

VIERA SCHEIBNEROVÁ¹SOME NEW INFORMATIONS ON THE CRETACEOUS OF THE
KLIPPEN BELT OF WEST CARPATHIANS

(Textfigs. 1—82)

Abstract. In paper is described recently found Coniacian microfauna from the Czorsztyn series. Critically are evaluated occurrences of the Coniacian quoted from various parts of the klippen belt by other authors with regard to the question of the so-called uninterrupted sedimentation between the Cenomanian (resp. Turonian) and Santonian. Described and figured are two new species, namely: *Planomalina puchovensis* n. sp., and *Globo truncana sigmoconcovata* n. sp., both from Coniacian of the klippen belt.

Introduction

During the years 1958—1962 the present author has made micropaleontological investigations in the klippen belt of West Carpathians in Považie, Orava, Pieňiny and Eastern Slovakia. Simultaneously was collected micropaleontological material from quite complete profiles of large klippens of the particular klippen series. Results of the study were published in the series of publications and some more recent results are in this paper.

In this paper I deal with the Cretaceous profile near Beňatina in Eastern Slovakia, which was studied by other authors, namely by E. Hanzlíková (unpublished, personal communication) and O. Samuel (1962).

In the Coniacian are described and figured all the species of the association. The microbiostratigraphy of the Coniacian on a whole is not sufficiently known and clear. However, the stratigraphy of this stage is of an extraordinarily importance in solution of tectonic and paleogeographic questions in the mediterranean region.

The author hopes, that it would represent a help for other authors studying similar problems in the mediterranean region.

*Some notes to the question of the Coniacian in the klippen belt
of West Carpathians*

Up to present some authors tried to prove the occurrence of the Coniacian on the basis of incomplete and non typical assemblages composed of *Globo truncanids* of the group *Globo truncana linneiana linneiana* (d'Orb.), (see for instance J. Salaj, 1961, p. 89) and on the other hand on the basis of the so called uninterrupted sedimentation between the Middle and Upper Cretaceous (O. Samuel, 1962, J. Salaj, 1961).

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I suggest that it is necessary to review critically the single data on the occurrence of the Coniacian in the klippen belt.

The first note on the presence of the Coniacian in the klippen belt we may find in the paper of V. Kantorová and A. Began (1958). These authors wrote about the possibility of the presence of the Coniacian in the vicinity of Pruské (Považie) on the basis of the species *Guembelina deflaensis* Sigal. Also in other papers we meet this species in the connection of the Coniacian question. Among others in the paper of J. Salaj (1961), who supposed the presence of this stage in the vicinity of Streženice near Púchov, in which he quotes that this species occurs in the Coniacian and Santonian of Brezovské pohorie. In the footnote he notes that J. Sigal (1955) „admits a possibility of the occurrence of this species also in the Santonian“. However, J. Sigal (1955) writes: „Ce Santonien pourrait débuter avec notre *Guembelina* (non *Ventilabrella*) *deflaensis* (environ $\frac{1}{4}$ supérieur de notre étage D de 1952 comme l'indique le texte p. 37, et non le tableau, par erreur de dessin).“ From the mentioned it is apparent, that *Guembelina deflaensis* Sigal occurred in the Coniacian by an omission during drawing of the stratigraphical table and in fact it represents Santonian species. Besides the mentioned authors, *Guembelina deflaensis* Sigal is regarded as Coniacian index fossil also by O. Samuel (1962) who made an attempt to prove an uninterrupted sedimentation between the Turonian and Upper Senonian in the klippen belt. O. Samuel (1962) describes the profile north of Beňatina in the Eastern Slovakia where crop out sediments in marly facies (Albian to Santonian, see p. 193). Without further explanation he uses for the sequence after Turonian the name Emscherian, with which the profile north of Beňatina ends as we may see also from his stratigraphical table. Lower Campanian red marls occur at the other locality, north east of Beňatina and the flysch Upper Campanian-Maastrichtian in the „vicinity of Beňatina and Podhorod“. Santonian in the mentioned profile does not occur. In accordance with the mentioned authors „sediments corresponding with the Lower Emscherian in comparison with beds below do not change either biofacially and their qualitative composition resembles microfossil assemblages of the Upper Turonian (see p. 159). In the Upper Emscherian described and figured species *Globotruncana ventricosa* White corresponds with *Praeglobotruncana hagni* Scheibnerová, described from the Middle Turonian of the Czorsztyn series. From other species O. Samuel (1962) listed *Globotruncana* cf. *concovata* (Brotzen), which he neither described, nor figured. At the other locality together with the „Upper Emscherian“ microfauna occurs *Sigalia deflaensis* (Sigal) which in accordance with recent knowledge is an index fossil of the Santonian. Finally, the microfauna quoted by O. Samuel (1962) is heterogenous, composed of stratigraphically indistinct species of the group *Globotruncana linneiana* (d'Orb.) and on the other hand of the Upper Senonian species: *Globotruncana subspinosa* Pessagno (which by Pessagno, 1962, represents Upper Campanian species) and *Globotruncana elevata* Dalbiez. Besides these species the mentioned author determined the species as follows: *Stensiöina praexsculpta* Brotzen (non Keller), *Stensiöina gracilis* Brotzen, *Stensiöina bohémica* Jírová, *Stensiöina* aff. *annae* Pozaryska, *Gyroidina praeglobosa* Brotzen, *Aragonia* cf. *ouzzanensis* (Rey). From the mentioned is clear that O. Samuel (1962) had neither uninterrupted sequence of the Middle and Upper Cretaceous, but nor the Coniacian and Santo-

nian. Campanian and Maastrichtian do not occur in the described profile, but only in the vicinity of Beňatina and Podhorod.

From the mentioned follows, that at any place in the klippen belt was not yet found the profile with uninterrupted sequence of the Middle and Upper Cretaceous, or Lower and Upper Cretaceous. Besides it, up to present quoted occurrence of the Coniacian did not contain the microfauna, typical for the Coniacian of the Téthys region.

Although it seems, that the microfauna of the Coniacian is up to present very little known and contains stratigraphically indistinct species, recently was found an outcrop near Púchov where occur two small klippen composed of the Coral limestones of the Trias (Carnian—Ladin), belonging probably to the Czorsztyn series. Immediately on the Triassic limestones lay yellow sandy marls in which was found very rich microfauna with the following species: *Ammodiscus* sp., *Trochamminoides* sp., *Triplasia murchisoni* Reuss, *Textularia foeda* Reuss, *Spiroplectamina praelonga* (Reuss), *Spiroplectamina baudouiniana* (d'Orb.), *Tritaxia pyramidata* Reuss, *Gaudryina rugosa* d'Orb., *Gaudryina pyramidata* Cushman, *Marssonella oxycona* (Reuss), *Sigmoilina* sp., *Nodosaria* sp., *Lenticulina* cf. *crepidula* (Ficht.-Moll), *Lenticulina jarvisi* (Cushman), *Lenticulina pseudosecans* (Cushman), *Lenticulina subalata* (Reuss), *Lenticulina orbicula* (Reuss), *Lenticulina* aff. *truncata* (Reuss), *Pseudoglandulina* sp. 1, *Pseudoglandulina* sp. 2, *Fronicularia goldfussi* Reuss, *?Stilostomella* sp., *Tappanina costifera* (Cushman), *Pleurostomella* sp., *Gyroidina nitida* (Reuss), *Gyroidina florealis* White, *Stensiöina* sp., *Anomalina ammonoides* (Reuss), *Shackoina* sp., *Planomalina ehrenbergi* Barr, *Planomalina aspera* (Ehrenberg), *Planomalina puchovensis* n. sp., *Rugoglobigerina kingi* Trujillo, *Praeglobotruncana imbricata* (Mornod), *Praeglobotruncana inornata* Bolli, *Praeglobotruncana* sp., *Globotruncana linneiana linneiana* (d'Orb.), *Globotruncana linneiana tricarinata* (Quereau), *Globotruncana sigali* Reichel, *Globotruncana spinea* Kikoïne, *Globotruncana concavata concavata* (Brotzen), *Globotruncana concavata primitiva* Dalbiez, *Globotruncana sigmoconcavata* n. sp., *Globotruncana schneegansi* Sigal, *Globorotalites micheliniana* (d'Orb.), *Heterohelix globulosa* (Ehrenberg), *Gabonella levis* Klasz, Marie, Rérat and *?Siderolites* sp.

From these species *Globotruncana concavata primitiva* Dalbiez, *Globotruncana spinea* Kikoïne and *Gabonella levis* Klasz, Marie, Rérat are known only from the Coniacian of the mediterranean province. *Globotruncana concavata carinata* Dalbiez, characteristic for the Santonian was not yet found in West Carpathians.

In the Pieniny klippen belt in Poland sediments with a microfauna of the Upper Turonian-Coniacian were described by M. Książkiewicz (1958). Recently S. W. Alexandrowicz, K. Birkenmajer and S. Geroch (1962) described the occurrence of the Coniacian in the Pieniny klippen belt. The mentioned authors studied 10 samples (from the collection of 25 samples), collected from various localities in Pieniny Mountains. In the Upper Turonian-Coniacian they list these Foraminifera: *Globotruncana* ex gr. *lapparenti* Brotzen, *Globotruncana marginata* (Reuss), *Stensiöina praeexsculpta* (Keller), *Stensiöina exsculpta* (Reuss), *Ventilabrella deflaensis* (Sigal), *Gaudryina rugosa* d'Orb., *Gaudryina pyramidata* Cushman, *Clavulinoides* cf. *amorphus* Cushman, *Dorothia trochoides* (Marsson), *Ammodiscus incertus*

(d'O r b.), *Recurvoides* sp., *Pleurostomella* sp., *Lenticulina* sp. and *Parella* sp. Unfortunately the authors did not give any conclusions about the stratigraphical and tectonical position of beds bearing the mentioned microfauna.

