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PTEROPOD SPECIES (MOLLUSCA, GASTROPODA, EUTHECOSOMATA) FROM THE LATE OLIGOCENE OF MOGENSTRUP, JYLLAND, DENMARK

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Janssen, A.W. Pteropod species (Mollusca, Gastropoda, Euthecosomata) from the Late Oligocene of Mogenstrup, Jylland, Denmark. — Contr. Tert. Quatern. Geol., 27(2-3): 83-91, 10 figs, 1 pl. Leiden, September 1990.

Three pteropod species are reported from a Late Oligocene (Chattian B) sediment (Vejle Fjord Formation, Brejning Clay Member) exposed in a coastal cliff near Mogenstrup, Jylland. Among these species *Limacina hospes* Rolle, 1861 was found here for the first time in sediments of which the age is known, while the species *L. valvatina* (Reuss, 1867) could be recognised with certainty for the first time from Chattian sediments. The presence of *Clio nielseni* sp. nov. allows speculations on its possible evolutionary development towards the Pliocene North Italian species *C. guidottii* Simonelli, 1896.

Key words — Gastropoda, Euthecosomata, Pteropoda, Late Oligocene, Chattian, Denmark, systematics.

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INTRODUCTION

The material discussed in this paper originates from an exposure of Late Oligocene sediments in a coastal cliff near Mogenstrup, North of Skive, in Jylland, Denmark. For detailed information on the geographical position, litho-, bio- and magnetostratigraphy, and the benthic molluscan fauna the reader is referred to the paper of Schnetler & Beyer (1990), published in this issue of Contributions to Tertiary and Quaternary Geology.

In the North Sea Basin, pteropods of Late Oligocene age have been recorded mainly from boulders of the so-called 'Sternberger Gestein', which are known from a number of localities, especially in Mecklenburg (G.D.R.), and also from more isolated occurrences in western Germany and southern Jylland (Gripp, 1964; Hucke, 1967; R. Janssen, 1979). Chattian pteropods from sediments *in situ* have occasionally been mentioned (*e.g.* Harder, 1913; Görges, 1952, R. Janssen, 1979).

Apparently, the vertical as well as the horizontal distribution of these Chattian holoplanktonic gastropods are still poorly known, which explains why several new facts have become known over the last years. R. Janssen (1979: 350-351), in his overall revision of the North Sea Basin Chattian molluscs, mentioned only three species. According to Janssen & King (1988) six pteropod species were known from this interval in the North Sea Basin, but only two of these were also recorded from Denmark, *viz.* '*Vaginella*' *tenuistriata* (Semper, 1861) and *Limacina* ? *valvatina* (Reuss, 1867).

Only the latter species is also present in the Mogenstrup association, together with a further *Limacina* species and a very interesting, as yet undescribed *Clio* species, the nearest relative of

which is known from Pliocene deposits in northern Italy. The possible evolutionary development of these *Clio*'s is put forward in this paper, since an apparently intermediate, Middle Miocene form is known from northern Italy.

Material

The material discussed here was brought together by several collectors during the years 1987 and 1988. The specimens were partly recovered by sediment processing, but full-grown *Clio* specimens in particular could only be collected during the actual field work, by breaking the sediment along the stratification.

The limacinid specimens are usually preserved as pyrite-filled shells, or pyritic internal moulds, whereas the cavoliniids were collected in shell preservation, usually without pyritic filling. Their embryonic parts, almost exclusively from washing residues, are as a rule not deformed, but the larger specimens have suffered from sediment compaction and are frequently rather distorted. Usually they are damaged during the process of breaking the sediment, with parts of the shell material sticking to the splitting planes.

Acknowledgements

The author is very grateful to Messrs K.I. Schnetler (Langå, Denmark), M.S. Nielsen (Odense, Denmark) and A.C. Janse (Brielle, The Netherlands), who made the material available for study and donated type or illustrated specimens to the collections of the Nationaal Natuurhistorisch Museum at Leiden, or the Geological Museum, Copenhagen.

