

SBORNÍK NÁRODNÍHO MUZEA V PRAZE

ACTA MUSEI NATIONALIS PRAGAE

XXXIX B (1984), No. 4

REDAKTOR: JIŘÍ ČEJKA

VÁCLAV ZIEGLER

Polabské muzeum Poděbrady

FAMILY PLEUROTOMARIIDAE SWAINSON, 1840 (GASTROPODA, ARCHAEOGASTROPODA) FROM THE BOHEMIAN CRETACEOUS BASIN

INTRODUCTION

This paper deals with the family *Pleurotomariidae* SWAINSON, 1840 from sediments of the Bohemian Cretaceous Basin. This family has not yet been studied in Czechoslovakia in greater detail. In addition to faunistic lists occasionally scattered in various papers, studies on pleurotomariids from the Cretaceous of Bohemia were carried out only by A. FRIČ (1869—1977) and V. WEINZETL (1910).

PREVIOUS STUDIES

A large number of species of the family *Pleurotomariidae* SWAINSON, 1840 was figured in papers by J. SOWERBY (1812—1845), B. B. SOWERBY (1820—1834) and F. MANTELL (1822). These species were assigned to the genus *Trochus* and differentiated in 1826 by J. L. M. DEFRANCE. His new genus *Pleurotomaria* is based on the same principal features (especially the shape of shell and sculpture) as are used for its present definition. Another significant turning point in studies of pleurotomariids is the year 1840, when W. SWAINSON based his definition of the new family *Pleurotomariidae* on the genus *Pleurotomaria* DEFRANCE. This was of decisive importance in giving a certain trend to further studies.

In the meantime, new pleurotomariids were described by some authors, among which the most important were G. A. GOLDFUSS and G. z. MÜNSTER (1826—1844) and H. B. GEINITZ (1839—1842). In the forties H. B. GEINITZ (1843, 1845—46, 1850) published additional three papers describing 7 new species of the family *Pleurotomariidae* SWAINSON. As far

as studies of the family are concerned, utmost importance must be attached to papers by A. d'ORBIGNY (1842, 1847, 1850—1852). He described and figured 45 species of the family *Pleurotomariidae* from the Cretaceous. His papers then became a basis for conducting studies over pleurotomariids in general. At that time, the first species of pleurotomariids from Bohemia were described by A. E. REUSS (1845).

With newly described species and abundant material available, some different features began to appear between certain groups of fossil and recent pleurotomariids. This refers especially to the outer shape of shell, particularly the shape of aperture or cross section of the last whorl near aperture. E. EUDES-DESLONGCHAMPS (1863—1869) was first scientist to draw attention to the differences in the shells of the family members and to describe a new genus *Leptomaria* (1865). Practically until quite recently, this genus has been regarded as a subgenus of the genus *Pleurotomaria*. P. FISHER is the second investigator to pay attention to the pleurotomariid features mentioned above, extending them by sculpture surface. In 1885 he excluded from the genus *Pleurotomaria* three additional new genera of the family, i. e. *Pyrgotrochus*, *Petrotrochus*, *Entemnotrochus*, and in collaboration with E. BAYLE erected a genus *Chelotia*. In 1891 E. KITTL established the genus *Stuorella*.

The two papers written by A. FRIČ (1869—1911) and V. WEINZETTL (1910) are fundamental importance for a study of pleurotomariid gastropods from the Bohemian Cretaceous Basin. Ten pleurotomariid species are figured, described and located in A. FRIČ's Studies on the Cretaceous of Bohemia. V. WEINZETTL (1910), in his comprehensive work on gastropods from the Cretaceous of Bohemia, described, among others, six pleurotomariid species, out of which one new. Nearly all other papers of the authors dealing with the Bohemian Cretaceous Basin mention pleurotomariid species only in faunistic lists or reports on discovery. V. ZIEGLER (1972) is the only scientist to describe one leptomariid species from the Middle Turonian of the Bohemian Paradise.

In the U.S.A., fossil pleurotomariids were studied especially by J. A. GARDNER (1916) and B. WADE (1916, 1917, 1918), who described, in addition to two cosmopolitan species, several specimens occurring in Cretaceous sediments of North America. In 1927, on the basis of recent material and zoological studies, W. A. LINDHOLM erected the genus *Mikadotrochus* which resembles the fossil genus *Leptomaria* in some characters, particularly the shape shell.

W. WENZ's paper (1938) is of fundamental importance for a modern study of Cretaceous pleurotomariid genera. Wenz also emphasizes the important structural elements of the shell, especially the shape of shell and aperture. Although some genera are thought by him to be subgenera (*Pyrgotrochus*, *Entemnotrochus*, *Mikadotrochus*) of the genus *Pleurotomaria*, definitions of the individual genera can by no means be regarded as less reliable. The system of work done by W. WENZ was followed by V. F. PSHELINTSEV and I. A. KOROBKOV (1960). The same year were published the Treatise on Invertebrate Paleontology [L. R. COX]. COX uses his studies made in 1925, 1956 and 1959 to describe new pleuromariid genera, specifically *Bathrotomaria*, *Conotomaria* and *Obornella*. In

addition, he specifies the distinction between the single genera using the shape of aperture, and points to another important generic character of pleurotomariids, the location of selenizone. This served as a basis for publishing modern paleontological papers on the family *Pleurotomariidae* SWAINSON, with special regard to N. SOHL's paper (1960) dealing with pleurotomariid gastropods of North America.

MATERIAL AND STATE OF PRESERVATION

The material comprising 251 specimens with two or more whorls of the suitable for measurement of the pleural angle has been gathered to study Upper Cretaceous gastropods of the family *Pleurotomariidae* SWAINSON. In addition, 316 fragments of various parts of shell were used. The material under consideration is from my own collection gathered by myself and from the collections of the National Museum of Prague, Geological Survey of Prague and some small museums and private collections.

As already stated above, the material also includes 316 small fragments stored in the collections just mentioned. This material are especially internal moulds totalling 206; the remainder are internal moulds with fragments of shells (31 pieces) and impressions of 79 pieces — early collections from small museums.

The shells of the family occur in all sediments of the marine development of the Bohemian Cretaceous, but their largest numbers are confined especially to a subtidal deposits throughout its development, in addition to the sediments of Lower and Middle Turonian age. They are less abundant in other zones within the Bohemian Cretaceous, except Santonian deposits.

The shells are best preserved in sediments of the Kolín area of the Bohemian Cretaceous. It is this area which yielded most preserved shells, although their original material was completely recrystallized to the mineral calcite. Both internal moulds and fragments of shells and such moulds are frequent here. However, if related to other animals, gastropods of the family *Pleurotomariidae* are only small part of the total faunal amount. A second area containing abundant fragments of the family is the Vltava - Beroun area, especially near Prague. It consist of Lower Turonian sandy and marly deposits containing solely internal moulds, but the surrounding sediments are fine enough to retain very exactly morphological structures and sculpture of the outer surface of shells. A third area in which the family members are found in relatively high numbers is the one composed of the Middle Turonian calcareous-sandy to sandy-calcareous sediments in the vicinity of Mladá Boleslav, Turnov and Jičín, in addition to equivalent sediments found in the surroundings of Ústí nad Orlicí and Česká Třebová. Here, the shells have been found preserved as internal moulds too and subordinately as those with large fragments of shells. Spatial preservation of shells or internal moulds is relatively well in all the areas mentioned above, and some shells are completely uncorrupted.

As already stated above, shells of the family occur in the other sedi-

ments to a substantially lower degree and their state of preservation evidently becomes poorer. The family members are very rare in conglomeratic and coarse sediments. In most cases internal moulds are poorly preserved, as are also their fragments and fragmentary shells interstitial matrix, so that taxonomic identification is very difficult. A somewhat better state of preservation of internal moulds is shown by block sandstone of "rocky towns", but their occurrence is very rare here. These sediments have as yet yielded only 3 internal moulds. Internal moulds from Upper Turonian marly rocks shows a comparatively good state of preservation, but they occur very rarely. Only internal moulds have been discovered here; what we are concerned here with are internal moulds sometimes contorted by pressure and other diagenetic processes.

At some places (Březno near Louny, Čížkovice, Srní near Pardubice) pyritized fauna has been found to contain also shells of the family. Morphological structures of the shell are particularly well preserved, but sculpture of the shell surface is partly obliterated. Another disadvantage of pyritized shells is that they are rather difficult to prepare for further study, especially by some modern techniques as pyrite has been chemically destroyed.

Internal moulds can be found especially in deeper portions of sedimentation areas within the Bohemian Cretaceous; the original material consisting of calcium carbonate is chemically corroded and locally completely extracted. The disturbance of shell material is not of primary origin, but is caused by the migration of elements in a rock during fossilization processes. Glauconitic sandstones are also known to contain numerous internal moulds and those with all surface sculptures obliterated; occasionally even the main shell structures are not discernible.

Traces left by mechanical abrasion and associated effects are visible on some shells showing complete preservation. Traces left by stone attack, rounding, breakage of shell into pieces and depression and depression can be observed.

Generally speaking, the fragments preserved are relatively suitable for examination of the family *Pleurotomariidae* SWAINSON from the Bohemian Cretaceous Basin.

Morphology of shell and deterministic features

Shells of the family *Pleurotomariidae* SWAINSON are mostly right-handed. In all the species described growth lines have been found on their body whorl and S-shaped on ventral side. The distance between the growth lines is irregular, varying between 3 and 3,6 mm for the single individuals.

Dimension of shells: The principal dimensions of shells are length, height and magnitude of pleural angle. It can be generally stated that pleurotomariid shells are of medium size.

The length of shells ranges from 5 to 100 mm, averaging about 50 mm. Although varying approximately between 6 and 100 mm, the heights of the shells are likewise on the average 50 mm.

The most important dimension of the shell is pleural angle that is invariable for each separate species. On the contrary if taken within the framework of a genus, it is highly variable. For instance, in the species

Pleurotomaria friči WEINZETTL it makes $150^{\circ} 31'$ but in the *Pleurotomaria geinitzi* d'ORBIGNY it is as low as $53^{\circ} 54'$. Besides, this value can well be discerned by means of the function sinus. Assuming that the pleural angle is the one included by opposite tangent lines of the two last whorl, it is quite sufficient for both tangent lines to determine the two following basic data: the distance and height difference between the tangent line contact on the whorls. From these values it is possible in an ordinary mathematical manner to calculate sinus; the magnitudes of both angle can be found in tables; both angles are them summed up and their sum subtracted from 180; and the difference thus obtained is the magnitude of the pleural angle.

Structure of shell: In recent members of the family *Pleurotomariidae* SWAINSON the shell consists of organic material cemented by calcium carbonate and mostly found in an aragonitic modification. The mineral calcite occurs only in the outer pseudoprismatic layer of recent shells.

Three principal layers composing a gastropod shell have been recognized in that family from the Bohemian Cretaceous Basin. These are: outer pseudoprismatic layer, middle prismatic layer and inner lamellar layer. Organic periostracum has not been found on any preserved shell of the family. Not has the aragonitic modification of calcium carbonate been found preserved in the shells composed only of calcite.

The following elements have been identified by analysing chemically ten samples from various localities: Ca, Mg, Si, Al, Mn, Fe, Ti and B. These single elements represent calcium in carbonates, or form extraneous admixtures in the shells, or were introduced into the shells secondarily by diagenetic processes.

It is interesting to note that, during our analyses, no important elements commonly reported from analyses of recent material have been discovered, i. e. copper, nickel and lead. As the metals are generally bivalent, it is probable that these elements were replaced during diagenesis by chemically more active, multivalent elements — iron and manganese.

Total shape of shell: Shells of all the family members are developed in spatial spiral (heliciform shell).

The individual genera are marked by a generally characteristic shape of shell, except the genus *Pleurotomaria* DEFRANCE bearing a moderately high, turbiniform, distinctly step-like shell in which the main differences lie, apart from pleural angle, especially in its length and height. However, rather remarkable changes have been noted in two species found in the Bohemian Cretaceous Basin. These are called *antiqua* and *friči*, the former having a shell shaped like a very low, small cone and the latter possessing an elliptical shell base and a low, step-like shell. The turbiniform type characteristically occurs in the genera *Batrothomaria* COX and *Leptomaria* E. EUDES—DESLONGCHAMPS, although it is conspicuously step-like in the former but somewhat obliterated by rounded whorls of the spira and last whorl in the latter. A characteristic feature of the genus *Conotomaria* COX is the low, symmetrical, conical shell on which whorls grade one into the other without forming distinct steps. An indistinct step-like form can also be observed in the genus *Pyrgotrochus*

P. FISCHER, but, in contrast to the preceding genus, it has a highly conical to tower-like shell. Its whorls are clearly separated from each other by a lower mound of tubercles.

With the exception of the species *P. antiqua* (3) and *P. fričii* (2), the number of whorls ranges from 4 to 8, but 6 are the most frequent.

Three development stages can be differentiated on the shell of the family members. Except for two transitional species, the remainder can be found to have the first two whorls forming a neanic stage of the shell and the successive spiral whorls representing a completely developed ephebic part of the shell, followed by last whorl. No embryonic shell has been found, for unfavourable sedimentation processes did not permit its preservation.

The neanic stage considerably differs from the ephebic one especially in the development of sculpture. The neanic part of the shell bears sculpture not yet fully developed and comparatively simple as related to that seen in the other parts.

Sutures are distinct and accentuated by an erect mound in some species (e. g., *turbinoides*, *bohemicus* and *conulus*); and become still more prominent by the presence of tubercles in the species *bohemicus* and *conulus*.

Three types of umbilicus can be discerned on the shells. The species described in this paper contain a false umbilicus (6 times), an umbilical suture (6 times) and a relatively broad umbilicus (once only). A prominent columella formed at the contact of the inner whorl part is visible in the species *geinitzi*, *maillana* and *secans*.