Conclusions

Significance of this found of Coniacian in the klippen belt is in possibility of new ideas of existence and age of folding during the Middle Cretaceous in the klippen belt. As it seems, on the basis of the facts found here and in many other places in the klippen belt, on klippens of the Czorsztyń series type or of the cordillery type on a whole, to which most probably belongs the klippen near Púchov, lay various transgressive members of the Cretaceous beginning with the Albian. The Coniacian of the klippen near Púchov lay to all appearance transgressively and so that it would represent the youngest member of the transgressive sequences of the Cretaceous. Since the klippen is surrounded by the Albian of the Manín (or Klape) series, we may suppose, that the folding was after the Coniacian. Naturally, it is clear, that this first found of sure Coniacian sequence in the klippen belt allows also other new interpretations.

SYSTEMATIC DESCRIPTION

Family Ammodiscidae

Genus *Ammodiscus* Reuss, 1862

Ammodiscus sp.

Textfig. 1

This species of the genus *Ammodiscus* is represented by the only one specimen, quite badly preserved. Any other specimens were not found in the studied samples. KPUK 0742.

Family Lituolidae

Genus *Trochamminoides* Cushman, 1910

Trochamminoides sp.

Textfigs. 2, 3

This genus is represented by two specimens of probably two different, unfortunately indeterminable species. One of specimens has planispirally coiled test, laterally strongly compressed, with 6 chambers. Chambers on both the sides concave. The chambers are overlapping. Aperture is on the basis of the last chamber. The wall is sandy, coarse-grained. Diameter: 0,5 mm, thickness: 0,2 mm.

The second specimen is planispirally coiled, strongly compressed laterally, with 5 chambers compressed from both the sides. The chambers are lesser overlapping than in the first described specimen. KPUK 0744. Diameter: 0,425 mm.



Fig. 1. *Ammodiscus* sp.,
locality of the Coniacian marls near Púchov.
KPUK 0742.

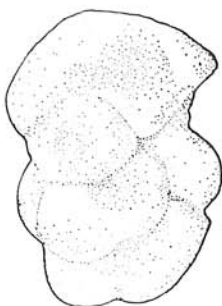


Fig. 2. *Trochamminoides*
sp. 1. KPUK 0744.

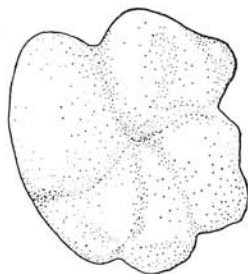


Fig. 3. *Trochamminoides*
sp. 2. KPUK 0744.

Genus *Triplasia* Reuss, 1854

Triplasia purchisoni Reuss, 1854

Textfig. 4

1854 *Triplasia Murchisoni* m, Reuss, Beiträge zur Charakteristik der Kreidenschichten in den Ostalpen. Dksch. Ak. Wiss. Wien, m.-n. Kl. 7, p. 65, Pl. 25, Fig. 1, 2 (fide A. Tollmann, 1960, p. 153).

1955 *Triplasia purchisoni*, Bartenstein, p. 173, Pl. 20, Fig. 6, 7a, b, 8.

1960 *Triplasia purchisoni*, Tollmann, p. 153–154, Pl. 7, Fig. 9; Pl. 8, Fig. 1–3.

Description of the test. Test free, uniserial, in cross-section triangular or quadrangular, sometimes strongly elongated. Aperture terminal, oval or rounded, sometimes with a short neck. Surface of the test smooth, fine-grained with rounded edges. In the studied material the prevailing part of specimens was with triangular cross-section. KPUK 0706. Length: 0,425 mm, width: 0,5 mm.

Stratigraphical distribution: this species is very common in the Middle and especially Upper Cretaceous of the klippen belt of West Carpathians.

Family Textulariidae

Genus *Textularia* De France, 1824

Textularia foeda Reuss, 1846

Textfig. 5a, b

1946 *Textularia foeda*, Reuss, Die Versteinerungen der böhmischen Kreidformation, Stuttgart, E. Schweizerbart, Abth. 2, p. 109, Pl. 43, Fig. 12a, b, 13 (fide Ellis-Messina, Catalogue of Foraminifera).

1928 *Textularia foeda*, Franke, p. 133, Pl. 12, Fig. 6.

1960 *Gaudryina foeda*, Trujillo, p. 307–308, Pl. 44, Fig. 7a, b.

1961 *Textularia foeda*, Scheibnerová, p. 33, Pl. 1, Fig. 7a, b.

Description of the test. Test free, biserial, strongly elongated, straight or slightly curved. The wall quite coarsely-grained. The chambers only slightly inflated, so that all the test is from the both sides moderately compressed.

Sutures straight or slightly curved. Aperture on the basis of the last chamber. KPUK 0751.

Stratigraphical distribution: this species occurs in the Middle and Upper Cretaceous of the klippen belt of West Carpathians.

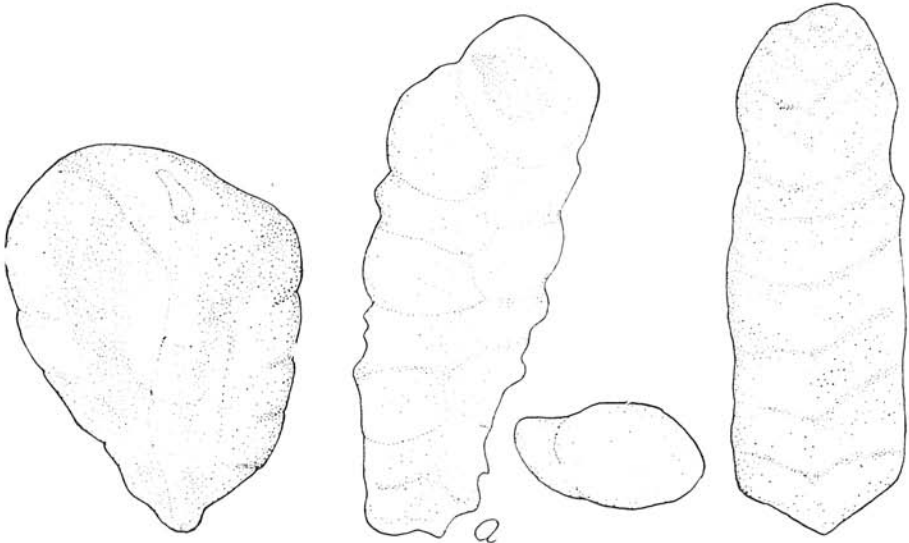


Fig. 4. *Triplasia murchisoni* Reuss, KPUK 0706.

Fig. 5. *Textularia foeda* Reuss, a — frontal view, b — view from above. KPUK 0751.

Fig. 6. *Spiroplectammina praelonga* (Reuss). KPUK 0793.

Genus *Spiroplectammina* Cushman, 1927
Spiroplectammina praelonga (Reuss, 1845)
 Textfig. 6

1845 *Textularia praelonga*, Reuss, Die Versteinerungen der böhmischen Kreideformation, Stuttgart, p. 39, Pl. 12, Fig. 14a—c (fide A. Tollmann, p. 154).

1928 *Spiroplectammina praelonga*, Franke, p. 149, Pl. 13, Fig. 20.

1960 *Spiroplectammina praelonga*, Tollmann, p. 154—155, Pl. 9, Fig. 1—3.

Description of the test. Test free, planispiral at the beginning, later biserial, strongly elongated, from both the sides compressed. Sutures indistinct, almost straight. KPUK 0793.

Measurements: length: 0,925 mm, width: 0,325 mm.

Stratigraphical distribution. In the studied region it occurs in abundance in the Middle Cretaceous.

Spiroplectammina baudouiniana (d'Orb., 1840)
 Textfig. 7

1840 *Textularia Baudouiniana*, d'Orbigny, Mém. sur les foraminifères de la

craie blanche du bassin du Paris. Mém. Soc. Géol. Fr., Sér. 1, vol. 4, Paris, p. 46, Pl. 4, Fig. 29, 30 (fide A. Tollmann, 1960, p. 155).

1928 *Textularia baudouiniana*, Franke, p. 135, Pl. 12, Fig. 12a, b.

1941 *Textularia Baudouiniana*, Marie, p. 63, Pl. 2, Fig. 28a, b.

1960 *Spiroplectammina baudouiniana*, Tollmann, p. 155–156, Pl. 9, Fig. 4–5.

Description of the test. Test free, at the beginning planispiral, later biserial, from both the sides compressed, only slightly elongated. An outline almost triangular. KPUK 0788.

Measurements: length: 0,550 mm, width: 0,300 mm.

Stratigraphical distribution: in the studied region this species occurs in the Middle Cretaceous.