Mr L. Bertolaso (Correggio, Italy) cooperated with regard to Italian material and locations. Dr W.J. Zachariasse (Instituut voor Aardwetenschappen, Rijksuniversiteit, Utrecht, The Netherlands) kindly gave an age interpretation of a foraminifer sample from northern Italy.

Mr J.W.M. Jagt (Venlo, The Netherlands) read the manuscript and corrected the English text. The photographic work was done by Ms I. Henneke (Nationaal Natuurhistorisch Museum, Leiden, The Netherlands).

Systematic part

Phylum	Mollusca
Classis	Gastropoda
Ordo	Thecosomata
Subordo	Euthecosomata
Familia	Limacinidae
Genus	*Limacina* Bosc, 1817

Limacina hospes Rolle, 1861
Text-figs 1-6

Selected synonyms:

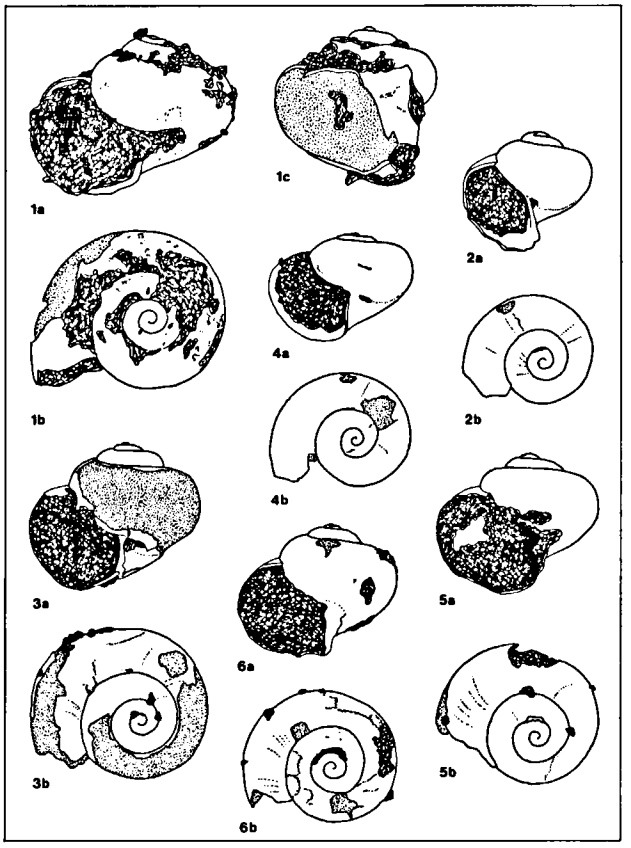
*v 1861 *Limacina hospes* Rolle, Rolle, p. 3, pl. 1, fig. 1, 1a-b (*non*fig. 2).
v. 1886 *Spirialis hospes* (Rolle) — Kittl, p. 69, pl. 2, fig. 39.
. 1912 *Spirialis hospes* Rolle — Gripp, p. 18, 21, 23.
. 1912 *Spirialis stenomphalus* n. sp., Gripp, pp. 21, 24, figs 5-7.
1979 *Limacina (Limacina) hospes* (Rolle 1862) — R. Janssen, p. 350 (*partim* ? May include *L. valvatina*).
v. 1984 *Limacina hospes* Rolle, 1861 — A.W. Janssen, p. 63, 69, pl. 2, fig. 1a-d.
v. 1986 *Spiratella dilatata* — A.W. Janssen, p. 148, fig. 1 (*non L. dilatata* von Koenen).
v. 1988 *Limacina antoniae* sp. nov. — Janssen & King, p. 363, figs 188, 194 (*nomen nudum*).
v. 1988 *Limacina dilatata* — Janssen & King, fig. 188 (*partim*, only the Middle Oligocene specimens, *non L. dilatata* von Koenen).
v. 1988 *Limacina* ? *dilatata* — Janssen & King, fig. 194 (*non L. dilatata* von Koenen).
v. 1988 *Limacina hospes* — Janssen & King, p. 363, 364, figs 188, 206.
v. 1989 *Limacina antoniae* Janssen & King, 1988 (*nomen nudum*) = *Limacina hospes* Rolle, 1861 — A.W. Janssen, p. 95.

non:

1940 *Spirialis stenomphalus* Gripp sp. — Sorgenfrei, pp. 59, 60, 113 (= ? *Limacina valvatina*).

