An account of the Cancellariidae (Gastropoda) of Winterswijk-Miste (Miocene, Hemmoorian), The Netherlands

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From the recently discovered mollusc fauna of Winterswijk-Miste (The Netherlands, province of Gelderland) nineteen species of Cancellariidae are described; one of these is supposed to be derived from Chattian sediments. The Miocene (Hemmoorian) age of this fauna is supported by the cancellariid species. Among the eighteen species collected in situ four species and a subspecies appeared to be new, viz. *Trigonostoma mistense, T. barnardi, T. lindeni, T. pouwi*, and *T. geslini josephinae*. Another new species, *Sveltia gliberti*, is described from the Edegem Sands in Belgium. Furthermore, a new subgenus, *Misteia*, is introduced within the genus *Trigonostoma* for *T. planispirum* Nyst (type species), *T. mistense* sp. nov. and *T. mutinense* (Foresti)

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Introduction

Ever since the discovery of the surprisingly rich mollusc fauna of Winterswijk-Miste there has been a continuous flow of mollusc species, appearing from the large sieving residues, that are new for this fauna or even new to science. It may be expected that future research will bring to light even more such species, as enormous quantities of material have been collected in the meantime by a lot of amateur collectors.

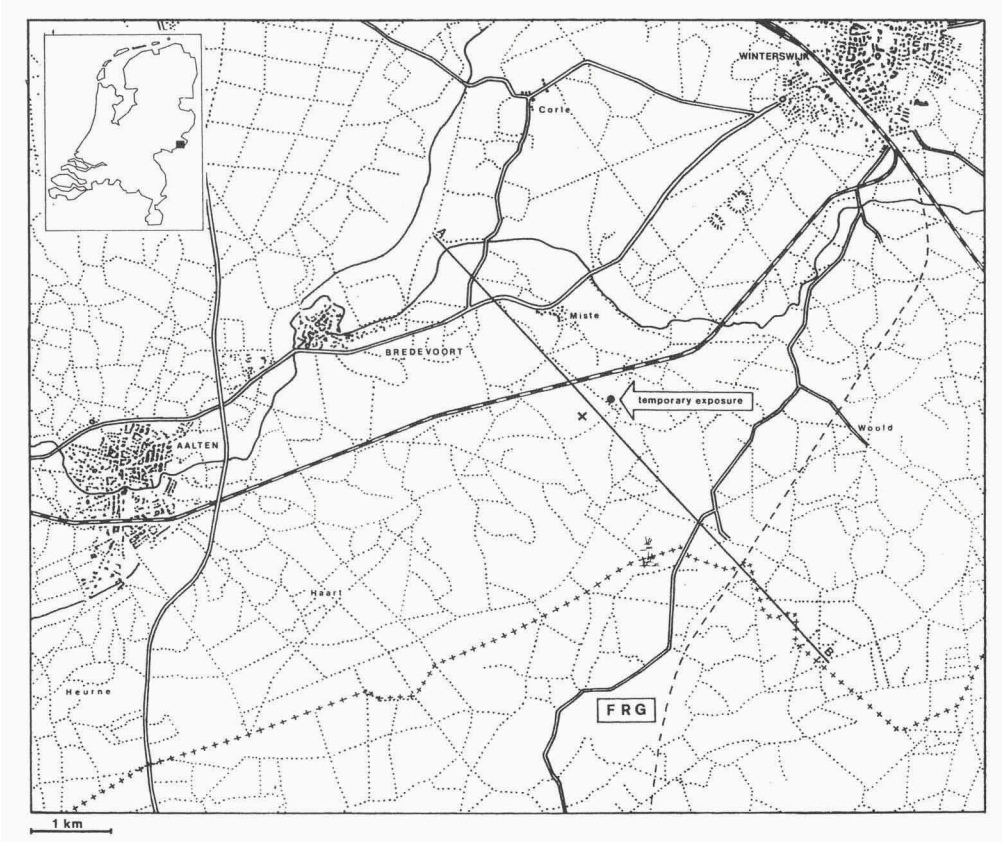

Fig. 1. Southwestern part of the Winterswijk area, with locations of the temporary outcrop (arrow) and section AB (see Fig. 2).

The discovery of this fauna was recorded by van den Bosch (1968), subsequent studies were executed by de Vogel (1970-1971), Boekschoten (1969) and Nordsieck (1972). This latter author gave a systematic description of the mollusc species found by him in a restricted quantity of residue (5 kg). Apart from the many mis-interpretations, it is therefore no wonder that Nordsieck's paper gives a rather poor impression of the Miste fauna. So, for instance, Nordsieck based his descriptions of the Cancellariidae on a total of 180 specimens. The number of specimens underlying the present paper is about 13 000!

Monographing the Miste mollusc assemblage is not yet possible at present. For quite some time I have been working on a provisional paper, intended to take an inventory of the mollusc species, giving illustrations, concise descriptions and, as far as possible, identifications for each of them. In that paper (Janssen, in press), to be published in the Dutch language (as a service to the many Dutch collectors), descriptions of new taxa are avoided, as well as opinions that (might) influence taxonomy.

Investigation of the Miste fauna will be laboreous and therefore it seems a practical policy to publish results on parts of the fauna from time to time. In earlier papers (Janssen, 1969, 1972), when describing faunas from other localities, I paid some attention to a restricted number of Miste species, but now the results of a complete family are available.

The family Cancellariidae is one of the most attractive groups among the Miste molluscs. It is represented by no less than 19 taxa, one of which is reworked from Chattian deposits. Four species and a subspecies proved to be new to science. Furthermore a new subgenus *Misteia* is introduced. The list of cancellariid species runs as follows (number of specimens in the RGM collection from Winterswijk-Miste between brackets):

Aneurystoma canaliculatum (A.W. Janssen, 1972)	(6)
Aneurystoma laurensi (Grateloup, 1832)	(12)
Babylonella fusiformis (Cantraine, 1835)	(2000)
Brocchinia mitraeformis parvula (Beyrich, 1856)	(24)
Cancellaria (Bivetiella) cancellata praecedens Beyrich, 1856	(9)
Cancellaria (Merica) bellardii Michelotti, 1847	(26)
Cancellaria (Merica) contorta gelriana A.W. Janssen, 1972	(674)
Cancellaria (Merica) evulsa postera Beyrich, 1856	(9)
Sveltia lyrata (Brocchi, 1814)	(1)
Sveltia varicosa paucicostata Peyrot, 1928	(5868)
Trigonostoma (Misteia) mistense sp. nov.	(1)
Trigonostoma (Misteia) planispirum (Nyst, 1845)	(60)
Trigonostoma (Trigonostoma) apertum (Beyrich, 1856)	(403)
Trigonostoma (Trigonostoma) barnardi sp. nov.	(410)
Trigonostoma (Trigonostoma) extractrix (Boettger, 1906)	(35)
Trigonostoma (Trigonostoma) lindeni sp. nov.	(43)
Trigonostoma (Ventrilia) geslini josephinae subsp. nov.	(145)
Trigonostoma (Ventrilia) pouwi sp. nov.	(3404)
Trigonostoma (Ventrilia) sp. nov.?	(1)
(total number of specimens:	13131)

LOCALITY AND STRATIGRAPHY

The position of the Miste locality is given in Fig. 1; stratigraphical conditions of the outcrop are given in Fig. 2. The fauna is of Miocene (Hemmoorian, Oxlundian in euhaline facies) age and was collected from the Aalten Member, Miste Bed. The section included the highly fossiliferous *Hiatella arctica* Assemblage Zone and the basal part of

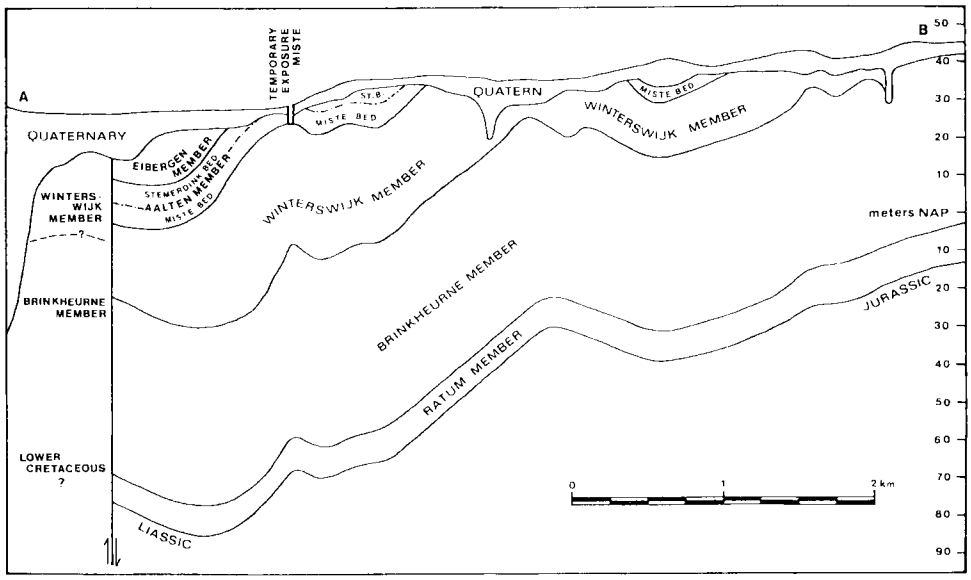

Fig. 2. NW-SE section through Tertiary deposits at Winterswijk-Miste (for location see Fig. 1).

the *Astarte radiata* Assemblage Zone. Most probably mollusc material from the *Astarte radiata* Assemblage Zone is present in the samples in restricted quantities only. Keeping the fauna from these zones apart is only possible for small samples (taken from very short intervals) as the determination of the assemblage zone is based on percentages of mollusc species (de Vogel, 1970-1971). There are hardly any lithological characteristics that could aid in separate sampling of the two assemblages.

For further details on the locality and stratigraphy the reader is referred to van den Bosch, Cadée & Janssen (1975) and to Janssen (in press). The Hemmoorian age of the Miste fauna is fully supported by the species composition of the Cancellariidae.

MATERIAL AND TYPE SPECIMENS

All material discussed in this paper (unless stated otherwise) is kept in the collections of the Rijksmuseum van Geologie en Mineralogie at Leiden (RGM registration numbers are added to the individual samples). The bulk of the material was collected by the author in 1971, additional specimens, also kept in the RGM collections, were collected by M. van den Bosch and F.J. Janssen. Paratypes of the species introduced here will be distributed to various collections, as summarised below.

	mistense	*barnardi*	*lindeni*	*g.josephinae*	*pouwi*
Rijks Geol. Dienst, Haarlem	–	5	1	1	10
Inst. r. Sc. nat., Brussel	–	5	1	1	10
Brit.Mus. (Nat. Hist.), London	–	3	–	1	10
Senckenberg, Frankfurt/Main	–	5	1	2	10
GLA Schleswig-Holstein, Kiel	–	5	–	1	10
A. Verhecken, Mortsel	–	5	–	1	10

Acknowledgements

For continuous sorting activities on sieving residues from Miste (and quite a lot of other localities as well) I am very grateful to Mr W. Pouw, assistant at the RGM department of Cenozoic molluscs.

I am much obliged to Mr A. Verhecken, Mortsel (Belgium) for fruitful discussions and for permission to use his files on cancellariid taxonomy.

Furthermore I thank all those private collectors who put material at my disposal or who cooperated in the sorting procedures of the RGM sieving residues. Mr W.A.M. Devilé prepared the photographs. Mr B.F.M. Collet and Mr J. Timmers drew Figures 1 and 2, respectively. Finally I want to thank Mrs W.M. Asfar-van der Peet for typing the manuscript.

Systematical part

Classis Gastropoda
Ordo Neogastropoda
Subordo Stenoglossa
Superfamilia Volutacea
Familia Cancellariidae
Genus *Aneurystoma* Cossmann, 1899

Aneurystoma canaliculatum (A.W. Janssen, 1972)
Pl. 1, figs. 3, 4; Pl. 5, fig. 2.

? 1925 *Trigonostoma (Ventrilia) boreobsoleta* nov. spec., Kautsky, p. 142, pl. 10, figs. 12-13.
1972 *Narona (Aneurystoma) canaliculata* sp. nov., A.W. Janssen, p. 40, pl. 7, figs. 8-9.
1972 *Trigonostoma (Ventrilia) boreobsoleta* Kautsky, 1925. — Nordsieck, p. 87, pl. 21, fig. 130 (non Kautsky).

Material — Holotype RGM 116 767 (Pl. 1, fig. 4); 2 paratypes and 3 specimens, RGM 116 768, 225 203-225 205.

Description — Shell solid, spindle-shaped, about 1 1/2 times as high as wide. The protoconch is slightly oblique and consists of 3 smooth and convex whorls in the form of a small *Natica* shell. On the last part of the protoconch (about 1/4 of a whorl) the spiral sculpture of the teleoconch is already weakly present. The boundary with the post-embryonic whorls is sharp, but not very distinct. There are about three teleoconch whorls, together forming a slightly scalaroid spira, which is the result of the fact that the sutures are situated in an excavated subsutural groove, which is especially obvious on the later whorls and reminds of *Trigonostoma*. In the available specimens the width of this subsutural groove is quite variable. The body whorl has a slightly convex base and is regularly constricted downwards. There is a very narrow umbilical slit, surrounded by a slightly inflated ridge. The apertura is oval, with a pointed upper corner and an only weakly indicated siphonal canal below. The apertural margin is only internally slightly thickened and provided with some 10 to 12 unequal denticles. The columella is excavated and has three spiral folds, of which the upper one is the strongest. Both lower folds are more oblique than the upper one. The callus is solid, sharply confined and rather far extended over the base of the body whorl. It covers the umbilicus for the greater part.

