Cretaceous of Chile (Bandel & Stinnesbeck, 2000) and the Palaeocene of West Greenland (Kollmann & Peel, 1983).

Superfamily Ringiculoidea Philippi, 1853
Family Ringiculidae Philippi, 1853
Genus *Gilbertia* Morlet, 1888

Type species (by monotypy) – *Gilbertia inopinata* Morlet, 1888b.

***Gilbertia ultima* (von Koenen, 1885)**
Plate 8, fig. 19

1885 *Cinulia ultima* von Koenen, p. 77, pl. 3, fig. 20.
1895 *Gilbertia ultima* von Koenen – Cossmann, p. 123.
1907 *Cinulia ultima* von Koenen – Grönwall & Harder, p. 59.
1920b *Cinulia ultima* von Koenen – Rosenkrantz, p. 8.
1937 *Cinulia ultima* von Koenen – Roedel, p. 218, pl. 1, fig. 19.
1939 *Gilbertia ultima* (von Koenen) – Ravn, p. 98, pl. 4, figs 17a-b.
1972 *Gilbertia ultima* (Koenen, 1885) – Moroz, p. 122, pl. 26, figs 5a-b, 6.

Material – Only the illustrated incomplete specimen is known.

Discussion – The specimen consists of the rear side of the last whorl. However, the characteristic spiral ornament and the much thickened labrum completely match the specimens described and illustrated by von Koenen (1885) and Ravn (1939).

Remarks – Morlet (1888a) used the genus name *Gilbertinia* in his original description of the type species, but later (1888b) used the genus name *Gilbertia*.

Order Cephalaspidea
Superfamily Philinoidea Gray, 1850 (1815)
Family Cylichnidae H. Adams & A. Adams, 1854
Genus *Cylichna* Lovén, 1846

Type species (by subsequent designation) – *Bulla cylindracea* Pennant, 1777.

***Cylichna discifera* von Koenen, 1885**
Plate 8, fig. 17

1885 *Cylichna discifera* von Koenen, p. 74, pl. 3, fig. 21.
1895 *Bulinella (Cylichnina)? discifera* von Koenen – Cossmann, p. 96.
1897 *Cylichna discifera* von Koenen – Grönwall, p. 67.
1904 *Cylichna discifera* von Koenen – Grönwall, p. 34.
1907 *Cylichna discifera* von Koenen – Grönwall & Harder, p. 59.
1920b *Cylichna discifera* von Koenen – Rosenkrantz, p. 8.
1937 *Cylichna discifera* von Koenen – Roedel, p. 217.
1939 *Cylichna discifera* von Koenen – Ravn, p. 99.
1976 *Cylichna discifera* Koenen, 1885 – Makarenko, p. 161, pl. 16, figs 31-34.

Other material – Five specimens (one impression MNO, casts MNO and ISL; one specimen with the shell preserved (MNO)).

Superfamily Philinoidea Gray, 1850 (1815)
Family Scaphandridae G.O. Sars, 1878
Genus *Roxania* Leach, 1847

Type species (by monotypy) – *Bulla cranchii* Fleming, 1828.

***Roxania clausa* (von Koenen, 1885)**
Plate 8, fig. 18

1885 *Bulla clausa* von Koenen, p. 73, pl. 3, fig. 22.
1895 *Roxania? clausa* von Koenen – Cossmann, p. 99.
1897 *Bulla clausa* von Koenen – Grönwall, p. 67.
1904 *Bulla clausa* von Koenen – Grönwall, p. 34.
1907 *Bulla clausa* von Koenen – Grönwall & Harder, p. 59.
1937 *Bulla clausa* von Koenen – Roedel, p. 217.
1939 *Roxania clausa* (von Koenen) – Ravn, p. 99.

Remarks – Only the illustrated specimen is known. It is preserved as an external impression and was found together with a specimen of *Siphonalia ariejansseni*. The specimen is incomplete, but the typical spiral ornament could be observed.

Gastropoda, incertae cedis
Plate 9, figs 5a-b

Material – Only the illustrated specimen is known.

Description – The only specimen found has a little more than one intermediate whorl and the body whorl preserved. The shell is somewhat deformed and the ornament is poorly preserved. The shell is ovoid-fusiform and the whorls are medium convex and separated by a deep suture. The body whorl equals *c.* 75 % of the estimated height, the aperture a little more than half the estimated height. The aperture is lengthened ovate with an acute posterior end and constricted into a rather short and narrow canal, which is turned to the left and has four knobs on the columellar side. The columella is slightly concave and the labrum is thickened and seems to have four rounded knobs. The spiral ornament consists of two strong spirals, the abapical of which is situated on the middle of the whorl. The rear side of the body whorl and the base have *c.* 10 weak spiral ribs. The two spirals have *c.* 20 weak knobs. On the parietal wall, there are six sharp oblique ribs, which are directed towards the aperture.

Discussion – The poor state of preservation excludes a final identification. *Galeodea elongata* (von Koenen, 1885) and *Pyropsis pacaudi* nov. sp. have a similar ornament. However, *Galeodea elongata* has three spirals, carinated whorls and about twice as many knobs, whereas *Pyropsis pacaudi* has two strong knob-bearing spirals, angular whorls, a much wider aperture and numerous fine spirals on the entire shell. Both species lack oblique ribs on the parietal wall.

Class Cephalopoda Cuvier, 1795
Subclass Nautiloidea Agassiz, 1847
Order Nautilida Agassiz, 1847
Family Hercoglossidae Spath, 1927
Genus *Cimomia* Conrad, 1866

Type species (by subsequent designation (Conrad 1866, p. 102)) – *Nautilus burtini* Galeotti, 1837.

***Cimomia* sp.**
Plate 9, figs 1a-c, 2

Other material – Four specimens (MNO).

Description – All specimens are more or less deformed, due to compaction and the thin-walled shell. The illustrated specimen (Plate 9, fig 1) is the best preserved, but the cross section is not completely preserved. The shell is medium sized (estimated maximum diameter *c.* 100 mm) and slightly depressed. Width/height could not be estimated precisely. The shell is involute with a narrow umbilicus (umbilicus generally about 10 % of shell diameter). The adult body chamber occupies half of the last whorl. The septa are closely spaced and slightly flexuous. The shell is relatively thin-walled with a smooth surface, except for very fine spirals and flexuous growth lines.

Discussion – The species is referred to *Cimomia* because of the slightly flexuous septal sutures. The genus *Eutrephoceras* Hyatt, 1894 is almost globulose and has almost straight septal sutures. Rosenkrantz (1944, p. 444) gave an overview of the nautiloids of the Cretaceous, Danian and Selandian deposits of Denmark and mentioned specimens of *Cimomia* and *Eutrephoceras* from boulders of Lellinge Greensand at Klintebjerg, Sealand. His illustrated specimen of a *Cimomia* (p. 444, fig. 3) has a diameter of about 300 mm. He later mentioned the specimens (1968, p. 153) and suggested the name *Cimomia fredericiregis* nov. sp. for the species from Klintebjerg, but never published it. Schnetler (2001) mentioned fragments of nautiloids from the Selandian at Sundkrogen, Copenhagen.

Results and conclusions

The Selandian fauna from Gundstrup contains 133 species of molluscs, 27 of which are new species, 83 are new for the Kerteminde Marl and 48 new for the Selandian of Denmark. Eighteen species are recorded in open nomenclature, five could only be identified to family level and five are incertae sedis. The fauna has 43 species in common with the Rugård fauna (similarity index 76.1 %) and 26 in common with the Hvalløs fauna (similarity index 87 %), both from the Kerteminde Marl. It has less affinity to the Lellinge Greensand from the Copenhagen area (75 species in common, similarity index 36.3 %) and Klintebjerg (35 species in common, similarity index 60 %).
This study reports several genera for the first time from

the Palaeocene of Denmark whilst some are new for the European Palaeocene. The genera *Quadrinervus* and *Drepanocheilus* survived the K/Pg boundary.

The greatest part of the molluscan fauna is only known from the Danish Subbasin. Similarities with faunas from Poland and Russia indicate a connection to the South-East. According to Clemmensen & Thomsen (2005) such a connection has existed during earliest to Early Selandian but was closed during the Late Selandian (Æbelø Formation). There are indications of genera having their origin in the Boreal Realm and the Tethys Sea, whereas there was no connection to the Paris Basin. According to Clemmensen & Thomsen (2005) the connection to the Arctic Sea was via the seaway between Norway and Greenland. The connection to the Tethys Sea was probably via seaways across Poland and Ukraine (Pozaryska, 1965).

The fauna lived at a palaeodepth of 100-150 m in a presumed subtropical climate. The palaeoenvironment is interpreted as being in the frame of the transgression of the Selandian Sea including the erosion of the underlying Danian sediments. The near-shore environment in the early Selandian was followed by gradually increasing water depth, resulting in deposits of fine-grained Kerteminde Marl and finally clay of the Æbelø Formation.