Type material — Holotype in the Natural History Museum, Vienna, Austria, registration no. 1859.XIV.233 (A.W. Janssen, 1984, p. 69, pl. 2, fig. 1a-d), from the 'Sternberger Gestein' of the Mecklenburg area (G.D.R.).

Description — The available specimens from Mogenstrup are generally not very well preserved, since pyrite is frequently not only present inside the shells, but also on the external surfaces. The shell is very small, sinistral. Adult specimens reach slightly more than three and a half whorls which are convex, separated by distinct sutures. The height/width-ratio is quite variable, ranging from about as high as wide, to distinctly wider than high. The periphery is gradually rounded. The base of the shell has a narrow umbilicus, measuring about one tenth of the shell diameter. In full-



Figs 1-6. *Limacina hospes* Rolle, 1861
Mogenstrup (Denmark, Jylland), coastal cliff exposure. Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member); 1a: frontal view, 1a-6a: frontal views; 1b-6b: apical views; 1c: lateral view. Leg. M.S. Nielsen, coll. RGM 229 779-784. Magnification x 25.

grown specimens (see the illustration of the holotype in A.W. Janssen, 1984, pl. 2, fig. 1a-d) the apertural margin is distinctly widened.

Material — Mogenstrup (Denmark, Jutland), North of Skive, coastal cliff exposure; Late Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member, unit 1: 34 specimens, leg./coll. M.S. Nielsen, Odense; 2 specimens, leg./coll. K.I. Schnetler, Langå; 2 specimens, ? 1 fragment, leg./coll. A.C. Janse, Brielle; 6 specimens (Text-figs 1-6), leg. M.S. Nielsen/coll. RGM 229 779-784.

Remarks — Among the available material from Mogenstrup the widened apertural margin was visible in three specimens. It is not possible to give a good illustration, as one of these is covered with pyrite for the greater part (compare Text-fig. 1), whereas the second shell, with a completely developed apertural margin, was broken during transport. Unfortunately, the third specimen was destroyed in an attempt to free it from pyrite.

The variation in the height/width-ratio of the present sample (the extremes of which are reflected in the illustrations) agrees with my observations (A.W. Janssen, 1989: 95) on Middle Oligocene (Rupelian) specimens from Belgium.

It is the first time that *L. hospes* is recorded from an unequivocal stratigraphic horizon within the Late Oligocene. Up to now this species was frequently mentioned from boulders of the so-called 'Sternberger Gestein', the exact age of which is questionable (Janssen & King, 1988: 363).

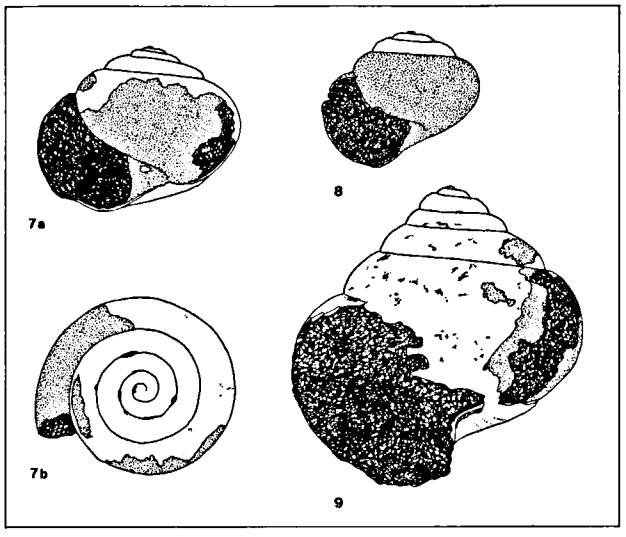
Limacina valvatina (Reuss, 1867)
Text-figs 7-9