The general shape of the aperture or cross section of the body whorl is a generic feature most typically occurring in the family. Although the principal shape varies in response to the species, the total outline remains essentially unchanged. Basic shapes of the aperture or the cross section of the body whorl are as follows (L. R. COX, 1960):

- 1) quadrangular
- 2) triangular with rounded apices
- 3) triangular with pointed apices
- 4) broadly ellipsoidal
- 5) ellipsoidal
- 6) narrowly ellipsoidal with sharp outer edge
- 7) ellipsoidal with the longer radius of ellipse running vertically
- 8) nearly circular
- 9) polygonal

There are no special features on the outer lip (external labium) of the family under study. The present author has found that, except the genus *Conotomaria* COX, a parietal callus is strongly developed on the inner lip (internal labium). Rather shallow columellar folds totalling 2 to 3 have been observed in the genus *Pleurotomaria* DEFRENCE.

A stable generic character is the localition of the selenizone, which is perceptible on nearly all pleurotomariids recorded from the Bohemian Cretaceous Basin. Its position is invariable within a genus and not considerably differ at species level. Selenizone is not usually broad either in recent or in fossil species; its width is, as a rule, 1—2 mm; and neither course nor shape are influenced by shell size.

Sculpture: Shells of the family here described mostly bear a certain and variously developed sculpture on both the dorsal and ventral sides of the whorls. This sculpture is clearly seen in the ephebic spiral part and on the last whorl, but is imperfectly developed in the neanic part of the spire.

Sculptures are divided into spiral and axial. These two types, if present, are usually located regularly, especially on the dorsal side of a whorl. The sculptures may vary especially in their sizes and shapes of their single elements.

To the spiral elements of pleurotomariid sculpture belong particularly spiral ridges, spiral furrows, and spiral ribs. The ridges are sometimes extended by tubercles of various sizes and shapes. Most frequently the tubercles consist of small cones or tongue-shaped forms.

Axial sculptural forms are composed only of axial ribs and furrows. Positive sculptures are extended by granules and rounded objects of small sizes. The pits occurring very rarely are quite unlike the forms just mentioned. All positive sculptures on the dorsal side of whorl are rounded.

The ventral side of a whorl bears, in addition to growth lines, V-shaped spiral furrows and rounded spiral mounds. To these may be added, though in some species only, axial furrows which, if used in combination with the mounds, form low and flat tubercles.

Sculpture of the individual pleurotomariid species is fairly invariable and is one of the main species features. It is true that the sculpture somewhat varies within one species, but it can by no means change to such an extent as to make the variability observable megascopically.

No muscle scars, colour of shell and operculum have been observed.

Generic features. The most significant generic features of the *Pleurotomariidae* SWAINSON family members are as follows:

- a) total shape and type of shell
- b) general shape of aperture
- c) position of selenizone

Species features. The most significant species features of the *Pleurotomariidae* SWAINSON family members are as follows:

- a) shape of shell at species level
- b) shape of aperture at species level
- c) sculpture at species level
- d) pleural angle (at fossils average magnitude)

SYSTEMATIC PART

(Description of species from the Bohemian Cretaceous Basin)

Gastropoda CUVIER, 1797

Prosobranchia MILNE—EDWARDS, 1848

Archaeogastropoda THIELE, 1925

Pleurotomariina COX et KNIGHT, 1960

Pleurotomariacea SWAINSON, 1840

Pleurotomariidae SWAINSON, 1840

Pleurotomaria DEFRANCE, 1826

Pleurotomaria antiqua (BINKHORST, 1861)

Pl. I, Fig. 1, 2, 3)

1861 *Halidis antiqua* n. sp. — J. BINKHORST: Monograf. des Gastr., p. 81, Pl. V and 2, Fig. 4

1910 *Pleurotomaria antiqua* Binkh. V. WEINZETTL: Gastropoda etc., p. 9, Pl. I, Fig. 34

1911 *Pleurotomaria antiqua* Binkh. — A. FRÍČ: Studie v oboru etc., Korycanské vrstvy, p. 13, Fig. 45

T y p u s : Holotype depicted by J. BINKHORST (1861) on pl. V and 2, fig. 4

L o c u s t y p i c u s : After original designation — Limbourg, Belgium

S t r a t u m t y p i c u m : Cenomanian, Cretaceous

M a t e r i a l : Two nearly complete specimens from the Collections of the National Museum, Prague; one nearly complete specimen, five internal moulds and one incomplete external mould all recently collected from excavations made for transgas pipeline at Korycany.

D e s c r i p t i o n : Shell low, conical, with three whorls separated distinctly by vertical, lower part of whorl on dorsal side. Each whorl thus consists of two parts: an upper, slightly obliquely inclined part and a lower, vertical part. On contact between gently sloping and vertical parts of whorl there are several large, erect tubercles separated from each other and forming disconnected, keel-like spiral mound. These tubercles have a circular orifice in their central part; it occurs in series called tremata and distinctly increases in size on tubercles close to aperture. Final spiral ribs on either half of whorl. Preserved, nearly complete specimens have last whorl with perceptible selenizone on lower, vertical part of whorl situated close to waist plane. Principal features of aperture (i. e. inner and outer lips and siphonal canal) not preserved; traces left only on ventral side by robust, welldeveloped parietal callus. Cross section of whorl next to vanished aperture assumes the shape of trapezoid with four apices; left trapezoidal side ends in sharp point and right one forms nearly regular figure with upper corner erect obliquely upwards. Upper edge of whorl S-shaped on left side. Shell sculptured with fine striations on ventral side. Umbilicus false. Internal moulds smooth, with distinct keel bearing tubercles.

Dimensions:

Shell — length 9.31 mm, height 6.71 mm
Aperture — length 3.49 mm, height 2.04 mm
Pleural angle (average) $110^{\circ} 16'$

Remarks and comparisons: The species was originally described as *Halidia antiqua*, but WEINZETTL (1910) rightfully attracted attention to some important characters common to the genus *Pleurotomaria* DEFRANCE (course of selenizone), and assigned it undoubtedly to that genus. V. WEINZETTL described the species on the basis of four specimens, and A. FRIČ (1911) mentioned merely four specimens as well. When studying the material in the National Museum, the present author had only two such specimens at his disposal; the remainder were new collections from excavations made for transgas pipelines. On the other hand, the excavated material was mostly taken from one locality at Korycany, where the specimens have been found associated with a large number of animals, especially gastropods, thereby representing thanatocoenosis of a littoral vagile benthos. No indications of symbiotic animals can be observed on any shell of the species under study.

This species is one of the last species of the genus *Pleurotomaria* DEFRANCE to terminate generic evolution and, at the same time, to indicate a trend towards a newly developing family of *Haliotidae*. Like the other species occurring in the Cenomanian, it shows a distinctly new specialization (i. e. tremata on keel tubercles, a reduced number of the whorls) which, under changing conditions, must have ultimately resulted in the formation of new gastropod forms. This species may clearly be distinguished from of the genus *Pleurotomaria* DEFRANCE by its shape and sculpture.

Occurrence and distribution: *Pleurotomaria antiqua* (BINKHORST) is stratigraphically restricted to the Albian and Cenomanian, especially to coastal sediments. It occurs in platform Cretaceous deposits of Western and Central Europe, but has not yet been discovered in similar sediments east of the Bohemian Massif.

In the Bohemian Cretaceous Basin, this species has only been reported from one locality containing medium-grained, calcareous sandstones with limonitic admixture at Korycany (marine Cenomanian). It was collected from two places: one is A. Frič's classical locality which is abandoned at the present time; the others is an excavation made for the transgas pipelines about half distance between the villages of Veliká Ves and Korycany.

Pleurotomaria friči WEINZETTL, 1910

(Pl. I, Fig. 4, 5, 6; Pl. VIII, Fig. 2)

1910 *Pleurotomaria* Friči n. sp. — V. WEINZETTL: *Gastropoda etc.*, p. 9, Pl. I, Fig. 35

1911 *Pleurotomaria* Friči WEINZ. — A. FRIČ: *Studie v oboru etc.*, Korycanské vrstvy, p. 13, Fig. 46

Typus: Lectotype here designated for the first time; nearly complete specimen with partly preserved shell, depicted by V. WEINZETTL (1910) as pl. I, fig. 35 and deposited together with other paralectotypes in the

Collections of National Museum, Prague, collection of paleontology No. 3587. In this paper lectotype is refigured as pl. I, fig. 4.

Locus typicus: After the original name, Korycany, Bohemia

Stratum typicus: Marine Cenomanian (Korycany Formation). Bohemian Cretaceous Basin

Material: In addition to the lectotype and 6 additional paralectotypes from the collections of the National Museum, Prague, three nearly completely preserved specimens containing limonitic admixture from the Korycany calcareous sandstones are available.

Description: Tube low, broadly ellipsoidal base, with 2 whorls unseparated distinctly from one another on sutures. Last whorl four times as large as succeeding one and nearly overlaps it. Sculpture on dorsal side of shell consisting of indistinct keel on lower part of whorl, with low tubercles bearing orifices on their apices up to a distance of 3 mm from aperture; spiral whorls with axial ribs also present. This combination occurs regularly and small tubercles are visible at the crossing of both forms, but it resembles a reticulate sculpture on the whole. Selenizone well discernible in lower part of body whorl, close to waist plane. Aperture trapezoidal in outline, with 4 apices out of which 3 clearly rounded and 1 elongated to point. External labium antecurrent in shape and interrupted by selenizone; internal labium bears robust parietal callus with 3 columellar folds. Ventral side of shell sculptured with fine spiral striae; umbilicus false. Internal moulds smooth, with only distinct tuberculate zone at the point of keel on the lower part of the whorl. Shell right-handed.

Dimensions:

Shell — length 15 mm, height 8.61 mm

Aperture — length 11.12 mm, height 6.20 mm

Pleural angle (average) $150^{\circ} 31'$

Remarks and comparison: Practically all specimens of the described species have been found in calcareous sandstones with limonitic admixture at one locality called Korycany. Six nearly complete specimens and one internal mould are from A. Frič's classical collection and three new specimens have been recovered from an excavation for the transgas pipelines at Korycany. As the shells show a comparatively good state of preservation, it can be assumed that they had not been transported for a long time or or distance (such as thanatocoenosis) and, possibly in three cases, they had not been transported at all. Although the species has been found associated with several other animals, no indications of symbiosis or parasitism have been observed.

Pleurotomaria friči WEINZETTL has so far been reported only from one locality in the Bohemian Cretaceous Basin and has not yet been described in foreign literature. It is one of the specialized species of the genus *Pleurotomaria* DEFRANCE showing affinities to *Pleurotomaria antiqua* (BINKHORST) on the basis of some morphological features of its shell (i. e. keel composed of tubercles at aperture and with tremata of them) and closely related to the family *Haliotidae*. It may be distinguished by its smaller size, less prominent sculpture on the dorsal side of the shell, and the aperture more roundedly shaped.

Occurrence and distribution: *Pleurotomaria friči* WEINZETTL is restricted, as indicated by the records as yet available, to the Upper Cenomanian of the Bohemian Cretaceous Basin, specifically to the close vicinity of Korycany (so-called surf area). Other Cenomanian localities have yielded incomplete internal moulds more remotely resembling the species just described.

Pleurotomaria geinitzi d'ORBIGNY, 1850

[Pl. II, Fig. 1—6; Pl. VIII, Fig. 3]

- 1834 *Pleurotomaria gigantea* SOWERBY — H. B. GEINITZ. Nachtrag zur Charakt. etc., p. 10, Pl. V, Fig. 5
1845 *Pleurotomaria gigantea* SOWERBY — A. E. REUSS: Verstein., p. 47, Pl. VI, Fig. 18
1846 *Pleurotomaria gigantea* SOWERBY — H. B. GEINITZ: Grundriss etc., p. 356, Pl. XV, Fig. 5, 6
1850 *Pleurotomaria Geinitzi* n. sp. — A. d'ORBIGNY: Pridrome etc., p. 153
1850 *Pleurotomaria Geinitzi* d'ORBIGNY — H. B. GEINITZ: Elbth. etc., I, 2, p. 258, Pl. 58, Fig. 2, 3
1910 *Pleurotomaria Geinitzi* d'ORBIGNY — V. WEINZETTL: Gastropoda etc., p. 9, Pl. I, Fig. 36, 37
1911 *Pleurotomaria Geinitzi* d'ORBIGNY — A. FRIČ: Studie v oboru etc., Korycanské vrstvy, p. 13, Fig. 47

Type: Lectotype figured by H. B. GEINITZ (1843) as *Pleurotomaria gigantea* SOWERBY on pl. V, fig. 5

Locustypicus: Oberau, Germany

Stratum typicum: Cenomanian, Cretaceous

Material: Fifty-nine specimens showing various state of preservation were available to me. The most frequent are internal moulds nearly or partly complete (37 specimens), followed by internal moulds containing fragmentary shell (7 specimens) and 5 nearly complete shells. These are mostly derived from a surf Cenomanian area of the Bohemian Cretaceous Basin composed of organodetrital rocks or calcareous sandstones.

Description: High turbinate shell with 6 whorls, out of which only 4 have been found preserved on our material in most cases. Whorls not clearly separated in sutures from each other and bear two prominent keels, one in upper part of whorl as those forming row in lower part. There are 4 rows of large tubercles, each 2 being separated from one another by spiral mound. Small tubercles total 9, while 5th, 6th, and 7th are always separated from successive, lower-lying row, narrow spiral mound. Selenizone in lower part of whorl and shifted toward its lower keel rather than toward its waist plane. Aperture trapezoidal, with 4 apices and concave upper and lower lines; left apex project into point and both apices on right side display visible arrangement of keels. Preserved fragments of outer lip suggest that it was antecurrent in shape. Parietal callus with 2 columellar folds usually preserved on inner lip. Ventral side of shell sculptured with 2 or 3 spiral rows of tubercles; low and narrow mounds extend along margin and inwards. Umbilicus false. Internal moulds smooth, with well discernible whorl keels. Shell right-handed.

Dimensions:

Shell — length 73.6 mm (average), 71 mm (min.), 77.70 mm (max.)
height 54.71 mm (average), 53.1 mm (min.), 70.12 mm (max.)