Family Verneulinidae

Genus *Tritaxia* Reuss, 1860

Tritaxia pyramidata Reuss, 1862

Textfig. 8

1862 *Tritaxia pyramidata*, Reuss, Foraminiferen des norddeutschen Hils u. Gault. Sitzungsab. K. Ak. Wiss., Bd. 40, Wien, Pl. 1, Fig. 9 (fide Ellis-Messina, Catalogue of Foraminifera).

1928 *Tritaxia pyramidata*, Franke, p. 138, Pl. 12, Fig. 18a–c.

1961 *Tritaxia pyramidata*, Scheibnerová, p. 34–35, Pl. 1, Fig. 9a, b.

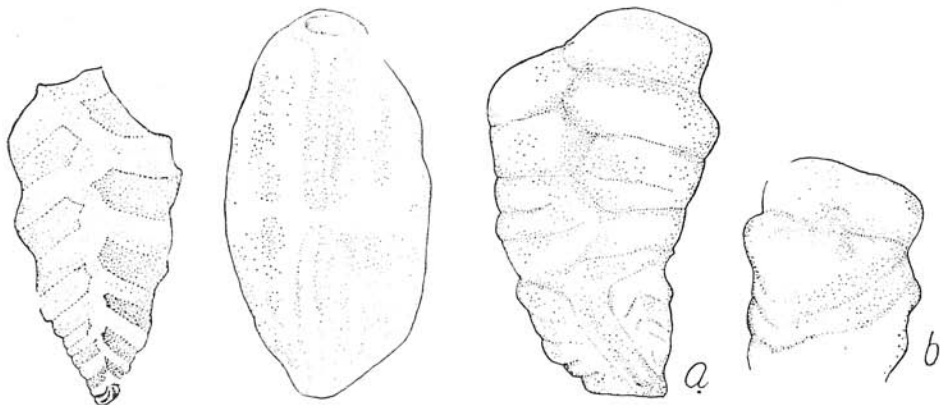


Fig. 7. *Spiroplectammina baudouiniana* (d'Orb.). KPUK 0788.

Fig. 8. *Tritaxia pyramidata* Reuss. KPUK 0727.

Fig. 9. *Gaudryina rugosa* d'Orb., a — lateral view, b — apertural view. KPUP 0762.

Description of the test: the test triserial with 1–2 last chambers uniserial. An outline of the test elongated, triserial with distinct edges and slightly concave walls. The cross-section triangular. Chambers flattened. Aperture terminal, rounded with distinct neck. Wall coarse-grained. KPUK 0727.

Measurements: length: 0,975 mm; breadth: 0,550 mm.

Stratigraphical distribution: in the studied region this species occurs in the Middle and Upper Cretaceous, sometimes in abundance.

Genus *Gaudryina* d'Orbigny, 1839

Gaudryina rugosa d'Orbigny, 1840

Textfig. 9a, b

- 1840 *Gaudryina rugosa*, d'Orbigny, Mém. sur les foraminifères de la craie blanche du bassin du Paris. Mém. Soc. Géol. Fr., Sér. 1, vol. 4, Paris, p. 44, Pl. 4, Fig. 20, 21 (fide A. Tollmann, 1960, p. 158).
 1928 *Gaudryina rugosa*, Franke, p. 141, Pl. 13, Fig. 30–37.
 1941 *Gaudryina rugosa*, Marie, p. 65, Pl. 2, Fig. 22–23.
 1953 *Gaudryina rugosa*, Hagn, p. 14, Pl. 1, Fig. 14.
 1960 *Gaudryina rugosa*, Tollmann, p. 158–159, Pl. 9, Fig. 12.

Description of the test: test triserial, later biserial, slightly elongated, slender, triangular. Sutures straight, distinct. Aperture on the basis of the last chamber. KPUK 0762.

Measurements: length: 0,625 mm, breadth: 0,375 mm.

Stratigraphical distribution: in the studied region this species occurs in the Middle and Upper Cretaceous.

Gaudryina pyramidata Cushman, 1926

Textfig. 10a, b

- 1926 *Gaudryina laevigata* Franke var. *pyramidata* Cushman, Bull. Amer. Ass. Petrol. Geol. 10, p. 587, Pl. 16, Fig. 8a, b.
 1956 *Gaudryina pyramidata*, Said et Kenawy, p. 124, Pl. 1, Fig. 26.
 1960 *Gaudryina pyramidata*, Trujillo, p. 308, Pl. 44, Fig. 9a–c.
 1960 *Gaudryina pyramidata*, Tollmann, p. 157–158, Pl. 9, Fig. 10–11.

Description of the test: the test is somewhat longer than broad, triangular, The chambers distinct, slightly inflated. Initial portion triserial, final portion biserial. Sutures distinct, slightly depressed. The wall arenaceous, smooth. The aperture on the inner margin of the last chamber. KPUK 0718.

Measurements: length: 0,500 mm, breadth: 0,375 mm.

Stratigraphical distribution: in the studied region this species is very characteristic for the Middle and Upper Cretaceous.

Family Valvulinidae

Genus *Marssonella* Cushman, 1933

Marssonella oxycona (Reuss, 1860)

Textfig. 11

- 1860 *Gaudryina oxycona*, Reuss, Die Foraminiferen der westfälischen Kreideformation. Sber. Ak. Wiss. Wien, m.-n. Kl., Abt. 1, 40 Bd., Wien, p. 229, Pl. 12, Fig. 3 (fide A. Tollmann, 1960, p. 160).
 1928 *Gaudryina oxycona*, Franke, p. 143, Pl. 13, Fig. 8a, b.
 1951 *Marssonella oxycona*, Noth, p. 38.
 1953 *Marssonella oxycona*, Hagn, p. 23, Pl. 1, Fig. 28.
 1960 *Dorothia oxycona*, Trujillo, p. 309–310, Pl. 44, Fig. 5a, b.
 1960 *Marssonella oxycona*, Tollmann, p. 160, Pl. 10, Fig. 3.
 1961 *Marssonella oxycona*, Scheibnerová, p. 35–36, Pl. 2, Fig. 2a, b.

Description of the test: the shape of the test conical, oval in transverse section. The initial end pointed and apertural end truncate. Chambers low, increasing slowly in height. Initially there are four to five chambers per whorl, later three and finally the test is biserial. Sutures horizontal, the wall arenaceous, smooth. Aperture on the basis of the last chamber. KPUK 0764.

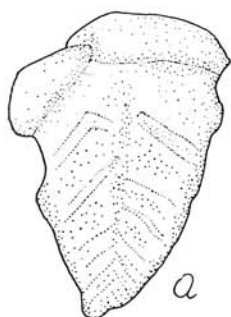


Fig. 10. *Gaudryina pyramidata* Cushman,
a — lateral view, b — apertural view.
KPUK 0718.



Fig. 11. *Marssonella oxycona*
(Reuss). KPUK 0764.

Measurements: length: 0,47 mm, thickness: 0,275 mm.

Stratigraphical distribution: the species is widely distributed in Lower to Upper Cretaceous of the studied region.

Family Miliolidae

Genus *Quinqueloculina* d'Orbigny, 1826

Quinqueloculina sp.

Textfig. 12

Description of the test: from two specimens one is quite well preserved, but as species underminable. The specimens carries the features of the genus *Quinqueloculina*, i. e. it is coiled in five plains. The shape is oval, with subacute edges. Sutures are quite indistinct, not deeply depressed. The aperture terminal, rounded, the tooth indistinct. KPUK 0725.

Measurements: length: 0,287 mm, breadth: 0,175 mm.

Stratigraphical distribution: the species was found in the Coniacian of the klippen belt of West Carpathians.

Family Nodosariidae

Genus *Nodosaria* Lamarck, 1816

Nodosaria sp.

Textfig. 13

Description of the test: the test composed of three inflated chambers, from which two first are almost globular and the last one strongly elongated. Sutures distinct, depressed, surface smooth. Aperture terminal, radial. In the studied samples was found only this one specimen. KPUK 0722.

Measurements: length: 0,8 mm, thickness: 0,35 mm.

Stratigraphical distribution: in the studied region this specimen was found in the Coniacian.

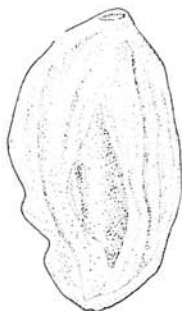


Fig. 12. *Quinqueloculina* sp. KPUK 0725. Fig. 13. *Nodosaria* sp. KPUK 0722.

Genus *Lenticulina* Lamarck, 1804

Lenticulina pseudo-secans (Cushman, 1938)

Textfig. 14a, b

1938 *Robulus pseudo-secans*, Cushman, Cushman, Contr. Foram. Res., v. 14, p. 32, Pl. 5, Fig. 3 (fide Trujillo, 1960, p. 314).

1960 *Lenticulina pseudo-secans*, Trujillo, p. 314, Pl. 45, Fig. 5a, b.

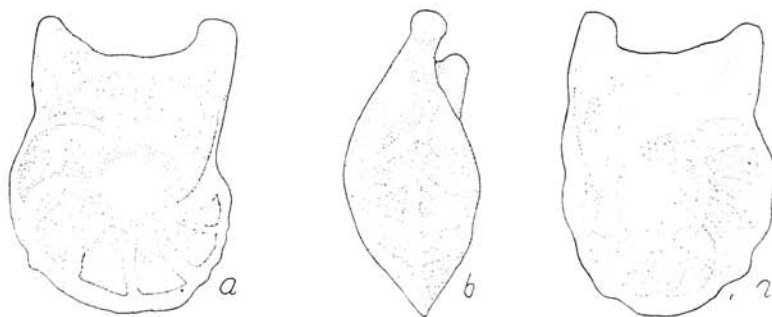


Fig. 14. *Lenticulina pseudo-secans* (Cushman), a — side view, b — apertural view. KPUK 0760.