Selected synonyms:

*v 1867 *Spirialis valvatina* Rss., Reuss, p. 32, 146, pl. 6, fig. 11a-b.
1882 *Spirialis valvatina* Reuss — von Koenen, p. 357.
v. 1886 *Spirialis valvatina* Reuss. — Kittl, p. 68, 69, 72, pl. 2, fig. 38.
? 1940 *Spirialis stenomphalus* Gripp sp. — Sorgenfrei, pp. 59, 60, 113 (*non* Gripp).
v. 1958 *Spiratella* cf. *valvatina* (Reuss) — Sorgenfrei, p. 353.
. 1964 *Spiratella atlanta* (Mörch 1874). — Anderson, p. 337, pl. 52, fig. 305a-b (*non* Mørch).
v. 1968 *Spiratella atlanta* (Mørch 1874) — Rasmussen, p. 243 (*partim*, includes also *Limacina atlanta, L. ingridae, L. irisae* and *L. wilhelminae*) (*non* Mørch).
v. 1968 *Spiratella valvatina* (Reuss 1867) — Rasmussen, p. 243, pl. 27, figs 1-3, 11.
v. 1968 *Spiratella gramensis* nov. sp. — Rasmussen, p. 244 (*partim*, includes also *Limacina gramensis*).
. 1972 *Spiratella valvatina* (Reuss, 1867) — Nordsieck, p. 18, 125, pl. 32, fig. 219 (3 figs, the two right-hand ones copied from Anderson, 1964).
v. 1972 *Spiratella valvatina* (Reuss, 1867) — A.W. Janssen, p. 12, 61, 62, figs 31-40, pl. 11, fig. 10.
v. 1984 *Limacina valvatina* (Reuss, 1867). — A.W. Janssen, p. 381, pl. 20, figs 1a-b, 2a-b.
v. 1988 *Limacina* ? *valvatina* — Janssen & King, p. 363, fig. 188, 204.
v.1988 *Limacina valvatina* — Janssen & King, p. 365, figs. 188, 194, 196-205.

Type material — Lectotype (A.W. Janssen, 1984) and six paralectotypes in the collection of the Natural History Museum at Vienna, Austria, registration no. 1867.VII.42, from Miocene ('Badenian') rock salt at Wieliczka, Galicia, Poland.

Description — For general descriptions and illustrations the reader is referred to the above-mentioned papers.



Figs 7-9. *Limacina valvatina* (Reuss, 1867)
7-8: Mogenstrup (Denmark, Jylland), coastal cliff exposure. Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member); 7a, 8: frontal views; 7b: apical view. Leg. M.S. Nielsen, coll. RGM 229 785-786. Magnification × 25.
9: Brejning (Denmark, Jylland), beach exposure. Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member); frontal view. Leg. A.C. Janse, coll. RGM 229 787. Magnification × 25.

Remarks — Up to the present, Late Oligocene specimens that resemble *Limacina valvatina* were treated with some suspicion (Janssen & King, 1988), because of the fact that the available material was scanty and the range of variation of *L. valvatina* is very wide, especially with regard to height/width-ratio. From Mogenstrup the number of specimens found is also restricted and their preservation is rather poor. Some additional material has become available, however, from other Danish Late Oligocene localities and it can no longer be denied that this material should be included in *L. valvatina*.

As far as the state of preservation allows this to be seen, the Mogenstrup specimens are relatively low (H/W-ratio about 83). This agrees more or less with Early Miocene (Vierlandian) specimens from Klintinghoved, Denmark (coll. RGM). In about equally old (Chattian B) faunas from Denmark (compare a specimen from Brejning, Text-fig. 9), however, specimens of more typical proportions (H/W-ratio about 105) are already present.