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Plate 1

1. *Nucula densistria* von Koenen, 1885. Silicone latex cast of right valve, external view. MGUH 31858. Length 12.7 mm, height 8.2 mm.
2. *Nuculana biarata* (von Koenen, 1885). Silicone latex cast of right valve, external view. MGUH 31859. Length 9.9 mm, height 6.2 mm.
3. *Nuculana symmetrica* (von Koenen, 1885). Silicone latex cast of right valve, external view. MGUH 31860. Length 8.0 mm, height 5.3 mm.
4. *Nuculana ovoides* (von Koenen, 1885). Silicone latex cast of right valve, external view. MGUH 31861. Length 9.0 mm, height 7.2 mm.
5. *Arcopsis limopsis* (von Koenen, 1885). Right valve of shell partly preserved, external view. MGUH 31862. Length 5.5 mm, height 3.6 mm.
6. *Modiolus mortenseni* nov. sp. Right valve of double valved specimen with shell preserved, external view. **Holotype**, MGUH 31863, DK 822. Length 44.2 mm, height 23.3 mm.
7. ?*Lithophaga* sp. External view of both valves of a double valved specimen. MGUH 31864. Length of left valve 15.4 mm, height 4.0 mm.
8. ?*Atrina rosenkrantzi* nov. sp. Left valve of double valved shell, external view. **Holotype**, MGUH 31865. Length 130 mm, height 100 mm.
9. *Pinna* sp. Double valved specimen with parts of the shell preserved, external view. MGUH 31866. Length of right valve 96 mm, height 33 mm.
10. *Pycnodonte (Phygraea) vesicularis* (Lamarck, 1806). Left valve of preserved shell, internal view. MGUH 31867. Length 12.2 mm, height 19.1 mm.
11. *Pycnodonte (Phygraea) vesicularis* (Lamarck, 1806). Right valve of preserved shell, internal view. MGUH 31868. Length 22.7 mm, height 40.4 mm.
12. *Pteria thomseni* nov. sp. Right valve of preserved shell, external view. **Holotype**, MGUH 31869, DK 823. Length 15.5 mm, height 11.2 mm.
13. *Pteria thomseni* nov. sp. Left valve of preserved shell, external view. **Paratype**, MGUH 31870. Length 29.5 mm, height 20.4 mm.
14. *Limaria geinitzi* (von Hagenow, 1842). Two valves of double valved specimen, external view. MGUH 31871. Length of largest valve 5.2 mm, height 6.6 mm.
15. *Propeamussium (Propeamussium) bisculptum* (von Koenen, 1885). Silicone latex cast of right valve, external view. MGUH 31872. Length 4.0 mm, height 4.2 mm.
16. *Delectopecten palaeocaenicus* (Staesche *in* Roedel, 1937). Right valve, external view. MGUH 31873. Length 3.0 mm, height 3.5 mm.
17. *Delectopecten palaeocaenicus* (Staesche *in* Roedel, 1937). Left valve, partly preserved, external view. MGUH 31874. Length 4.5 mm, height 4.7 mm.
18. *Phacoides* (s. lat.) *lepis* (von Koenen, 1885). Left valve with shell partly preserved, external view. MGUH 31875. Length 10.5 mm, height 10.1 mm.
19. *Parvilucina planistria* (von Koenen, 1885). Left valve with shell partly preserved, external view. MGUH 31876. Length of largest specimen 9.5 mm, height 8.3 mm.
20. *Parathyasira regularis* (Grönwall & Harder, 1907). Silicone latex cast of left valve, external view. MGUH 31877. Length 12.1 mm, height 11.0 mm.