Sculpture starts with 6 primary spirals; in the interspaces almost immediately secondary spirals are present. On the younger volutions a third series of spirals may develop. Close to the apertura these generations are distinctly recognizable as such. In some shells the spirals on the body whorl are wider, in others they are narrower than their interspaces. Radial sculpture is not always present. If present it consists of numerous weak riblets, slightly curved and prosocline, forming weak knobs on the spiral elements. Usually these riblets are so weak that they get lost between the sometimes slightly lamellose growth-lines. On the base of the body whorl the spiral sculpture increases slightly in strength, whereas the radial elements fade away.

Dimensions — The height of the shells reaches c. 13 mm.

Remarks — Since the introduction of this species in 1972 some more specimens have become available, from which it is obvious that the variability is still larger than supposed. This concerns not only shell ornamentation, but also the relative height, the convexity and the depth and width of the subsutural groove. There is among my material not one specimen, however, that really approaches the form described by Kautsky sub nomine *T. boreobsoleta.* This latter form is slightly larger and has a coarser sculpture in which the secondary spirals develop in a later stage. In the absence of real transitional forms I prefer to maintain the name *canaliculatum* for the time being.

Aneurystoma laurensi (Grateloup, 1832)
Pl. 1, figs. 1, 2; Pl. 5, fig. 1.

1832 *Cancellaria Laurensii.* Nob., Grateloup, p. 341.
1840 *Cancellaria Laurensii.* Grat. — Grateloup, Cancellaire, pl. 1, fig. 24.
1872 *Cancellaria Laurensii.* Grat. — von Koenen, p. 160.
1890 *Cancellaria (d.Merica) Laurensii* Grat. — Hoernes & Auinger, p. 281, pl. 33, figs. 1a-c, 2a-c, 3a-b.
1899 *Masslya Laurensii.* Grat. — Cossmann, p. 40, pl. 2, figs. 13-14.
1928 *Sveltia (Aneurystoma) Laurensi* (Grateloup) (emend.). — Peyrot, p. 232, pl. 13, figs. 48-49.
1964 *Narona (Aneurystoma) Laurensi* (Grateloup, 1832). — Anderson, p. 276, pl. 30, fig. 218.

Material — Twelve specimens, RGM 225 206-225 210.

Remarks — In the Miste fauna this species is only slightly more common than *A. canaliculatum.* Both species resemble each other, but in *A. laurensi* a subsutural groove is absent and the shell is considerably more slender. Its umbilicus is less accentuated and there are also differences in sculpture, viz. in *laurensi* the second generation of spirals develops not earlier than on the second teleoconch whorl and the radial sculpture usually is stronger. Finally all available specimens of *laurensi* have a thin callus on the base of the body whorl, which is poorly delimited.

Cossmann (loc. cit.) considered *laurensi* and *A. dufouri* (Grateloup), a species related to *A. canaliculatum* and the type species of *Aneurystoma*, to belong to quite different groups, reckoning *laurensi* to the genus *Masslya* (or *Massyla*?). In my opinion, however, the differences quoted by Cossmann are of minor importance and furthermore some specimens of *A. canaliculatum* with a weakly developed subsutural groove resemble *A. laurensi* so much that it is impossible for me to place these species in different genera.

Dimensions — The height of the shells reaches 17.5 mm.

Genus *Babylonella* Conrad, 1865

Babylonella fusiformis (Cantraine, 1835)
Pl. 1, figs. 9-12; Fig. 3

1835 *Cancellaria fusiformis*. Nob., Cantraine, p. 391.
1856 *Cancellaria pusilla* Phil. sp. — Beyrich, p. 323 (partim, ? non Philippi).
1872 *Cancellaria subangulosa* Wood. — von Koenen, p. 161 (partim, ? non Wood).
1899 *Sveltella Dumasi*, nov. sp., Cossmann, p. 194, pl. 2, fig.12.
1907 *Cancellaria subangulosa* Wood. — Ravn, p. 340, pl. 6, fig. 17 (? non Wood).
1914 *Cancellaria subangulosa* S. Wood. — Gripp, p. 26, pl. 3, figs. 4-6 (? non Wood).
1925 *Admete (Babylonella) fusiformis* Cantr. var. *subangulosa* Wood. — Kautsky, p. 144 (? non Wood).
1928 *Sveltella Dumasi* Cossmann. — Peyrot, p. 260, pl. 13, figs. 141-143.
1952 *Admete (Babylonella) fusiformis* Cantraine, sp. 1836. — Glibert, p. 131, pl. 8, fig. 18.
1956 *Admete (Babylonella) subangulosa* (S. Wood 1848). — Rasmussen, p. 80, pl. 7, fig. 5a-b (? non Wood).
1958 *Admete* cf. *fusiformis* (Cantraine). — Sorgenfrei, p. 246, pl. 51, fig. 170.
1960a *Babylonella fusiformis subangulosa* Wood, sp. 1870. — Glibert, p. 82.
1964 *Babylonella fusiformis* (Cantraine 1835). — Anderson, p. 276, pl. 30, figs. 219, 219a.
1968 *Admete fusiformis* (Cantraine 1836). — Rasmussen, p. 169.
1972 *Narona. (Sveltella) fusiformis* (Cantraine, 1835) — Nordsieck, p. 87, pl. 21, fig. 132.
1972 *Narona. (Sveltella) fusiformis* (Cantraine, 1835) f. *crassicostata* n., Nordsieck, p. 88.

Material — 2000 specimens, RGM 225 228-225 233.

Description — Small and solid, conical to high conical shells with a constricted base, about two times as high as wide, but with a considerable variation in this latter respect. The protoconch (Fig. 3) has 2 1/2 convex whorls. About halfway the second whorl starts a radial sculpture of numerous narrow, thread-like riblets, that are strongly curved backwards and flexuous in their upper and lower parts. These riblets very gradually increase in strength. Between the radial sculpture elements still much finer ornamentation is present, consisting of inconspicuous threads that run more or less perpendicularly

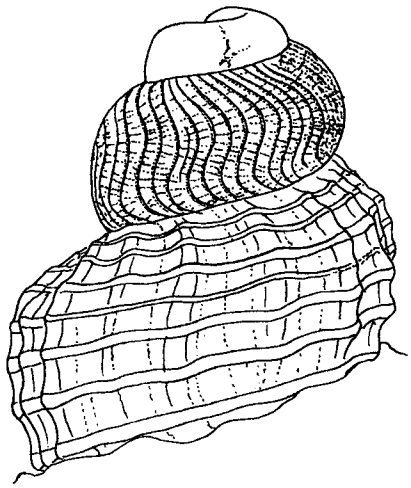

Fig. 3. Babylonella fusiformis (Cantraine, 1835), × 50; protoconch and first teleoconch whorl; Winterswijk-Miste, RGM 225 229.

to the radial elements, consequently diverging backwards. They are not always continuous from one interspace to the next. The boundary with the teleoconch is obvious, as the first teleoconch radial rib is much stronger than the last one of the protoconch. On the last half whorl of the protoconch the spirals of the teleoconch sculpture are already weakly indicated. The teleoconch has five volutions at the most, regularly increasing in size. The body whorl occupies 3/5 of the total shell height and the apertura about 2/5. These ratios are however subject to considerable variation. The base of the ultimate whorl is slightly convex and gradually constricted downwards. There is a slightly thickened margin around the partly or completely covered umbilicus. The apertura is rounded triangular. Only a very restricted number of specimens have the inner apertural margin slightly thickened and provided with weak denticles; in almost all specimens this shell part is thin and smooth. Two weak spiral folds are present on the columella, sometimes the basal part of the columella is truncated and resembles a weak third fold. At the base of the apertura lies a short and hardly indicated siphonal canal. This species has a very variable sculpture consisting of 4 to 7 primary spiral threads, comparatively high and well-defined. At about 2/3 of the height of the whorls a somewhat stronger spiral is present, causing the whorls to be angular to a higher or lesser degree, the upper part being flattened and sloping downwards obliquely, the lower part more convex. On the second or third whorl a set of secondary spirals is usually present, in a few shells this takes place on the fourth or even the fifth whorl. There are some 15 radial ribs per whorl, which gradually fade away on the base of the body whorl. On and between these ribs the spirals remain equally strong. In very well-preserved specimens an extremely fine spiral striation is visible between the sculpture elements. Fine growth-lines are locally present.

Dimensions — The height of the shells reaches c. 12 mm.

Remarks — As is obvious from the above description, this species is extremely variable, in the details of the surface sculpture as well as in general outline. The degree of angularity of the whorls ranges from almost regularly convex to carinated, with all intermediate forms present.

This species is part of a lineage, with the Oligocene *B. pusilla* (Philippi) as forerunner and the Pliocene *B. subangulosa* (Wood) as successor. Specimens of *pusilla* from the Chattian of the Lower Rhine area are very similar to the Miocene form and differ only, in fact, by the thickened and denticulated inner apertural margin of most adult specimens, a feature only rarely present in Miocene shells. Specimens from Hessen (Glimmerode) remain considerably smaller than the Lower Rhine and Miste specimens, but they also have their inner apertural margins frequently thickened and provided with teeth. Thus I doubt strongly if *pusilla* and *fusiformis* are to be separated taxonomically.

There is, on the other hand, hardly any doubt on the question whether or not the Miocene material of the North Sea Basin may be considered identical with *fusiformis*. Cantraine (1835) described this species from Pliocene deposits in the Sienna region in Italy. Pliocene Italian specimens may have a slightly coarser sculpture and reach somewhat larger dimensions. Generally, however, they agree closely with our shells, also in the characters of the protoconch (Pavia, 1975, p. 148, pl. 7, figs. 19a-b, 23a-b).

Unfortunately, I have no specimens available of the form *subangulosa* (Wood), described from the British Pliocene. From the literature (Wood, 1848, p. 66, pl. 7, fig. 20; Wood, 1872, p. 47, pl. 3, fig. 27; Harmer, 1918, p. 409) it is difficult to obtain a clear idea of this form, but anyhow the sculpture seems to be somewhat denser.

Quite recently I had an opportunity to study the type material of *Cancellaria nysti* Hoernes, 1856, kept in the Naturhistorisches Museum at Wien, Austria. This form is closely related to *fusiformis* and differs only by its relatively slender shell form. The

protoconch's sculpture of *nysti* is identical with that of *fusiformis* (see also Davoli, 1982, p. 68).

Nordsieck claims this species to belong to *Sveltella* Cossmann, 1889. Indeed, there are certain similarities, at least judging from the data provided by Cossmann (1899). But no details on the protoconch ornamentation are given. Also, a species from the Miocene of Saubrigues (SW France), *Sveltella dumasi* Cossmann, 1899, is considered by its author to be a typical *Sveltella*. Two specimens of *dumasi* are present in the RGM collections (from the type locality). They are slightly less slender than the shell described by Cossmann but certainly belong to the same species. These two shells agree in every detail with the *fusiformis* specimens from the North Sea Basin's Miocene. So, in my opinion, *dumasi* is a junior synonym of *fusiformis*. A final conclusion on the generic position of *fusiformis* is not possible for me, as the type species of neither *Sveltella* nor *Babylonella* are available to me. A check of for instance the very typical protoconch sculpture is essential for a definite determination of the genus. Therefore I maintain the usual denomination *Babylonella*, until there will be a possibility to compare the type species.

Genus *Brocchinia* Jousseaume, 1887

Brocchinia mitraeformis parvula (Beyrich, 1856)
Pl. 1, figs. 5-7; Pl. 5, fig. 3; Fig. 4.

1856 *Cancellaria parvula* Beyr., Beyrich, p. 326, pl. 28, fig. 8a-b.
1872 *Cancellaria mitraeformis* Broc. — von Koenen, p. 163 (non Brocchi).
1890 *Cancellaria (g. Narona) bicarinata* nov. form., Hoernes & Auinger, p. 281, pl. 33, fig. 16a-c.
1894 *Brocchinia mitraeformis* (Br.) var. *anodosomagna* Sacc., Sacco, p. 69, pl. 3, fig. 84 ('costae transversae inter se distantiores').
1894 *Brocchinia mitraeformis* (Br.) var. *paucicostulata* Sacc., Sacco, p. 69, pl. 3, fig. 86 ('Costulae transversae in regione mediosupera anfractuum rariores, distantiones,....').
1914 *Cancellaria mitraeformis* var. *bicarinata* Hoern. u. Auing. - Gripp, p. 27, pl. 3, fig. 7.
1925 *Brocchinia parvula* Beyr. - Kautsky, p. 137.
1950 *Brocchinia mitraeformis* (Brocchi) var. — Beets, p. 35, pl. 1, figs. 6-8, 10a.
1950 *Brocchinia parvula* (Beyrich) — Beets, p. 36, pl. 1, figs. 1-5.
1952 *Cancellaria (Brocchinia) mitraeformis* f. *parvula*, Beyrich, 1856. — Glibert, p. 130, pl. 9, fig. 6.
1960b *Narona (Brocchinia) mitraeformis* f. *parvula* Beyrich, sp. 1856. — Glibert, p. 4.

Material — Twenty-four specimens, RGM 225 223-225 227.

Description — Small, but comparatively solid shell, high conical with constricted base, about 2 1/2 times as high as wide. The protoconch is in only one specimen fairly well preserved. It has 2 1/2 convex whorls that quickly increase in diameter and have the form of a small and relatively high *Natica* shell. The boundary with the teleoconch is sharp. The postembryonic shell has slightly more than five whorls, slowly and regularly increasing in size. The uppermost 1/3 part of the whorls is slightly concave, the lower part is somewhat convex, the transition between these parts is rather gradual. The sutures are distinct, but not very deep. The body whorl of adult shells occupies about half the height of the complete shell. Its base is slightly convex and has no umbilicus. The apertura is relatively small and obliquely reniform, its height equals about 3/10 of the shell height. The callus is solid, clearly defined and not far extended onto the base of the body whorl. There are two heavy spiral folds on the columella, lying close together, sometimes abruptly truncated anteriorly. The basal part of the apertura forms a short and rather

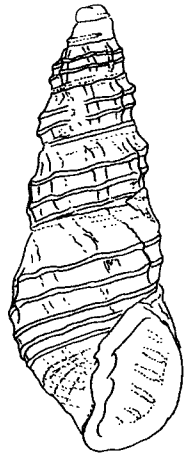

Fig. 4. *Brocchinia mitraeformis parvula* (Beyrich, 1856), × 6, Voslau, Austria; lectotype of *Cancellaria (Narona) bicarinata* Hoernes & Auinger, 1890; coll. Naturhistorisches Museum Wien, Austria, no. 1872 XXX 107.

wide, but hardly or not excavated, siphonal canal. The inner side of the apertural margin is hardly or not thickened and bears some 6 to 10 deeply protruding, elongated denticles.