Younger specimens, of Middle Miocene age, are generally relatively higher, with figures for the H/W-ratio up to 110. During the Late Miocene this ratio becomes still higher. Specimens with a H/W-ratio over 110 are considered to belong to *L. gramensis* (Rasmussen, 1968) (compare A.W. Janssen, in prep.).

Obviously, a more detailed study of the *L. valvatina*-complex, including all North Sea Basin occurrences, may lead to a further taxonomical subdivision. The reader is referred to A.W. Janssen (in prep.) for more details on this subject. In the Paratethys *L. valvatina* apparently develops into a range of forms which are absent from the North Sea Basin. This subject merits a special study.

Material — Mogenstrup (Denmark, Jutland), North of Skive, coastal cliff exposure; Late Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member, unit 1: 5 specimens (leg./coll. M.S. Nielsen, Odense); 3 specimens (leg. M.S. Nielsen, coll. K.I. Schnetler); 2 specimens (leg. M.S. Nielsen/coll. RGM 229 785-786, Text-figs. 7-8).

Familia	Cavoliniidae
Subfamilia	Clioinae
Genus	*Clio* Linné, 1767

Clio nielseni sp. nov.
Text-fig. 10, Pl. 1, Figs 1-3

Holotype — Specimen showing the dorsal side and a small part of the ventral side, on two slabs of sediment, Pl. 1, Fig. 1a-b, coll. RGM 229 775a-b (leg. M.S. Nielsen, Odense).

Locus typicus — Mogenstrup, North of Skive, Jylland, Denmark, coastal cliff exposure.

Stratum typicum — Glauconitic sand (unit 1, see Schnetler & Beyer, 1990), Vejle Fjord Formation, Brejning Clay Member (Late Oligocene, Chattian B).

Derivatio nominis — This new species is named after Mr Mogens S. Nielsen at Odense, Denmark, who repeatedly supplied the author with pteropod material from the Danish Cainozoic, and also collected the holotype of this species.

Diagnosis — A transversely sculptured species of the genus *Clio*, with a dorsally curved apical shell part, closely related to *C. guidottii* Simonelli, 1896, but differing by its wider apical angle, a much finer transverse sculpture and a less distinctly produced central ridge on the ventral surface.

Description — Shell conical, bag-shaped, uncoiled, bilaterally symmetrical. The general shell form is elongated triangular, with straight margins and an apical angle of about 32°. The transverse diameter of the full-grown shell is some three times larger than the dorso-ventral diameter, but this figure might be influenced by deformation of the shell due to sediment compaction. The apical shell part is slightly curved dorsally, the adult shell is straight.

The protoconch (Text-fig. 10) is globular-ovoid with a distinct apical spine. It is separated from the post-larval shell by a clear constriction. The initial part of the teleoconch has a circular transverse section. From a diameter of 0.5 mm onwards the shell becomes gradually flattened dorso-ventrally and two lateral carinae develop which separate the more convex dorsal side from the flatter ventral part. In the adult shell the ventral and the dorsal shell parts seem to be about equally convex. At least in the juvenile shell, the margins have a squarish transverse section. Because of the state of preservation of the adult specimens this feature cannot be observed.

On the dorsal side a central radial rib is present, accompanied by a weaker lateral rib on each side. These lateral ribs are about as wide as the central one and leave flat to slightly concave zones along the margins, which again are of more or less the same width. On the ventral side a single central radial rib develops which is wider than the dorsal one and occupies about half the shell width. The ventral ridge becomes obsolete in apertural direction, whereas the dorsal ones remain distinct.

A transverse sculpture, persistant towards the aperture, is present on both sides of the shell, starting earlier on the dorsal than on the ventral side. The riblets are somewhat irregular and follow the direction of the growth lines accurately, with a distinctly stronger curvature in apertural direction on the dorsal than on the ventral side. Their number is about 25 per cm shell length. Near the margins the transverse sculpture fades on both sides of the shell.