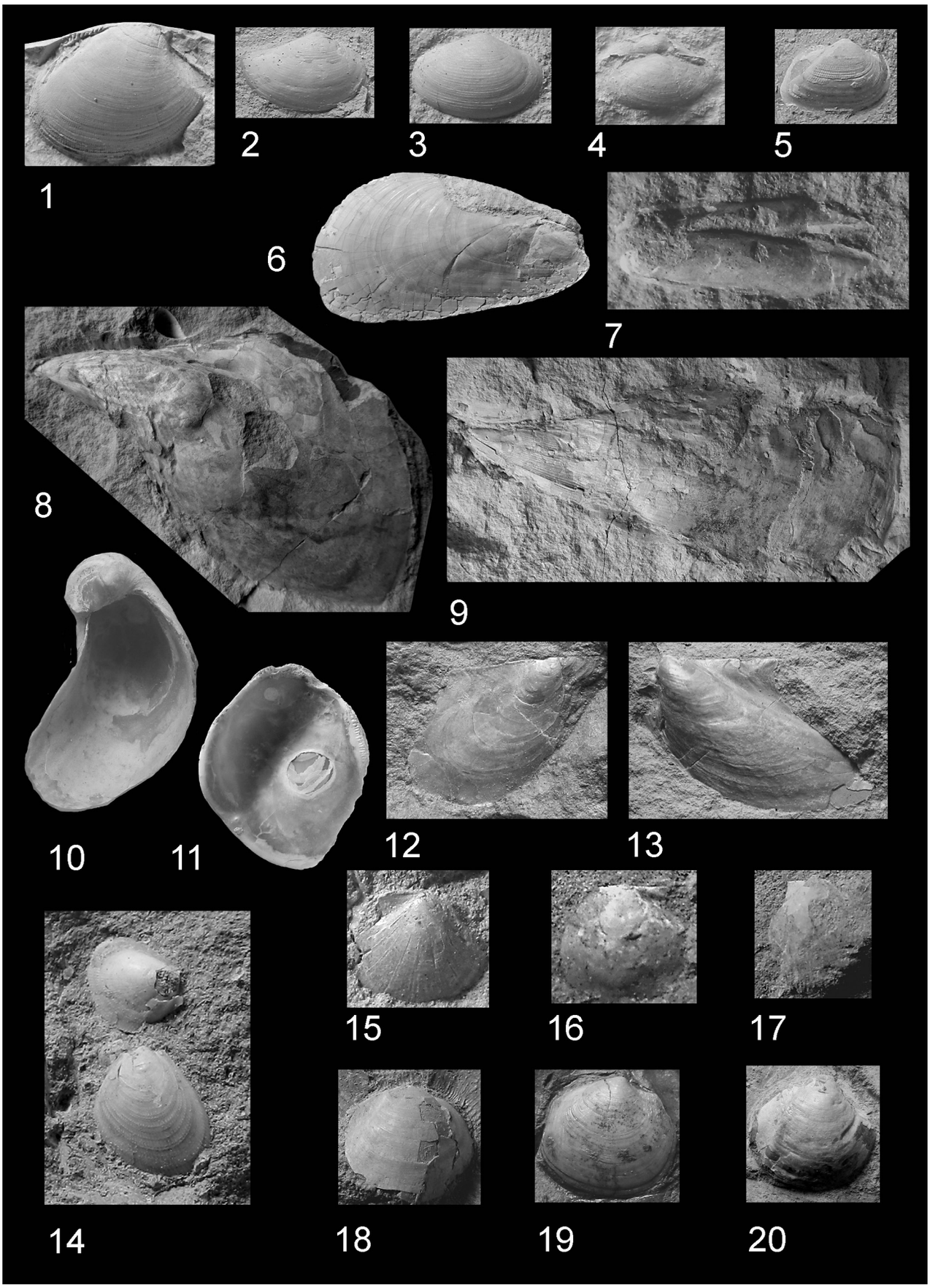

Plate 1

Plate 2

1. *Protocardia semidecussata* (von Koenen, 1885). Silicone latex cast, external view of left valve. MGUH 31878. Length 12.5 mm, height 12.0 mm.
2. Astartidae, gen. et sp. indet. Silicone latex cast, external view of left valve. MGUH 31879. Length 9.5 mm, width 7.4 mm.
3. Astartidae, gen. et sp. indet. Silicone latex cast, external view of left valve. MGUH 31880. Length 2.8 mm, width 2.5 mm.
4. ?*Anisodonta* sp. External view of right valve of specimen with the shell partly preserved. MGUH 31881. Length 7.0 mm, height 5.2 mm.
5. ?*Netastoma* sp. Silicone latex cast, external view of right valve. MGUH 31882. Length 10 mm, height 7.5 mm.
6. Teredinidae, gen. et sp. indet. Numerous calcitic tubes. MGUH 31883. Length 98 mm, height 63 mm.
7. *Lyonsia baltica* Roedel, 1935. External view of right valve a specimen with the shell partly preserved. MGUH 31884. Length 19.0 mm, height 9.1 mm.
8. *Pholadomya (Bucardiomya)* ?*margaritacea* (Sowerby, 1823). External view of right valve of double valved specimen. MGUH 31885. Length 46 mm, height 32.4 mm and width of double valved specimen 25 mm.
9. *Periploma ravni* (Schnetler, 2001). External view of right valve of double valved specimen. MGUH 31886. Length 13.8 mm, height 10.6 mm.
10. *Cuspidaria heilmannclauseni* nov. sp. Silicone latex cast. External view of right valve. **Holotype**, MGUH 31887, DK 824. Length 38.5 mm, width 21.5 mm.
11. *Cuspidaria heilmannclauseni* nov. sp. External view of right valve of specimen with the shell partly preserved. **Paratype**, MGUH 31888. Length 45 mm, width 32 mm.
12. *Cuspidaria anderseni* nov. sp. Silicone latex cast. External view of left valve. **Holotype**, MGUH 31889. Length 21 mm, width 11 mm.
13. Bivalvia, gen. et sp. indet. 1. External view of right valve of specimen with the shell partly preserved. MGUH 31890. Length 12.0 mm, height 9.5 mm.
14. Bivalvia, gen. et sp. indet. 2. Left valve of shell, partly preserved, external view. MGUH 31891. Length 10.8 mm, height 10.0 mm.
15. Bivalvia, gen. et sp. indet. 3. Silicone latex cast, external view. MGUH 31892. Length 27 mm, height 10 mm.
16. Bivalvia, gen. et sp. indet. 4. External view of left valve with the shell preserved. MGUH 31893. Length 5.8 mm, height 4.1 mm.
17. ?*Diplodonta* sp. External view of right valve of specimen with the shell partly preserved. MGUH 31894. Length 15.2 mm, height 12.0 mm.
18. ?*Diplodonta* sp. External view of right valve of specimen with the shell partly preserved. MGUH 31895. Length 15.2 mm, height 12.0 mm.
19. *Antalis undifera* (von Koenen, 1885). External view of specimen with the shell partly preserved. MGUH 31896. Length 69 mm, maximum diameter 6 mm.
20. *Antalis rugifera* (von Koenen, 1885). External view of specimen with the shell partly preserved. MGUH 31897. Length 27 mm, maximum diameter 7 mm.
21. *Siphonodentalium intumescens* (von Koenen, 1885). External view of specimen with the shell preserved. MGUH 31898. Length 4.9 mm, maximum diameter 1.1 mm.

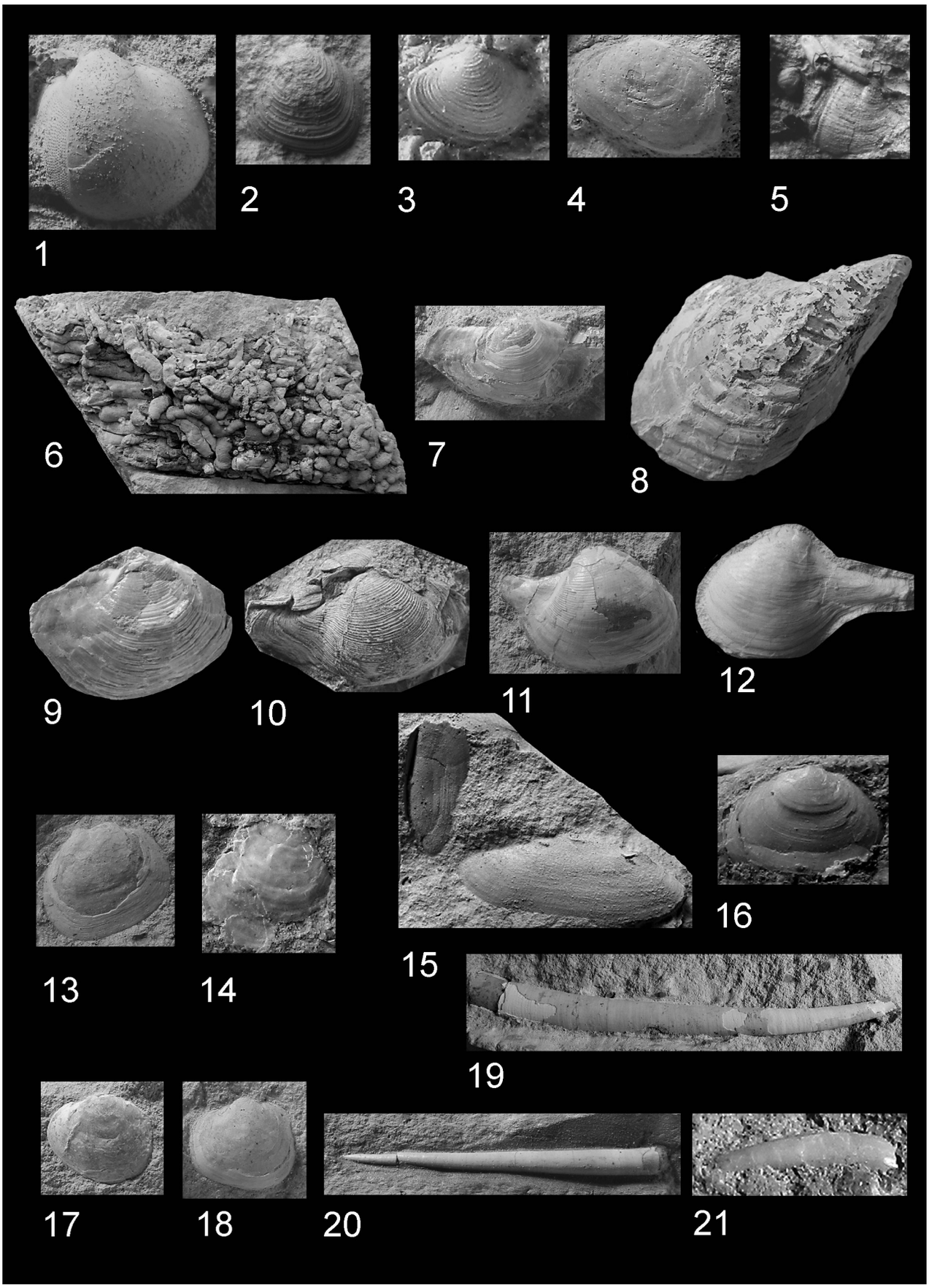

Plate 2

Plate 3

1. *Emarginula* sp. Silicone latex cast, lateral view. MGUH 31899. Length 3.9 mm, height 1.8 mm, width 1.9 mm.
2. *Scurria rieae* nov. sp. Silicone latex cast; 2a: lateral view, 2b apical view. **Holotype**, MGUH 31900, DK 825. Length 10 mm, height 7 mm, width 7 mm.
3. *Lepeta poulseni* (Ravn, 1939). Silicone latex cast; 3a: apical view, 3b lateral view. MGUH 31901. Length 12.3 11.7 mm, width 8.5 mm, height 3.6 mm.
4. *Cidarina johnstrupi* (Grönwall & Harder, 1907). Silicone latex cast, apertural view. MGUH 31902. Height 15.5 mm, width 10.9 mm.
5. *Cidarina johnstrupi* (Grönwall & Harder, 1907). Silicone latex cast, rear view. MGUH 31903. Height 14.0 mm, width 10.9 mm.
6. *Cidarina johnstrupi* (Grönwall & Harder, 1907). Silicone latex cast, umbilical view. MGUH 31904. Diameter 10.6 mm.
7. *Eucycloscala crassilabris* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31905. Height 8.7 mm, width 5.1 mm.
8. *Metacerithium hauniense* (von Koenen, 1885). Silicone latex cast, MGUH 31906. Height 22.2 mm, width 10.4 mm.
9. *Metacerithium hauniense* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31907. Height of cast 42.1 mm, width 61.5 mm.
10. *Orthochetus zigzag* (Grönwall & Harder, 1907). Silicone latex cast, apertural view. MGUH 31908. Height 32.0 mm, width 7.2 mm.
11. *Orthochetus zigzag* (Grönwall & Harder, 1907). Silicone latex cast, apertural view. MGUH 29253. Height 34.7 mm, width 10.5 mm. (= Fig. 1 G in Darragh, 2010).
12. *Orthochetus zigzag* (Grönwall & Harder, 1907). Silicone latex cast, apertural view. MGUH 31909. Height 33 mm, width 8 mm.
13. *Orthochetus zigzag* (Grönwall & Harder, 1907). Silicone latex cast, apertural view. MGUH 31910, DK 826. Height 32 mm, width 9 mm.
14. *Orthochetus darraghi* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31911, DK 828. Height 34.2 mm, width 11.6 mm.
15. *Orthochetus grewingki* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31912. Height 41.2 mm, width 13.1 mm.
16. *Orthochetus grewingki* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31913, DK 827. Height 28.3 mm, width 9.3 mm.
17. *Orthochetus grewingki* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31914. Height 45.2 mm, width 12.2 mm.
18. *Orthochetus grewingki* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31915, DK 829. Height 31.4 mm, width 11.2 mm.
19. ?*Orthochetus* sp. Silicone latex cast, rear view. MGUH 31916, Height 14.5 mm, width 7.1 mm.
20. ?*Orthochetus* sp. Silicone latex cast, apertural view. MGUH 31917, DK 829. Height 17 mm, width 9 mm.
21. *Turritella suessi* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31918. Height 25.2 mm, width 7.7 mm.