The sculpture consists of 5 or 6 narrow and distinctly defined spiral lines that are restricted to the lower convex part of the whorls. The uppermost spiral lies more or less at the transition of concave to convex. On both sides of this spiral a secondary one develops on the younger whorls. In adult specimens such secondary spirals may insert elsewhere as well. The basal part of the body whorl bears about 10 similar spiral threads. All spirals remain distinctly narrower than their interspaces. Close to the columella the sculpture weakens somewhat. Radial sculpture is present as wide and ill-defined undulations, some 7 or 8 per whorl. On the ultimate whorl these undulations are less distinct or even disappear completely. The radial sculpture is most obvious at the transition of the concave part of the whorls to the convex part. Below the periphery it fades away rapidly.

Dimensions — The height of the shell reaches c. 13 mm.

Remarks — The typical *parvula* (Beyrich) differs from *mitraeformis* (Brocchi) by the presence of only two spirals on the penultimate whorls. *C. bicarinata* Hoernes & Auinger is a junior synonym. This form, of which I could study the original illustrated specimen (here represented in Fig. 4), has three rather prominent spiral threads on the last three whorls. I herewith designate this shell as the lectotype of *C. bicarinata* Hoernes & Auinger.

B. mitraeformis in its typical form is characterized by a dense spiral sculpture (Rossi Ronchetti, 1955, fig. 142; Pinna & Spezia, 1978, p. 169, pl. 68, fig. 1, 1a). The specimens from Miste have more spirals than typical *parvula*, but they are widely spaced, thread-like and very narrow. Such forms should be included in *parvula* in my opinion, whereas the name *mitraeformis* s.s. has to be restricted to the form with crowded spirals separated by narrow interspaces (see also Davoli, 1982, p. 61, pl. 7, figs. 4a-b). As typical *mitraeformis* does not occur in the North Sea Basin *parvula* is considered to be a subspecies, which is also present in the Mediterranean Pliocene (RGM collection). In the North Sea Basin *parvula* is known from Chattian to Kattendijkian.

Genus *Cancellaria* Lamarck, 1799
Subgenus *Bivetiella* Wenz, 1943

Cancellaria (Bivetiella) cancellata praecedens Beyrich, 1856
Pl. 1, figs. 13-15; Pl. 5, fig. 5.

1856 *Cancellaria cancellata* Lin. sp. Var. *praecedens*., Beyrich, p. 321, pl. 27, fig. 2a-b.
? 1872 *Cancellaria cancellata* L. — von Koenen, p. 160 (non Linné).
? 1872 *Cancellaria cassidea* Broc. — von Koenen, p. 165 (non Brocchi).
1925 *Bivetia cancellata* Lam. var. praecedens Beyr. — Kautsky, p. 136, pl. 10, fig. 1.
1952 *Cancellaria (Cancellaria) cancellata* f. *praecedens* Beyrich, 1856. — Glibert, p. 120.
1958 *Cancellaria (Cancellaria) cancellata* (L.). — Sorgenfrei, p. 239, pl. 50, fig. 164 (non Linné).
1960a *Cancellaria (Bivetiella) cancellata praecedens* Beyrich, 1856. — Glibert, p. 66.
1964 *Cancellaria (Merica) contorta* Basterot 1825. — Anderson, p. 270, pl. 29, fig. 210a-b (non Basterot).
1972 *Bonellitia* cf. *evulsa* (Solander, 1766). — Nordsieck, p. 88, pl. 21, fig. 134 (non Solander).

Material — Nine specimens, RGM 225 120-225 123.

Remarks — Though the subspecies *praecedens* shows rather a wide range of variability it differs constantly from the Pliocene and Recent southern European nominal subspecies in being smaller, relatively higher (less inflated) and in having considerably finer sculpture with partly well-developed secondary spirals. The second set of spirals develops on the second or third whorl and a third series may insert on the upper flattened part of the younger whorls.

The rather few specimens from Winterswijk-Miste show a lesser degree of variation than the population at Dingden, in which specimens are present with a less developed shoulder that are comparatively also somewhat higher than the Miste shells. These latter forms agree better with the original description of Beyrich.

Dimensions — The height of the largest specimen is c. 21 mm.

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

Cancellaria (Merica) bellardii Michelotti, 1847
Pl. 1, figs. 16-18; Pl. 5, fig. 8.

1841 *Cancellaria evulsa* Sow. var. *Taurinia* Bell., Bellardi, p. 249, pl. 2, figs. 17,18.
1847 *Cancellaria Bellardii*. mihi., Michelotti, p. 225.
? 1854 *Cancellaria contorta* Bast. — Hoernes, p. 311, pl. 34, figs. 7a-b, 8a-b (? non de Basterot).
1894 *Bonellitia evulsa* var. *taurinia* Bell. — Sacco, p. 45, pl. 3, fig. 12a-b.
1925 *Merica contorta* Bast. — Kautsky, p. 137, pl. 10, fig. 2 (non de Basterot).
1972 *Cancellaria (Merica) contorta bellardii* Michelotti, 1847. — A.W. Janssen, p. 38, pl. 8, fig. 2.

non 1854 *Cancellaria Bellardii* Micht. — Hoernes, p. 314, pl. 34, fig. 17a-b (= *C. contorta saccoi* Hoernes & Auinger, 1890) et fig. 18a-b (= *C. contorta* aff. *gelriana* Janssen, 1972).

Material — Twenty-six specimens; RGM 116 757, 116 765, 225 124-225 128.

Remarks — *C. bellardii* closely resembles *C. contorta gelriana* and may be distinguished by its relatively wider shell with a considerably higher body-whorl. The height of the apertura equals half the height of the entire shell or even exceeds it a little. Also there is a difference in sculpture. Because a secondary set of spiral elements develops only in a rather late stage, adult specimens of *bellardii* have no more than two generations of spirals, resulting in a much coarser sculpture than in *contorta gelriana*. A further difference is the fact that in *bellardii* the whorls are slightly expanded just below the suture, which gives the spira a more scalariform appearance.

In the extensive and variable material of *C. contorta gelriana* of Winterswijk-Miste it is possible to isolate a few extreme specimens in which the apertura has the same proportions as in *bellardii*. Such shells can always be separated, however, by their various generations of secondary spirals.

In earlier papers I regarded *bellardii* as a subspecies of *contorta* (de Basterot, 1825), but the fact that both *bellardii* and *contorta gelriana* are present in the Miste fauna contradicts this concept. One could of course regard the entire material as one very variable taxon, but this is an unsatisfactory solution in view of the considerable differences in form and sculpture. Therefore I consider *bellardii*, for the time being, as a separate species, realizing that the correctness of this view has to be tested with the help of material from other localities.

Dimensions — The height of the largest specimens is c. 20 mm.

Cancellaria (Merica) contorta gelriana A.W. Janssen 1972
Pl. 2, figs. 1-7; Pl. 5, fig. 7.

? 1854 *Cancellaria Bellardii* Micht. — Hoernes, p. 314, pl. 34, figs. 18a-b (= *C.* aff. *gelriana*) (non Michelotti) (non fig. 17a-b = *C. contorta saccoi* Hoernes & Auinger, 1890).
1872 *Cancellaria evulsa* Sol. — von Koenen, p. 158 (partim, non Solander).
? 1872 *Cancellaria contorta* Bast. — von Koenen, p. 159 (non de Basterot).
1918 *Bonellitia evulsa* (Solander) var. *semicostata* (Sacco). — Harmer, p. 403, pl. 40, fig. 14.
? 1952 *Cancellaria (Merica) contorta* Basterot, sp. 1825 — Glibert, p. 121 (non de Basterot).
1952 *Cancellaria (Merica) beyrichi* Mayer, 1858. — Glibert, p. 122, pl. 9, fig. 9 (non Mayer).
? 1960a *Bonellitia evulsa taurinia* Bellardi, sp. 1841. — Glibert, p. 80 (? partim, non Bellardi).
1972 *Cancellaria (Merica) contorta gelriana* subsp. nov., A.W. Janssen, p. 39, pl. 8, figs. 5a-b, 6.
1972 *Bonellitia granulata* (Nyst). — Nordsieck, p. 89, pl. 21, fig. 135 (non Nyst).

Material — Holotype RGM 116 754 (Pl. 2, fig. 1); 102 paratypes, RGM 116 755-116 756; 711 specimens, RGM 225 129-225 140.

Remarks — This form shows a remarkable variability, in shell form as well as in details of the ornamentation. Relatively wide specimens remind strongly of the ancestral *C. evulsa postera* Beyrich. In a very restricted number of specimens from Winterswijk-Miste (Pl. 2, fig. 5) the sculpture is coarser, because of a late development of secondary spirals. Such shells resemble *C. bellardii* in sculpture, but can easily be separated by their different proportions. A similar shell with coarse sculpture was described by R. Janssen (1979, p. 305, pl. 16, fig. 38 sub.nomine aff. *contorta*) from the Late Oligocene of the Lower Rhine area. This specimen, however, seems to have closer affinities to *bellardii* than to *contorta gelriana*.

Dimensions — The largest shell has a height of c. 26 mm.

Cancellaria (Merica) evulsa postera Beyrich, 1856
Pl. 2, fig. 8.

1856 *Cancellaria evulsa* Sol. sp. Var. γ *postera*., Beyrich, p. 307, pl. 26, figs. 3-5 (non fig. 2).
1907 *Cancellaria evulsa* Solander sp. — Ravn, p. 339, pl. 6, fig. 16 (partim, non Solander).
1957 *Admete (Bonellitia) evulsa* Solander, sp. 1766 f. *postera*. — Glibert, p. 75 (partim).
1960a *Bonellitia evulsa postera* Beyrich, 1856. — Glibert, p. 80.
1978 *Cancellaria (Merica) evulsa* (Solander in Brander 1766). — R. Janssen, p. 114 (non Solander) (with extensive synonymy).
1979 *Cancellaria (Merica) evulsa* (Solander 1766). — R. Janssen, p. 305 (non Solander).

Material — Seven specimens, RGM 225 141-225 142.

Remarks — Among the numerous specimens of *C. contorta gelriana* a few shells were found having a relatively short and thick-set shell-form. These specimens have a fine spiral ornamentation, consisting of four generations of spiral threads, lying very close on the younger whorls. By their form these shells resemble somewhat *C. cancellata praecedens*, which however has an entirely different sculpture and also a better developed pseudumbilicus.

In shape as well as in sculpture these few shells agree very well with *C. evulsa postera* from the Chattian of several localities in the North Sea Basin. As all specimens from Winterswijk-Miste show a certain degree of wear and tear it must be assumed that these are reworked specimens of Chattian age. This is in good agreement with the occurrence at Miste of other Late Oligocene species (van den Bosch, Cadée & Janssen, 1975, p. 76).

Dimensions — The height of the largest shell is 18 mm.

Genus *Sveltia* Jousseaume, 1887

Sveltia lyrata (Brocchi, 1814)
Pl. 1, fig. 8; Pl. 5, fig. 4.

1814 *Voluta lyrata*: nob., Brocchi, p. 311, pl. 3, fig. 6.
1841 *Cancellaria lyrata* Broc. — Bellardi, p. 238, pl. 1, figs. 1, 2.
1854 *Cancellaria Lyrata* Brocc. — Hoernes, p. 308, pl. 34, figs. 4a-b, 5a-b.
1856 *Cancellaria lyrata* Broc. sp. — Beyrich, p. 332, pl. 27, figs. 7, 8a-c.
1872 *Cancellaria lyrata* Broc. — von Koenen, p. 164 (partim).
1936 *Cancellaria (Sveltia) lyrata* Brocchi. — Sieber, p. 96.
1952 *Sveltia lyrata* (Brocchi 1814) — Rossi Ronchetti, p. 270, fig. 144.
? 1952 *Narona (β-Sveltia) lyrata parvicarinata* (Kautsky), 1925 — Hinsch, p. 170 (? non Kautsky).
1960a *Narona (Calcarata) lyrata* Brocchi, sp. 1814. — Glibert, p. 72.
1964 *Narona (Sveltia) lyrata* (Brocchi 1814). — Anderson, p. 274, pl. 30, fig. 215.
1982 *Narona (Sveltia) lyrata* (Brocchi, 1814) — Davoli, p. 51, pl. 5, figs. 9, 11-13.

Material — Only one juvenile shell was found: RGM 225 222.

Description — The available shell consists of the protoconch and only 1 1/2 teleoconch whorl. The protoconch is situated obliquely, it has 2 3/4 smooth and convex whorls in the form of a somewhat high-spired *Natica* shell. The boundary with the teleoconch is sharp. The teleoconch whorls are distinctly carinated, with a flat and obliquely sloping adapical part and an almost vertical part below this. The base of the body whorl is constricted. The

apertura is more or less oval and has a rather obvious siphonal canal, which is slightly curved to the left. The columella has two strong spiral folds.

The sculpture on the teleoconch consists of three narrow spiral threads on the lower part of the whorls. The upper one develops quickly into the carina, separating the upper and lower part of the whorls. The base of the body whorl has another six spirals, decreasing in strength downwards. Three slightly stronger spirals are present on the canal. Between this primary set of spirals a second generation develops from the beginning of the second teleoconch whorl. The upper part of the whorls has some four, very vague spiral lines. Comparatively high and narrow radial riblets are present that are slightly prosocline. On the points of intersection small knobs are formed; on the carina lie short spines.