Description of the test: the shape of the test is strongly umbonate with acute and keeled periphery. There are eight to nine quite distinct chambers in the adult coil. Sutures distinct, raised, straight or slightly curved. Wall is smooth. The aperture radiate, on the neck. Figured specimen anomalous, with two necks with apertures. KPUK 0760.

Measurements: diameter: 0,650 (0,575) mm, thickness: 0,337 mm.

Stratigraphical distribution: the species up to present known only from the Coniacian of the klippen belt of West Carpathians.

Lenticulina crepidula (Fichtel et Moll, 1798)
Textfig. 15a, b

1798 *Nautilus crepidula*, Fichtel et Moll, *Tesaceogr. microscopica*, Wien, p. 65, Pl. 19, Fig. g—i (fide A. Tollmann, 1960, p. 169).

non 1951 *Lenticulina (Astacolus) crepidulus*, Noth, Pl. 4, Fig. 21.

1960 *Astacolus crepidula*, Tollmann, p. 169, Pl. 13, Fig. 7.

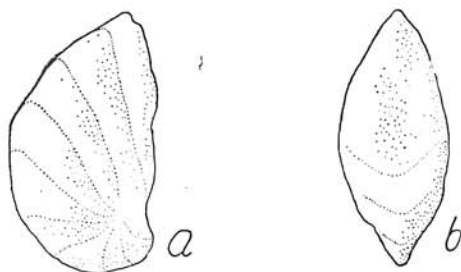


Fig. 15. *Lenticulina crepidula* (Fichtel and Moll), a — side view, b — apertural view. KPUK 0780.

Description of the test: test small, elongated, planispirally coiled. Chambers broad, from both the sides compressed. Periphery slightly rounded. The aperture at the peripheral part of the last chamber. 8—9 chambers in the last whorl. Surface smooth. KPUK 0708.

Measurements: longer diameter; 0,4 mm, shorter diameter: 0,25 mm, thickness: 0,2 mm.

Stratigraphical distribution: the species was found up to present only in the Coniacian of the klippen belt of West Carpathians.

Lenticulina jarvisi (Cushman, 1938)
Textfig. 16

1938 *Marginulina jarvisi*, Cushman, *Cushm. Lab. Foram. Res. Contr.* vol. 14, p. 35, Pl. 5, Figs. 17, 18 (fide Trujillo, 1960, p. 317).

non 1936 *Astacolus jarvisi*, Brotzen, p. 56, Pl. 3, Figs. 5—7.

1960 *Astacolus jarvisi*, Trujillo, p. 317, Pl. 46, Fig. 2a, b.

Description of the test: the shape of the test elongated, compressed. Earlier portion coiled, later uncoiling, with a slightly concave ventral margin, a convex dorsal margin and rounded periphery. The chambers are distinct. Sutures distinct, slightly limbate, not raised and somewhat curved. Aperture is at the peripheral angle, radiate. KPUK 0724.

Measurements: longer diameter: 0,775 mm, shorter diameter: 0,325 mm, thickness: 0,160 mm.

Stratigraphical distribution: in the studied region was found in the Coniacian of the klippen belt.

Lenticulina subalata (Reuss, 1854)

Textfig. 17a, b.

- 1854 *Cristellaria subalata*, Reuss, Beiträge zur Charakteristik der Kreidenschichten in den Ostalpen. Dksch. Ak. Wiss. Wien, m.-n. Kl. 7, p. 68, Pl. 25, Fig. 13 (fide A. Tollmann, p. 164).
 1950 *Cristellaria (Lenticulina) subalata*, Ten Dam, p. 21, Pl. 2, Fig. 1.
 1951 *Lenticulina (Lenticulina) subalata*, Bartenstein-Brand, p. 283, Pl. 5, Fig. 112, 113.
 1951 *Lenticulina (Robulus) subalata* (non Reuss) Franke, Noth, p. 40, Pl. 1, Fig. 34a-c.
 1953 *Lenticulina subalata*, Hagn, p. 37, Pl. 3, Fig. 8.
 1960 *Robulus subalatus*, Tollmann, p. 164-165, Pl. 11, Fig. 3.

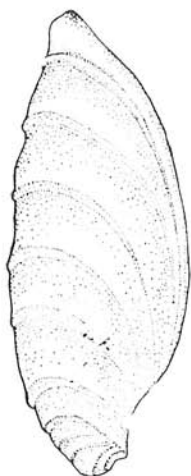


Fig. 16. *Lenticulina jarvisi* (Cushman).
KPUK 0724.

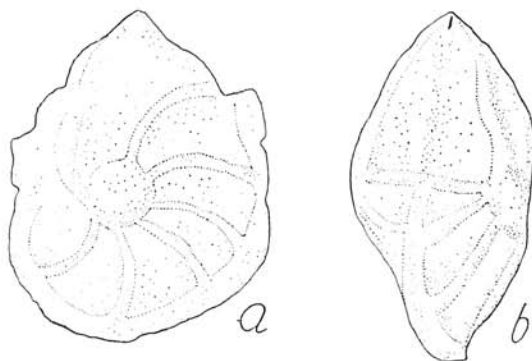


Fig. 17. *Lenticulina subalata* (Reuss). a — side view, b — apertural view. KPUK 0708.

Description of the test: the shape rounded, strongly umbonate, with sharp, keeled periphery. Sutures distinct, curved. The aperture at the peripheral portion of the last chamber. Surface smooth.

Measurements: longer diameter: 0,575 mm, shorter diameter: 0,4 mm, thickness: 0,3 mm.

Stratigraphical distribution: the species occurs in the klippen belt of West Carpathians in the Jurassic, Lower, Middle and Upper Cretaceous. KPUK 0708.

Lenticulina aff. *truncata* (Reuss, 1950)

Textfig. 18a, b

- 1850 *Cristellaria truncata*, Reuss, Die Foraminiferen und Entomostraceen des Kreidemergels von Lemberg. Haiding. natw. Abh. 4, Wien, p. 32, Pl. 2, Fig. 8a, b (fide A. Tollmann, p. 165).

1928 *Cristellaria gibba* d'Orb. f. *truncata* Reuss, Franke, p. 106, Pl. 9, Fig. 24a, b.

1953 *Lenticulina* cf. *truncata* Hagn, p. 37, Pl. 3, Fig. 7.

1960 *Robulus* cf. *truncatus*, Tollmann, p. 165, Pl. 11, Fig. 4-5.

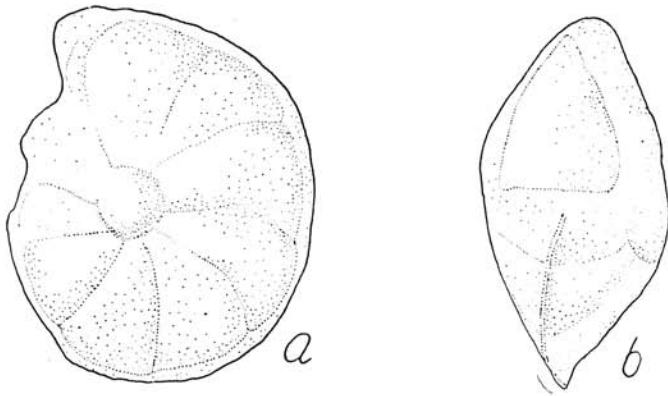


Fig. 18. *Lenticulina* aff. *truncata* (Reuss). a - side view, b - apertural view. KPUK 0708.

Description of the test: planispirally coiled, slightly elongated test with acute, sometimes keeled periphery and smooth surface. In the last whorl 8-10 chambers. Sutures slightly curved, distinct.

Measurements: longer diameter: 0,67 mm, shorter diameter: 0,525 mm, thickness: 0,3 mm.

Stratigraphical distribution: in the klippen belt the species is known up to present only from the Coniacian.

Lenticulina orbicula (Reuss, 1854)

Textfig. 19a, b

1854 *Cristellaria orbicula*, Reuss, Beiträge der Charakteristik der Kreideschichten in den Ostalpen. Dksch. Ak. Wiss. Wien, m.-n. Kl. 7, Wien, p. 68, Pl. 25, Fig. 12a, b.

1960 *Robulus orbiculus*, Tollmann, p. 164, Pl. 11, Fig. 2.

Description of the test: the shape of the test rounded, umbonate, with 10-12 chambers in the last whorl. Sutures indistinct. Surface smooth. Aperture at the peripheral end of the last chamber.

Measurements: longer diameter: 0,75 mm, shorter diameter: 0,65 mm, thickness: 0,4 mm.

Stratigraphical distribution: in the klippen belt the species was found up to present only in the Coniacian. KPUK 0708.

Genus *Pseudoglandulina* Cushman, 1929

Pseudoglandulina sp. 1

Textfig. 20a, b

Test elongate, composed of three chambers elongated in shape. Surface smooth

sutures depressed, horizontal; the aperture terminal, rounded. In the studied samples was found the only one specimen. KPUK 0732.