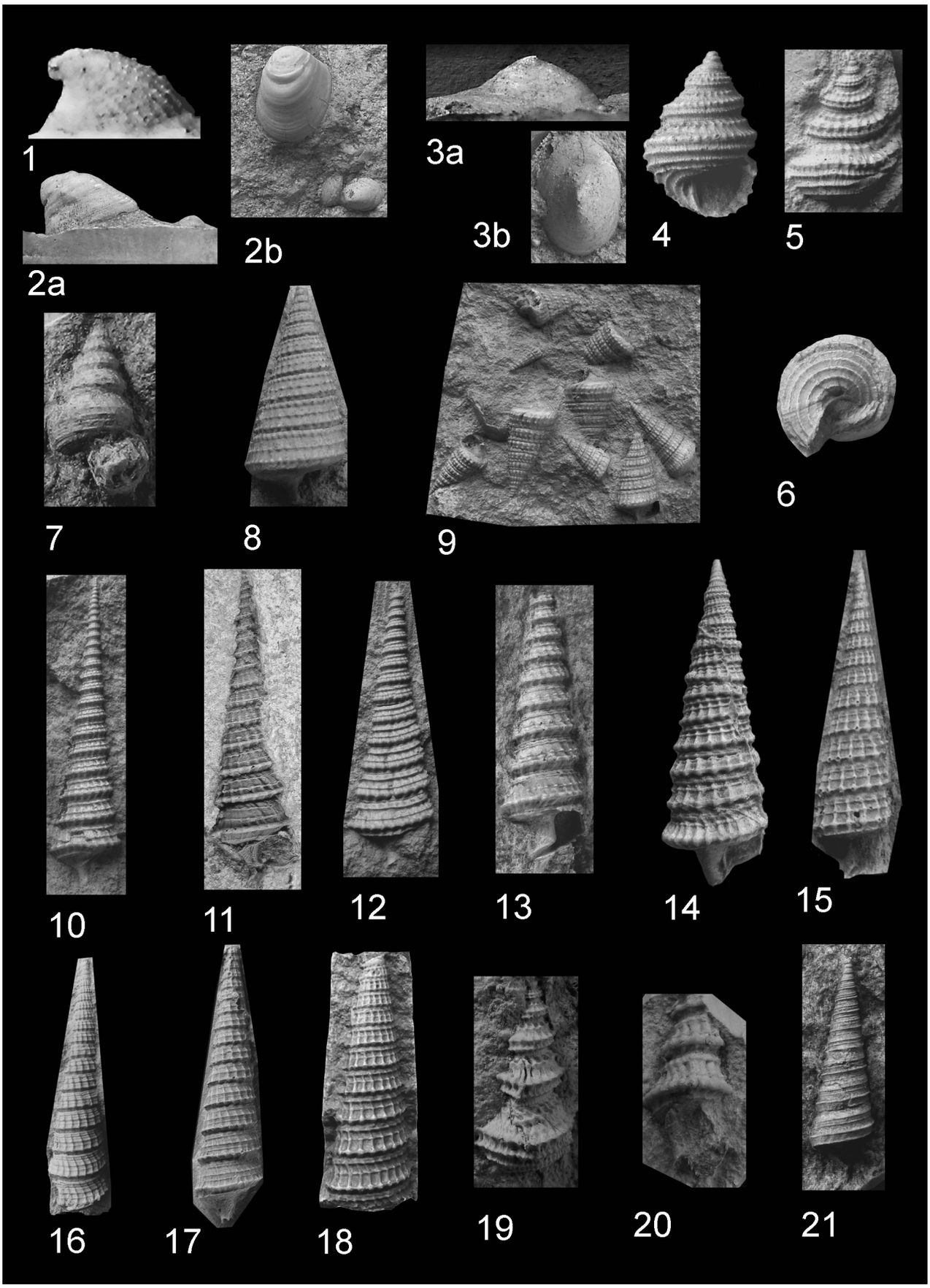

Plate 3

Plate 4

1. *Capulus* sp. Silicone latex cast, rear view. MGUH 31919. Height 9.7 mm, width 11.8 mm.
2. *Eocypraea* sp. 2a: Internal mould, apertural view. 2b: Silicone latex cast, apertural view. MGUH 31920. Height 20.1 mm, width 15.5 mm.
3. *Palaeocypraea* cf. *suecica* (Schilder, 1928). Silicone latex cast, apertural view. MGUH 31921, DK 830. Height 21.6 mm, width 18.4 mm.
4. *Priscoficus* sp. Silicone latex cast, rear view. MGUH 31922. Height 27.2 mm, width 22.1 mm.
5. *Euspira detrita* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31923. Height 17.6 mm, width 14.1 mm.
6. *Euspira detracta* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31924. Height 22 mm, width 18 mm.
7. *Tectonatica lindstroemi* (von Koenen, 1885). Specimen with shell almost completely preserved, apertural view. MGUH 31925. Height 14.4 mm, width 9.9 mm.
8. *Trachytriton eliseae* nov. sp. Silicone latex cast; 8a: apex, 8b: oblique apertural view of last whorl. **Holotype**, MGUH 31926, DK 831. Height of apex 37.5 mm, width 19.3 mm. Height of last whorl 36.0 mm, width 20.4 mm.
9. *Sassia bjerringi* (Ravn, 1939). Silicone latex cast, apertural view. MGUH 31927. Height 18.4 mm, width 10.2 mm.
10. *Sassia bjerringi* (Ravn, 1939). Silicone latex cast, apertural view. MGUH 31928. Height 19.6 mm, width 8.6 mm.
11. *Galeodea elongata* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31929. Height 21.6 mm, width 16.1 mm.
12. *Galeodea elongata* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31930. Height 20.8 mm, width 14.7 mm.
13. *Coniscala johnstrupi* (Mörch, 1874). Silicone latex cast, apertural view. MGUH 31931. Height 31.4 mm, width 22.5 mm.
14. *Acirsa elatior* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31932. Height 24.2 mm, width 6.7 mm.
15. *Acirsa* sp. Silicone latex cast, rear view. MGUH 31933. Height 16.2 mm, width 3.0 mm.
16. *Clathroscala bruennichi* (Ravn, 1939). Silicone latex cast, rear view. MGUH 31934. Height 29.5 mm, width 13.6 mm.
17. *Clathroscala gryi* (Ravn, 1939). Silicone latex cast, oblique apertural view. MGUH 31935. Height 33.2 mm, width 9.6 mm.
18. *Opaliopsis* sp. Silicone latex cast, apertural view. MGUH 31936. Height 28.5 mm, width 9.5 mm.
19. *Eulima solidula* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31937. Height 12.0 mm, width 3.8 mm.