Dimensions — The height of the shell is 4.8 mm.

Remarks — Kautsky (1925) described a var. *parvicarinata* in this species, which in my opinion is a form of *Sveltia varicosa paucicostata* (see below).

In the Middle Miocene of the North Sea Basin *S. lyrata* is a very rare species. During the Late Miocene it seems to be slightly less scarce here, but it changes its form somewhat by the presence of a weaker carina on the whorls. In the Paratethys and the Mediterranean area this species is widespread during Miocene and Pliocene (Davoli, 1982, p. 47).

Sveltia varicosa paucicostata Peyrot, 1928
Pl. 2, figs. 9-13; Pl. 5, fig. 9.

1856 *Cancellaria varicosa* Broc. sp. — Beyrich, p. 329, pl. 27, fig. 6 (non Brocchi).
1872 *Cancellaria varicosa* Broc. — von Koenen, p. 164 (partim, non Brocchi).
1918 *Sveltia varicosa* (Brocchi). — Harmer, p. 398, pl. 40, fig. 17 (partim, non Brocchi, non figs. 15 and 16).
1928 *Sveltia varicosa* (Brocchi) mut. *paucicostata* nov. mut., Peyrot, p. 218, pl. 14, fig. 7.
1952 *Cancellaria (Sveltia) varicosa* Brocchi, sp. 1814 forme *paucicostata* Peyrot. — Glibert, p. 128, pl. 10, figs. 1c-d.
1958 *Cancellaria (Narona) varicosa* (Brocchi). — Sorgenfrei, p. 244, pl. 51, figs. 169a-b (non Brocchi).
1960a *Narona (Sveltia) varicosa* var. *paucicostata* Peyrot, sp. 1928. — Glibert, p. 71.
1964 *Narona (Sveltia) varicosa* (Brocchi 1814). — Anderson, p. 273, pl. 30, fig. 214 (non Brocchi).
1972 *Narona (Sveltia) varicosa* (Brocchi, 1814). — Nordsieck, p. 87, pl. 21, fig. 131 (non Brocchi).
? 1979 *Narona (Sveltia)* aff. *varicosa* (Brocchi, 1814). — R. Janssen, p. 306, pl. 16, fig. 40 (? non Brocchi).

Material — 5868 specimens, RGM 225 211-225 221.

Description — This species has an attractive, slender conical and solid shell. It is about 2 1/2 times as high as wide. The protoconch, situated somewhat obliquely, has three rather convex whorls, quickly increasing in diameter and together resembling a small *Natica* shell in outline. The boundary with the post-embryonic whorls is not very obvious. Completely full-grown shells may have up to 6 1/2 teleoconch whorls. These are relatively high and slightly shouldered, separated by distinct suture lines. The ultimate whorl occupies 3/5 of the entire shell height and is constricted towards the base. The apertura equals about 2/5 of the complete shell-height. At its base it has a fairly distinct siphonal canal, which is however not incised. The callus is not very expanded on the base of the

ultimate whorl and sharply delimited. In some shells it partly covers the pseudumbilicus, which is surrounded by a weak thickening. The columella has three spiral folds, the lower one of these is the weakest. The inner side of the apertural margin may be slightly thickened and bears a variable number (some 4 to 12) elongated denticles that rather frequently are prolonged onto the not thickened inner shell wall.

The sculpture starts on the first teleoconch whorl with four primary spiral threads, almost equally wide as their interspaces and rather ill-defined. Secondary sets of spirals develop between the primary spirals. Full-grown shells may have up to four generations of spiral elements. One primary spiral, demarcating more or less the weak shoulder at the upper part of the whorls, is stronger than the others. Frequently in the Miste material the spirals are distinctly lighter in colour than their interspaces. Radial sculpture consists of about 14 ribs on the earliest whorls; they are much stronger than the spiral threads and prosocline. On the younger whorls their number decreases, to about 7 ribs in very large specimens, and the distances between the ribs become wider.

Dimensions — The height of the shell reaches 27 mm.

Remarks — In some specimens the spiral sculpture is restricted to one generation, or a second generation develops only in a very late stage, which results in a relatively coarse sculpture. In addition such specimens are less slender than the form described above. Only very few of these specimens were found (Pl. 2, fig. 13); they agree in every detail with the shells described by Kautsky (1925, p. 139, pl. 10, fig. 4) sub nomine *Sveltia (Calcarata) lyrata* Brocchi, var. *parvicarinata*. This form, of course, has nothing to do with *lyrata*. It might be indicated, if required, as *S. varicosa paucicostata* (Peyrot) f. *parvicarinata* (Kautsky).

The North Sea Basin material agrees perfectly with the form *paucicostata* Peyrot from the Miocene of southwestern France. Glibert (1952, p. 128, pl. 10, fig. 1a-b) distinguished a somewhat resembling form from the Edegem Sands as f. *simplicior* (Sacco). Specimens as described by Glibert, also known from the Vierlandian (Sorgenfrei, 1940, p. 47, pl. 6, fig. 9) and the (?) Hemmoorian (Kautsky, 1925, p. 138, pl. 10, fig. 3), differ from *simplicior* from the Italian Pliocene by a much shorter shell, slightly carinated whorls and much finer sculpture. This form is significantly different from *paucicostata*. It can not be considered to be a subspecies of *varicosa*, as both this form and *paucicostata* are simultaneously present in the Edegem Sands. For this form I propose the name *Sveltia gliberti* sp. nov. Holotype is the shell illustrated by Glibert (1952, pl. 10, fig. 1a-b). Four specimens from the Edegem Sands in the RGM collection (RGM 182 628 and 182 993) are to be considered as paratypes. Three of these are represented here (Pl. 2, figs. 14 and 15; Pl. 5, fig. 6).

R. Janssen (1979, p. 306, pl. 16, figs. 40 and 41 respectively) mentioned two shells, *Narona (Sveltia)* aff. *varicosa* (Brocchi) and *Narona (Sveltia)* sp., from the Late Oligocene. The former seems to agree almost completely with the Miocene *paucicostata*, though it is rather worn, and the latter is undoubtedly a *S. gliberti* sp. nov. Thus, we have to reckon with the probability that both forms occur already together from early Chattian times.

During the Pliocene *S. varicosa* has a wide distribution in the Mediterranean area, whereas it is succeeded in the North Sea Basin by *S. jonkaireana* (Nyst, 1845).

Genus *Trigonostoma* de Blainville, 1827

Subgenus *Misteia* subgen. nov.

Diagnosis — Shell biconical, slightly higher than wide, with convex whorls that may have a flattened part below the suture. Subsutural carina absent. Base of shell with pseudumbilicus surrounded by an inflated ridge. Apertura triangular to semicircular. Columella biplicated (subtriplicated). Sculpture of numerous spiral threads and vague radial riblets. Siphonal canal hardly indicated.

Type species — *Cancellaria planispira* Nyst, 1845.

Derivatio nominis — The genus is named after the hamlet Miste in the municipality of Winterswijk.

Remarks — *Misteia* differs from the most related taxon, *Ovilia* Jousseaume, 1887, by its higher spira and by the fact that the sutures are not situated in a depression. The absence of a subsutural zone bordered by a carina makes *Misteia* quite different from all other groups within the genus *Trigonostoma*, but still its general appearance points to a close relationship. Therefore *Misteia* is not given the rank of a genus on its own.

Except for the type species also *Trigonostoma mistense* sp. nov. (described below) and *T. mutinense* (Foresti) (1883, p. 302, pl. 1, fig. 1a-c; see also Davoli, 1982, p. 37, pl. 1, figs. 22, 24-26, pl. 4, figs. 9, 13) are considered to belong to the new subgenus.

Trigonostoma (Misteia) mistense sp. nov.
Pl. 3, fig. 4a-b.

Locus typicus — Winterswijk-Miste (The Netherlands, province of Gelderland), temporary outcrop, about 2.00-3.75 m below surface.

Stratum typicum — Miocene, Aalten Member, Miste Bed, *Hiatella arctica* Assemblage Zone, or (less probably) basal part of *Astarte radiata* Assemblage Zone.

Derivatio nominis — The species is named after the type locality.

Material — Holotype RGM 225 202 (Pl. 3, fig. 4a-b), the only specimen available.*)

Description — Shell rather solid, about 1.3 times as high as wide. The protoconch is damaged, only its ultimate whorl is preserved. Just like a part of the first teleoconch whorl, its surface is worn. There are 2 1/4 post-embryonic whorls that increase rapidly in diameter. From the boundary between protoconch and teleoconch to the apertura the whorls are attached to each other at an ever lower point of the preceding whorl, which results in a deep and remarkably oblique suture. The ultimate whorl occupies almost the entire shell height; it is distinctly inflated. The narrow base of the shell is surrounded by a somewhat thickened ridge. The apertura is semicircular and slightly higher than half the height of the shell. The columella is somewhat concave and has two rather heavy and very oblique spiral folds. The callus is rather restricted and thin, it covers the pseudumbilicus completely. At the place of the pseudumbilicus the callus is distinctly indented. Downwards the callus is narrowed in the form of a point and coincides with the basal

*) A second specimen, also from the type locality, was donated to the RGM by Mr R. Uum (Lelystad). This shell, only slightly smaller than the holotype (height 21 mm), shows some minor differences in shape and sculpture. The specimen became available at a very late time (January 1984) when this paper was in press already. It was registered as RGM 227 096 and may be considered a paratype.

prolongation of the lower columellar fold. There is hardly an indication of a siphonal canal. The inner wall of the apertural margin is not thickened and smooth.

Sculpture starts with some primary spiral threads, with almost simultaneously developing secondary spirals in the interspaces. The spiral threads are separated by very narrow grooves. The somewhat wider spiral just below the suture repeatedly divides into several narrower ones. By the continuing lower attachment of the whorls more and more spiral threads appear from under the suture. Close to the apertura the body whorl has some 40 flattened spiral threads of unequal width, as the second generation of spirals does not reach quite the strength of the first series. Also third generation spirals develop locally on the ultimate whorl. Radial sculpture is restricted to a vague and very indistinct undulation, mainly at the second teleoconch whorl. These undulations can therefore not be counted. The growth-lines are prosocline. On the first whorl they form narrow and rather regularly spaced crenulations on the spiral threads, but this is only visible at a magnification of 10 x or more. This feature is absent (not only because of a slightly worn surface) on the body whorl.

Dimension — The height of the shell is c. 22 mm.

Remarks — *T. (M.) mistense* sp. nov. is obviously related to *T. planispirum* and for some time I wondered if the only available shell might represent an extreme variation of that species. Considering however the variability of the *planispirum* population of Miste (sixty specimens could be studied) this is very unlikely. Not a single specimen of *planispirum* shows the slightest indication of being a transitional form to *mistense*. Therefore the introduction of a new specific name seems to be justified. *T. mistense* differs from *planispirum* by its larger dimensions and a lower number of whorls. *T. planispirum* with a shell height of c. 18 mm has some three teleoconch whorls. Equal-sized *mistense* is estimated to have at least one whorl less, which is a significant difference. Furthermore the suture of *mistense* is much more oblique and the whorls are regularly convex instead of having a flattened upper part. The spiral elements of *mistense* are not thread-like, but more flattened with very narrow interspaces. A third (lower) pseudofold on the columella is absent in *mistense*.

Trigonostoma (Misteia) planispirum (Nyst, 1845)
Pl. 3, figs. 1-3; Pl. 6, fig. 1.

1845 *Cancellaria planispira* Nob., Nyst, p. 481, pl. 38, fig. 22a-b.
1952 *Cancellaria (Trigonostoma) planispira* Nyst, 1843. — Glibert, p. 123, pl. 9, fig. 10.
1975 *Trigonostoma planispira* (Nyst, 1845). — van den Bosch, Cadée & Janssen, pl. 12, fig. 5.

Material — Sixty specimens, RGM 184 721, 225 196-225 201.

Description — Solid, biconical shell with a relatively depressed spira and triangular base, about 1 1/4 times as high as wide. The protoconch axis is oblique with respect to the axis of the teleoconch and consists of 2 3/4 smooth and rather convex whorls in the form of a small *Natica* shell. The boundary with the teleoconch is sharp. On the ultimate part of the protoconch (about 1/8 of the last whorl) the spiral sculpture of the teleoconch is already weakly present. The teleoconch has three whorls that quickly increase in size. The upper part of the whorls, to almost half the distance between the upper and lower suture, is flattened and descends obliquely to a weak ridge below which the shell wall is slightly

convex. Just below the suture the flattened part of the whorls is slightly concave. The body whorl is very large and occupies almost 9/10 of the entire shell height. The apertura is rounded triangular with a hardly incised siphonal canal at its base. The callus is rather restricted and covers completely or almost completely a pseudumbilicus, which is surrounded by an inflated margin. At the place of the pseudumbilicus the callus shows a faint impression. The columella has two moderately strong spiral folds, the upper one of which is the strongest. Close to the apertura the lower margin of the columella is slightly thickened, making the appearance of a weak third fold. The inner wall of the apertural lip is only slightly thickened and has a variable number of narrow, elongated denticles.

The sculpture starts on the first teleoconch whorl with 6 to 7 primary spirals, which are wider than their interspaces. The fourth spiral from above is slightly stronger than the other ones and is situated on the line where the flattened part of the whorls changes into the convex part. A series of secondary spirals develops rapidly, usually already at a short distance from the boundary with the protoconch. They appear at first near the suture and on both sides of the fourth spiral, later also on the remaining parts of the whorl. On the body whorl of large specimens a third generation of spirals may develop, but usually only two are present. The first teleoconch whorls are devoid of radial sculpture. On later whorls usually weak radial folds are visible, that may however remain completely absent in some specimens. If present, the radial riblets are prosocline just as the growth-lines that locally between the spiral elements and to a much lesser degree also on the spirals may show a somewhat lamellose appearance.