Aperture — length 36.2 mm (average), 34.63 mm (min.), 40.14 mm (max.)
height 21.11 mm (average), 19.86 mm (min.), 23.6 mm (max.)
Pleural angle 53° 54' (average)

Remarks and comparisons: In earlier literature this species was believed to be identical with *Leptomaria gigantea* (SOWERBY) (previously *Pleurotomaria gigantea* SOWERBY) especially because of the similar structure of its shell. Remarkable distinguishing features are number of whorls (8 in *L. gigantea*) and undoubtedly the shape of aperture and cross section of last whorl. This species was correctly regarded as a separate one by A. d'ORBIGNY (1850) using the description made by H. B. GEINITZ (1843). In the Bohemian Cretaceous Basin, *Pleurotomaria geinitzi* d'ORBIGNY occurs exclusively in Cenomanian sediments of a subtidal area. On the contrary, *Leptomaria gigantea* (SOWERBY) has been described only once (V. ZÁZVORKA 1928 — loc. Džbánov near Vysoké Mýto), but the material has not been preserved nor verified by new collections.

Out of 6 whorls of the shell under study, only 4 can often be found on the lower part of that shell. The preserved material shows clearly that the first two whorls consist of an essentially thinner shell wall than can be seen on lower whorls. During post mortal transport in a subtidal zone both upper whorls were being torn away from the other parts of the shell. These two whorls suggest a neanic stage of the shell on the basis of all their features (thin shell wall, simple sculpture of indistinct shapes).

Occurrence and distribution: This species can be found only in Cenomanian sediments of the Bohemian Cretaceous Basin; in western Europe, it has also been recorded from littoral sediments of Albian age (A. d'ORBIGNY, 1850). On Czechoslovak territory, the species is limited solely to a subtidal facies zone, although large numbers have been reported from some localities near Kolín.

Localities in the Bohemian Cretaceous Basin: Kolín - Zálábí, Mezhořez, Radovesnice, Zibohlavý, Velká Ves near Prague, Kutná Hora.

Pleurotomaria grata nov. spec.

(Pl. I, Fig. 7, 8, 9; Pl. VIII, Fig. 4)

Typus: Holotype here depicted on pl. I. fig. 7, 8 for the first time and deposited in the paleontological collections of National Museum, No. 6334

Locustypicus: Vrchoslav near Teplice, Bohemia

Stratum typicum: Marine Cenomanian, Cretaceous

Derivatio nominis: Gratus, -a, -um (Lat.) = pleasant, agreeable.

Additional material: One complete and one incomplete internal moulds with fragmentary shell from coarse kaolinitic sandstones at Vranové near Malá Skála.

Diagnosis: A species of the genus *Pleurotomaria* DEFRANCE with prominent step-like shell and two distinct keels on right side of whorl.

Description: Shell lowly turbiniform, with 4 whorls bearing distinct, sharp keels visible on their right side, so that shell becomes clearly step-like in nature. Ventral side of shell convex. Sculpture on dorsal side of shell consisting of spiral grooves with punctate pits. There are 6 grooves per whorl, located nearly regularly apart (1.9—2.21 mm).

Contrary to this, pits are spaced very irregularly, at distances ranging from 0,3 to 2 mm. Two sharp keels erect on right side of whorl, upper having its apex turned upwards and lower having apex as continuation of convex ventral side of shell. Selenizone very well discernible, just below waist plane of whorl. On ventral side, sculpture composed of S-shaped growth lines, in addition to clearly visible traces left by parietal callus with three columellar folds. Cross section of whorl typically quadrate beyond aperture; right side projecting into whorl and lower as well as left sides forming convex enclosure making acute angle at contact with shell. Internal moulds bear visible indications of sculpture only on dorsal side. Umbilicus false. Shell right-handed.

Dimensions:

Holotype NM 6434 — shell — length 59.22 mm, height 28.46 mm

Aperture — length 28.06 mm, height 14.17 mm

Pleural angle $100^{\circ} 44'$

Vranová specimen:

Shell — length 57.96 mm, height 28.46 mm

Aperture — length 28.06 mm, height 14.17 mm

Pleural angle $100^{\circ} 41'$

Remarks and comparisons: This new species of the genus *Pleurotomaria* DEFRANCE ranks with large species members but much exceeds the other representatives in size. Its shell with a distinctly step-like pattern and the whorl bearing two keels on the right side are another prominent features. This is only pleurotomariid species absent from subtidal facies zone, although its habitat is not much unlike that of the zone. Nor has sculpture developed to such an extent as can be observed in the species from the surf zone.

The new species has yet been found as two complete specimens only at two localities (Vrchoslav, Vrchové) lying much apart. It can be assumed, however, that these two localities were earlier united with each other, as is indicated by the discoveries made in the Ještěd Mts. piedmont area and identified as fragments of shells assignable to the species on the basis of the whorl shape. These fragments are not mentioned in the chapter on material because they do not serve as a basis for describing the species, yet I feel it necessary to give an account of them as an important connecting line between Vrchoslav and Vranové.

The species is accompanied by a typical assemblage of Cenomanian block sandstones — *Neithea aequicostata* (LAMARCK), *Gervilia kozakoviensis* FRIČ, *Chlamys subacutus* (LAMARCK) and *Rhynchostreon suborbiculatum* (LAMARCK).

Occurrence and distribution: The new species is known only from the marine Cenomanian of the Bohemian Cretaceous Basin, specifically from the its northern part.

Bathrotomaria COX, 1956

Bathrotomaria perspectiva (MANTELL, 1822)

(Pl. III, Fig. 1—6; Pl. VIII, Fig. 5)

1822 *Cirrus perspectivus* n. sp. — F. MANTELL: Geol. of Sussex, Tab. XVIII, Fig. 12

1823 *Cirrus perspectivus* MANT. — J. SOWERBY: Mineral. conch. etc., 5, p. 35, Tab. 428, Fig. 1, 2

- 1832 *Pleurotomaria perspectiva* [MANT.] — A. PASSY: Géol. de la Seine-Inf. etc., p. 335
 1841 *Pleurotomaria distincta* DUJARDIN — F. A. ROEMER: Die Versteinerungen etc., p. 82
 1842 *Pleurotomaria perspectiva* SOWERBY — A. d'ORBIGNY: Paléont. Franc. etc., p. 25—256, Pl. 196
 1846 *Pleurotomaria perspectiva* [MANT.] — H. B. GEINITZ: Grundriss etc., p. 355
 1850 *Pleurotomaria perspectiva* d'ORB. — A. d'ORBIGNY. Prodrôme etc., p. 153
 1889 *Pleurotomaria perspectiva* [MANT.] — A. FRÍČ: Studie v oboru etc., Teplické vrstvy, p. 69, Fig. 49
 1910 *Pleurotomaria perspectiva* [MANT.] — V. WEINZETTL: Gastropoda etc., p. 10

Typus: Lectotype is the specimen depicted by F. MANTELL (1822) on pl. XVIII, fig. 12

Locustypicus: England

Stratum typicus: Upper Cretaceous (Cenomanian — Turonian)

Material: Seven complete and 16 incomplete internal moulds from calcareous sandstones of Upper Turonian age. Fragments of shells have been found preserved on 4 specimens.

Description: Shell high, turbiniform, with 6 whorls, out of which only 4 most frequently preserved, in two cases 5. Whorls indistinctly separated, making angle of about 42° , rather high, and giving shell robust appearance. Last whorl bears prominent keel cut by selenizone, located in mid-whorl, and slightly shifted (1 mm) above centre of whorl. Some internal molds bear fragmentary preserved shells with distinct sculpture of dorsal part. Sculpture consisting of very low, narrow spiral mounds but lacking on ventral part. A. d'ORBIGNY (1842) states that the shell ventral part bears no sculpture. Umbilicus true, very narrow. Shell right-handed.

Dimensions:

- Shell — length 71.03 mm (average), 81 mm (max.), 59.90 mm (min.)
 height 51.92 mm (average), 59.96 mm (max.), 47.77 mm (min.)
 Aperture — length 27.7 mm (average), 30.03 mm (max.), 25.11 mm (min.)
 height 17.6 mm (average), 19.8 mm (max.), 16.61 mm (min.)
 Pleural angle $93^{\circ} 27'$ (average)

Remarks and comparisons: All previous authors ranged *Bathrotomaria perspectiva* (MANTELL) to the genus *Pleurotomaria* DE-FRANCE especially because the genus *Bathrotomaria* COX has been established quite recently and no one investigator made an attempt to examine the species in greater detail. The present author is the first to assign the species *perspectiva* to the genus on the basis of the typical shape of its aperture and especially the location of the selenizone, the latter being referred to as a characteristic feature of that genus.

It occurs rather rarely in the Bohemian Cretaceous Basin and, despite intense investigation, it has been found as two or three specimens at the localities. Although additional discoveries can be made in the future, the species seems to be very rare in general.

Like *Pleurotomaria geinitzi* d'ORBIGNY, this species is very often found not as a complete shell, but merely as four lower whorls. The two upper whorls (if present) in generally preserved specimens also form a neanic stage of the shell with imperfectly developed sculpture.

Occurrence and distribution: *Bathrotomaria perspectiva* (MANTELL) has been reported only from Upper Turonian calcareous se-

diments in the Teplice area. H. B. GEINITZ (1846) also recorded it from the same rock in Upper Silesia.

Localities in the Bohemian Cretaceous Basin: Upper Turonian — Lahošť, Hudcov, Čížkovice.

Conotomaria COX, 1959

Conotomaria mailleana (d'ORBIGNY, 1842)

(Pl. IV, Fig. 1—4; Pl. VIII, Fig. 6)

1842 *Pleurotomaria mailleana* n. sp. — A. d'ORBIGNY: Paléon. Franc. etc., pp. 253—254, Pl. 195

1846 *Pleurotomaria mailleana* d'ORB. — H. B. GEINITZ: Grudriss etc., p. 356

1850 *Pleurotomaria mailleana* d'ORB. — A. d'ORBIGNY: Prodrome etc., p. 153

1960 *Conotomaria mailleana* (d'ORB.) — L. R. COX: Treatise etc., p. I 219, Fig. 131/9

T y p u s : Lectotype shown by A. d'ORBIGNY (1842) as pl. 195 and by L. R. COX (1960) as fig. 131/9 on p. I 218

L o c u s t y p i c u s : Mnt. Sainte-Catherine, Seine-Inferieure, France

S t r a t u m t y p i c u m : Cenomanian, Cretaceous

M a t e r i a l : Two incomplete internal molds from surf facies calcareous sandstone: the earlier specimen, deposited in the collection of the National Museum, is from Kolín, loc. U Prachovny; the other shows a better state of preservation and was taken from small quarries at Vitice in the Kutná Hora area.

D e s c r i p t i o n : Shell low, symmetrically conical; 7 whorls. Only 4 lower whorls, incl. last whorl, have been found preserved in two specimens from the Bohemian Cretaceous Basin. Aperture not preserved, but its characteristic shape may be inferred from last whorl. Course of selenizone preserved on dorsal side of internal molds from Vitice. Selenizone lies at boundary between first and second thirds of upper part of whorl to form a distinct mound. Whorl gently inclined toward selenizone, but increases in slope away from it so as to end in sharp projection. Sculpture imperceptible on both specimens available, but it is thought by A. d'ORBIGNY (1842) to consist of higher mounds alternating with lower ones. Shape of aperture and / or cross section of last whorl is not unlike that of ellipse projecting into acute angle; its upper part bears low, inextensive keel indicating course of selenizone. Umbilicus false, columella prominent. Shell right-handed.

D i m e n s i o n :

Shell NM — length 54 mm
aperture — length 23.4 mm, height 15.1 mm,
pleural angle 161°
Shell VZ 917 — length 52.73 mm
aperture — length 23.2 mm, height 15 mm
pleural angle 161°

R e m a r k s a n d c o m p a r i s o n s : The present author is the first scientist to draw attention to the specimen from the the Bohemian Cretaceous Basin. There is still another specimen available, but it has been neither identified nor published. The existence of this species is also supported by the discovery of one additional specimen. *Conotomaria secans* (d'ORBIGNY) is rather more abundant in sediments of the Bohemian Cretaceous Basin, but it only occurs from the Lower Turonian onwards

and is greater in size. *Conotomaria mailleana* is restricted solely to the Cenomanian and may be distinguished from other species of the superfamily *Pleurotomariacea* not only by the shape of its shell but, more importantly, by the shape aperture and (or) cross section of last whorl, in addition to the location of its selenizone.

All previous authors have reported the species exclusively from the Cenomanian. As it has been only found in Cenomanian marine sediments of Bohemia, additional discoveries can be regarded as an important stratigraphic marker.

Occurrence and distribution: *Conotomaria mailleana* (d'ORBIGNY) has only been recorder from Cenomanian surf facies calcareous sandstones in the Kolín and Kutná Hora areas.

Localities in the Bohemian Cretaceous Basin: Cenomanian — Kolín — U Prachovny, Vitice.

Conotomaria secans (d'ORBIGNY, 1842)

(Pl. IV, Fig. 5—8; Pl. VIII, Fig. 7)

1842 *Pleurotomaria secans* n. sp. — A. d'ORBIGNY: Paléont. Franc. etc., p. 261—262, Pl. 200, Fig. 1—4

1846 *Pleurotomaria secans* d'ORB. — A. E. REUSS: Böhm. Kreide etc., I, p. 47, Pl. X, Fig. 8

1850 *Pleurotomaria secans* d'ORB. — A. d'ORBIGNY: Prodrôme etc., p. 224—225

Typus: Lectotype — specimen figured by A. d'ORBIGNY (1842) as pl. 200, fig. 1—4

Locus typicus: Cognac, France

Stratum typicum: Senonian, Cretaceous

Material: Mostly from the collections of the Geological Survey, Prague, and the National Museum. It includes 4 nearly complete internal moulds without embryonic shell and 2 incomplete moulds having no upper whorl of shell. Found in mediumgrained kaolinic sandstone of Turonian and Senonian age.

Description: Shell low, conical, with 5 whorls and distinct course of selenizone at contact of first and second thirds of whorl. Immediately above selenizone in dorsal direction there is keel composed of regularly alternating tubercles about 2.17 mm in size. Above this keel lie 3 spiral lines consisting of minute tubercles up to 1 mm in size and located irregularly apart. Just below keel and selenizone, i. e. in lower part of whorl there are 5 spirals consisting of still finer tubercles than those seen in first third of whorl, attaining up to 0.6 mm in size. Dorsal sculpture rapidly diminishes on last two whorls. On ventral side, sculpture consisting of shallow spiral furrows varying in number (7 to 10). In addition, S-shaped and irregularly spaced growth lines can be observed ventrally. Aperture without parietal callus and low, longitudinally elliptical in outline. Both ends of this ellipse are terminated along its longer axis with shell margins at acute angles.