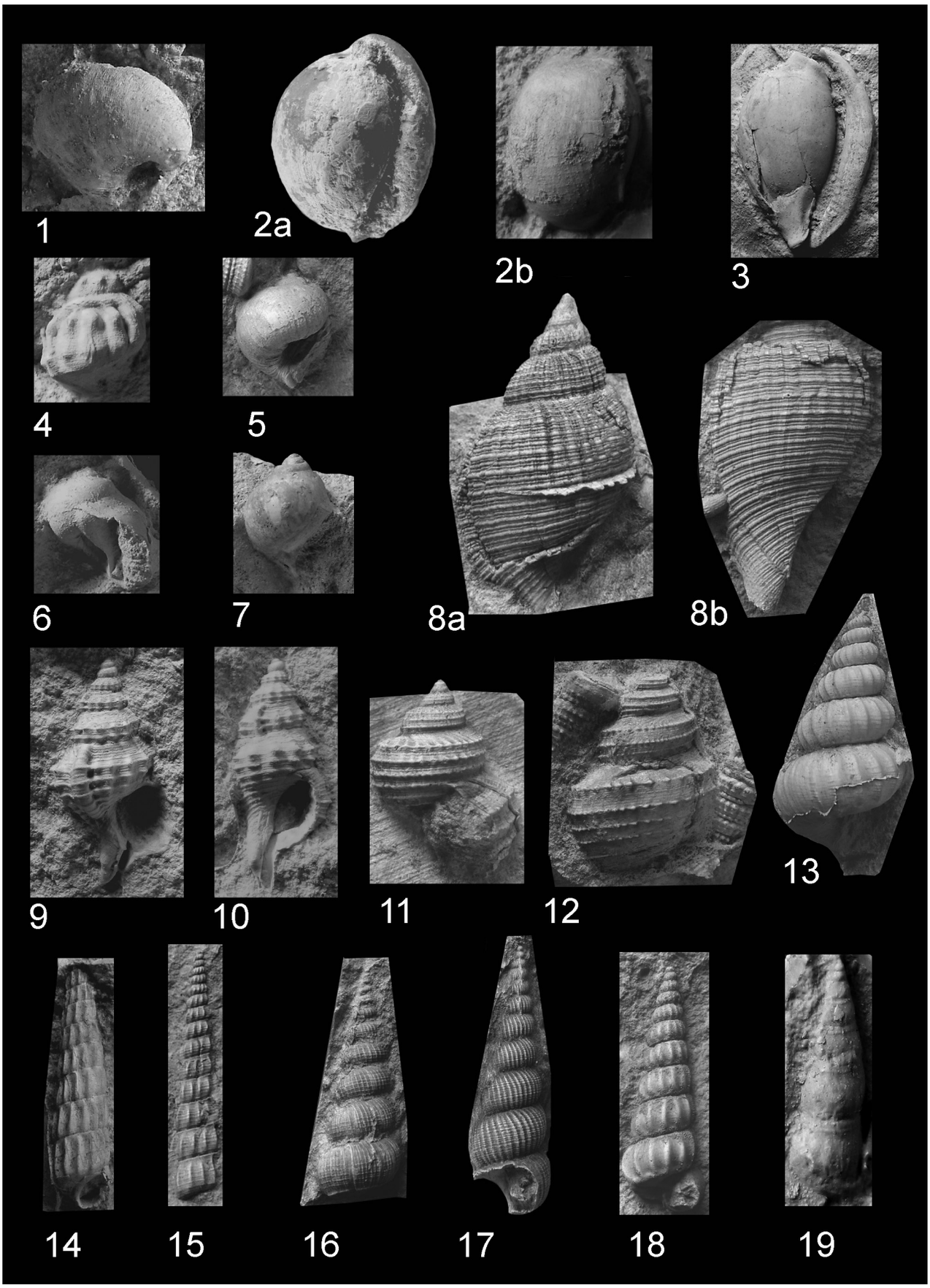

Plate 4

Plate 5

1. *Aporrhais gracilis* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31938. Height 10.4 mm, width 8.5 mm.
2. *Aporrhais gracilis* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31939. Height 14.2 mm, width 9.5 mm.
3. *Quadrinervus wienekei* nov. sp. Silicone latex cast, apertural view. **Paratype**, MGUH 31940, DK 8333. Height 23.7 mm, width 18.8 mm.
4. *Quadrinervus wienekei* nov. sp. Silicone latex cast, rear view. **Holotype**, MGUH 31941. Height 25 mm, width 21 mm.
5. *Drepanocheilus koeneni* (Grönwall & Harder, 1907). Silicone latex cast; 5a: apertural view, 5b: rear view. MGUH 31942, DK 832. Height 18.1 mm, width 14.2 mm.
6. *Kangilioptera gundstrupensis* nov. sp. Silicone latex cast; 6a: apertural view, 6b: rear view. **Holotype**, MGUH 31943, DK 834. Height 23.7 mm, width 19.9 mm.
7. *Kangilioptera gundstrupensis* nov. sp. Interior of wing, showing the lobe at the anterior edge, compared with *Kangilioptera ravni* (Rosenkrantz 1970, p. 431, fig. 9.2, MGUH 10798). **Paratype**, MGUH 31944. Height of wing 23.5 mm, width 13.5 mm.
8. *Xenophora* sp. Silicone latex cast; 8a: umbilical view, 8b: apical view, 8c: lateral view. MGUH 31945. Height 13.1 mm, 22.7 mm.
9. ?*Epetrium pernilleae* nov. sp. Silicone latex cast, rear view. **Holotype**, MGUH 31946, DK 835. Height 32.5 mm, width 6.0 mm.
10. ?*Epetrium flemmingi* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31947, DK 836. Height 30.1 mm, width 4.5 mm.
11. Triphoridea, gen. et sp. indet. Silicone latex cast, apertural view. MGUH 31948. Height 22 mm, width 4.8 mm.
12. *Cerithiopsis emilieae* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31949, DK 837. Height 19.9 mm, width 3.8 mm.
13. *Cerithiopsis andreae* nov. sp. Specimen with the shell preserved and impression of another specimen. **Holotype**, MGUH 31950, DK 839. Height 16.9 mm, width 6.5 mm.
14. ?*Cerithiopsis luiseae* nov. sp. Silicone latex cast, lateral view. **Holotype**, MGUH 31951, DK 840. Height 29.8 mm, width 4.5 mm.
15. *Truncaria benjamini* nov. sp. Silicone latex cast; 15a: apertural view, 15b: rear view. **Holotype**, MGUH 31952, DK 843. Height 15.3 mm, width 7.3 mm.
16. *Cerithiopsis boanderseni* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31953. Height 34.7 mm, width 8.3 mm.
17. ?*Cerithiopsis* sp. Silicone latex cast, rear view. MGUH 31954. Height 15.1 mm, width 2.5 mm.
18. *Ataxocerithium cingulatum* (Grönwall & Harder, 1907). Silicone latex cast of apex and fragment of the same specimen. MGUH 31955. Height of apex 21.0 mm, width 7.3 mm; height of fragment 20.2 mm, width 9.2 mm.
19. ?*Ataxocerithium exsculptum* (Grönwall & Harder, 1907). Silicone latex cast, apertural view. MGUH 31956, DK 841. Height 16.0 mm, width 8.2 mm.
20. *Variseila monbergi* (Ravn, 1939). Silicone latex cast, apertural view. MGUH 31957. Height 10.6 mm, width 2.5 mm.
21. *Cerithiella salmae* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31958, DK 826. Height 25.2 mm, width 6.8 mm.
22. *Cerithiella malakae* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31959, DK 838. Height 30.1 mm, width 7.5 mm.

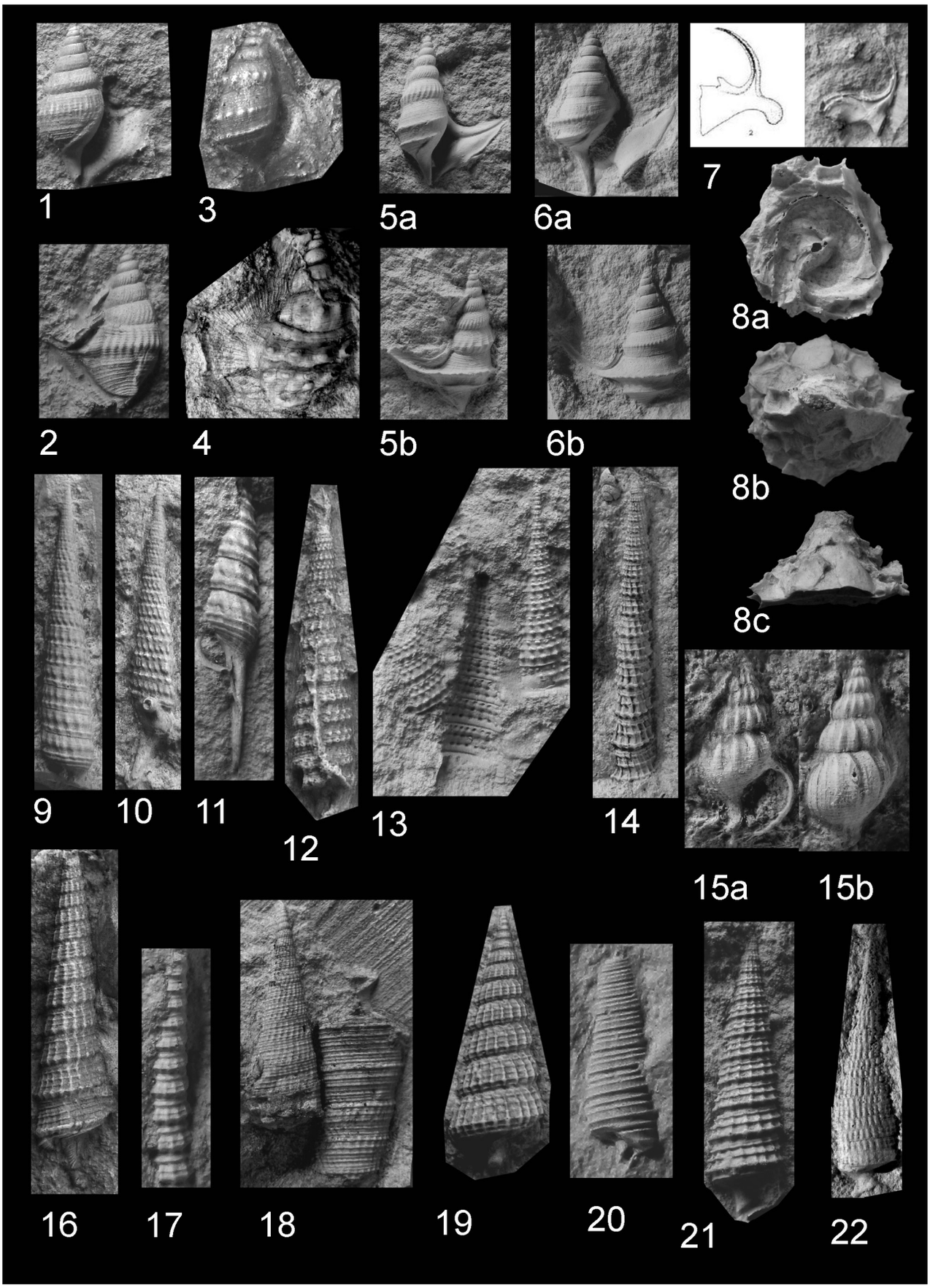
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Plate 5