Dimensions — The height of the shell reaches c. 18 mm.

Remarks — This species was known from the North Sea Basin in a few specimens only and except for the type locality Bolderberg in Belgium only from the Miocene of the Peel area in the Netherlands. The occurrence in the Miste fauna of such magnificent specimens therefore was quite a surprise. In Miste this species offers only a slight variability, restricted to details of the ornamentation and the degree of flattening of the upper part of the whorls. *T. planispirum* is closely related to *T. mutinense* (Foresti), which is much larger and has a granulated sculpture (Davoli, 1982, p. 37).

Subgenus *Trigonostoma* s.s.

Trigonostoma (Trigonostoma) apertum (Beyrich, 1856)
Pl. 3, figs. 5-8; Pl. 6, fig. 2.

1856 *Cancellaria aperta* Beyr., Beyrich, p. 336, pl. 28, fig. 5a-d.
1872 *Cancellaria spinifera* Grat. — von Koenen, p. 165 (partim, non Grateloup, specimen from Eibergen in RGM collection).
1872 *Cancellaria aperta* Beyr. — von Koenen, p. 167 (partim).
1906 *Cancellaria (Gulia) geslini* (Bast.) var. *ornatissima* n., Boettger p. 50.
? 1925 *Trigonostoma aperta* Beyr. — Kautsky, p. 139, pl. 10, fig. 5.
1934 *Cancellaria (Ventrilia) geslini ornatissima* (Boettger). — Zilch, p. 260, pl. 17, fig. 23.
1952 *Cancellaria (Trigonostoma) aperta* Beyrich, 1856. — Glibert, p. 124, pl. 9, fig. 12c (partim, non fig. 12a-b = *T. lindeni* sp. nov.).
1964 *Trigonostoma aperta* (Beyrich 1856). — Anderson, p. 272, pl. 29, fig. 212 (partim).
1975 *Trigonostoma ornatissima* (Zilch, 1935). — van den Bosch, Cadée & Janssen, pl. 14, fig. 13.

Material — 403 specimens, RGM 184 741, 225 158-225 164.

Remarks — *T. apertum* may be distinguished from *T. barnardi* sp. nov. by a number of features, the most important of which is the form of the subsutural zone. In *apertum* this zone is completely flat and horizontal on the first teleoconch whorls instead of distinctly excavated as in *barnardi*. On the younger whorls of *apertum* the carina of the subsutural zone gradually becomes more rounded and simultaneously the subsutural zone becomes slightly concave. A further striking difference between these two species is found in the development of the spiral sculpture. In *apertum* the primary spirals are considerably narrower than their interspaces, especially so just below the subsutural carina, and well-defined. Also the secondary spirals show a more thread-like appearance. Together with the higher number of radial riblets a much more rugged sculpture is formed than in *T. barnardi*. Furthermore there is a number of smaller differences as e.g. the much less pronounced spines of the subsutural carina in *apertum*, the relatively wider shell and the fact that the protoconch axis hardly or not deviates from the teleoconch axis.

T. apertum resembles and has up to now almost always been mixed up with *T. lindeni* sp. nov., described below. This latter form not only reaches larger dimensions, but is usually also relatively wider and has more convex whorls. The subsutural zone of *lindeni* is concave all over its length from protoconch to apertura and the carina separating this zone from the rest of the shell remains sharp, also in completely adult specimens. The spiral sculpture of *lindeni* shows a different development: the spiral threads lie closer and are stronger than in *apertum*. At the points of intersection with the usually higher number of radial riblets *T. lindeni* shows a lamellose structure. In *apertum* the secondary spirals are always markedly weaker than the primary ones, whereas in *lindeni* the various generations of spirals reach almost the same strength, separated by very narrow interspaces. The protoconch of *T. lindeni* is larger than that of *apertum*.

Though I have not been able to study the type specimen, Beyrich's description and illustrations clearly demonstrate that his name *C. aperta* covers the form with a flat subsutural zone. *C. ornatissima* Boettger, described from the Rumanian Miocene (Kostej), is based on a typical juvenile specimen of *T. apertum*, thus both names are synonyms. The specimen illustrated by Kautsky has the size of an adult *T. lindeni*, but its coarse sculpture and relatively narrow umbilicus point to *apertum*. The shape of the subsutural zone on the earliest whorls is invisible in his illustration.

Dimensions — The height of the largest specimen in the Miste material is 21 mm.

Trigonostoma (Trigonostoma) barnardi sp. nov.
Pl. 3, figs. 9-14; Pl. 6, fig. 3.

1872 *Cancellaria spinifera* Grat. — von Koenen, p. 165 (partim, non Grateloup).
1964 *Trigonostoma aperta* (Beyrich 1856) — Anderson, p. 272 (partim).
1964 *Trigonostoma calais* Kautsky 1925. — Anderson, p. 272, pl. 29, fig. 213 (non Kautsky).
1972 *Trigonostoma umbilicaris pluricosta* Kautzky. — Nordsieck, p. 86, pl. 21, fig. 128 (non Kautsky).

Locus typicus — Winterswijk-Miste (The Netherlands, province of Gelderland), temporary outcrop, about 2.00-3.75 m below surface.

Stratum typicum — Miocene, Aalten Member, Miste Bed, *Hiatella arctica* Assemblage Zone (or, less probably, basal part of *Astarte radiata* Assemblage Zone).

Derivatio nominis — The species is named in honour of Mr C.P. Barnard, assistant at the RGM department of Cenozoic molluscs.

Material — Holotype RGM 225 148 (Pl. 3, fig. 11); paratypes: 409 specimens, RGM 225 149-225 157.

Description — Shell solid, triangular-conical, about 1 1/2 times as high as wide or somewhat less, rather variable height/width-ratios. The protoconch has 2 3/4 smooth and convex whorls, its axis is slightly oblique with respect to the teleoconch axis. The boundary with the post-embryonic whorls is sharp, but very often it can only be observed by a difference in colour of the shell material and by the start of the spiral sculpture.The largest specimens have up to 4 3/4 teleoconch whorls that are rather convex. They increase regularly and rather quickly in diameter. The whorls are attached to each other at a point far below the middle of the foregoing whorl. The body whorl occupies somewhat less than 3/4 of the entire shell height. At the upper part of the whorls lies a rather wide concave subsutural zone, abaxially delimitated by a carina. The shell has a wide and deep umbilicus, surrounded by an inflated margin. The apertura is triangular. The columella has two rather solid spiral folds, close to the apertura a weak third fold may be present, bordering the siphonal canal. The inner side of the apertural margin is slightly thickened and bears 8 to 12 regularly spaced elongated denticles on its vertical part, some 2 to 3 close-set and rather indistinct denticles may be present on the inner side of the subsutural zone. The siphonal canal is only weakly developed and hardly or not indented.

Ornamentation starts on the first teleoconch whorl with 5 or 6 spirals, that are not very sharply defined. They have about the same width as their interspaces. The upper spiral develops into the carina separating the subsutural zone from the convex shell part. Secondary generations of spirals develop soon and up to four generations of spirals may be present on adult shells. The various generations of spirals are usually clearly recognizable as such. The strength of the spirals in adult shells is somewhat variable, but hardly ever these spirals reach a cord-like appearance. The base of the body whorl and the umbilical wall have a similar spiral sculpture. Initially the concave subsutural zone is smooth, but on the younger whorls secondary spirals may develop on its surface. The radial sculpture starts with about 13 to 15 rather strong, slightly prosocline ribs per whorl. On the younger whorls these ribs generally increase in strength and decrease in number. Sometimes they are broad and very strong, in other shells they may disappear almost completely. At the points of intersection with the spirals lie small tubercles. At the places where the radial ribs reach the carina short and solid spines are present; frequently these spines overhang the subsutural zone. On the umbilical margin only knobs are formed.

Dimensions — The height of the shell reaches 28 mm.

Remarks — *T. barnardi* sp. nov. differs from *T. spiniferum* (Grateloup, 1832), a species from the Miocene of SW France, by being relatively less high with more convex whorls and by the possession of a narrower and more excavated subsutural zone, a considerably narrower umbilicus and a denser spiral sculpture. *T. umbilicare* (Brocchi, 1814), a Mediterranean species also known from some Miocene and Pliocene deposits in the North Sea Basin, has higher and less convex whorls, a different sculpture and only two spiral folds on its columella, also in completely adult specimens. This latter species is absent from the Miste fauna.

Trigonostoma (Trigonostoma) extractrix (Boettger, 1906)
Pl. 2, fig. 16; Pl. 6, fig. 4.

1906 *Discohelix (Pseudomalaxis) extractrix* n. sp., Boettger, p. 138.

1915 *Pseudomalaxis extractrix* Boettger — Cossmann, p. 143, pl. 12, figs. 25-26 (= holotype).
1934 *Pseudomalaxis extractrix* (Boettger) — Zilch, p. 219, pl. 7, fig. 23.
1964 *Trigonostoma protrigonostoma* Sacco 1894. — Anderson, p. 271, pl. 29, fig. 211 (non Sacco).
1972 *Trigonostoma protrigonostoma* Sacco, 1894. — Nordsieck, p. 85, pl. 21, fig. 126 (non Sacco).

Material — Thirty-five specimens, RGM 225 143-225 147.

Description — Very characteristic, fragile shell with completely disconnected teleoconch whorls together forming a high spiral; the entire shell is about 1 1/2 times as high as wide. The protoconch has 2 3/4 smooth and convex whorls in the form of a small *Natica* shell. The boundary between protoconch and teleoconch is sharp. Adult specimens may have three teleoconch whorls that do not touch each other, resulting in a completely open suture. These whorls are triangular in section, with a flat to slightly concave adapical part. Abaxially this part is delimited by a rather sharp carina bearing widely spaced, low spines. On the columellar side this upper flat part of the whorls gradually changes into the umbilical shell-wall. The outer shell-wall below the carina is only very slightly convex. The transition into the umbilicus consists of an obvious carina that bears spines just like the upper carina. The body whorl occupies 2/3 of the entire shell height. The apertura is triangular. The columella has two weak spiral folds.

The shell sculpture is very weakly developed. Obscure and widely separated spirals are visible on the younger whorls, but the shell surface of the upper horizontal part and the umbilicus lacks spiral sculpture. Very vague radial sculpture, corresponding to the spines on both upper and lower carinae, is sometimes present. Usually, however, these are no more than slightly lamellose prosocline growth-lines.

Dimensions — The height of the shell reaches c. 17 mm.

Remarks — *T. extractrix* is closely related to *T. protrigonostoma* Sacco, 1894, but this latter species has the whorls, but for a part of the body whorl, connected to each other and a sculpture of solid radial ribs and much more obvious spirals.

These species (and others, e.g. *boettgeri* Cossmann, 1915 and *dingdensis* Anderson, 1964) do not belong in *Pseudomalaxis*, but are typical cancellariids because of their dextral instead of sinistral embryonic whorls and the presence of columellar folds. A similar remark of the present author concerning *dingdensis* Anderson (A.W. Janssen, 1967, p. 132) apparently lead Nordsieck (1972, p. 51) to his statement that the genus *Pseudomalaxis* is reckoned to the 'Cancellarioiden'!

Trigonostoma (Trigonostoma) lindeni sp. nov.
Pl. 4, figs. 1-4; Pl. 6, fig. 6.

1872 *Cancellaria aperta* Beyr. — von Koenen, p. 167 (partim, non Beyrich).
? 1952 *Cancellaria (Ventrilia) behmi* Beyrich, 1856. — Glibert, p. 127, pl. 8, fig. 19 (partim, non Beyrich, non fig. 15 = *T. pouwi* sp. nov.).
1952 *Cancellaria (Trigonostoma) aperta* Beyrich, 1856. — Glibert, p. 124, pl. 9, figs. 12a-b (partim, non Beyrich; non fig. 12c = *T. apertum*).
1964 *Trigonostoma aperta* (Beyrich 1856). — Anderson, p. 272 (partim, non Beyrich).
1972 *Trigonostoma aperta* (Beyrich, 1856). — Nordsieck, p. 86, pl. 21, fig. 127 (non Beyrich).

Locus typicus — Winterswijk-Miste (The Netherlands, province of Gelderland), temporary outcrop, about 2.00-3.75 m below surface.

Stratum typicum — Miocene, Aalten Member, Miste Bed, *Hiatella arctica* Assemblage Zone or (less probably) basal part of *Astarte radiata* Assemblage Zone.

Derivatio nominis — The species is named in honour of Mr J. van der Linden, technical co-operator of the RGM museum, for his repeated and inspired technical assistance to the RGM department of Cenozoic molluscs.

Material — Holotype RGM 225 165 (Pl. 4, fig. 4); paratypes: 25 specimens and 17 fragments, RGM 225 166-225 172.

Description — Shell moderately solid, conical to depressed conical, somewhat less high than wide, to distinctly wider than high. Juvenile specimens are comparatively higher than adult ones. The protoconch has 3 1/4 convex whorls and a small nucleus. Its axis is hardly or not oblique, compared to the axis of the teleoconch. The transition to the post-embryonic whorls is sharp.On the last 1/4 whorl of the protoconch the spiral sculpture is already visible. In adult shells the teleoconch has about 4 1/2 rather convex whorls that are fused to each other over a short distance only. There is a wide and excavated subsutural depression, separated from the lower part of the whorls by a distinct carina. The body whorl occupies about 3/4 to 4/5 of the entire shell height. The apertura is triangular. The columellar part is thin-shelled and frequently broken out. There are two columellar folds of which the lowermost one is much weaker. In a few specimens a third, very weak spiral fold is present adapically from the two main folds. The siphonal canal is hardly indicated and in fact no more than the mouth of the umbilical carina. The inner side of the apertural lip is slightly thickened. Its vertical part has about 12 to 15 regularly spaced elongated denticles. On the inner side of the subsutural zone some 1-3 denticles may be present. The callus is only connected with the preceding whorl over a short distance. The base of the shell has a wide and funnel-shaped umbilicus, in which all foregoing whorls are visible. The transition of the base of the shell to the umbilicus has the form of a distinct carina.