Umbilicus false, columella prominent. Shell right-handed.

Dimensions:

Shell — length 60.1 mm (mean-average), 87 mm (max.), 47.1 mm (min.)
height 17.3 mm (average), 21.2 mm (max.), 15.94 mm (min.)

Aperture — length 25.3 mm (average), 26.7 mm (max.), 22.75 mm (min.)
height 7 mm (average), 7.92 mm (max.), 5.78 mm (min.)
Pleural angle 154° 30'

Remarks and comparisons: As the present author is the first to range the species to the genus *Conotomaria* COX, it must be mentioned that all basic species features, i. e. the shape of shell and aperture and (or) crosssection of last whorl and the course of selenizone are in full agreement with the description of that genus. These features distinguish it from the species *Leptomaria seriatogranulata* (GOLDFUSS), but both have a similar sculpture; a character which in the past had often made the investigators refer *Conotomaria secans* (d'ORBIGNY) to that species. Comparison between species of the genus *Conotomaria* COX has been made in the presending chapter. It is worth mentioning that species just described occurs in the Bohemian Cretaceous Basin froh the Lower Turonian to Coniacian inclusive. It has rarely been found at the localities, the largest number of its specimens (4) being reported from Bílá Hora. The fragmentary internal moulds upon which the species description is not based and which are not included in the amount of the material are known from several localities.

Occurrence and distribution: *Conotomaria secans* (d'ORBIGNY) is confined only to fine medium kaolinic sandstones of Lower Turonian to Coniacian (inclusive) age of the Bohemian Cretaceous Basin.

Localities in the Bohemian Cretaceous Basin:

Lower Turonian — Bílá Hora, Měcholupy

Middle Turonian — Muzlov, Železnice

Upper Turonian — Stradonice near Louny

Coniacian — Přivýšina, Prachov

Leptomaria E. EUDES—DESLONCHAMPS, 1864

Leptomaria linearis (MANTELL, 1822)

(Pl. V, Fig. 1—4; Pl. VIII, Fig. 8)

- 1822 *Trochus linearis* n. sp. — J. MANTELL: Geol. of Sussex, p. 110, Pl. 18, Fig. 16, 17
1845 *Pleurotomaria linearis* [MANT.] — A. E. REUSS: Verstein. I, p. 47, Pl. X, Fig. 8a
1846 *Pleurotomaria linearis* [MANT.] — H. B. GEINITZ: Grundriss, p. 355, Pl. XV, Fig. 1
1850 *Pleurotomaria linearis* [MANT.] — H. B. GEINITZ: Der Quadr. Sachs., p. 5
1874 *Pleurotomaria linearis* [MANT.] — H. B. GEINITZ: Elbthalg. II, p. 165, Pl. 29, Fig. 10
1883 *Pleurotomaria linearis* [MANT.] — A. FRIČ: Isterschicht., p. 95, Fig. 75
1889 *Pleurotomaria linearis* [MANT.] — A. FRIČ: Teplitzersch., p. 74, Fig. 48
1893 *Pleurotomaria linearis* [MANT.] — A. FRIČ: Priesenersch., p. 84
1905 *Pleurotomaria (Leptomaria) linearis* [MANT.] — K. DENINGER: Die Gastropoden etc., p. 24
1910 *Pleurotomaria linearis* [MANT.] — V. WEINZETTL: Gastropoda etc., p. 10

Typus: Lectotype — specimen figured by J. MANTELL (1822) on pl. 18, fig. 16, 17

Locus typicus: Sussex, England

Stratum typicum: Turonian, Cretaceous

Material: Sixty-seven specimens. Incomplete internal moulds total 59; the remainder are internal moulds with fragments of shell. Embryonic and neanic stages of shells and apertures especially are not preserved.

Description: This species may be classed with low types of *Leptomaria*. Lowly turbiniform shell consisting of 6 whorls, out of which only 4 have been found preserved in fossil state in most cases. Two upper whorls of spire composed of essentially thinner shell wall and indicate its neanic stage; sculpture not as well developed as that on whorls 3 to 6. Furrows shallower and ribs lower. On dorsal side, sculpture composed of 19 spiral ribs and selenizone also forming a gently erect rib. First eight ribs average 1.2—1.25 mm in size, followed by one rib about 2 mm in size; next comes selenizone succeeded by one rather broad rib (2 mm); and lower part of whorl bears 9 spiral ribs averaging 0.5—0.7 mm in size. Eleven spiral grooves of approximately uniform size (ca 1.3 mm) visible on ventral side. Aperture swung and circular ellipse (top part) in outline bearing sharp edges on upper surface.

Labium internum well developed, with parietal callus visible also on internal moulds. Columellar folds not observed. Umbilicus true, very narrow. Shell right-handed.

D i m e n s i o n s :

Shell — length 82.5 mm (average, mean), 92.6 mm (max.), 77.96 mm (min.)
height 30 mm (average), 31.76 mm (max.), 27.86 mm (min.)
Aperture — length 21 mm (average), 38.6 mm (max.), 16.8 mm (min.)
height 17 mm (average), 17.78 mm (max.), 13.7 mm (min.)
Pleural angle 127° 56' (average)

Remarks and comparisons: This and the species *Leptomaria seriatogranulata* (GOLDFUSS) are among those pleurotomariid specimens most commonly found in sediments of the Bohemian Cretaceous Basin. It is confined to sediments in the deeper portions of continental sea.

As already stated above, this species belongs to low leptomariid types sharing with high types common generic features, i. e. the shape of aperture and (or) cross section of last whorl and of shell. It is therefore necessary to assign it to the genus *Leptomaria* E. EUDES—DESLONG-CHAMPS. The species is also one of the youngest pleurotomariids discovered on Czechoslovak territory. It occurs for the first time in the Middle Turonian and survives into the Coniacian, but reaches its peak of evolution during Upper Turonian time; at the Turonian — Senonian boundary, however is a rapid decrease in numbers of specimens; ultimately, its occurrence became stable on a lower stratigraphical level and thus the species can also be found in Coniacian sediments. It has not been reported from Santonian regression sediments of the Bohemian Cretaceous Basin.

Occurrence and distribution: *Leptomaria linearis* (MANTELL) occurs in all sediment types in Cretaceous sea deeper portions from the Lower to Upper Turonian, and Coniacian.

Localities in the Bohemian Cretaceous Basin:

Middle Turonian — Dolánky, Kněžnice, Klokočské Loučky, Rovensko p. Troskami, Vápeník, Vazovské údolí, Turnov - Farářství, Železnice, Libuň, Ohrazenice, Brandýs n. Orlicí, Morašice, Muzlov, Pátek, Opolany, Odřepsy
Upper Turonian — Oškobrh, Hradčany, Žehuňská obora
Coniacian — Prachov, Mašov, Březno near Louny

Leptomaria plauensis (GEINITZ, 1857)

(Pl. V, Fig. 5—8; Pl. VIII, Fig. 9)

1857 *Pleurotomaria plauensis* n. sp. — H. B. GEINITZ: Elbthalg. etc. I, p. 258, Pl. 57, Fig. 17

1905 *Pleurotomaria (Leptomaria) plauensis* GEINITZ — K. DENINGER: Die Gastropoden etc., p. 4

Typus: Lectotype — specimen figured by H. B. GEINITZ (1857) on pl. 57, fig. 17

Locus typicus: Plauen, tunnel von Oberau

Stratum typicum: Cenomanian, Cretaceous

Material: Ten incomplete internal moulds with fragments of shell mostly collected from surf facies calcareous rocks.

Description: Shell can be comparatively accurately described despite its fragmentary preservation. Lowly turbiniform, regular, with 6 whorls. First two whorls represent neanic stage and marked by thin shell wall as well as spiral sculpture only. Other whorls of spire and last whorl bear dorsally sculpture consisting of spiral and axial low ribs and thereby forming rib-like network. Shell wall rapidly increases in thickness so as to attain a value of nearly 3 mm on last whorl. Sculpture ventrally composed of shallow, spiral grooves and S-shaped lines. Selenizone immediately above mid-whorl, its course being marked by a zone that cuts sculpture. Aperture irregularly triangular, with outer side broadly rounded. Inner lip with parietal callus strongly developed. No columellar folds have been observed. Umbilicus true, very narrow. Shell right-handed.

Dimensions:

Average size have been measured on the specimen from the collection VZ, No. 1086.

Shell — length 32.6 mm, height 19.71 mm

Aperture — length 12.24 mm, height 19.71 mm

Pleural angle $126^{\circ} 20'$

Remarks and comparison: This species belongs to small leptomariid species and is one of a few representatives living in surf zone. It is rare in sediments of the Bohemian Cretaceous Basin and may clearly be distinguished from other generic members by its size. The species is found in association with *Pleurotomaria geinitzi* d'ORBIGNY in Cenomanian surf sediments, but differs from especially in its sculpture and the shape of aperture.

Occurrence and distribution: *Leptomaria plauensis* (GEINITZ) is confined to calcareous surf sediments of Cenomanian and Lower Turonian age in the Kolín area of the Bohemian Cretaceous Basin. It has not yet been reported from the other parts of the Bohemian Cretaceous Basin, but is known from higher-lying sediments in Poland and Plauen in GDR.

Localities in the Bohemian Cretaceous Basin:

Cenomanian — Kolín - Zálabí, Mezholezy

Upper Turonian — Kamajka, Kaňk, Radim, Velim, Zbyslav

Leptomaria seriatogranulata (GOLDFUSS, 1841)

(Pl. VI, Fig. 1–5; Pl. VIII, Fig. 10)

1841 *Pleurotomaria seriatogranulata* n. sp. — A. GOLDFUSS: Petrefacta Germ., III, p. 75, Pl. 186, Fig. 10

1846 *Pleurotomaria seriatogranulata* GOLDF. — H. B. GEINITZ. Grundriss. etc., p. 356, Pl. XV, Fig. 2

- 1874 *Pleurotomaria seriatogranulata* GOLDF. — A. FRIČ: Vrstvy bělohorské a malnické etc., p. 102, Fig. 47
1910 *Pleurotomaria seriatogranulata* GOLDF. — V. WEINZETTL: Gastropoda etc., p. 9, Pl. I, Fig. 38

T y p u s : Lectotype figured by A. GOLDFUSS (1841) on pl. 186, fig. 10
L o c u s t y p i c u s : Bohemia

S t r a t u m t y p i c u m : Lower Turonian, Cretaceous

M a t e r i a l : Forty-seven specimens showing various state of preservation. Incomplete internal moulds largely available (30); in four cases internal moulds with preserved fragments of shell allowing the outer form of the shell to be reconstructed.

D e s c r i p t i o n : Lowly turbiniform shell with 6 whorls, out of which only 4 have been found preserved in most cases. First two whorls of spire minute and rarely preserved on internal moulds (i. e. only 6 in the total amount of the material under study). These bear sculpture consisting of irregularly interrupted spiral ridges varying between 4 and 7 in number. Both whorls suggest neanic stage of shell. Subsequent 4 whorls essentially more robust, with prominent sculpture on dorsal side of shell. Sculpture composed of longitudinal tubercles aligned in spiral lines numbering 7 to 9. Tubercles become longer toward aperture and grade into nearly regular granules on third and fourth whorls. Sculpture on ventral side consists of low mounds numbering 6 to 9 and interrupted by S-shaped growth lines. Just immediately above mid-whorl extends selenizone, course of which on section is characterized by low, uninterrupted keel. Aperture characterized by rounded shape, except outer lower edge where upper part of whorl rather suddenly grades into its base. Inner lip bears strongly developed parietal callus; columellar folds not established. Umbilicus true, very narrow. Shell right-handed.

D i m e n s i o n s :

Shell — length 63.73 mm (average), 92 mm (max.), 53.34 mm (min.)
 height 32.76 mm (average), 38.66 mm (max.), 27.44 mm (min.)
Aperture — length 26.7 mm (average), 29.91 mm (max.), 21.1 mm (min.)
 height 14.61 mm (average), 16.22 mm (max.), 10.89 mm (min.)
Pleural angle $120^{\circ} 50' \pm 5'$

R e m a r k s a n d c o m p a r i s o n s : Systematic assignment of the species which corresponds to the genus *Leptomaria* E. EUDES—DESLONG-CHAMPS especially on the basis of the shape of its aperture has not yet been critically examined in any previous paper.

This species is one of the largest Czechoslovak members of the superfamily *Pleurotomariacea* and commonly can be found in Lower Turonian sediments, except surf facies sediments from which it has not been recorder sofar. It resembles *Conotomaria secans* (d'ORBIGNY) on the basis of sculpture, but this character is less regular, its tubercles are more elongate and it can clearly be distinguished by the shape of aperture and cross section of last whorl. It differs from other pleurotomariids in possessing a distinct sculpture.

O c c u r r e n c e a n d d i s t r i b u t i o n : *Leptomaria seriatogranulata* (GOLDFUSS) can be found in marly nad sandy sediments of Lower Turonian age (zones III and IV). Specimens coming from zone IV usually

have a lower and more regular sculpture but less prominent growth lines on ventral side.

Localities in the Bohemian Cretaceous Basin:

Lower Turonian — Bílá Hora, Smečno, Dvůr Králové, Přelouč, Železnice (Obecní les), Louny, Měcholupy, Slaný, Ždánice, Malnice

Leptomaria turbinoides (d'ORBIGNY, 1842)

(Pl. VI, Fig. 6—8; Pl. VIII, Fig. 13)

1842 *Pleurotomaria turbinoides* n. sp. — A. d'ORBIGNY: Paléon. Franc., p. 270—271, Pl. 204

1850 *Pleurotomaria turbinoides* d'ORB. — A. d'ORBIGNY: Prodrôme etc., II, p. 224

T y p u s : Lectotype figured by A. d'ORBIGNY (1842) on pl. 204

L o c u s t y p i c u s : Royan (Charente — Inférieure), France

S t r a t u m t y p i c u m : Cretaceous

M a t e r i a l : One nearly completely preserved specimen forming internal mould (NM coll.) and 4 fragmentary internal moulds of various parts of shell.