Plate 6

1. *Siphonalia morteni* nov. sp. Silicone latex cast; 1a: rear view, height 18.5 mm, width 7.5 mm; 1b: apertural view, 24.0 mm, width 10.5 mm. **Paratype**, MGUH 31960. Height 16.6 mm, width 7.0 mm.
2. *Siphonalia morteni* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31961, DK 842. Height 16.6 mm, width 7.0 mm.
3. *Siphonalia ariejansseni* Schnetler, 2001. Silicone latex cast; 3a: apertural view, 3b: rear view. MGUH 31962. Height 24 mm, width 8 mm.
4. *Falsifusus danicus* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31963. Height 32.8 mm, width 10.2 mm.
5. *Clavilithes hauniensis* (Ravn, 1939). Silicone latex cast, rear view. MGUH 31964, DK 844. Height 29.5 mm, width 14.0 mm. Estimated height 40 mm.
6. *Latirulus lemchei* (Schnetler, 2001). Silicone latex cast, apertural view. MGUH 31965. Height 16.4 mm, width 6.1 mm.
7. *Levifusus moerchi* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31966. Height 35.1 mm, width 15.5 mm.
8. *Levifusus metteae* nov. sp. Silicone latex cast. Oblique apical view of apex. **Paratype**, MGUH 31967. Height of apex 13 mm.
9. *Levifusus metteae* nov. sp. Silicone latex cast; 9a: apex, height 18 mm, width 17.8 mm; 9b: apertural view of body whorl of the same specimen, height 22.5 mm, width 15.0 mm. **Holotype**, MGUH 31968.
10. ?*Astyris* sp. Silicone latex cast, apertural view. MGUH 31969. Height 17.6, width 6.1 mm.
11. *Urosalpinx pyruloides* (von Koenen, 1885). Silicone latex cast; 11a: apertural view, 11b: rear view. MGUH 31970. Height 32.5 mm, width 19.2 mm.
12. *Urosalpinx pyruloides* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31971. Height 12.0 mm, width 6.8 mm.
13. Muricidae, gen. et sp. indet. Silicone latex cast, rear view. MGUH 31972. Height 17.2 mm, width 15.6 mm.
14. *Vexillum aequicostatum* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31973. Height 35.0 mm, width 10.6 mm.
15. *Exilia frejae* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31974. Height 31.5 mm, width 10.1 mm.
16. *Volutoderma flexiplicata* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31975. Height 53 mm, estimated width 19 mm.
17. *Volutoderma flexiplicata* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31976. Height 50 mm, estimated width 20 mm.
18. *Athleta (Volutocorbis) nodifera* (von Koenen, 1885). Silicone latex cast, lateral view. MGUH 31977. Height 23.5 mm, width 9.8 mm.
19. *Athleta nikoilajii* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 31978, DK 845. Height 33.0 mm, width 13.6 mm.
20. *Athleta nikoilajii* nov. sp. Silicone latex cast, rear view. **Paratype**, MGUH 31979. Height 37.5 mm, width 13.7 mm.

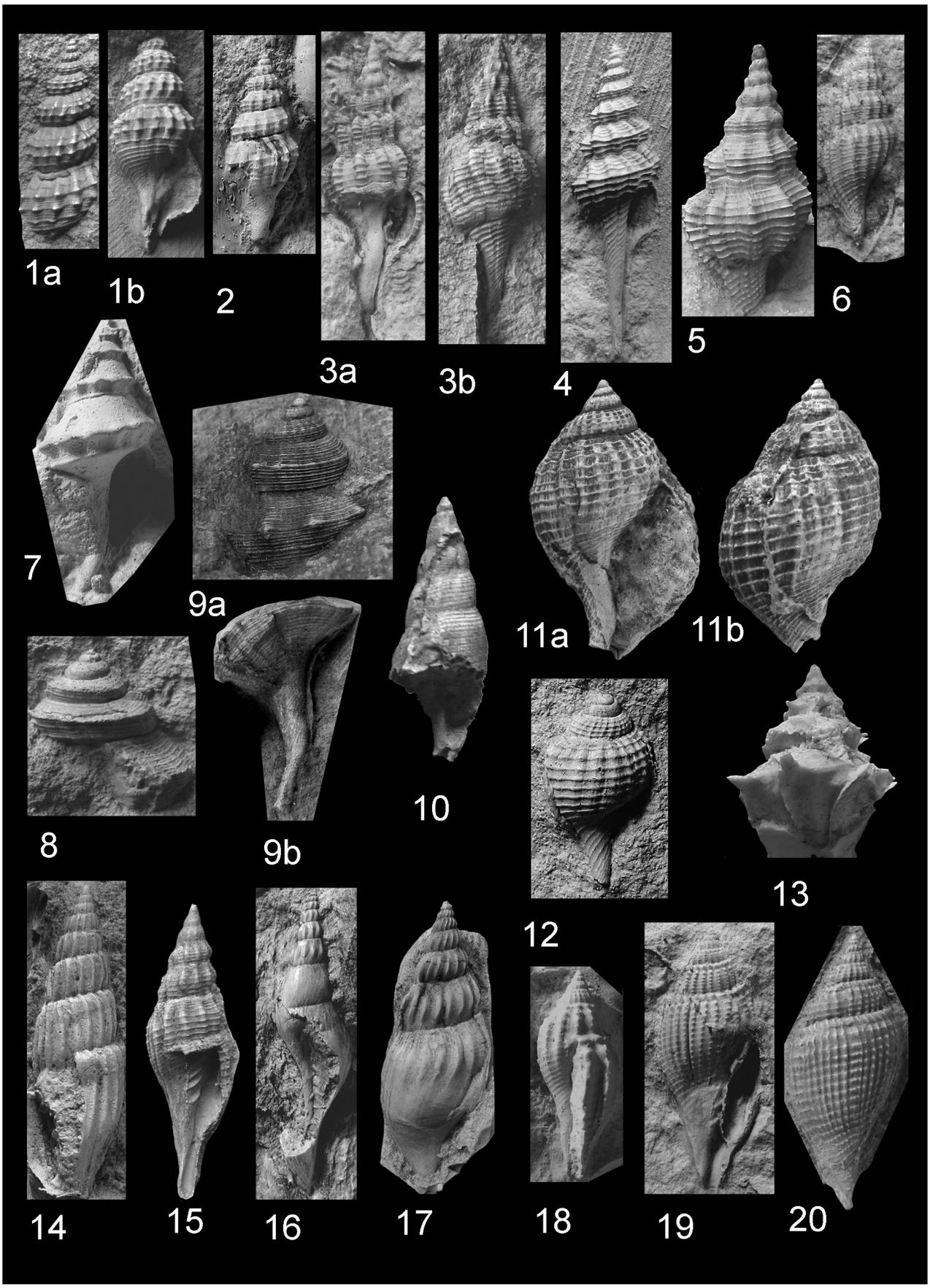

Plate 6

Plate 7

1. *Euroscaphella crenistria* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31980. Height 36.5 mm, width 12.4 mm.
2. *Ancilla flexuosa* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31981. Height 23.5 mm, width 10.2 mm.
3. *Exilia crassistria* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31982. Height 22.5 mm, width 7.6 mm.
4. *Exilia crassistria* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31983. Height 43 mm, width 13 mm.
5. *Exilia crassistria* (von Koenen, 1885). Silicone latex cast, oblique apertural view. MGUH 31984, DK 846. Height 15.5 mm, width 3.8 mm.
6. *Pyropsis jakobseni* nov. sp. Silicone latex cast; 6a: apex, 6b: apertural view. **Holotype**, MGUH 31985, DK 851. Height 17.5 mm, width 16.1 mm. Estimated height *c.* 28 mm.
7. *Pyropsis pacaudi* nov. sp. Silicone latex cast; 7a: apertural view, 7b: rear view. **Holotype**, MGUH 31986, DK 852. Height 28.5 mm, width 19.7 mm.
8. *Hemipleurotoma gryi* (Ravn, 1939). Silicone latex cast, rear view. MGUH 31987. Height 22.4 mm, width 8.3 mm.
9. *Hemipleurotoma gryi* (Ravn, 1939). Silicone latex cast, rear view. MGUH 31988. Height 22.7 mm, width 9.0 mm.
10. *Turricula torelli* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31989. Height 23.8 mm, width 7.2 mm.
11. *Turricula rosenkrantzi* (Ravn, 1939). Silicone latex cast, lateral view. MGUH 31990. Height 24.9 mm, width 5.5 mm.
12. *Hemipleurotoma danica* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31991. Height 11.5 mm, width 3.6 mm.
13. *Eopleurotoma selandica* (von Koenen, 1885). Silicone latex cast; 13a: apertural view, 13b: rear view. MGUH 31992. Estimated height 11.8 mm, width 4.1 mm.
14. *Turricula hauniensis* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31993. Height 83 mm, width 22 mm.
15. *Turricula johnstrupi* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31994. Height 38 mm, width 16.5 mm.
16. *Turricula fissicosta* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 31995. Height 12.5 mm, width 4.6 mm.
17. *Turricula laeviuscul*a (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31996. Height 21.3 mm, width 8.6 mm.
18. *Turricula vibekeae* nov. sp. Silicone latex cast; 18a: apertural view, 18b: rear view. **Holotype**, MGUH 31997, DK 847. Height 27.1 mm, width 9.5 mm.