The sculpture starts on the initial whorl with 5 or 6 primary spirals. They are thread-like and about half as wide as their interspaces. The uppermost spiral develops into the carina of the subsutural zone. On the second whorl a generation of secondary spirals starts to develop in the interspaces, on the fourth or fifth whorl another series of secondary spirals is present. Finally the shell is covered with close-set thread-like spirals, separated by only very narrow interspaces. The radial sculpture consists of about 20 rather weak and somewhat prosocline riblets per whorl. On the ultimate whorl these riblets may somewhat increase in strength (a few shells only); if so, their number will be lower than usual. Usually the radial sculpture is no more than a not very strong undulation of the shell-wall. At the points of intersection of radial and spiral sculptural elements small and somewhat lamellose tubercles are formed, giving the shell a rugged surface. Within the umbilicus these points of intersection usually bear small lamellose spines. The subsutural carina has very short spines, formed by the radial sculpture. The umbilical carina has only weak knobs.

Dimensions — The height of the largest specimen is 28 mm; some fragments indicate that this species may reach a height of at least 35 mm.

Remarks — Up to now this species has not been distinguished from *T. apertum*. The differences, however, are distinct and constant (see 'Remarks' in the description of *T.*

apertum), so there is no doubt about the specific independency of both. *T. barnardi* is smaller and relatively higher, and has an entirely different sculpture of widely spaced and less pronounced spiral threads and much heavier radial ribs. In *barnardi* the subsutural carina bears solid spines; these are less conspicuous and more numerous in *lindeni*. The umbilicus of *T. barnardi* is considerably narrower.

Subgenus *Ventrilia* Jousseaume, 1887

Trigonostoma (Ventrilia) geslini josephinae subsp. nov.
Pl. 4, figs. 10-13; Pl. 6, fig. 5.

1958 *Cancellaria (Narona) calcarata* (Brocchi). — Sorgenfrei, p. 243, pl. 51, fig. 168a (partim, non Brocchi, non fig. 168b = *Sveltia calcarata*).
1975 *Trigonostoma* sp. — van den Bosch, Cadée & Janssen, pl. 12, fig. 6.

Locus typicus — Winterswijk-Miste (The Netherlands, province of Gelderland), temporary outcrop, about 2.00-3.75 m below surface.

Stratum typicum — Miocene, Aalten Member, Miste Bed, *Hiatella arctica* Assemblage Zone (or, less probably, basal part of *Astarte radiata* Assemblage Zone).

Derivatio nominis — This subspecies is named in honour of the former assistant of the RGM molluscs department, Mrs J.M. Petermann- Huigsloot.

Material — Holotype RGM 225 176 (Pl. 4, fig. 11); paratypes: 14 specimens and 33 fragments, RGM 184 772, 225 173-225 175, 225 177- 225 180.

Description — Shell not very solid, usually more than 1 1/2 times as high as wide, scalaroid-conical in form with trilateral whorls. The protoconch is slightly oblique and has 2 1/2 convex whorls that quickly increase in diameter, together forming a small *Natica* like shell. The boundary with the teleoconch is sharp. Adult specimens may reach 4 1/2 teleoconch whorls. The upper part of the whorls is flat and horizontal. Abaxially this zone is delimited by a carina. Below this carina the whorls are slightly convex. The body whorl occupies 3/4 of the entire shell height, its base is triangular and has a narrow pseudumbilicus surrounded by a carina. Juvenile specimens lack this pseudumbilicus. The apertura is triangular. The columella has two rather heavy spiral folds; close to the apertura a third, very weak fold may be present below these. The inner side of the apertural lip has 10 to 15 narrow elongated denticles in adult specimens. The siphonal canal is hardly indicated, no more than a narrow gutter at the base of the apertura.

The sculpture starts with two spirals on the earliest teleoconch whorl. The upper one of these develops quickly to the subsutural carina. On the younger whorls gradually more spirals become visible, as the point of attachment between the whorls shifts downwards. The body whorl has, apart from the subsutural carina, four strong spirals, of which the basal one is the umbilical carina. In entirely full-grown specimens the body whorl is attached to the umbilical carina of the preceding whorl, sometimes in such a way that the whorls are almost disconnected, with small interstices in the suture. Radial sculpture consists of somewhat prosocline lamellose riblets, of which there are 10 to 14 on the body whorl. At the points of intersection with the spiral sculpture distinct spines are present. The spines on the subsutural carina are the strongest. Fine secondary spirals may be present, mainly between the subsutural carina and the second primary spiral. The inner wall of the umbilicus has a regular spiral sculpture.

Dimensions — The height of the shell reaches 30 mm.

Remarks — The material described here differs only slightly from the nominal species, *T. geslini geslini* (de Basterot, 1825) (see Peyrot, 1928, p. 238, pl. 13, figs. 29-30, 30a), the main difference being the much more accentuated sculpture of the Miste specimens, resulting in distinct and sometimes quite elongated spines at the points of intersection of spiral and radial sculpture elements. Two specimens from Léognan (SW France) in the RGM collection have some more spiral threads, because of the fact that a secondary spiral sculpture is better developed. These differences, though apparently constant, are not considered to be of specific value and therefore the North Sea Basin population is given the rank of a geographical subspecies. Except for Winterswijk-Miste this form is only known from Denmark (Arnum Formation, Sorgenfrei, 1958).

Trigonostoma (Ventrilia) pouwi sp. nov.
Pl. 4, figs. 5-9; Pl. 6, fig. 7.

1950 *Trigonostoma (Ventrilia)* spec. — Beets, p. 32, pl. 1, figs. 15-17.
1952 *Cancellaria (Ventrilia) behmi* Beyrich, 1856. — Glibert, p. 127, pl. 9, fig. 15a-b (non Beyrich) (non pl. 8, fig. 19a-b ?).
1972 *Trigonostoma (Ventrilia) behmi* (Beyrich, 1856). — Nordsieck, p. 86, pl. 21, fig. 129 (non Beyrich).
1975 *Trigonostoma behmi* (Beyrich, 1856). — van den Bosch, Cadée & Janssen, pl. 14, fig. 12 (non Beyrich).

non 1856 *Cancellaria Behmi* Beyr., Beyrich, p. 334, pl. 28, fig. 6a-b.
non 1960a *Trigonostoma (Ovilia) behmi* Beyrich, sp. 1856. — Glibert, p. 70.

Locus typicus — Winterswijk-Miste (The Netherlands, province of Gelderland), temporary outcrop, about 2.00-3.75 m below surface.

Stratum typicum — Miocene, Aalten Member, Miste Bed, *Hiatella arctica* Assemblage Zone or (less probably) basal part of *Astarte radiata* Assemblage Zone.

Derivatio nominis — The species is named in honour of Mr W. Pouw, assistant of the RGM department of Cenozoic molluscs, who has been working for a long time on the Miste fauna, sorting out enormous quantities of sieving residues.

Material — Holotype RGM 225 181 (Pl. 4, fig. 8); paratypes: 3403 specimens, RGM 184 741, 225 182-225 193.

Description — Solid, conical shell with constricted base and strongly carinated whorls, about 1.3 to 1.5 times as high as wide. The protoconch is distinctly oblique and consists of 2 1/2 to 2 3/4 smooth and convex whorls in the form of a small *Natica* shell. The boundary with the teleoconch is sharp. There are up to 4 1/2 post-embryonic whorls, that increase slowly in diameter. A very distinct and deeply excavated zone is present just below the suture. Below this zone the whorls are slightly convex. The subsutural zone is confined by a prominent carina. The body whorl occupies 4/5 of the entire shell height. Its base is regularly convex and narrowed downwards. There is a relatively small but very deep pseudumbilicus, surrounded by an obvious, inflated ridge. The apertura is triangular and about half as high as the complete shell or only very slightly higher. The columella has two strong spiral folds and a third, much weaker one, below these. The callus has a subcircular extension on the base of the body whorl. There is a rather distinct siphonal canal that coincides with the end of the inflated ridge surrounding the pseudumbilicus.

The inner margin of the apertural lip is slightly thickened and provided with 10 to 14 long and sometimes deeply protruding denticles on its vertical part. These denticles may already be present in very juvenile specimens. The inner wall of the subsutural zone may have 0 to 4 less distinct denticles. The place where the subsutural carina touches the apertural margin is shaped as a shallow canal.

The sculpture starts with about 7 to 8 spiral threads that are at first distinctly wider than their interspaces. The upper one of these develops quickly into the subsutural carina. Secondary sets of spirals insert between the primary ones. The ultimate whorls are covered with a high number of inequal spiral threads, separated by interspaces that are usually narrower than the spiral threads themselves. On the inner umbilical wall the spiral sculpture is much weaker and widely spaced. The surface of the subsutural depression has usually no spiral sculpture at all, only very rarely a vague spiral striation may be present. The radial sculpture consists of about 20 slightly prosocline riblets per whorl.They are most obvious just above the suture of the earliest whorls and quickly decrease in strength on the later whorls. The body whorl of adult shells usually has only some ill-defined undulations or lacks radial sculpture completely. On the earlier whorls having radial sculpture the ornamentation is accentuated at the points of intersection of spiral and radial elements, with indistinct spines at the subsutural carina. The growth-lines are prosocline, just like the radial sculpture, or slightly more oblique. They show a lamellose development in the subsutural zone.

Dimensions — The height of the shell reaches 30 mm. Some fragments indicate still larger dimensions.

Remarks — It is quite curious that this species, so common in the Miste fauna, appears to be undescribed. Mainly on the authority of Glibert (1952) this species is incorporated in most collections sub nomine *T. behmi* (Beyrich). This *behmi*, however, is an entirely different species of early Rupelian age, which is comparatively wider, with a different sculpture and e.g. a strongly knobbed subsutural carina.

T. pouwi is more closely related to *T. acutangulum* (Faujas de St Fond, 1817), as it was interpreted by North Sea Basin workers (see for example Sorgenfrei, 1958, p. 241, pl. 51, fig. 166). This species, indicated here as *Trigonostoma (Ventrilia)* sp. nov.?, however, has a flat and not an excavated subsutural zone, the edge of which is not sharply carinated. Its base is more convex and quite suddenly constricted towards the umbilicus, which is narrower than in *pouwi*. In *T. pouwi* the radial sculpture disappears almost completely on the younger volutions.

The sculpture of *T. pouwi* resembles that of *T. barnardi,* but the spiral elements are comparatively less coarse and the radial riblets on the first whorls are weaker and more numerous. The radial sculpture in *T. barnardi* is much more oblique as well. A further difference is the presence of distinct spines on the subsutural carina in *T. barnardi.*

Trigonostoma (Ventrilia) sp. nov. ?
Pl. 4, fig. 14; Pl. 6, fig. 8.

1925 *Trigonostoma (Ventrilia) acutangula* Fauj. — Kautsky, p. 141, pl. 10, fig. 9 (non Faujas de St Fond).
1952 *Cancellaria (Ventrilia) acutangula* Faujas, 1817. — Glibert, p. 126, pl. 9, fig. 8 (non Faujas de St Fond).
1958 *Cancellaria (Trigonostoma) acutangula* Faujas-de-Saint-Fond. — Sorgenfrei, p. 241, pl. 51, fig. 166 (non Faujas de St Fond).

Material — One juvenile specimen only, RGM 225 194.

Remarks — Among the abundant specimens of *T. pouwi* one shell was found that, though resembling it closely at first view, differs from equal-sized specimens of that species by a flat and horizontal subsutural zone instead of a deeply excavated one. The carina is obscured by some spiral threads. The radial riblets are well developed on this subsutural zone, much more so than in *T. pouwi*. The protoconch, the ornamentation (except for the development of the subsutural carina) and the features of base and apertura are very similar to those of juvenile *T. pouwi*.

There can be hardly any doubt on the identity of this specimen from Miste with those described by Kautsky, Glibert and Sorgenfrei. *T. acutangulum* (Faujas de St Fond, 1817) from the Burdigalian of southwestern France, resembles this form by its flat and not excavated subsutural zone, but it is not identical because of the very high whorls and a much coarser radial sculpture. A juvenile specimen from Léognan is illustrated here on Pl. 6, fig. 9a-b (RGM 225 195, ex RGM 56 649). A further difference is that adult shells of *acutangulum* have their base produced downwards, much more so than the apparently adult specimen illustrated by Kautsky. Most probably the form from the North Sea Basin is undescribed. The material available to me is however insufficient for a final decision. Curiously enough Harmer (1918, p. 401, pl. 40, fig. 2) described a specimen of the true *acutangulum* from the East Anglian Red Crag. If this locality is correct the occurrence is quite puzzling!

Dimensions — The height of the only specimen from Miste is 10 mm.

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Note: More or less simultaneously Beyrich's paper was also published in the Z. deutsch. geol. Gesellsch., vols 5, 6 and 8 (resp. 1853, 1854 and 1856). The part containing the descriptions of the Cancellariidae was published in the periodical in 1856 and in the book issue in 1857. As only the latter one was available to me I quoted page numbers etc. from this issue, but with the date 1856.

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Plate 1

All specimens from Winterswijk, Miste, temporary exposure, about 2.00-3.75 m below surface; Miocene, Hemmoorian, Aalten Member, Miste Bed, *Hiatella arctica* Assemblage Zone or (less probably) lower part of *Astarte radiata* Assemblage Zone.

Figs. 1- 2. *Aneurystoma laurensi* (Grateloup, 1832)
1: × 2, RGM 225 209; 2: × 3, RGM 225 208.

Figs. 3- 4. *Aneurystoma canaliculatum* (A.W. Janssen, 1972)
3: × 3, RGM 225 203; 4: Holotype, × 2, RGM 116 767.

Figs. 5- 7. *Brocchinia mitraeformis parvula* (Beyrich, 1856)
5: × 3, RGM 225 225; 6: × 3, RGM 225 226; 7: × 2, RGM 225 224.