Paratypes — From the type locality (unit 1): 1 apical shell fragment with protoconch (leg. M.S. Nielsen/coll. Geological Museum, Copenhagen, no. MGUH 20 339), 1 defective specimen showing dorsal side (leg. K.I. Schnetler/coll. Geological Museum, Copenhagen, no. MGUH 20 340); 1 apical shell fragment with protoconch, 2 more or less defective specimens, each on two pieces of sediment, 2 fragmentary specimens (leg./coll. K.I. Schnetler, Langå); 11 apical shell fragments with protoconch, 5 apical shell fragments without pro-

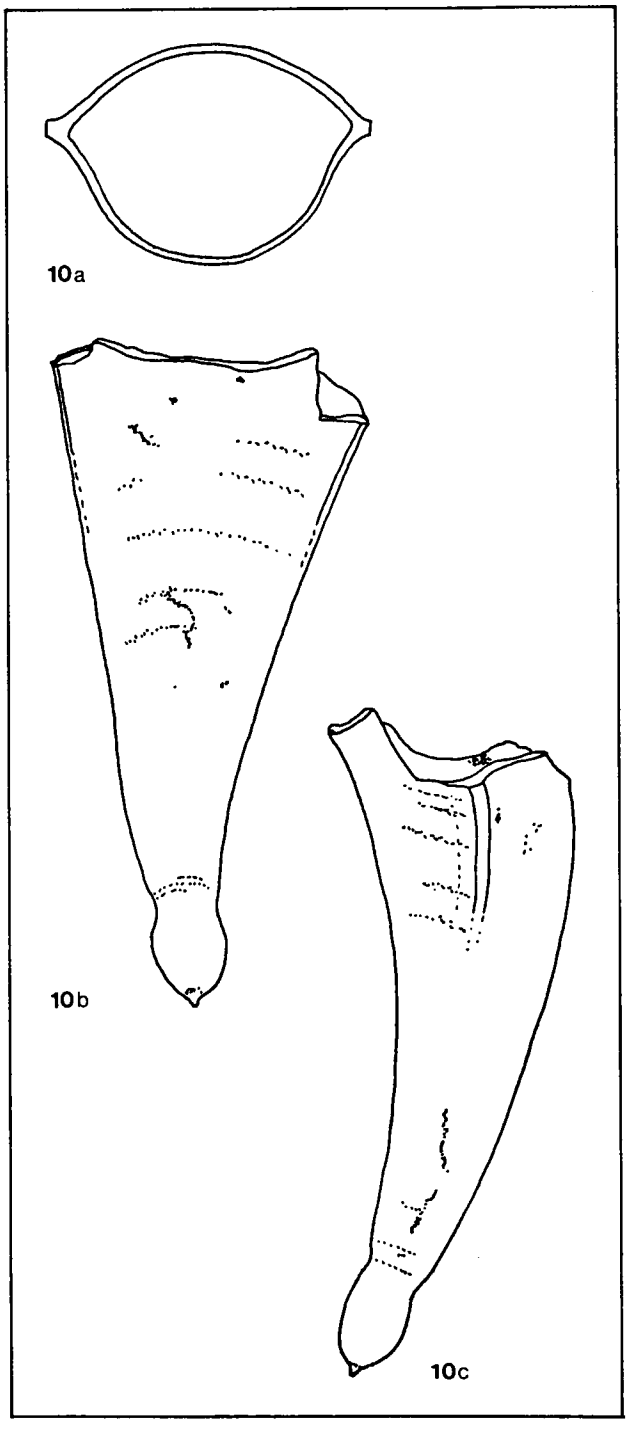


Fig. 10. *Clio nielseni* sp. nov., paratype (apical shell part). Mogenstrup (Denmark, Jylland), coastal clif exposure. Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member); a: apertural view; b: dorsal view; c: right lateral view. Leg. M.S. Nielsen, coll. RGM 229 776. Magnification x 50.