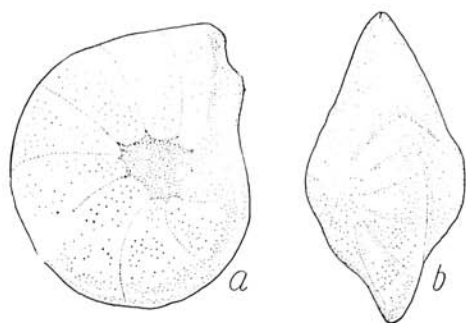


Fig. 19. *Lenticulina orbicula* (Reuss),
a - side view, b - apertural view.
KPUK 0708.

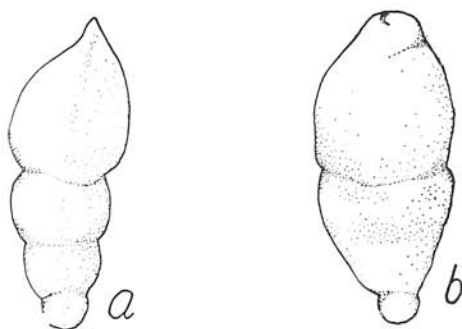


Fig. 20. *Pseudoglandulina* sp. 1,
a - lateral view,
b - apertural view. KPUK 0732.

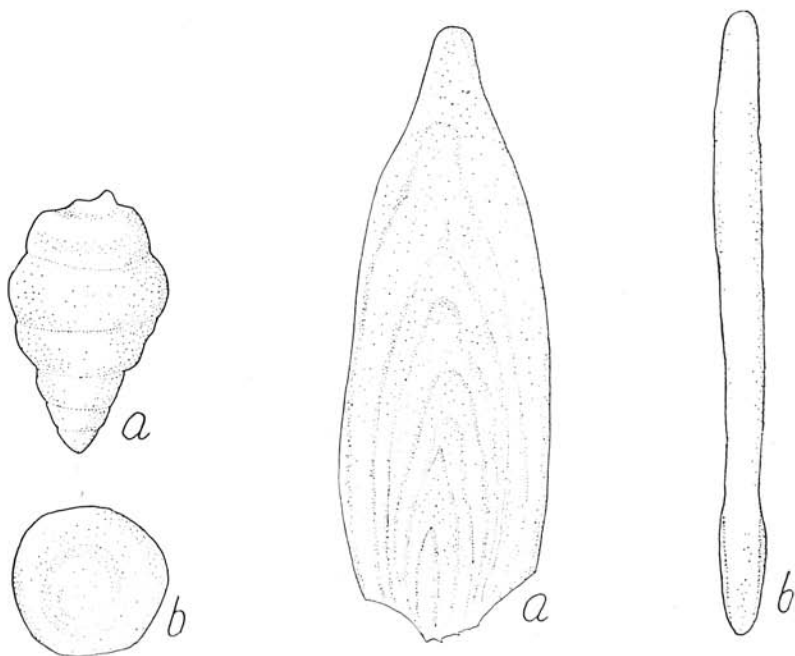


Fig. 21. *Pseudoglandulina* sp. 2, a - lateral view, b - apertural view,
KPUK 0743.

Fig. 22. *Frondicularia goldfussi* Reuss,
a - lateral view, b - apertural view.
KPUK 0738.

Pseudoglandulina sp. 2

Textfig. 21a, b

The test elongate, uniserial, composed of six broad chambers with smooth surface. The fifth chamber most broad, the earlier portion pointed. The aperture terminal, indistinct. In the studied samples was found the only one, here figured specimen. KPUK 0743.

Genus *Frondicularia* De France, 1824*Frondicularia goldfussi* Reuss, 1860

Textfig. 22a, b

1860 *Frondicularia Goldfussi*, Reuss, Die Foraminiferen der westfälischen Kreideformation. Sb. Ak. Wiss. Wien, m.-n. Kl., Abt. 1, 44, Wien, p. 48, Pl. 4, Fig. 7 (fide A. Tollmann, 1960, p. 174).

1953 *Frondicularia goldfussi*, Hagn, p. 63, Pl. 5, Fig. 4.

1957 *Frondicularia goldfussi*, Pozaryska, p. 143, Pl. 22, Fig. 4, Pl. 25, Fig. 3.

1960 *Frondicularia goldfussi*, Tollmann, p. 174, Pl. 15, Figs. 2, 3.

Description of the test: the shape of the test oval, elongated, slender. From both sides compressed. KPUK 0738.

Measurements: length: 1,375 mm, thickness: 0,05 mm; breadth: 0,5 mm.

Stratigraphical distribution: the species was found up to present only in the Coniacian of the klippen belt of West Carpathians.

Family Buliminidae

Genus *Stilostomella* Guppy, 1894? *Stilostomella* sp.

Textfig. 23a, b

The shape of the test elongated, uniserial. The test composed of six chambers with smooth surface. Sutures distinct, horizontal. The aperture subterminal, nearly triangular, or kidney-shaped. In the studied samples was found only here figured specimen. KPUK 0734.

Genus *Tappanina* Montanaro Gallitelli, 1955*Tappanina costifera* (Cushman, 1937)

Textfig. 24–25a, b

1937 *Bolivinita costifera* n. sp., Cushman, A few new species of American Cretaceous foraminifera. Contr. Cushman Lab. Foram. Res., Sharon, v. 13, p. 4, p. 105, Pl. 15, Fig. 15a, b (fide Ellis–Messina, Catalogue of Foraminifera).

1956 *Tappanina costifera*, Montanaro–Gallitelli, Pl. 7, Figs. 5–7.

Description of the test: test biserial, in microsphaerical specimens slender, in macrosphaerical ones broadly triangular. Faces generally concave and horizontally carinate. Chambers quite distinct 11–14 in number, increasing gradually in size. Sutures deep, narrow, lesser distinct in the adult stages. Carinae are horizontal or arched or irregularly undulate. They are absent in the earliest stage. Final chamber more or less inflated. Aperture narrow, at the base of the final chamber. KPUK 0749.

Measurements: length: 0,2 (0,3) mm, thickness: 0,1 mm.

Stratigraphical distribution: the species was found in the Coniacian of the klippen belt.

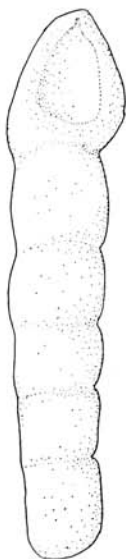


Fig. 23. ?*Stilostomella* sp. KPUK 0734.

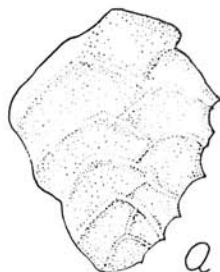
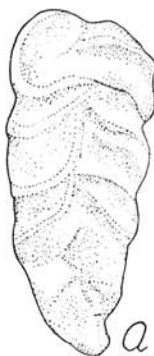


Fig. 24–25. *Tappanina costifera* (Cushman), a — lateral view, b — apertural view. KPUK 0749.

Family Ellipsoidinidae

Genus *Pleurostomella* Reuss, 1860

Pleurostomella sp.

Textfig. 26

The test elongated, biserial with tendency to uniserial shape. The chambers are alternated themselves. Aperture subterminal, arched. In the studied samples was found only this specimen, described and figured here. KPUK 0755.

Measurements: length: 0,425 mm, thickness: 0,22 mm.

Stratigraphical occurrence: in the studied region the species was found only in the Coniacian, klippen belt.

Family Discorbidae

Genus *Gyroidina* d'Orbigny, 1826

Gyroidina nitida (Reuss, 1846)

Textfigs. 27–28a–c

1846 *Rotalia nitida*, Reuss, Die Versteinerungen der Böhmisches Kreideformation Stuttgart, Bd. 34, Pl. 8, Fig. 52, Pl. 13, Fig. 8, 20 (fide Brotzen, 1936, p. 157).

- 1928 *Rotalia soldani* f. *nitida*, Franke, p. 187, Pl. 18, Fig. 1.
 1936 *Gyroidina nitida*, Brotzen, p. 157, Pl. 11, Fig. 3a-c, Textfig. 58.
 1953 *Gyroidina nitida*, Hagn, p. 86, Pl. 7, Fig. 17.
 1960 *Gyroidina nitida*, Trujillo, p. 331-332, Pl. 48, Fig. 2a-c.
 1960 *Gyroidinoides nitida*, Tollmann, p. 186-187, Pl. 19, Fig. 2.
 1961 *Gyroidina nitida*, Scheibnerová, p. 48, Pl. 5, Fig. 3a-c.

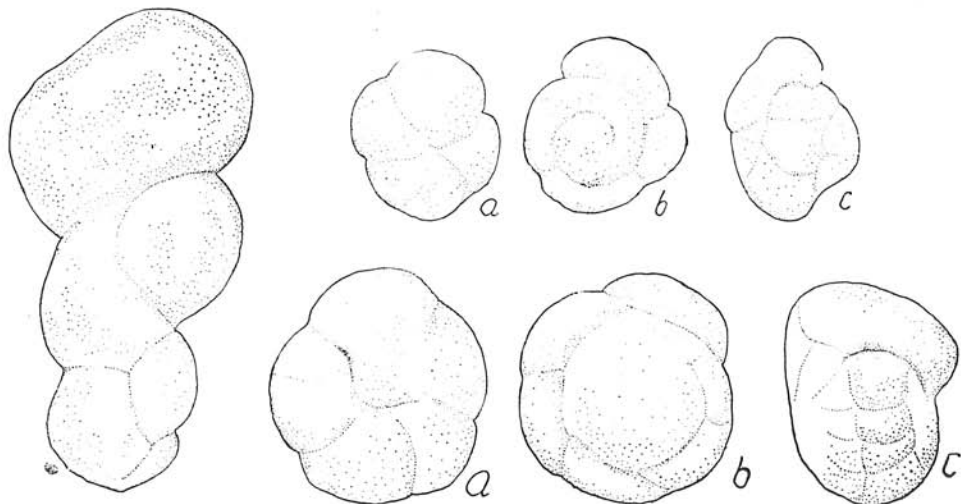


Fig. 26. *Pleurostomella* sp. KPUK 0755.