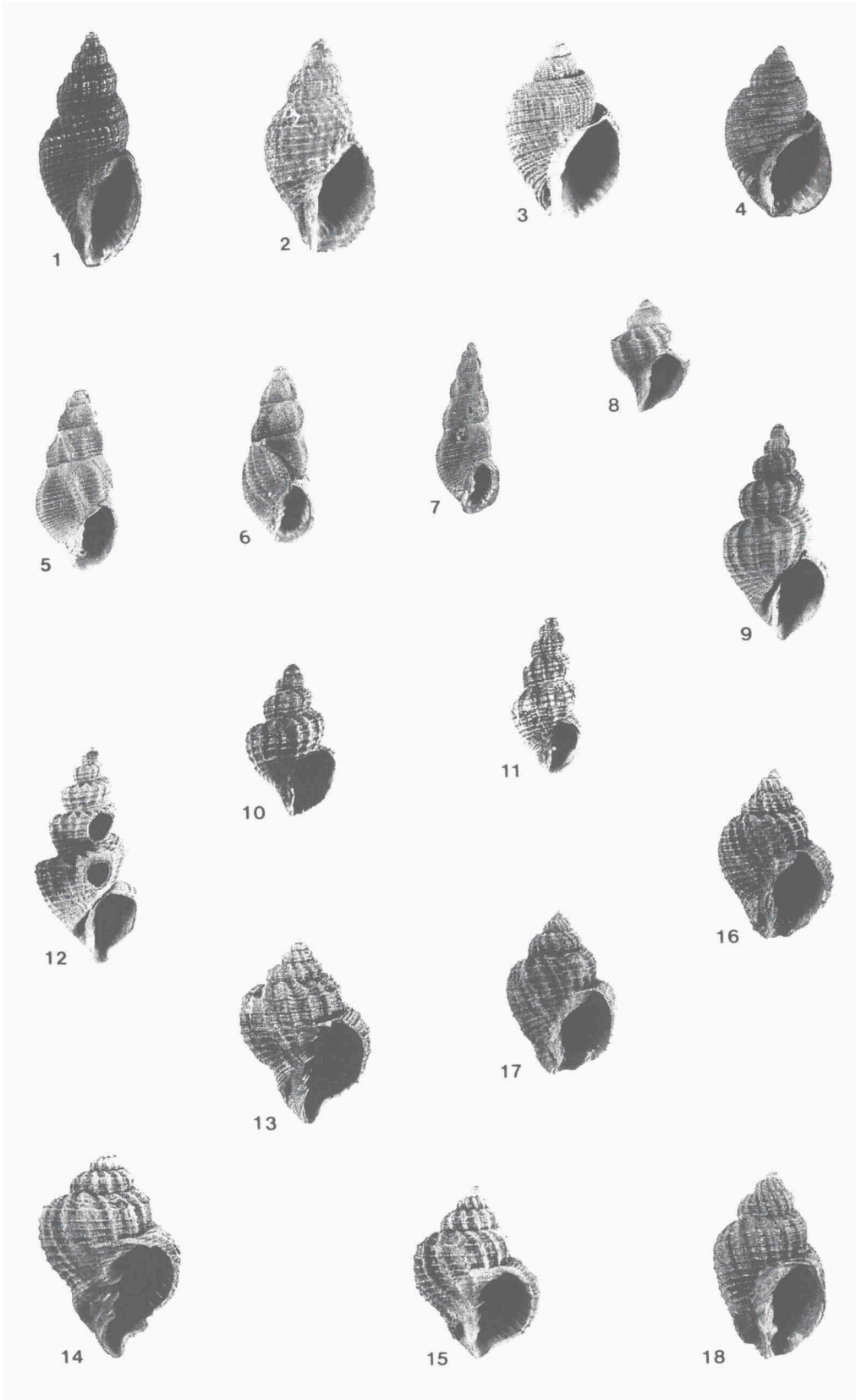
Fig. 8. *Sveltia lyrata* (Brocchi, 1814)
8: × 4, RGM 225 222.

Figs. 9-12. *Babylonella fusiformis* (Cantraine, 1835)
9: × 3 1/2, RGM 225 233; 10: Thick-set form, × 3, RGM 225 231; 11: Slender form, × 3 1/2, RGM 225 232; 12: Strongly carinated form, × 3, RGM 225 230.

Figs. 13-15. *Cancellaria (Bivetiella) cancellata praecedens* Beyrich, 1856
13: × 1 1/2, RGM 225 122; 14: × 1 1/2, RGM 225 121; 15: × 1 1/2, RGM 225 123.

Figs. 16-18. *Cancellaria (Merica) bellardii* Michelotti, 1847
16: × 1 1/2, RGM 116 757 (also depicted in Janssen, 1972, pl. 8, fig. 2); 17: × 1 1/2, RGM 225 127; 18: × 1 1/2, RGM 225 124.

Plate 1



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Manuscript received 13 January 1983.

Plate 2

All specimens, except figs. 14 and 15, from Winterswijk, Miste (see caption of Pl. 1). Figs. 14 and 15 from Antwerpen, Belgium, construction-pit for Kennedy Tunnel, right bank of Schelde river; Miocene, Hemmoorian, Edegem Sands.

Figs. 1- 7. *Cancellaria (Merica) contorta gelriana* A.W. Janssen, 1972
1: Holotype, × 1 1/2, RGM 116 754 (also depicted in A.W. Janssen, 1972, pl. 8, fig. 5); 2: × 1 1/2, RGM 225 132; 3: × 1 1/2, RGM 225 130; 4: × 2, RGM 225 136; 5: Specimen with coarse spiral sculpture, × 1 1/2, RGM 225 138; 6: Shell distorted as a result of balanid growth on penultimate whorl, × 2, RGM 225 135; 7: Shell slightly distorted because of balanid growth on the second teleoconch whorl, × 1 1/2, RGM 225 131.

Fig. 8. *Cancellaria (Merica) evulsa postera* Beyrich, 1856
× 1 1/2, specimen probably reworked from Chattian deposits, RGM 225 142.

Figs. 9-12. *Sveltia varicosa paucicostata* Peyrot, 1928;
9: × 1 1/2, RGM 225 213; 10: × 1 1/2, RGM 225 215; 11: × 1 1/2, RGM 225 216; 12: Shell with coarse spiral sculpture, × 1 1/2, RGM 225 214.

Fig. 13. *Sveltia varicosa paucicostata* Peyrot, 1928 f. parvicarinata (Kautsky)
× 2, RGM 225 221.

Figs. 14-15. *Sveltia gliberti* sp. nov., paratypes.
14: × 2, RGM 182 628a; 15: × 2, RGM 182 628b.

Fig. 16. *Trigonostoma (Trigonostoma) extractrix* (Boettger, 1906)
× 2, RGM 225 145.

Plate 2

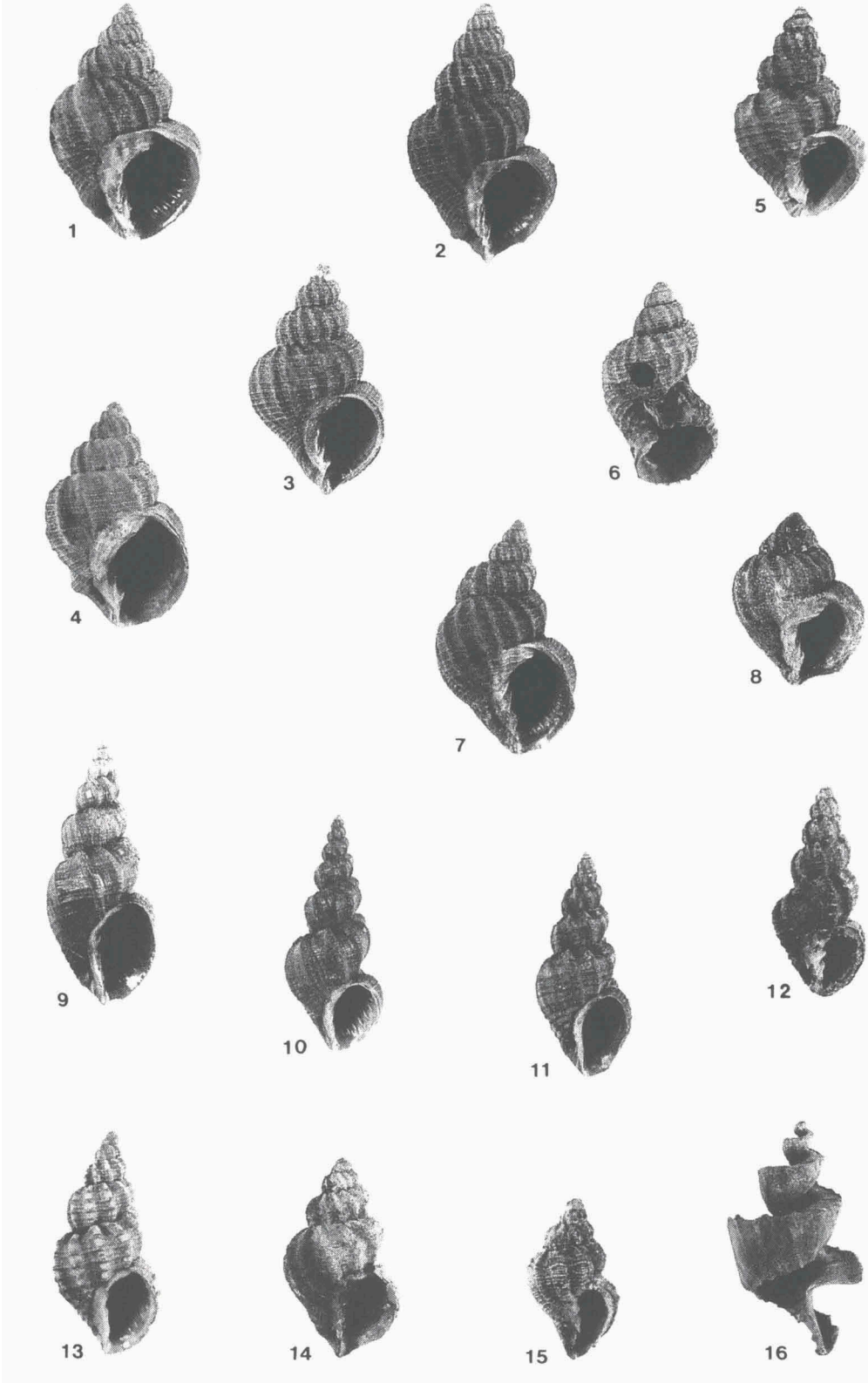

Plate 3

All specimens from Winterswijk, Miste (see caption of Pl. 1).

Figs. 1- 3. *Trigonostoma (Misteia) planispirum* (Nyst, 1845)
1: × 2, RGM 225 200; 2: × 2, RGM 225 199; 3: × 1 1/2, RGM 225 198.

Fig. 4. *Trigonostoma (Misteia) mistense* sp. nov.
Holotype, × 1 1/2, RGM 225 202.

Figs. 5- 8. *Trigonostoma (Trigonostoma) apertum* (Beyrich, 1856)
5: × 1 1/2, RGM 225 161; 6: × 1 1/2, RGM 184 741 (also depicted by van den Bosch, Cadée & Janssen, 1975, pl. 14, fig. 13, sub nomine *T. ornatissima* (Zilch, 1935)); 7: × 1 1/2, RGM 225 160; 8: × 1 1/2, RGM 225 162.

Figs. 9-14. *Trigonostoma (Trigonostoma) barnardi* sp. nov.
9: Paratype, × 1 1/2, RGM 225 155; 10: Paratype, × 1 1/2, RGM 225 152; 11: Holotype, × 1 1/2, RGM 225 148; 12: Paratype, × 1 1/2, RGM 225 154; 13: Paratype, × 1 1/2, RGM 225 151; 14: Paratype, × 1 1/2, RGM 225 153.