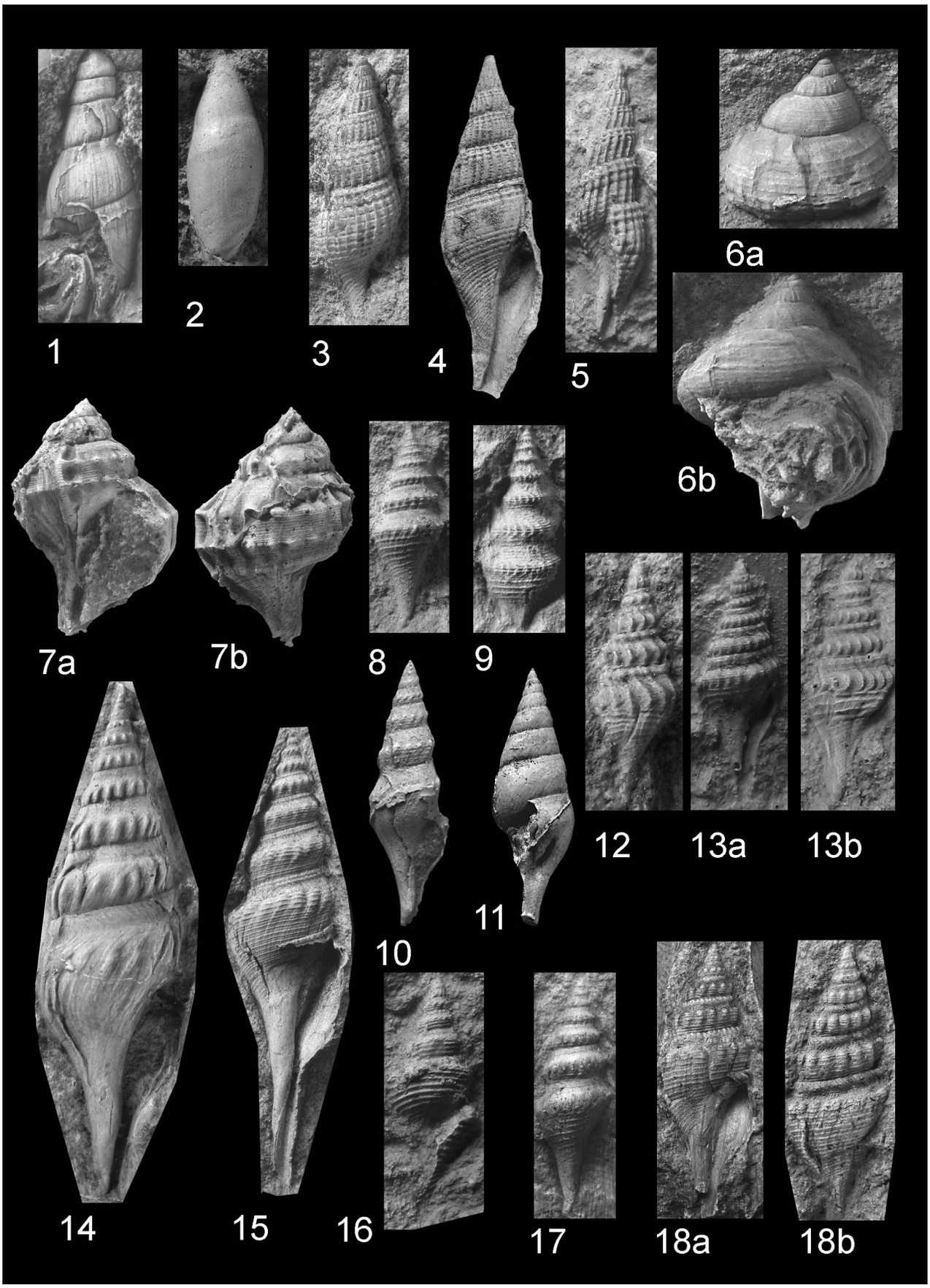

Plate 7

Plate 8

1. *Pseudocochlespira koeneni* (Arkhanguelsky, 1904). Silicone latex cast, apertural view. MGUH 31998. Height 37.5 mm, width 7.0 mm.
2. *Pseudocochlespira boeggildi* (Ravn, 1939). Silicone latex cast, apertural view. MGUH 31999. Height 16.9 mm, width 12.5 mm.
3. ?*Pseudocochlespira* sp. Silicone latex cast, rear view. MGUH 32000. Height 26.8 mm, width 15.5 mm.
4. *Boreocomitas brevior* (von Koenen, 1885). Silicone latex cast; 4a: apertural view; height 22.6 mm, width 9.5 mm; 4b: rear view; height 18.1 mm, width 9.0 mm. MGUH 32001.
5. *Pseudotoma inconspicua* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 32002, DK 848. Height 27.4 mm, width 12.5 mm.
6. *Belophos steenstrupi* (von Koenen, 1885). Silicone latex cast ; 6a: apertural view; 6b: rear view. MGUH 32003, DK 850. Height 18.8 mm, width 8.6 mm.
7. *Borsonia binodosa* von Koenen, 1885. Silicone latex cast, apertural view. MGUH 32004. Height 17.2 mm, width 7.2 mm.
8. ?*Mangelia stoutjesdijki* nov. sp. Silicone latex cast, apertural view. **Holotype**, MGUH 32005, DK 849. Height 17.1 mm, width 7.2 mm.
9. ?Cancellariidae, gen. et sp. indet. Silicone latex cast, apertural view. MGUH 32006. Height 9.5 mm, width 5.5 mm.
10. *Ravniella regularis* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 32007. Height 14.4 mm, width 8.6 mm.
11. *Nonactaeonina elata* (von Koenen, 1885). Silicone latex cast, apertural view. MGUH 32008. Height 27.6 mm, width 8.0 mm.
12. *Pseudomalaxis pingelii* (Mörch, 1874). Silicone latex cast; 12a: apical view, 12b: umbilical view. MGUH 32009. Diameter 14.9 mm.
13. *Pseudomalaxis groenwalli* Ravn, 1939. Silicone latex cast; 13a: apical view, 13b: umbilical view. MGUH 32010. Diameter 7.7 mm.
14. *Neamphitomaria* sp. Specimen with shell preserved, apical view. MGUH 32011. Diameter 2.1 mm.
15. *Mathilda fenestrata* (Grönwall & Harder, 1907). Silicone latex cast, apical view. MGUH 32012. Height 16.4 mm, width 8.0 mm.
16. *Mathilda* cf. *carinata* (Ravn, 1939). Silicone latex cast, apertural view. MGUH 32013. Height 6.5 mm, width 3.1 mm.
17. *Cylichna discifera* (von Koenen, 1885). Specimen with shell preserved, rear view. MGUH 32014. Height 9.2 mm, width 3.5 mm.
18. *Roxania clausa* (von Koenen, 1885). Silicone latex cast, rear view. MGUH 31962. Height 8.5 mm, width 3.5 mm.
19. *Gilbertia ultima* (von Koenen, 1885). Defective specimen with shell preserved, rear view. MGUH 32015. Height of last whorl 4.0 mm, width 4.5 mm.