Fig. 27-28. *Gyroidina nitidia* (Reuss), a - spiral view, b - umbilical view, c - apertural view. KPUK 0759.

Description of the test: the shape of the test rotaloid, nearly as high as broad, very convex, consisting of three very narrow embracing whorls with a small umbilicus on the conical umbilical side. The spiral side almost flat, without umbilicus. The periphery globular and edge rounded. Sutures are shallowly depressed, scarcely visible. Aperture small on the inner side of the last chamber.

Measurements: diameter: 0,2 (0,4) mm, thickness: 0,1 (0,3) mm.

Stratigraphical distribution: in the studied region the species occurs in all the Cretaceous, mainly Upper. KPUK 0759.

Gyroidina florealis White, 1928
 Textfig. 29a-c

- 1928 *Gyroidina florealis*, White, p. 293, Pl. 40, Fig. 3.
 1960 *Gyroidina florealis*, Trujillo, p. 331, Pl. 48, Fig. 1a-c.

Description of the test: the shape rotaloid, planoconvex, spiral side flattened, umbilical side deeply convex and the periphery with a rather broad, sharp keel. The suture limbate, curved, the wall smooth. Aperture at the base of the last chamber. KPUK 0721.

Measurements: diameter: 0,2 mm, thickness: 0,18 mm.

Stratigraphical distribution: the species was found in the studied region only in the Coniacian of the klippen belt.

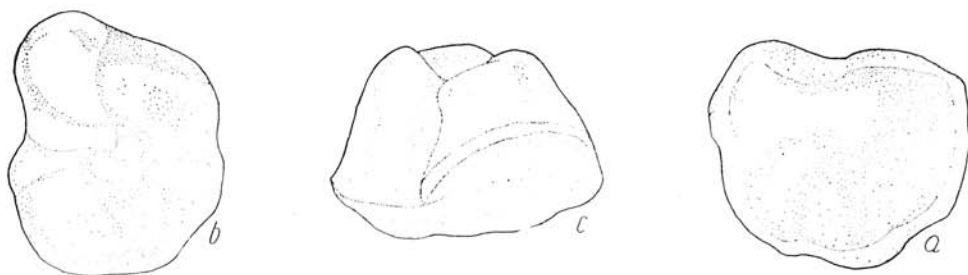


Fig. 29. *Gyroidina florealis* White, a — spiral view, b — umbilical view, c — apertural view. KPUK 0721.

Genus *Stensiöina* Brotzen, 1936

Stensiöina sp.

Textfig. 30a—c

Description of the test: the test planoconvex, with more inflated umbilical side. The periphery rounded or with fine keel. The spiral side with distinct

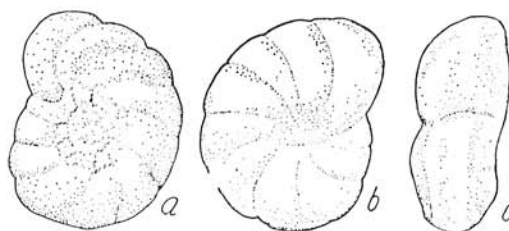


Fig. 30. *Stensiöina* sp., a — spiral view, b — umbilical view, c — apertural view. KPUK 0712.

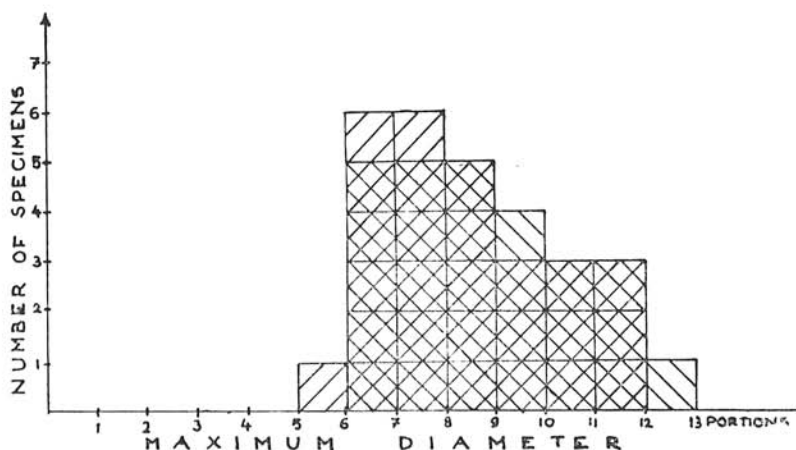


Fig. 31. Frequency distribution graph showing the maximum diameter of shells of *Stensiöina* sp. Dextral (▤) and sinistral (▧) forms. In all graphs 1 portion = 0,025 mm.

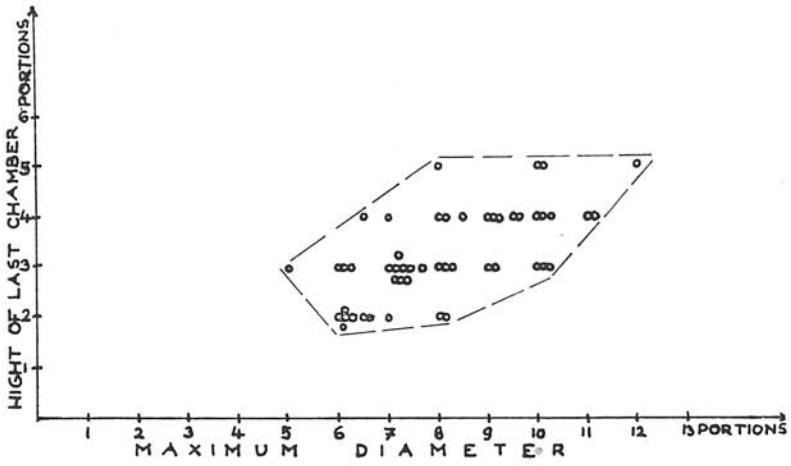


Fig. 32. Maximum diameter plotted against hight of the last chamber of shells of *Stensiöina* sp. Based on 50 specimens.

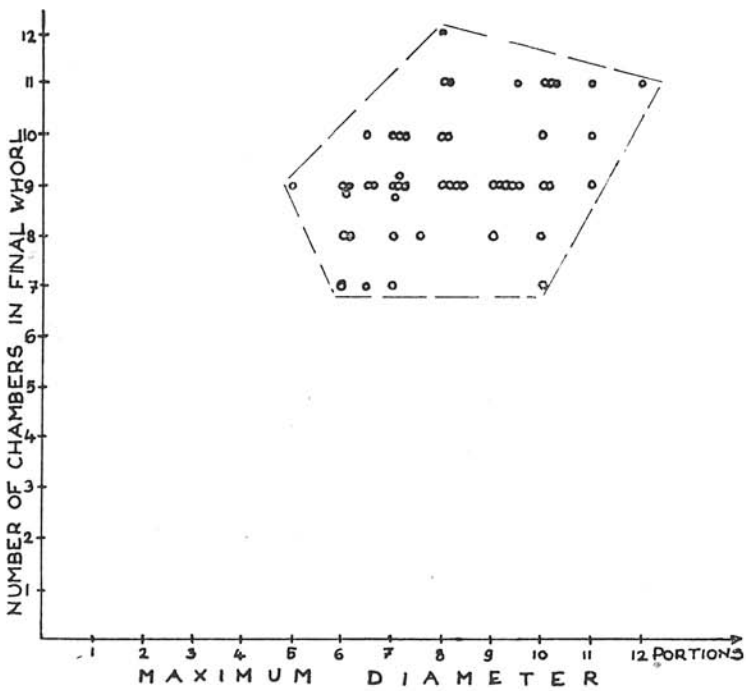


Fig. 33. Maximum diameter plotted against number of chambers in the final whorl of shells of *Stensiöina* sp. Based on 50 specimens.

sculpture in the form of undulate spiral lines with undulate „partitions“. The species resembles *Stensiöina praeexsculpta* (Keller) and *Stensiöina exsculpta* (Reuss). The species needs further study. KPUK 0712.

Measurements: longer diameter: 0,30 mm, shorter diameter: 0,2 mm, thickness: 0,1 mm.

Stratigraphical distribution: in the studied region the species occurs in the Coniacian. Similar forms were found also in the Turonian of the klippen belt.