D e s c r i p t i o n : This species may be ranked with high *Leptomaria*. Shell highly turbiniform, with 4 whorls, regular at base. As only an internal mould with no sculpture has been found preserved, whorls are separated from each other by a distance of 2 mm at aperture of shell but decreasing toward its apex. A. d'ORBIGNY (1842) describes sculpture as consisting of low, spiral and axial ribs forming a regular lattice as the result of their mutual intersection. Cross section of last whorl shaped like an ellipse pointed on its inner side, flattened in upper part, and elongated into a small, keel-like projection characterizing the course of selenizone on its outer side. Sculpture on ventral side is similar to that on dorsal. Umbilicus true (A. d'ORBIGNY, 1842). Shell right-handed.

D i m e n s i o n s :

Shell — internal mould) — length 53 mm, height 36.1 mm

Aperture (cross section of last whorl — internal mould) — length 23.5 mm, height 13.72 mm

Pleural angle 64° 6'

R e m a r k s a n d c o m p a r i s o n s : The species being described markedly differs from other pleurotomariid species from the Bohemian Cretaceous Basin in the shape of its whorls, so that even its fragmentary part can be identified with certainty. It has so far been found in calcareous sediments of Cenomanian and Turonian age in the Bohemian Cretaceous Basin, although A. d'ORBIGNY (1850) described it as one of Coniacian species. Its distribution in the Bohemian Cretaceous Basin is limited to a surf facies zone.

O c c u r r e n c e a n d d i s t r i b u t i o n : *Leptomaria turbinoides* (d'ORBIGNY) rarely occurs in calcareous surf facies sediments of Cenomanian and Lower Turonian age.

Localities in the Bohemian Cretaceous Basin:

Cenomanian — Kolín - U Práchevny

Lower Turonian — Kamajka, Radim, Velim (Kamajka — see Pl. II, fig. 5)

Pyrgotrochus, P. FISCHER, 1885

Pyrgotrochus bohemicus spec. nov.

(Pl. VII, Fig. 1—4; Pl. VIII, Fig. 12)

Typus: Holotype here figured for the first time on pl. VII, figs. 1—4, and collected in the Coll. V. Ziegler, in the National Museum in Prague No. 0 5155.

Locus typicus: Písnik near Česká Lípa, Bohemia

Stratum typicum: Middle Turonian (Trigoniidae Beds), Cretaceous

Derivatio nominis: Bohemicus, -a, -um (Lat.) = Bohemian; after author's country

Material: In addition to the holotype collected early in this century, 6 fragmentary internal moulds from various parts of the Bohemian Cretaceous Basin, but exclusively from the Middle Turonian.

Diagnosis: A species of the genus *Pyrgotrochus* P. FISCHER with high conical shell. Whorls separated from each other by high mound containing tubercles on whorl base; selenizone in lower half of whorl, just above mound bearing tubercles; pleural angle $44^{\circ} 50'$.

Description: Holotype represented by nearly complete fossil without outer lip and embryonic shell. Shell consisting of 8 whorls clearly separated from each other by high ridge bearing tubercles on base of each whorl. Selenizone above this ridge. Fourteen fine spiral grooves between upper suture of whorl and selenizone; their course irregularly undulose. In addition, very low, counter-directionally bent, flexuous axial ribs disappearing two spiral whorls can be seen under microscope. Grooves on them indistinguishable; only basal ridge bearing tubercles discernible (neanic stage of shell). On ventral side sculpture composed of numerous, low spiral mounds and shallow spiral grooves; growth lines S-shaped, clearly visible. Aperture and (or) cross section of last whorl having form of an irregular pentagon with rounded apices bearing prominent inner lip. Here lies large parietal callus with two rather indistinct columellar folds in its upper part. Umbilicus true, very narrow. Shell right-handed.

Dimensions of holotype:

Shell — length 64.67 mm, height 57.72 mm

Aperture — length 29.2 mm, height 14.59 mm

Pleural angle $44^{\circ} 50'$

Remarks: This species is the geologically youngest species (Middle Turonian) hitherto found to belong to the genus *Pyrgotrochus* P. FISCHER. It is thus useful for extending the stratigraphical limit of the generic distribution up to the Middle Turonian inclusive. Its high shell and typical sculpture of the whorl are two features that clearly distinguish it from all pleurotomariids found in sediments of the Bohemian Cretaceous Basin. A similar species has not been discovered in the studied literature either. Its shell showing a very good state of preservation bears numerous animals attached to the dorsal side probably already in life of this animal. These are especially serpulid worms and subordinately bryozoans, thereby indicating a relatively clean water sea.

Occurrence and distribution: This newly described species has only been found in Middle Turonian sediments in the area extending from Česká Lípa through Turnov and its vicinity as far as Skalice n. Svi-

tavou. Except the early holotype only single fragments of internal moulds of various shell parts have been obtained from most localities.

Localities in the Bohemian Cretaceous Basin:

Middle Turonian — Česká Lípa (Písník), Dolánky, Vápeník, Ústí n. Orlicí, Muzlov

Pyrgotrochus conulus (FRIČ, 1879)

(Pl. VII, Fig. 5—7; Pl. VIII, Fig. 13)

1879 *Pleurotomaria conulus* n. sp. — A. FRIČ: Vrstvy bělohorské a malnické etc., p. 102, Fig. 48

T y p u s : Holotype is the specimen deposited in the Coll. of the National Museum in Prague, without number and depicted by A. FRIČ (1879) in fig. 48

L o c u s t y p i c u s : Dřínov

S t r a t u m t y p i c u m : Lower Turonian (former Semice Marls — Malnice Formation), Cretaceous

M a t e r i a l : Holotype and three additional fragments of internal moulds from the same locality. With the exception of holotype, the fragments are derived from various parts of last whorl.

D e s c r i p t i o n : Eight whorls forming shell of the species being described are distinctly divided into two parts. First two whorls of shell bear weakly developed sculpture, with tubercles low imperceptible on first whorl. These two whorls represent neanic stage of shell and are clearly separated from five additional prominent whorls of spire and last whorl. Their size increases conically, whereas first two do not completely fill the conical surface consisting of other spire whorls and last whorl. These whorl are also composed of two parts: one projecting toward upper suture is flat and close to it bears high spiral ridge with fine grooves; next come 3 rows of minute tubercles bearing fine spiral grooves. Between first and second rows of tubercles lies still another row of minute tubercles, 3 minute per 1 tubercle of adjoining rows. In third row whorl runs nearly perpendicular downward and bears 7 fine grooves. Ventral side of shell is sculptured in a similar manner, but it bears only 6 instead of 7 spiral grooves. Selenizone visible in upper half of perpendicular whorl part. Cross section of last whorl (as aperture is not preserved) shaped like an irregularly elongated hexagon with nearly perpendicular right side. Umbilicus true, very narrow. Shell right-handed.

Holotype is slightly laterally compressed.

D i m e n s i o n s :

Holotype — Shell — length 4.96 mm, height 9.11 mm
Aperture — length 3.97 mm, height 2.9 mm
Pleural angle 47° 11'

R e m a r k s a n d c o m p a r i s o n s : In contrast to the newly described species *Pyrgotrochus bohemicus* n. sp., the species under discussion is geologically older as it has so far been recorded from the Lower Turonian and a single locality only. Besides, it is essentially smaller in size and may easily be distinguished from other superfamily members living in a sea of the Bohemian Cretaceous Basin by the shape of its shell.

O c c u r r e n c e a n d d i s t r i b u t i o n : *Pyrgotrochus conulus* FRIČ

is known from a single locality of the Bohemian Cretaceous Basin, Dřínov, assignable stratigraphically to the upper Lower Turonian.

A d d i t i o n a l n o t e :

A. E. REUSS (1845) described the species *Pleurotomaria faunata* REUSS and V. ZÁZVORKA (1928) *Pleurotomaria gigantea* SOWERBY from the Bohemian Cretaceous Basin. These two species have been described in literature, but the material serving as a basis for such description is not available. Nor have they been confirmed by recent collecting activities. *Pleurotomaria sublaevis* REUSS (A. E. REUSS, 1845) and *Pleurotomaria baculitarum* GEINITZ A. FRÍČ, 1893) can rightfully be regarded as the species *Solarium baculitarum* (GEINITZ).

LITERATURE

- ANDERT, H. (1928): Die Kreideablagerungen zwischen Elbe und Jeschken. I. Das Elbsandsteingebirge östlich der Elbe. Abh. Preuss. geol. L.-A., N. F. 112. Berlin
- ANDERT, H. (1929): Die Kreideablagerungen zwischen Elbe und Jeschken. II. Die nordböhmisches Kreide zwischen Elbsandsteingebirge und Jeschken und das Zittauer Sandsteingebirge. Abh. Preuss. geol. L.-A., N. F. 117. Berlin
- ANDERT, H. (1934): Die Kreideablagerungen zwischen Elbe und Jeschken. III. Die Fauna der obersten Kreide in Sachsen, Böhmen und Schlesien. Abh. Preuss. geol. L.-A., N. F. 159. Berlin
- BINKHORST, J. T. van den (1861): Monographic des Gastéropoden et Céphalopoden de la craie supérieure du Limbourg. 179 p. Lyon
- BURCKHARDT, C. (1897): Zur Systematik und Phylogenie der Pleurotomariiden. N. Jb. Min. 1897, 1, 198—210. Stuttgart
- COX, L. R. (1956): Observations on gastropod descriptive terminology. Malac. Soc. London Proc., 31, 190—202. London
- COX, L. R. (1959): Thoughts on the classification of the Gastropoda. Malac. Soc. London Proc., 33. London
- COX, L. R. and KNIGHT, J. B. (1960): Suborders of Archaeogastropoda. In Treatise on Invertebrate Paleontology. pl. I 169 — I 331. University of Kansas
- DEFRANCE, J. L. M. (1826): Dictionnaire universal des Sciences natureles. p. 39—44. Paris
- DENINGER, K. (1905): Die Gastropoden der Sächsischen Kreideformation. Beitr. Pal. Oester. Ungers. Orien, 18, 1—35, Pl. 1—4. Wien
- EUDES-DESLONGCHAMPS, E. (1863—1869): Notés paléontologiques. Caen, Paris
- EUDES-DESLONGCHAMPS, E. (1865): Note sur la délimitation des genres Trochotoma et Ditremaria. Bull. Soc. linn. Normandie, 9, 421—433, Pl. 3. Paris
- FISCHER, P. (1885): Manual de Conchyliologie et de Paléontologie conchyliologique. T. G., 689—896. Paris
- FRÍČ, A. (1869): Paleontologische Untersuchungen der einzelnen Schichten der böhmischen Kreideformation. Perucer Schichten. Korycaner Schichten. Arch. naturwiss. Landes-Durchfor. Böhm., I, 181—242. Praha
- FRÍČ, A. (1870): Studie v oboru křídového útvaru v Čechách. I. Paleontologická bádání v jednotlivých vrstevních pásmech českého křídového útvaru. Perucké vrstvy. Korycanské vrstvy. Arch. přírodověd. Výzk. Čech, I, 163—217. Praha
- FRÍČ, A. (1877): Studien im Gebiete der böhmischen Kreideformation. II. Die Weissenberger und Malnitzer Schichten. Arch. naturwiss. Landes-Durchforsch. Böhm., Bd. 4, 1. Praha
- FRÍČ, A. (1879): Studie v oboru křídového útvaru v Čechách. II. Bělohorské a Malnické vrstvy. Arch. přírodověd. Výzk. Čech, 4. Praha
- FRÍČ, A. (1883): Studien im Gebiete der böhmischen Kreideformation. III. Die Iser-schichten. Arch. naturwiss. Landes-Durchforsch. Böhm., Bd. 5, 2. Praha
- FRÍČ, A. (1885): Studie v oboru křídového útvaru v Čechách. III. Jizerské vrstvy. Arch. přírodověd. Výzk. Čech, V., 2. Praha
- FRÍČ, A. (1889): Studie v oboru křídového útvaru v Čechách. IV. Teplické vrstvy. Arch. přírodověd. Výzk. Čech, VII., 8. Praha
- FRÍČ, A. (1894): Studie v oboru křídového útvaru v Čechách. V. Březenské vrstvy. Arch. přírodověd. Výzk. Čech, IX., 1. Praha
- FRÍČ, A. (1898): Studie v oboru křídového útvaru v Čechách. VI. Chlomecké vrstvy. Arch. přírodověd. Výzk. Čech, V., 4. Praha
- FRÍČ, A. (1911): Studie v oboru křídového útvaru v Čechách. Illustrovaný seznam zkamenělin cenomanních vrstev korycanských. Arch. přírodověd. Výzk. Čech, XV., 1. Praha
- GEINITZ, H. B. (1839—1842): Charakteristik der Schichten und Petrefacten des sächsischen Kreidegebirges. p. 46. Dresden — Leipzig
- GEINITZ, H. B. (1843): Die Versteinerungen von Kieslingswalda und Nachtrag zur Charakteristik des sächsisch-böhmischen Kreidegebirges. p. 23, 6 Pl. Dresden — Leipzig
- GEINITZ, H. B. (1845—1846): Grudriss der Versteinerungskunde. Dresden
- GEINITZ, H. B. (1850): Das Quadergebirge oder die Kreideformation in Sachsen, mit besonderer Berücksichtigung der Glaukotreichen Schichten. 44 p., 1 Pl. Leipzig