toconch, 1 fragment of ventral side, 1 specimen showing inner surface of dorsal side, 1 specimen showing ventral side, (leg./coll. M.S. Nielsen, Odense); ? 1 small fragment of ventral side (leg./coll. A.C. Janse, Brielle); 1 deformed specimen on two pieces of sediment showing apical curvature and protoconch (Pl. 1, Fig. 3) (leg. K.I. Schnetler/coll. RGM 229 778); 1 apical shell fragment with protoconch (Text-fig. 10), 1 internal mould with attached defective shell showing both ventral and dorsal side (Pl. 1, Fig. 2a-b) (leg. M.S. Nielsen, respectively coll. RGM 229 776- 777).

From the type locality (unit 2): 1 fragmentary internal mould with shell remnants, showing both ventral and dorsal side (leg./coll. K.I. Schnetler, Langå).

Discussion — According to its original description, the closely related species *Clio guidottii* Simonelli, 1896 attains a considerably larger size (up to 36 mm shell length) and differs by its narrower apical angle, its convex margins, the relatively broader central ridge on the dorsal side and its markedly coarser transverse sculpture of about 10-11 riblets per cm shell length (Simonelli, 1896, p. 186, fig. 1). Furthermore, this species is considerably younger (see next paragraph).

Very similar is also the extremely rare Recent species *Clio scheelei* Munthe, 1887, known only by the holotype taken off the west coast of Patagonia (Munthe, 1887, p. 18, figs 15-19). There are, however, clear differences. In *C. scheelei* the central ridge on the dorsal side is distinctly wider than the lateral ridges (thus more closely resembling the Italian Pliocene *C. guidottii* !). The shell of *C. scheelei* is completely straight in lateral view, whereas in *C. nielseni* the apical part displays a dorsal curvature. Finally the protoconch of *C. scheelei* is more globular and lacks an apical spine (Munthe, 1887, p. 19 and fig. 18).

Similar furthermore is *Clio lavayssei* Rutsch, 1934, from the Miocene of Trinidad. In this species, however, the dorsal side has only one radial rib, whereas the ventral side is stated to be gradually convex without any radial rib. This latter statement, however, seems to be contradicted by one of the illustrations (Rutsch, 1934, p. 308, pl. 8, fig. 4), which indicates the presence of a rather wide ventral rib. On occasion this should be checked on the type material in the Basel Museum.

Notes on related species — The discovery of *Clio nielseni* sp. nov. in the Late Oligocene of Denmark necessitates some notes on the related species *Clio guidottii*, which was supposed to be collected from Pliocene pelitic deposits. Simonelli (1896, p. 185) concluded as follows on the age of the molluscan fauna from the 'argille marine' near Sivizzano (Parma area, northern Italy):

'In questa fauna si possono, senza fatica, riconoscere prevalenti i caratteri propri alle zone piuttosto profonde del nostro pliocene; e si potrebbe addirittura dir che si tratta di piacenziano.'.

Clio guidottii was also recorded by Robba (1977, p. 595, pl. 20, fig. 4; pl. 21, fig. 1), who claimed a Middle Miocene (Serravallian) age for his material. A specimen of this Serravallian form is illustrated here on Pl. 1, Fig. 4.

Robba commented as follows on the age of the sediment from which the type material of *C. guidottii* was collected by Simonelli:

'*C. guidottii* Simonelli è stata finora segnalata solo dal suo autore in Emilia, presso Sivizzano, dove è stata rinvenuta in rocce che, nella Carta geologica della provincia di Parma (1966), vengono indicate come «Marne del Termina» e riferite all'«Elveziano» superiore-Tortoniano; il lavaggio di un frammento di matrice marnosa distaccato dall' olotipo ha fornito un'associazione contenente *Globigerinoides obliquus extremus* e quindi non più antica del Tortoniano superiore.'