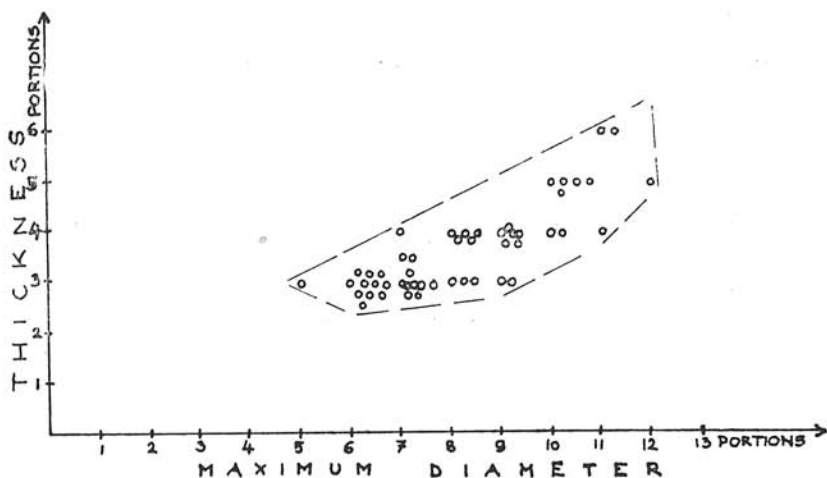


Fig. 34. Maximum diameter plotted against thickness of shells of *Stensiöina* sp. Based on 50 specimens.

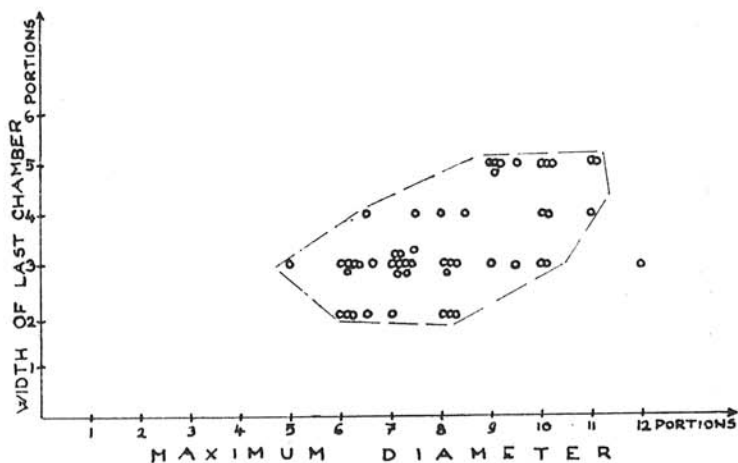


Fig. 35. Maximum diameter plotted against width of the final chamber of shells of *Stensiöina* sp. Based on 50 specimens.

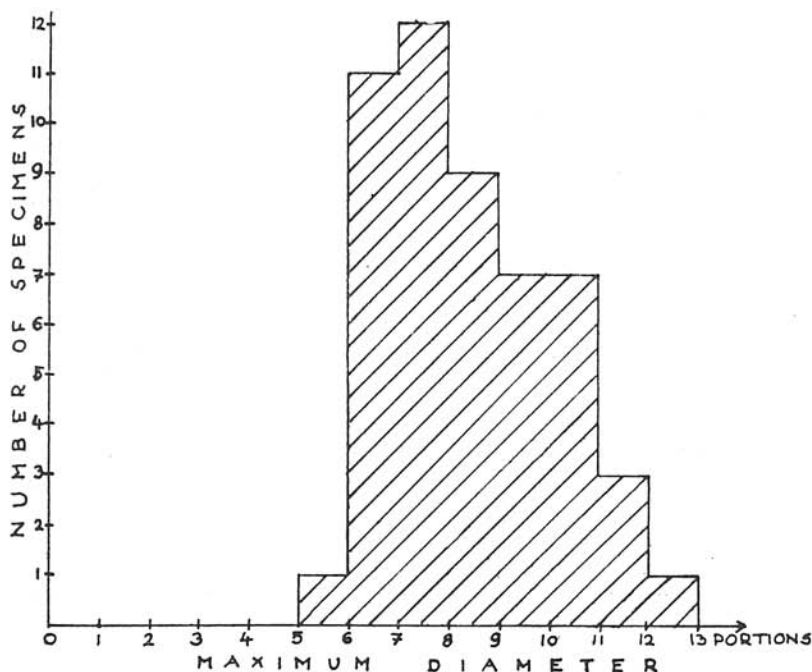


Fig. 36. Histogram showing the maximum diameter of shells of *Stensiöina* sp. Based on 50 specimens.

Genus *Anomalina* d'Orbigny, 1826
Anomalina ammonoides (Reuss, 1845)
 Textfig. 37a-c

1845 *Rosalina ammonoides* m., Reuss, Die Versteinerungen der böhmischen Kreideformation. 1 Abt., Stuttgart, p. 36, Pl. 8, Fig. 53, Pl. 13, Fig. 66 (fide F. Brotzen, 1942, p. 48).

1942 *Gavelinella ammonoides*, Brotzen, pp. 48-49, Fig. 16.

Description of the test: planispiral slightly biconvex test with 11-14 chambers in the final whorl. The spiral side less convex than the umbilical one, which is sometimes flattened. Umbilicus broad, shallow. Periphery lobulate. KPUK 0716.

Measurements: diameter: 0,175 mm, thickness: 0,07 mm.

Stratigraphical distribution: the species occurs in the studied region in all the Cretaceous, both Lower and Upper.

Family Hantkeninidae

Genus *Planomalina* Loeblich et Tappan, 1957
Planomalina ehrenbergi Barr, 1962
 Textfig. 38a-c

1962 *Planomalina ehrenbergi* n. sp., Barr, p. 563, Pl. 69, Fig. 1a, b.

Description of the test: test free, planispiral, with slightly trochoid initial

whorl, biumbilicate, periphery nearly circular, weakly lobulate. Chambers globular to subglobular. In the final whorl 7–8 chambers. Sutures radial, distinct, depressed, slightly curved. Aperture interiomarginal, extending back along both umbilical margins to the septum. KPUK 0757.

Measurements: longer diameter: 0,2 mm, shorter diameter: 0,175 mm, thickness: 0,1 mm.

Stratigraphical distribution: the species is firstly recorded from the klippen belt of West Carpathians.

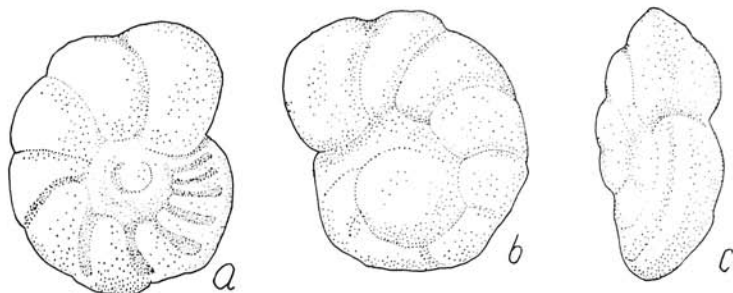


Fig. 37. *Anomalina ammonoides* (Reuss), a — spiral view, b — umbilical view, c — apertural view. KPUK 0716.

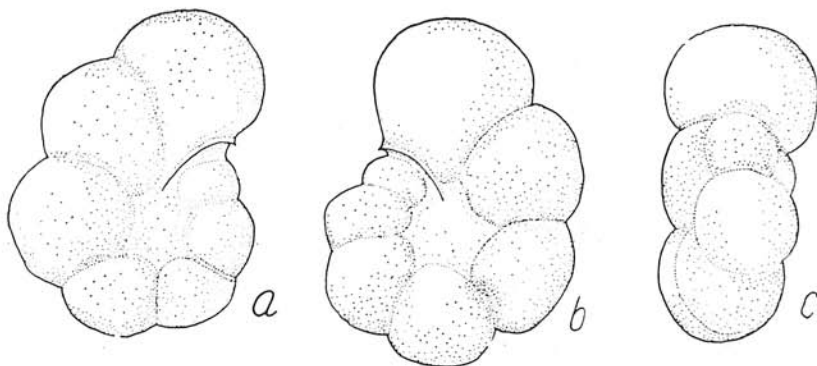


Fig. 38. *Planomalina ehrenbergi* Barr, a–b — umbilical views, c — apertural view. KPUK 0757.

Planomalina aspera (Ehrenberg, 1854)
Textfig. 39a–c

1854 *Rotalia aspera*, Ehrenberg, Mikrogeologie, Leipzig, p. 24, Pl. 27, Figs. 57–58, Pl. 28, Fig. 42, Pl. 31, Fig. 44 (fide F. T. Barr, 1962, p. 561).

1936 *Globigerinella aspera*, Brotzen, p. 170, Pl. 13, Fig. 2.

1962 *Planomalina aspera*, Barr, pp. 561–562, Pl. 69, Fig. 4a, b.

Description of the test: test free, planispiral, with slightly trochoid initial whorl, biumbilicate. Periphery circular, lobulate, chambers globular. In final whorl 5–6 chambers rapidly and uniformly increasing in size. Sutures distinct,

radial, depressed, slightly curved. Primary aperture interiomarginal, extending back along both umbilical margins to the septum. KPUK 0737.

Measurements: longer diameter: 0,3 mm, shorter diameter: 0,25 mm, thickness: 0,15 mm.

Stratigraphical distribution: the species was up to present in the klippen belt of West Carpathians found only in the Coniacian.