- GEINITZ, H. B. (1874): Elbthalgebirge. I. Der Untere Quader. *Palaeontographica*, **20**, 1—320. Stuttgart
- GOLDFUSS, A. G. (1826—1844): Petrefacta Germanie. Teil 1—3. Düsseldorf
- HOLZAPFEL, E. (1888—1889): Die Mollusken der Aachener Kreide. *Palaeontographica*, **34**, 29—80, Pl. 4—20; *Palaeontographica*, **35**, 139—268, Pl. 8—29. Stuttgart
- MACHÁČEK, J. (1927): Fauna VIII. pásma křídového útvaru v Železnici. *Věst. Stát. úst. geol.*, III, 90—95. Praha
- MACHÁČEK, J. (1928): Pásma I.—IX. křídového útvaru v sev. křídle rovenského přesyky v okolí Železnice. *Rozpr. čs. věd. a umění, tř. II*, **32**, č. 29. Praha
- MALKOVSKÝ, M. et al. (1974): Geologie české křídové pánve a jejího podloží. NČSAV Praha, 262 p. Praha
- MANTELL, F. (1822): *Geology of Sussex*. London
- MÜNSTER, G. (1839—1846): Beiträge zur Petrefaktenkunde. Bayeruth
- ORBIGNY A. d' (1842): Paléontologie Française. Terrains Crétacés. Gastropoda. 237—276, Pl. 188 (Figs. 8—12) — 206. Paris
- ORBIGNY, A. d' (1847): Description des animaux invertébrés; 2. Gastéropodes. 149—236. Paris.
- ORBIGNY, A. d' (1850—1852): Prodrôme de paléontologie stratigraphique universelle des animaux mollusques et rayonnés. II, 153—154, 192, 224—225. Paris
- PŠELINCEV, V. F. et KOROBKOV, I. A. (1960): Brjučonogie in *Osnovy paleontologii*. GNTI, 65—73. Moskva
- QUENSTEDT, A. (1852): *Handbuch der Petrefactenkunde*. 424—425. Tübingen
- REUSS, A. E. (1845—1846): Die Versteinerungen der böhmischen Kreideformation. 1. et 2. Abt. Stuttgart
- ROEMER, F. A. (1841): *Die Versteinerungen Norddeutschen Kreidegebirges*. Hannover
- SOUKUP, J. (1956): Stratigrafické rozdělení křídý Českého masivu. Několik poznámek k názvosloví a ke stratigrafické tabulce. *Věst. ÚÚG*, **31**, 173—180. Praha
- SOWERBY, G. B. (1820—1834): The genera of recent and fossil shells for the use of students in conchology and geology. *Proc. malacol. Soc. London*
- SOWERBY, J. (1812—1845): *The Mineral Conchology of Great Britain*. London
- WEINZETTL, V. (1910): Gastropoda českého útvaru křídového. *Palaeontographica Bohemiae*, VIII, 1—56, 6 Pl. Praha
- WENZ, W. (1938—1944): *Gastropoda Handbuch der Paläozoologie*. Vol. 6, Teil 1—7. Berlin
- ZÁZVORKA, V. (1928): *Pleurotomaria gigantea* SOW. z českého útvaru křídového. *Čas. Nár. mus.*, CII, 106. Praha
- ZIEGLER, V. (1972): Fauna středního turonu Českého ráje. *Gastropoda. Práce a studie — přír.*, 4/1972, 15—26, Pl. 3—5. Pardubice

VÁCLAV ZIEGLER

**ČELEĎ PLEUROTOMARIIDAE SWAINSON, 1840
(GASTROPODA, ARCHAEOGASTROPODA Z ČESKÉ KŘÍDOVÉ PÁNVE)**

V předložené práci se autor zabývá zástupci čeledi *Pleurotomariidae* SWAINSON z české křídové pánve a zároveň provedl revizi druhů uvedených v pracích A. FRIČE [1869—1911] a zejména V. WEINZETTLA [1910]. Systematickým zpracováním čeledi ze sedimentů české křídové pánve bylo zjištěno 5 rodů s 13 druhy. Autor současně popsal dva nové druhy pleurotomariidních gastropodů, a to druhy *Pleurotomaria grata* spec. nov. a *Pyrgotrochus bohemicus* spec. nov.

Ke studiu českých svrchnokřídových plžů nadčeledi *Pleurotomariacea* SWAINSON bylo nashromážděno 251 jedinců, u kterých bylo zachováno dva a více závitů ulity, podle kterých lze měřit pleurální úhel. Kromě toho bylo ve studiu použito dalších 316 úlomků z různých částí ulity. Materiály pocházejí ze sbírky V. ZIEGLERA, uložené ve sbírkách Národního muzea a z dalších sbírek Národního muzea v Praze, Ústředního ústavu geologického v Praze a některých menších muzeí a soukromých sbírek.

EXPLANATIONS OF THE PLATES
VYSVĚTLIVKY K TABULÍM

PLATE I.

- Fig. 1. *Pleurotomaria antiqua* (BINKHORST, 1861), Korycany, Upper Cenomanian. NMP = Collection of the National Museum in Prague] — No. 107. Photo V. Ziegler
- Fig. 2. *Pleurotomaria antiqua* (BINKHORST, 1861), Korycany, Upper Cenomanian. NMP — No. 107. Photo V. Ziegler
- Fig. 3. *Pleurotomaria antiqua* (BINKHORST, 1861), Korycany, Upper Cenomanian. NMP — No. 107. Detail of sculpture of dorsal part. Pict. V. Ziegler
- Fig. 4. *Pleurotomaria friči* WEINZETTL, 1910, Korycany, Upper Cenomanian. NMP — No. 3587, lectotype. Photo V. Ziegler
- Fig. 5. *Pleurotomaria friči* WEINZETTL, 1910, Korycany, Upper Cenomanian. NMP — No. 3587. Photo V. Ziegler
- Fig. 6. *Pleurotomaria friči* WEINZETTL, 1910, Korycany, Upper Cenomanian. NMP — No. 3587. Detail of sculpture of dorsal part. Pict. V. Ziegler
- Fig. 7. *Pleurotomaria grata* spec. nov., Vrchoslav, Upper Cenomanian. NMP — No. 6434. — 8. Photo V. Ziegler
- Fig. 9. *Pleurotomaria grata* spec. nov., Vrchoslav, Upper Cenomanian. NMP — No. 6434. Detail of sculpture of dorsal part. Pict. V. Ziegler

PLATE II

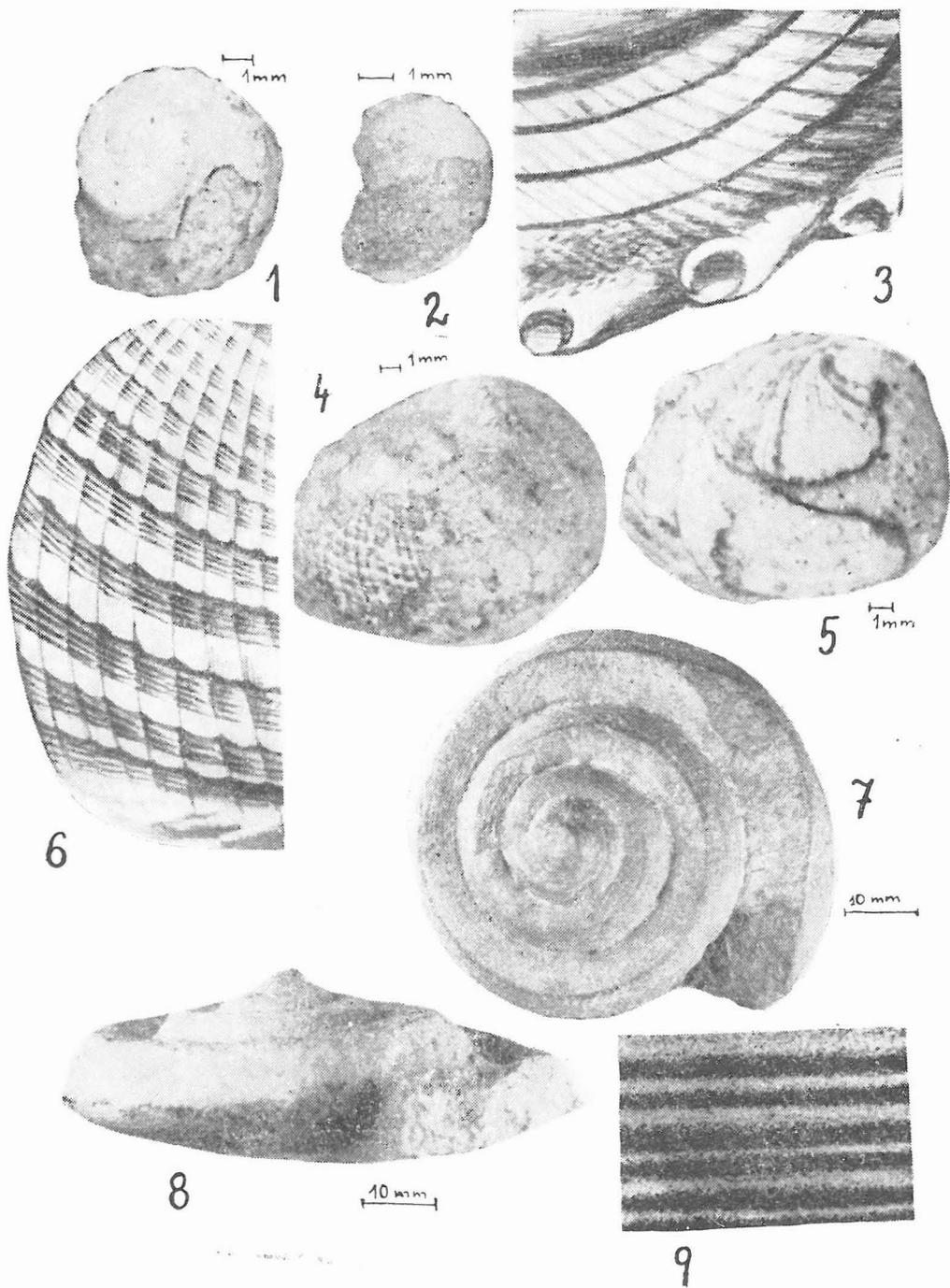
- Fig. 1. *Pleurotomaria geinitzi* d'ORBIGNY, 1850, Kutná Hora, Upper Cenomanian. — 2. NMP — No. 3590. Photo V. Ziegler
- Fig. 3. *Pleurotomaria geinitzi* d'ORBIGNY, 1850, Kolín — Zálabí, Upper Cenomanian. — 4. NMP — No. O 5155. Coll. of V. Ziegler. Photo V. Ziegler
- Fig. 5. *Leptomaria turbinoides* d'ORBIGNY, 1842, Kamajka, Lower Turonian. NMP — No. 3589. Photo V. Ziegler
- Fig. 6. *Pleurotomaria geinitzi* d'ORBIGNY, 1850, Kolín — Zálabí, Upper Cenomanian. NMP — No. O 5155. Coll. of V. Ziegler. Detail of sculpture of dorsal part. Pict. V. Ziegler

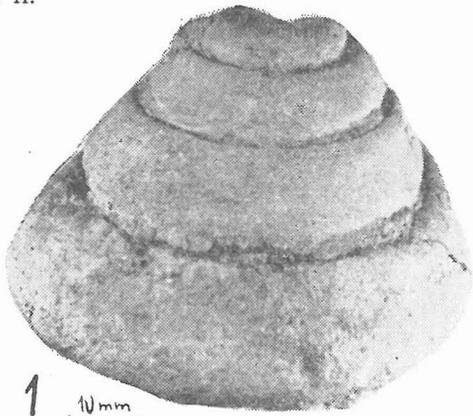
PLATE III.

- Fig. 1. *Bathrotomaria perpectiva* (MANTELL, 1822), Čížkovice — Upper Turonian. Coll — 3. Coll. of the Geological Survey, No. 2491. Photo V. Ziegler
- Fig. 4. *Bathrotomaria perpectiva* (MANTELL, 1822), Hudcov, Upper Turonian. NMP — No. 6436. Photo V. Ziegler
- Fig. 5. *Bathrotomaria perpectiva* (MANTELL, 1822). Lahošť, Upper Turonian. NMP — No. 6435. Photo V. Ziegler
- Fig. 6. *Bathrotomaria perpectiva* (MANTELL, 1822), Lahošť, Upper Turonian. NMP — No. 6435. Pict. V. Ziegler

PLATE IV.

- Fig. 1. *Conotomaria mailleana* [d'ORBIGNY, 1842], Kolín — U Práchevny, Upper — 3. Cenomanian. Coll. of V. Ziegler. NMP — No. O ????. Photo V. Ziegler
- Fig. 4. *Conotomaria mailleana* [d'ORBIGNY, 1842], Kolín — U Práchevny, Upper Cenomanian. Coll. of V. Ziegler. Detail of sculpture of dorsal part. Pict. V. Ziegler
- Fig. 5. *Conotomaria secans* [d'ORBIGNY, 1842], Bílá Hora, Lower Turonian. Photo V. Ziegler
- Figs. 6. *Conotomaria secans* [d'ORBIGNY, 1842], Stradonice near Louny. — 7. NMP — No. 2344. Photo V. Ziegler
- Fig. 8. *Conotomaria secans* [d'ORBIGNY, 1842], Stradonice near Louny. NMP — No. 2344. Detail of sculpture of dorsal part. Pict. V. Ziegler