Robba (1977, p. 583, fig. 3) concluded the vertical distribution of *C. guidottii* to be Serravallian-Tortonian, but leaving the possibility of a somewhat younger age. Curiously, Bernasconi & Robba (1982, p. 217, tab. 4) restrict the age of *C. guidottii* to 'Middle Miocene'.

The fauna recorded by Simonelli comprises several further pteropod species, *viz.*:

Clio braidensis (Bellardi)
Cuvierina astesana (Rang)
Diacria trispinosa (Lesueur)
Cavolinia rattonei Simonelli.

Of these species *Cuvierina astesana* is restricted to the Pliocene (Zanclian - ?Piacentian), and, in my opinion, *C. braidensis* is also confined to the (?Early) Pliocene. This would suggest that Simonelli's material originated from various stratigraphical levels.

The fact that the species mentioned by Simonelli really belong to a single association could be ascertained only recently (May 1990), near Viano in the Parma area, not far from the Sivizzano locality from which Simonelli collected his material. In close cooperation with Mr L. Bertolaso (Correggio, Italy), who in fact discovered the locality, the present author collected an entirely identical pteropod association, including the magnificent species *Cavolinia rattonei* (exclusively known from this association).

The foraminifer association from this sediment was taken by Dr W.J. Zachariasse (Instituut voor Aardwetenschappen, Rijksuniversiteit, Utrecht) to belong to zone MPL 2 (= Zanclian), indicated by the occurrence of *Globorotalia margaritae* Bolli. This approaches Simonelli's dating as Piacentian and contradicts Robba's and, in particular, Bernasconi & Robba's conclusions.

Thus, there appears to be a considerable difference in age between typical *Clio guidottii* and Robba's specimens from the Serravallian. In view of the fact that a closely related Chattian species is now known, one might wonder if this Serravallian form in fact could represent an intermediate form between *C. nielseni* and *C. guidottii*. Evidence in favour of such an evolutionary lineage is the number of transverse riblets: according to Robba's illustrations about 16 per cm shell length. A closer inspection of the Serravallian samples is needed for a final conclusion in this matter.

Incidentally, at Viano only two specimens of *C. guidottii* were collected, one of which (L. Bertolaso coll.) unfortunately is in a rather deformed condition. In its actual state it is 24 mm in length. Reconstruction of the missing apical part suggests an overall length of 30 mm. The other specimen (leg. A.W. Janssen, coll. RGM 229 788, Pl. 1, Fig. 5) is equally long, undeformed, but it lacks the greater part of its ventral face. In this specimen the apical part is also missing, but the margin is slightly convex in frontal view, as was indicated by Simonelli. In both specimens the transverse sculpture is strikingly coarse and agrees exactly with Simonelli's indication of 10-11 riblets per cm shell length.

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PLATE 1

Figs 1-3 *Clio nielseni* sp. nov.
Mogenstrup (Denmark, Jylland), coastal cliff exposure. Oligocene, Chattian B (Vejle Fjord Formation, Brejning Clay Member).
1a-b. Holotype, leg. M.S. Nielsen, coll. RGM 229 775.
2a-b. Paratype, leg. M.S. Nielsen, coll. RGM 229 777; a: dorsal view, b: ventral view.
3. Paratype (deformed specimen showing apical curvature and protoconch), leg. K.I. Schnetler, coll. RGM 229 778.

Fig. 4 *Clio* sp., ? intermediate between *C. nielseni* sp. nov. and *C. guidottii* Simonelli, 1896; dorsal view.
Near Arguello (Italy, Piedmont). Miocene, Serravallian (Cassinasco Formation). Leg. E. Robba, coll. RGM 229 791.

Fig. 5 *Clio guidottii* Simonelli, 1896.
Near Viano (Italy, Parma). Pliocene, Zanclian (zone MPL2). Leg. A.W. Janssen, May 1990, coll. RGM 229 788.
a: External mould with shell remnants of dorsal side; b: internal mould with shell remnants, dorsal side; c: do., ventral side.

PLATE 1