Plate 3

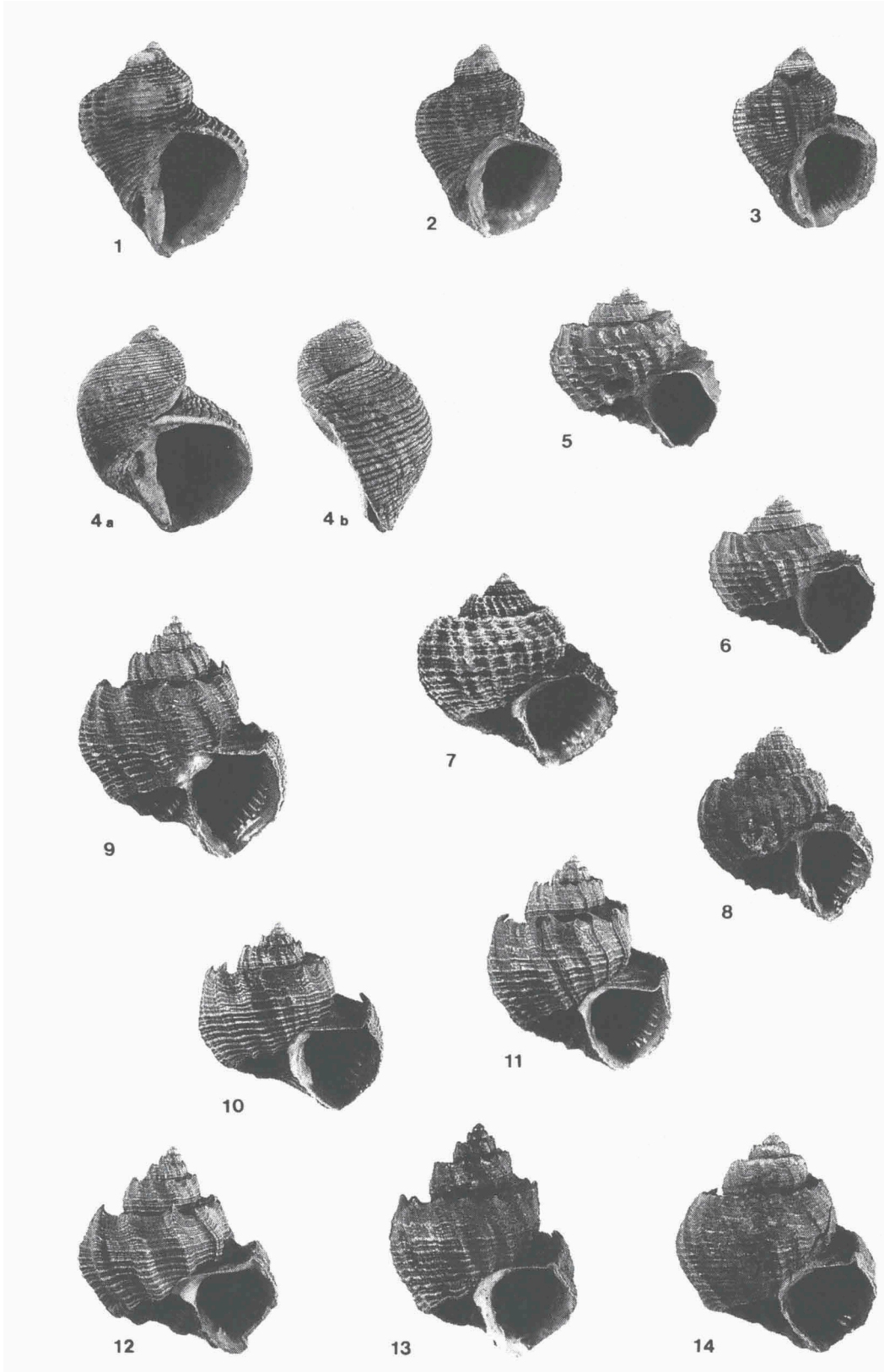

Plate 4

All specimens from Winterswijk, Miste (see caption of Pl. 1).

Figs. 1- 4. *Trigonostoma (Trigonostoma) lindeni* sp. nov.
1: Paratype, × 1 1/2, RGM 225 167; 2: Paratype, × 1 1/2, RGM 225 168; 3: Paratype, × 2, RGM 225 169; 4: Holotype, x 1 1/2, RGM 225 165.

Figs. 5- 9. *Trigonostoma (Trigonostoma) pouwi* sp. nov.
5: Paratype, × 1 1/2, RGM 225 189; 6: Paratype, × 1 1/2, RGM 225 187; 7: Paratype, × 1 1/2, RGM 225 188; 8: Holotype, × 1 1/2, RGM 225 181; 9: Paratype, × 1 1/2, RGM 225 190.

Figs. 10-13. *Trigonostoma (Ventrilia) geslini josephinae* subsp. nov.
10: Paratype, × 1 1/2, RGM 225 175; 11: Holotype, × 1 1/2, RGM 225 176; 12: Paratype, × 1 1/2, RGM 225 178; 13: Paratype × 1 1/2, RGM 225 177.

Fig. 14. *Trigonostoma (Ventrilia)* sp. nov. ?
× 2, RGM 225 194.

Plate 4

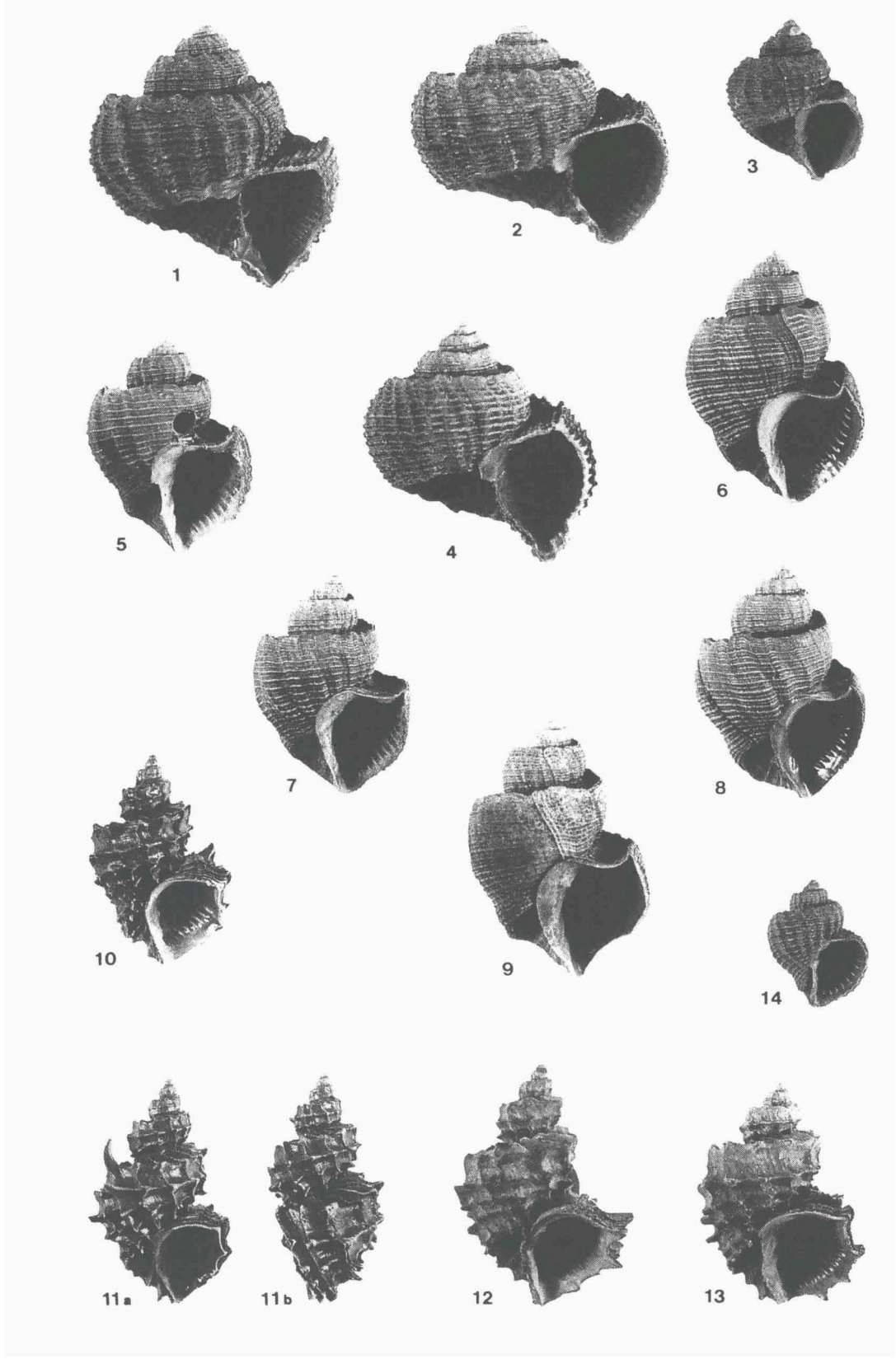

Plate 5

All specimens, except figs. 5 and 6, from Winterswijk, Miste (see caption of Pl. 1). Fig. 5 from Dingden (Nordrhein-Westfalen, F.R.G.), exposure near Konigsmühle, Bislicher Schichten, Miocene, Reinbekian. Fig. 6 from Antwerpen (see caption of Pl. 2, figs. 14 and 15).

Fig. 1. *Aneurystoma laurensi* (Grateloup, 1832)
Protoconch, × 10, RGM 225 207.

Fig. 2. *Aneurystoma canaliculatum* (A.W. Janssen, 1972)
Protoconch, × 10, RGM 225 204.

Fig. 3. *Brocchinia mitraeformis parvula* (Beyrich, 1856)
Protoconch, × 10, RGM 225 227.

Fig. 4. *Sveltia lyrata* (Brocchi, 1814)
Protoconch, × 10, RGM 225 222.

Fig. 5. *Cancellaria (Bivetiella) cancellata praecedens* Beyrich, 1856
Protoconch, × 10, RGM 225 234.

Fig. 6. *Sveltia gliberti* sp. nov.
Paratype, protoconch, × 10, RGM 182 993a.

Fig. 7. *Cancellaria (Merica) contorta gelriana* A.W. Janssen, 1972
Protoconch, × 10, RGM 225 133.

Fig. 8. *Cancellaria (Merica) bellardii* Michelotti, 1847
Protoconch, × 10, RGM 225 128.

Fig. 9. *Sveltia varicosa paucicostata* Peyrot, 1928
Protoconch, × 10, RGM 225 217.

Plate 5

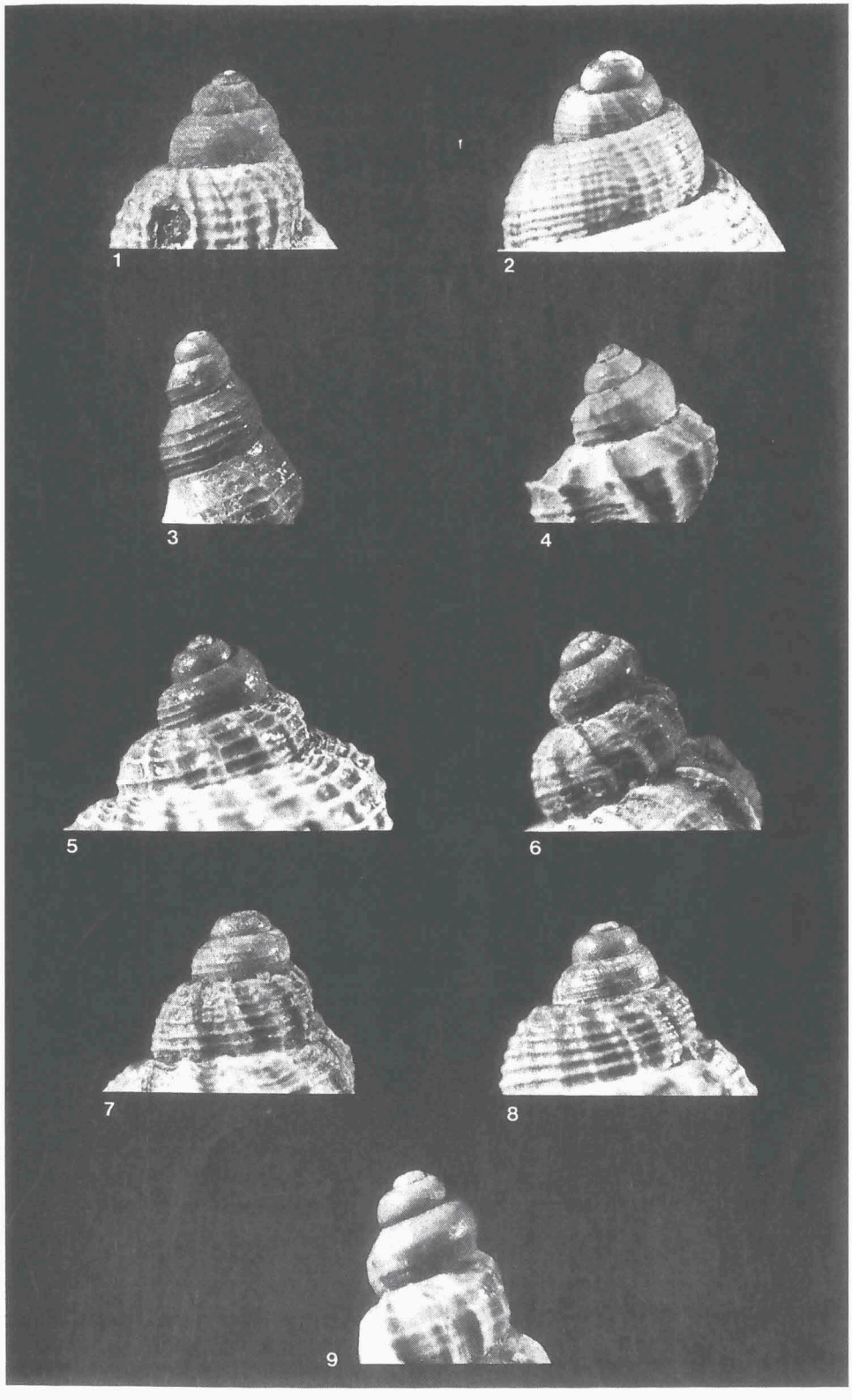

Plate 6

All specimens, except fig. 9, from Winterswijk, Miste (see caption of Pl. 1). Fig. 9 from Léognan, France, Faluns de Léognan, Miocene, Burdigalian.

Fig. 1. *Trigonostoma (Misteia) planispirum* (Nyst, 1845)
Protoconch, × 10, RGM 225 197.

Fig. 2. *Trigonostoma (Trigonostoma) apertum* (Beyrich, 1856)
Protoconch, × 10, RGM 225 159.

Fig. 3. *Trigonostoma (Trigonostoma) barnardi* sp. nov.
Paratype, protoconch, × 10, RGM 225 150.

Fig. 4. *Trigonostoma (Trigonostoma) extractrix* (Boettger, 1906)
Protoconch, × 10, RGM 225 146.

Fig. 5. *Trigonostoma (Ventrilia) geslini josephinae* subsp. nov.
Paratype, protoconch, × 10, RGM 225 174.

Fig. 6. *Trigonostoma (Trigonostoma) lindeni* sp. nov.
Paratype, protoconch, × 10, RGM 225 170.

Fig. 7. *Trigonostoma (Ventrilia) pouwi* sp. nov.
Paratype, protoconch, × 10, RGM 225 186.

Fig. 8. *Trigonostoma (Ventrilia)* sp. nov. ?
Protoconch, × 10, RGM 225 194.

Fig. 9. *Trigonostoma (Ventrilia) acutangulum* (Faujas de St Fond, 1817)
a: × 2; b: × 10, RGM 225 195.

Plate 6