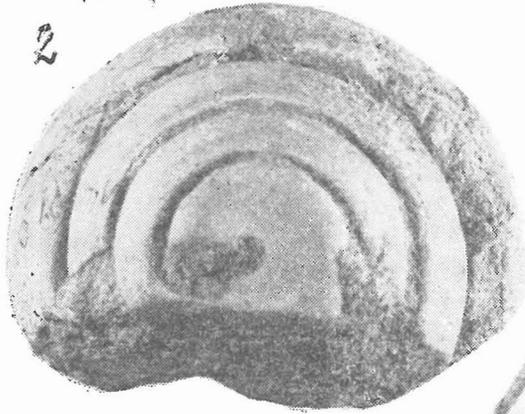




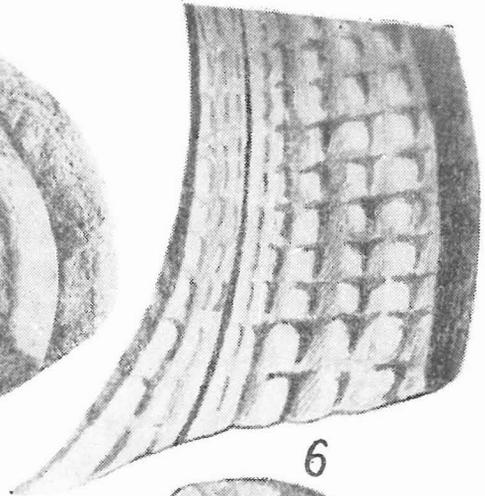
1 10 mm



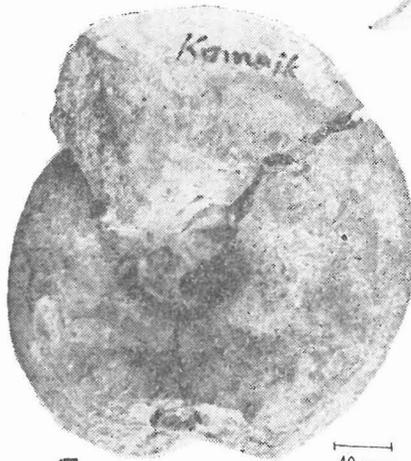
3 10 mm



2



6



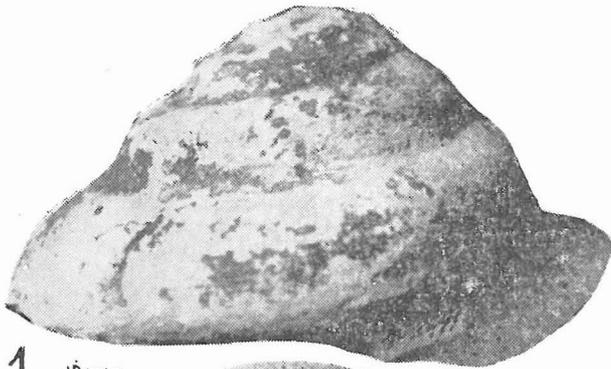
5

10 mm

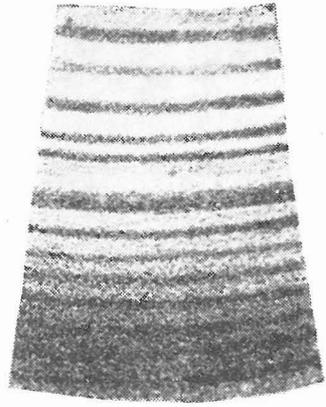


4

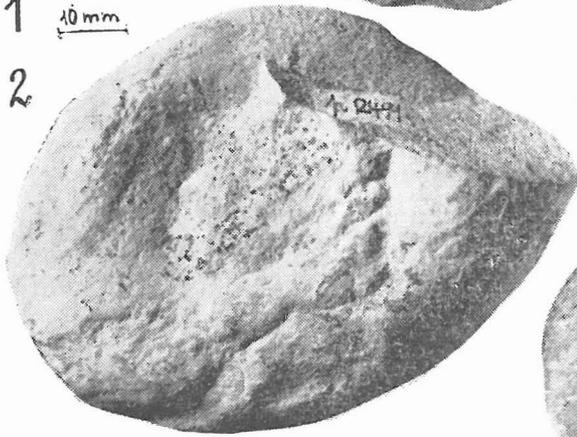
10 mm



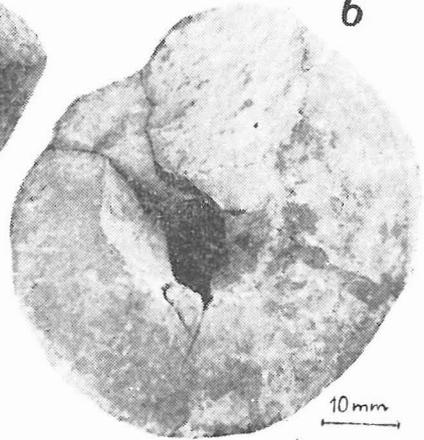
1 10mm



6



2



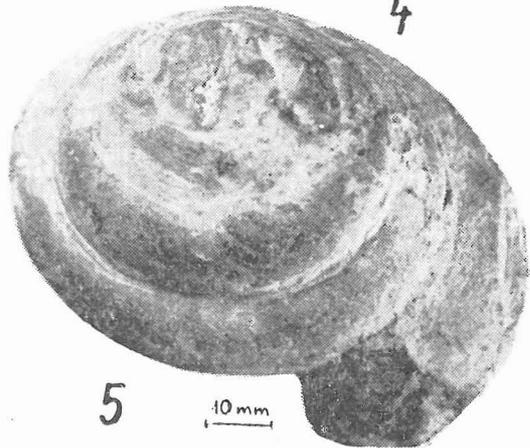
10mm

4



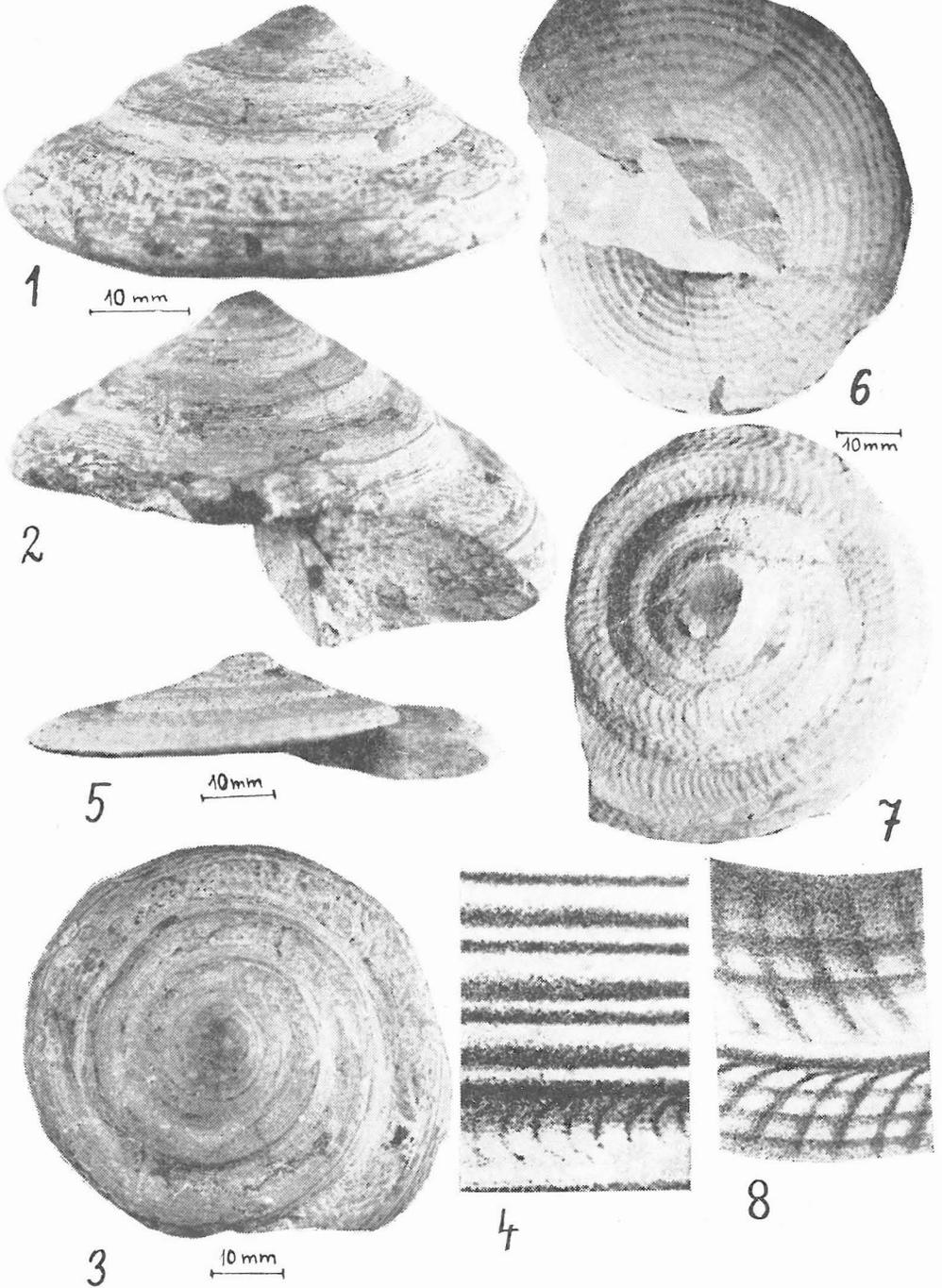
3

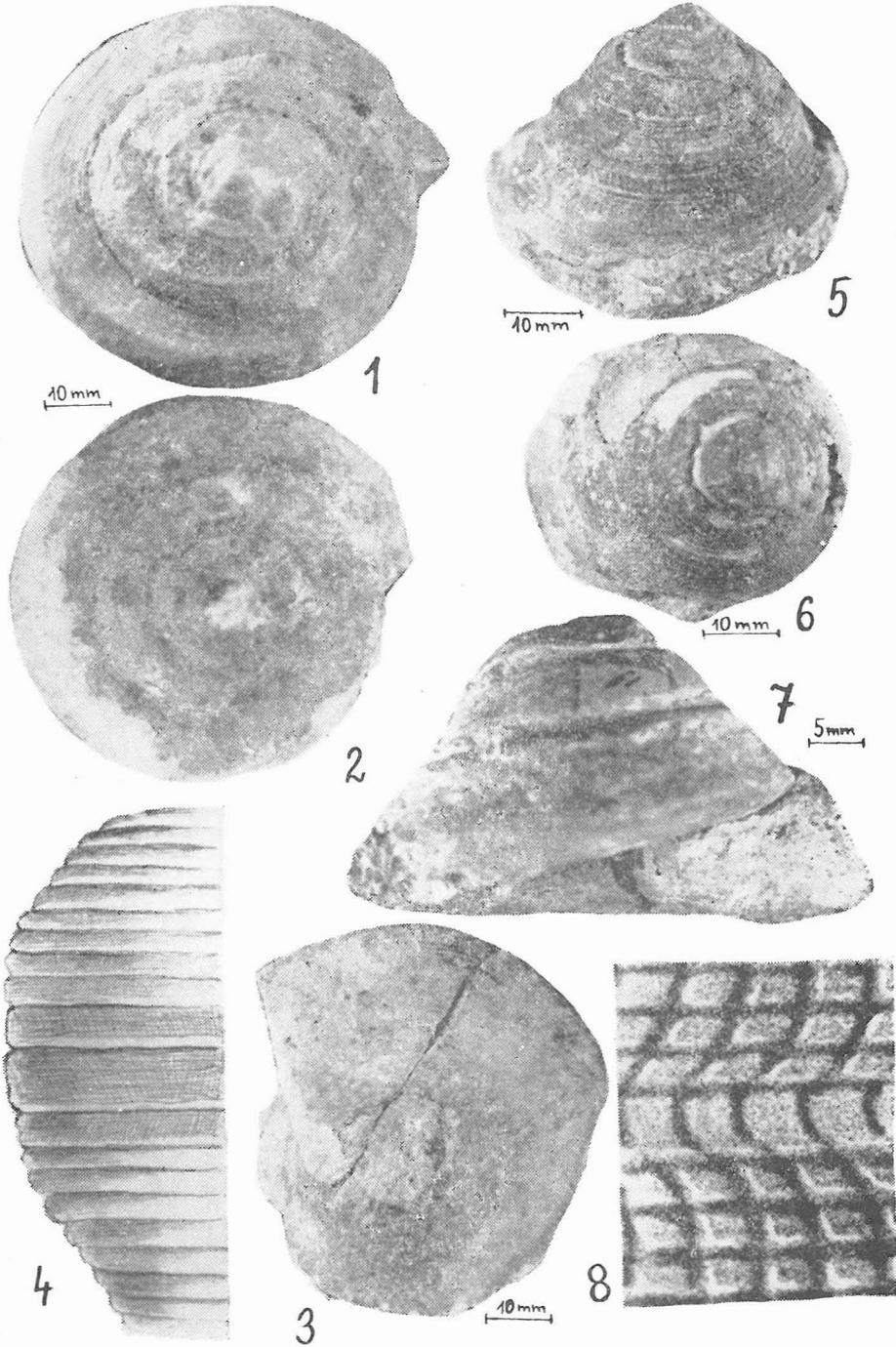
10mm

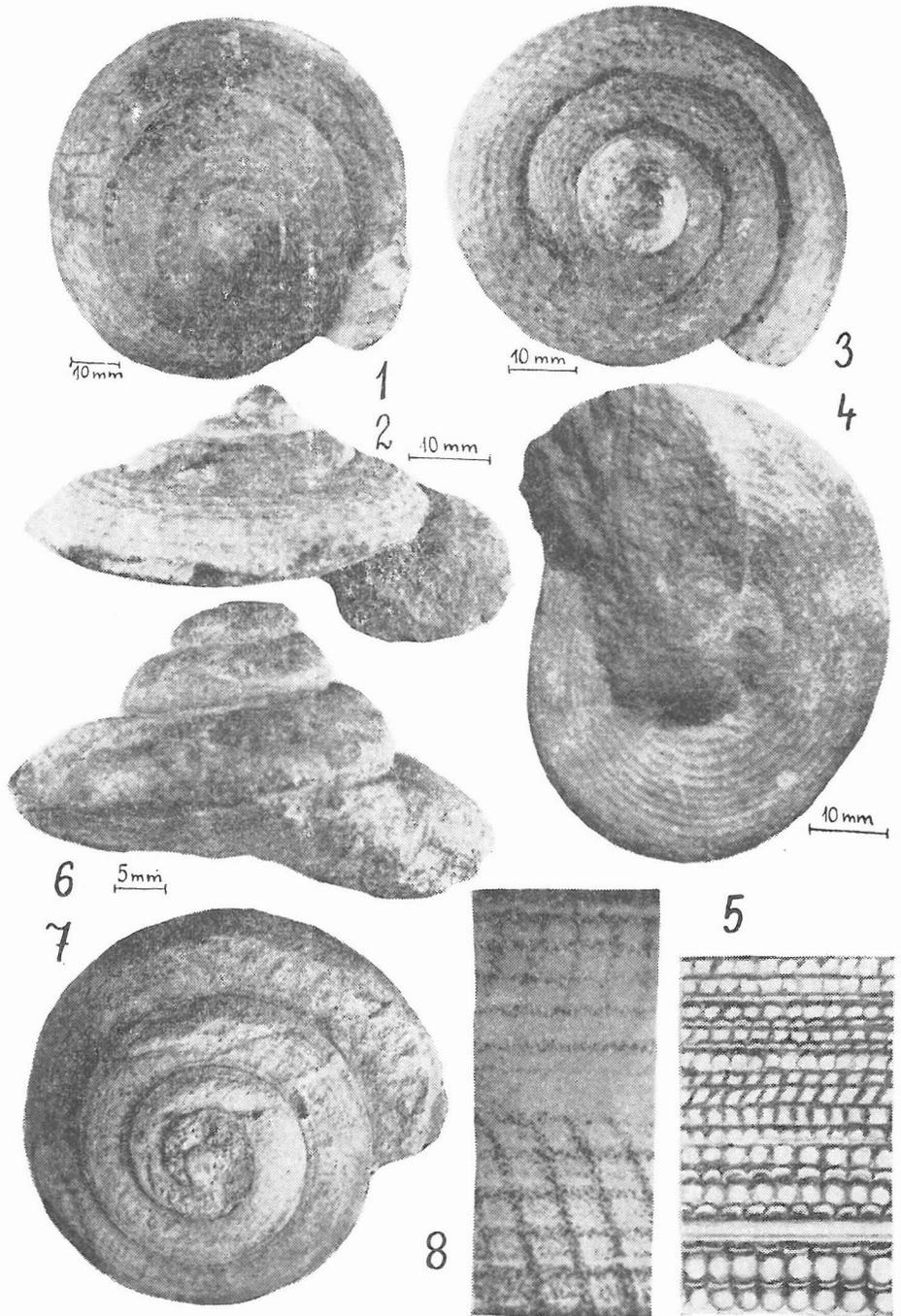


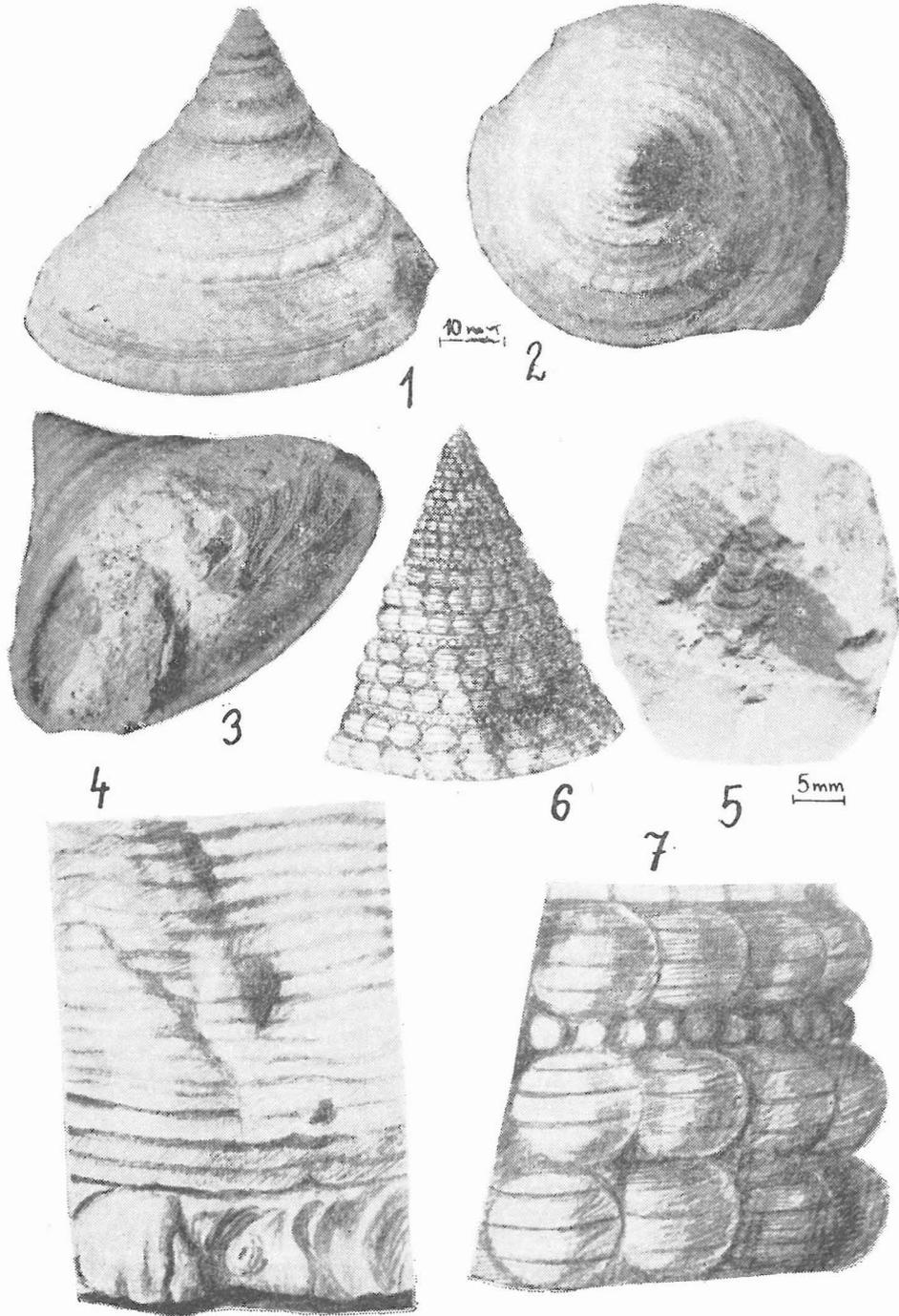
5

10mm









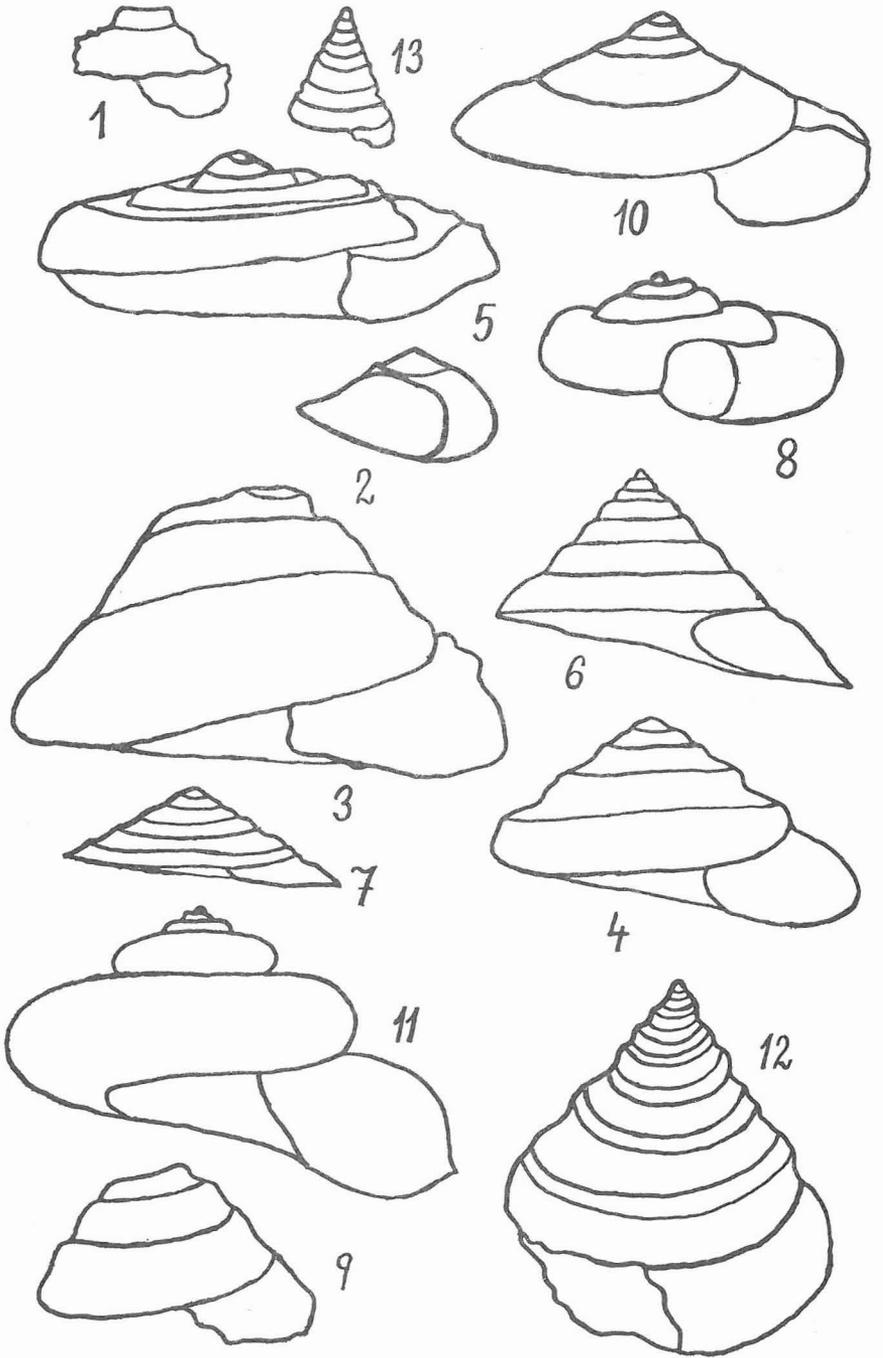


PLATE V.

- Fig. 1. *Leptomaria linearis* (MANTELL, 1822), Klokočské Loučky, Middle Turonian. NMP — No. O ?????? Coll. of V. Ziegler. Photo V. Ziegler
- Fig. 2. *Leptomaria linearis* (MANTELL, 1822), Hudcov, Upper Turonian. Coll. of the Museum Litoměřice. Photo V. Ziegler
- Fig. 3. *Leptomaria linearis* (MANTELL, 1822), Litoměřice, Upper Turonian. Coll. of the Museum Litoměřice — No. 3145. Photo V. Ziegler
- Fig. 4. *Leptomaria linearis* (MANTELL, 1822), Klokočské Loučky, Middle Turonian. NMP — No. Coll. of V. Ziegler. Detail of sculpture of dorsal part. Pict. V. Ziegler
- Figs. 5. *Leptomaria plauensis* (GEINITZ, 1857), Zbyslav, Lower Turonian.
- 6. NMP — No. 3589. Photo V. Ziegler
- Fig. 7. *Leptomaria plauensis* (GEINITZ, 1857), Kamajka, Lower Turonian. NMP — No. 3589. Photo V. Ziegler
- Fig. 8. *Leptomaria plauensis* (GEINITZ, 1857), Zbyslav, Lower Turonian. NMP — No. 3589. Detail of sculpture of dorsal part. Pict. V. Ziegler

PLATE VI.

- Figs. 1. *Leptomaria seriatogranulata* (GOLDFUSS, 1841), Bílá Hora, Lower Turonian.
- 2. NMP — No. 2167. Photo V. Ziegler
- Figs. 3. *Leptomaria seriatogranulata* (GOLDFUSS, 1841), Lenešice, Lower Turonian.
- 4. NMP — No. 4617 e. Photo V. Ziegler