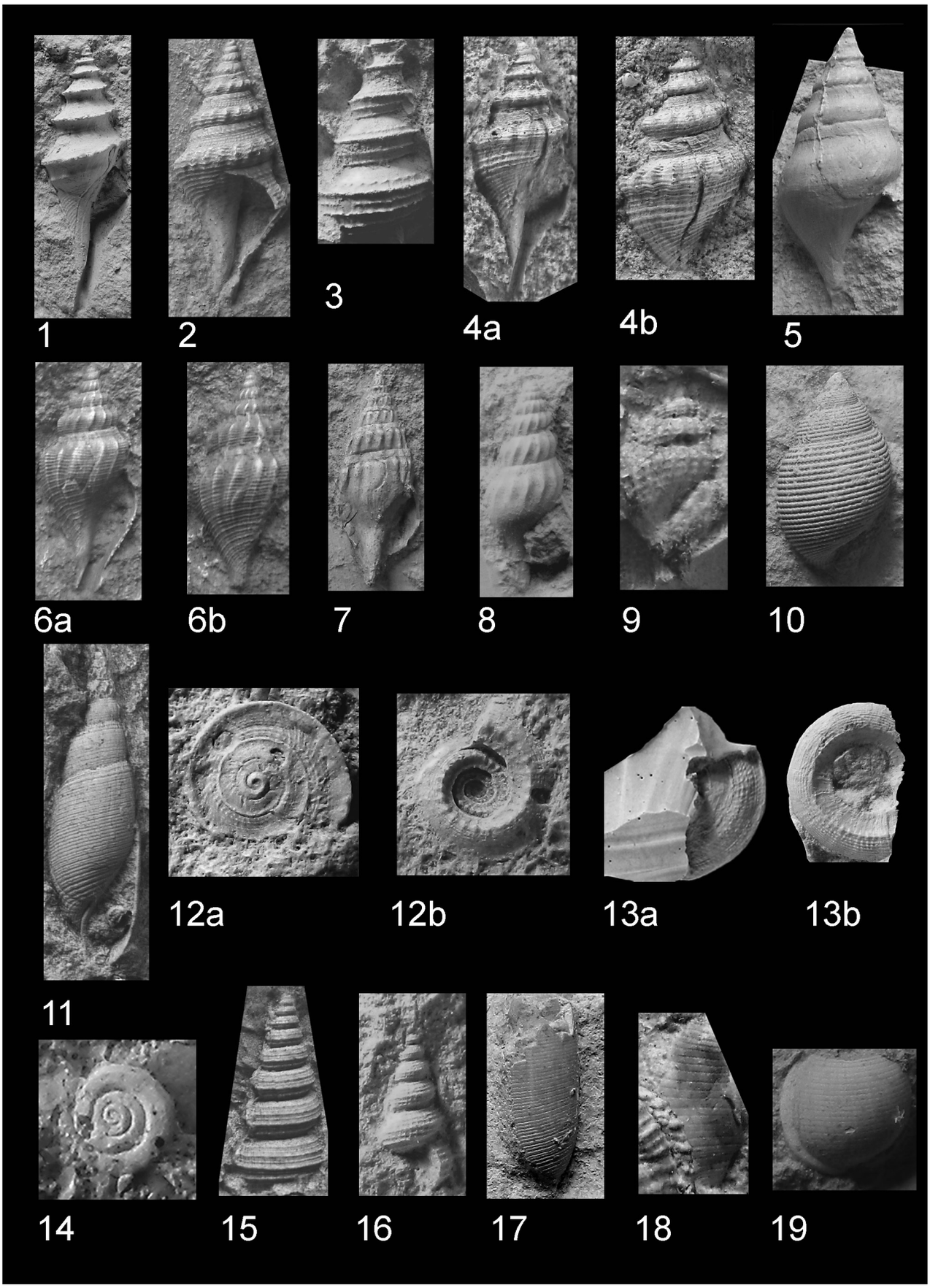

Plate 8

Plate 9

1. *Cimomia* sp. Specimen with shell preserved. MGUH 32016. Maximum diameter 53 mm, width 38 mm.
2. *Cimomia* sp. Specimen with shell preserved. MGUH 32017, DK 812. Maximum diameter 43 mm.
3. *Quadrinervus wieneke* nov. sp. Specimen with the shell partly preserved. **Paratype**. MGUH 32018. Height 22 mm, width 18 mm.
4. *Kangilioptera gundstrupensis* nov. sp. Interior of wing, showing the lobe at the anterior edge. **Paratype**, MGUH 32063. Height of wing 16 mm, width 14.5 mm.
5. Gastropoda, incertae sedis. Silicone latex cast; 5a: apertural view, 5b: rear view. MGUH 32019. Height 10.1 mm, width 6.5 mm.
6. Silicone latex cast with *Cidarina johnstrupi* (Grönwall & Harder, 1907) and *Orthochetus zigzag* (Grönwall & Harder, 1907). MGUH 32020. Height of cast 19 mm, length 39 mm.
7. *Pteria thomseni* nov. sp. Slab of Kerteminde Marl with three specimens. **Paratypes**, MGUH 32021. Height of slab 72 mm, length 110 mm.
8. Silicone latex cast with *Latirulus lemchei* (Schnetler, 2001); *Borsonia binodosa* (von Koenen, 1885); *Orthochetus zigzag* (Grönwall & Harder, 1907) and *Sassia bjerringi* (Ravn, 1939). MGUH 32022. Height of *Orthochetus zigzag* 24 mm.
9. Silicone latex cast with *Metacerithium hauniensis* (von Koenen, 1885) and Muricidae, gen. et sp. indet. MGUH 32023. Height of cast 23 mm, width 22 mm.

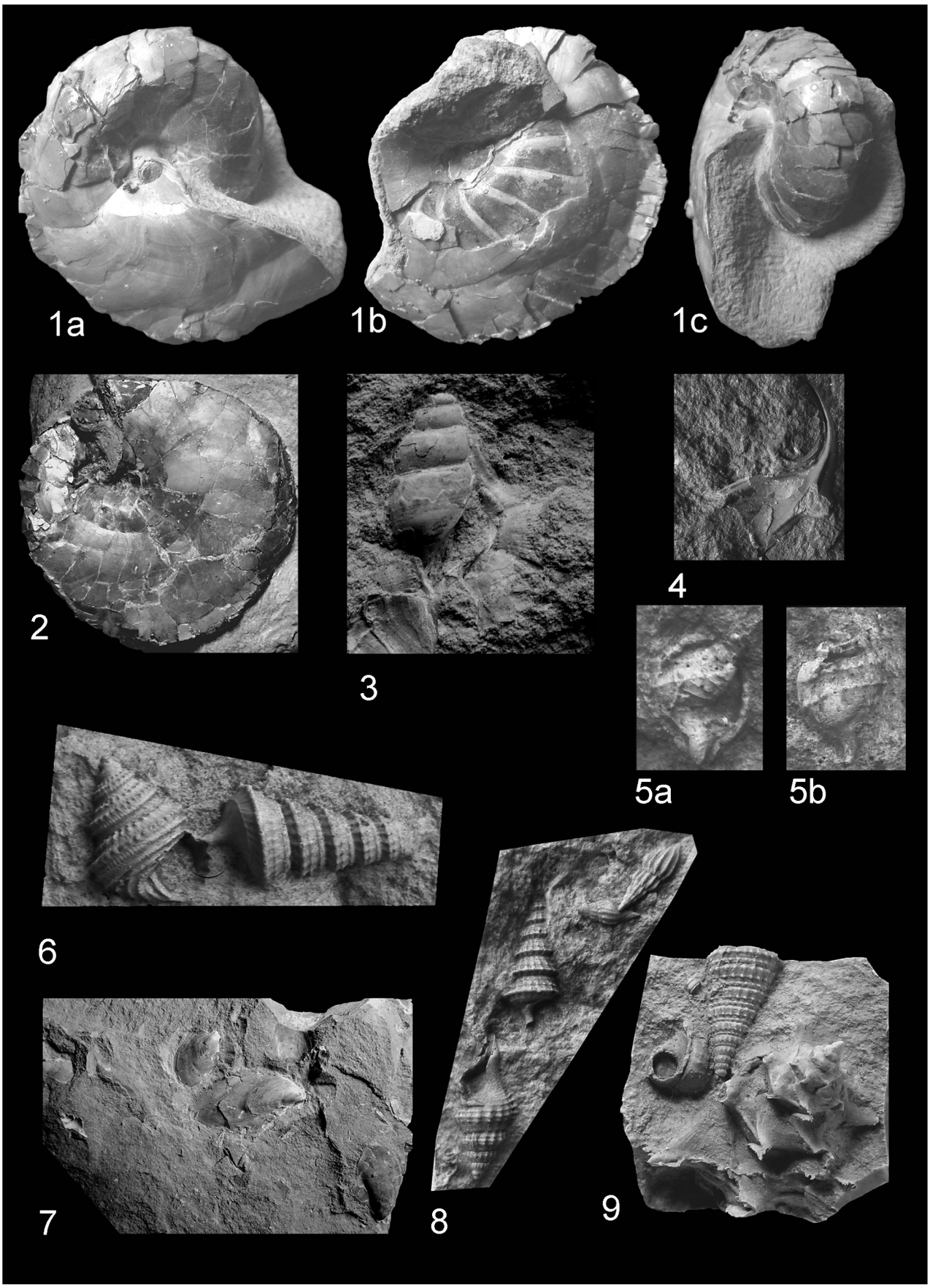

Plate 9