- Fig. 1. *Leptomaria seriatogranulata* (GOLDFUSS, 1841), Bílá Hora, Lower Turonian. NMP — No. 2167. Detail of sculpture of dorsal part. Pict. V. Ziegler
- Figs. 6. *Leptomaria turbinoides* (d'ORBIGNY, 1842), Kolín, Upper Cenomanian.
- 7. NMP — without number. Photo V. Ziegler
- Fig. 8. *Leptomaria turbinoides* (d'ORBIGNY, 1842), Kolín, Upper Cenomanian. NMP — without number. Detail of sculpture of dorsal part. Pict. V. Ziegler

PLATE VII.

- Figs. 1. *Pyrgotrochus bohemicus* nov. spec., Písnik near Česká Lípa, Middle Turonian.
- 3. NMP — No. O 5155. Coll. of V. Ziegler. Holotype. Photo V. Šilhanová
- Fig. 4. *Pyrgotrochus bohemicus* nov. spec., Písnik near Česká Lípa, Middle Turonian. NMP — No. O 5155. Coll. of V. Ziegler. Detail of sculpture of dorsal part. Pict. V. Ziegler
- Fig. 5. *Pyrgotrochus conulus* (FRÍČ, 1879), Dřínov, Lower Turonian. NMP — without number. Photo V. Ziegler
- Fig. 6. *Pyrgotrochus conulus* (FRÍČ, 1879). Reconstruction of A. FRÍČ (1879)
- Fig. 7. *Pyrgotrochus conulus* (FRÍČ, 1879). Detail of sculpture of dorsal side (by A. FRÍČ, 1879)

PLATE VIII.

Shape of shells of pleurotomariid species on the Bohemian Cretaceous Basin.

- Fig. 1. *Pleurotomaria antiqua* (BINKHORST, 1861)
- Fig. 2. *Pleurotomaria friči* (WEINZETTL, 1910)
- Fig. 3. *Pleurotomaria geinitzi* (d'ORBIGNY, 1850)
- Fig. 4. *Pleurotomaria grata* spec. nov.
- Fig. 5. *Bathrotomaria perspectiva* (MANTELL, 1822)
- Fig. 6. *Conotomaria mailleana* (d'ORBIGNY, 1842)
- Fig. 7. *Conotomaria secans* (d'ORBIGNY, 1842)
- Fig. 8. *Leptomaria linearis* (MANTELL, 1822)
- Fig. 9. *Leptomaria plauensis* (GEINITZ, 1857)
- Fig. 10. *Leptomaria seriatogranulata* (GOLDFUSS, 1841)
- Fig. 11. *Leptomaria turbinoides* (d'ORBIGNY, 1842)
- Fig. 12. *Pyrgotrochus bohemicus* spec. nov.
- Fig. 13. *Pyrgotrochus conulus* (FRÍČ, 1879)

SBORNÍK NÁRODNÍHO MUZEA V PRAZE — ACTA MUSEI NATIONALIS PRAGAE

Volumen XXXIX B (1983), No. 4

Redaktor: Ing. JIŘÍ ČEJKA, CSc.

Cena tohoto čísla Kčs 6,—