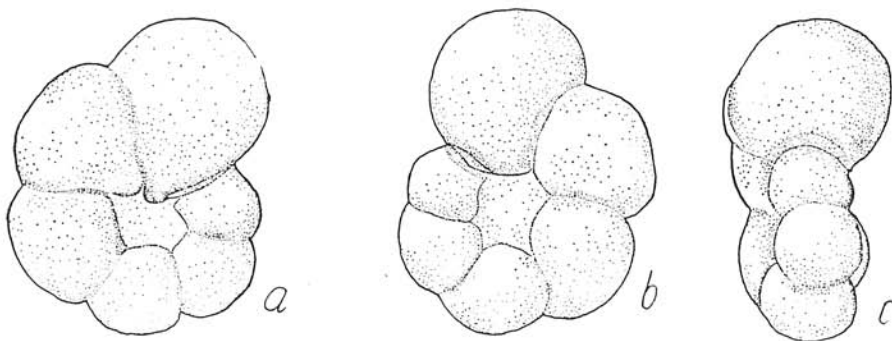


Fig. 39. *Planomalina aspera* (Ehrenberg), a-b — umbilical views, c — apertural view. KPUK 0737.

Planomalina puchovensis n. sp.
Textfig. 40a-c

Holotype: specimen described and figured in this paper on the textfigure 40a-c. Deposited in the Micropaleontological collection of the Department of Paleontology of the Faculty of Natural sciences of J. A. Comenius university in Bratislava, No. KPUK 0715.

Locus typicus: north of Púchov, western Slovakia.

Stratum typicum: Coniacian, Czorsztyń series of the klippen belt of West Carpathians.

Derivatio nominis: puchovensis after type locality north of Púchov, western Slovakia.

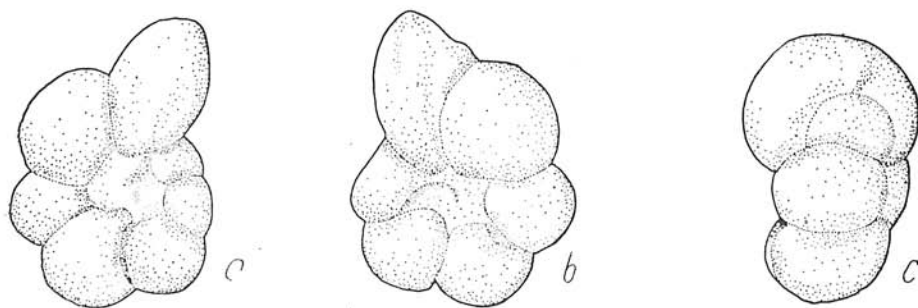


Fig. 40. *Planomalina puchovensis* n. sp., a-b — umbilical views, c — apertural view, holotype. KPUK 0715.

Measurements of the holotype: longer diameter: 0,175 mm, shorter diameter: 0,125 mm, thickness: 0,1 mm, 200X.

Diagnosis: planispiral, biumbilicate test with six chambers in the final whorl. The last chamber strongly inflated, sometimes compressed.

Description of the holotype: test planispiral, biumbilicate, with six chambers in the final whorl. Sutures radial, depressed, distinct. The aperture extends back along both umbilical margins to septum, at the umbilical portions of the chambers relict apertures.

Remarks: from *Planomalina ehrenbergi* Barr differs new species in having less number of chambers in the final whorl and different shape of the last chamber.

Genus *Shackoina* Thalmann, 1932

Shackoina sp.

Textfig. 41a-c

Test free, nearly planispiral, biumbilicate. Final four chambers elongate, surface smooth. The aperture interiomarginal, indistinct. In the studied samples was found the only one specimen. KPUK 0763.

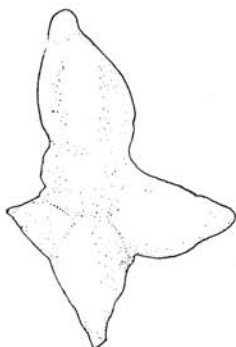


Fig. 41. *Shackoina* sp. KPUK 0763.

Family Globigerinidae

Genus *Rugoglobigerina* Bronnimann, 1952

Rugoglobigerina kingi Trujillo, 1960

Textfig. 42a-c

1960 *Rugoglobigerina kingi* Trujillo new species, Trujillo, p. 339-340, Pl. 49, Fig. 5a-c.

Description of the test: test rotaloid, compressed, spiral side convex, umbilical one flattened. The periphery lobulate. In the ultimate whorl 6-8 chambers, increasing regularly in size as added. Sutures distinct, depressed, straight and radial on both sides. The umbilicus deep. The aperture interiomarginal, high arched. KPUK 0730.

Measurements: diameter: 0,375 mm, thickness: 0,224 mm.

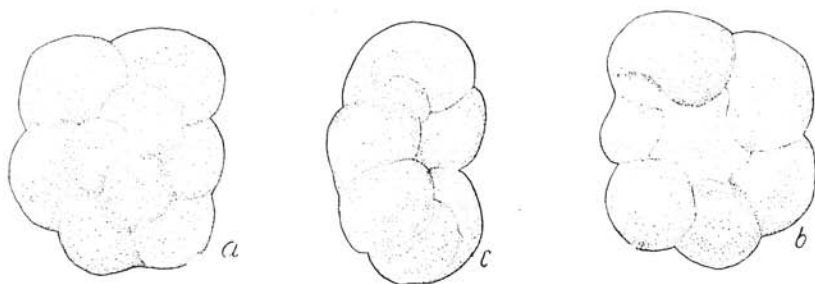


Fig. 42. *Rugoglobigerina kingi* Trujillo, a — spiral view, b — umbilical view, c — apertural view. KPUK 0730.

Family Globorotaliidae

Genus *Praeglobotruncana* Bermudez, 1952

Praeglobotruncana imbricata (Mornod, 1949)

Textfigs. 43–44a–c

1949 *Globotruncana imbricata*, Mornod, pp. 589–590, Fig. 5 (IIa–c, IIIa–c), Pl. 15, Figs. 21–43.

1954 *Globotruncana imbricata*, Hagn et Zeil, pp. 34–35, Pl. 2, Fig. 6, Pl. 5, Figs. 9, 10.

1958 *Globotruncana imbricata*, Książkiewicz, Fig. 16.

1961 *Praeglobotruncana imbricata*, Scheibnerová, pp. 62–63, Pl. 10, Fig. 3a–c.

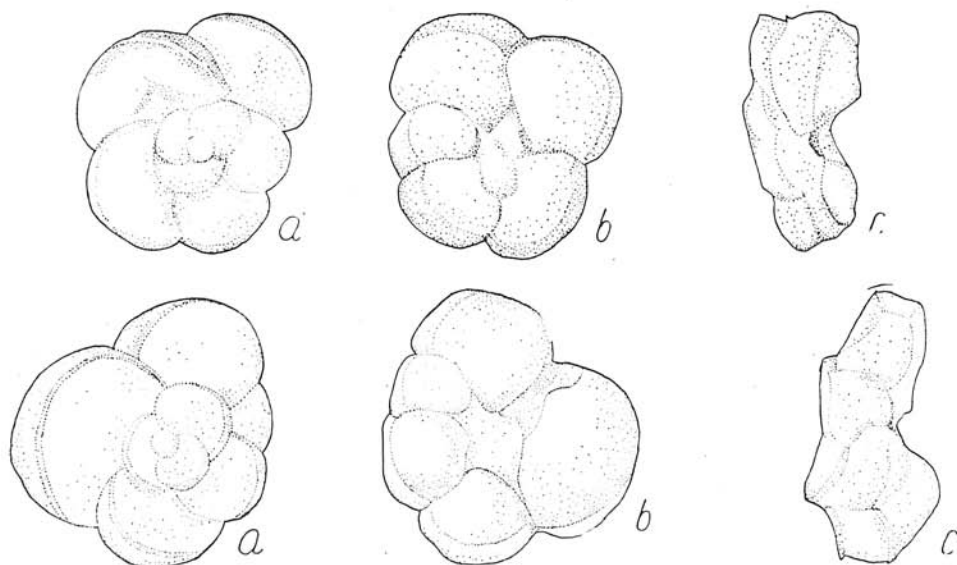


Fig. 43–44. *Praeglobotruncana imbricata* (Mornod), a — spiral view, b — umbilical view, c — apertural view. KPUK 0746.

Description of the test: test trochospirally coiled with 5–6 chambers in the final whorl. Chambers inflated. Periphery with two keels. Umbilicus narrow and deep. Surface smooth. Aperture interiomarginal, with lip. Sutures radial, deepened, sometimes slightly curved. KPUK 0746.

Measurements: longer diameter: 0,425 mm, shorter diameter: 0,450 mm, thickness: 0,2 mm.

Stratigraphical distribution: the species was recorded from the Upper Cenomanian – Lower Turonian and on the other hand in Coniacian. The stratigraphical occurrence of this species needs further revision. (Figs. 45–58.)

Praeglobotruncana inornata Bolli, 1957
Textfigs. 59–60a–c

1957 *Praeglobotruncana inornata*, Bolli, p. 57, Pl. 13, Figs. 5a–6c.

Description of the tests: test low trochospiral, biconvex, periphery strongly lobate, early chambers of the final whorl rounded at periphery. Occasionally last chambers with sharp peripheral edge or faint keel. The four chambers of the last whorl increase rapidly in size. Sutures slightly curved on the spiral side, depressed, on the umbilical side straight, depressed. Umbilicus shallow, wide. Aperture interiomarginal. KPUK 0729.

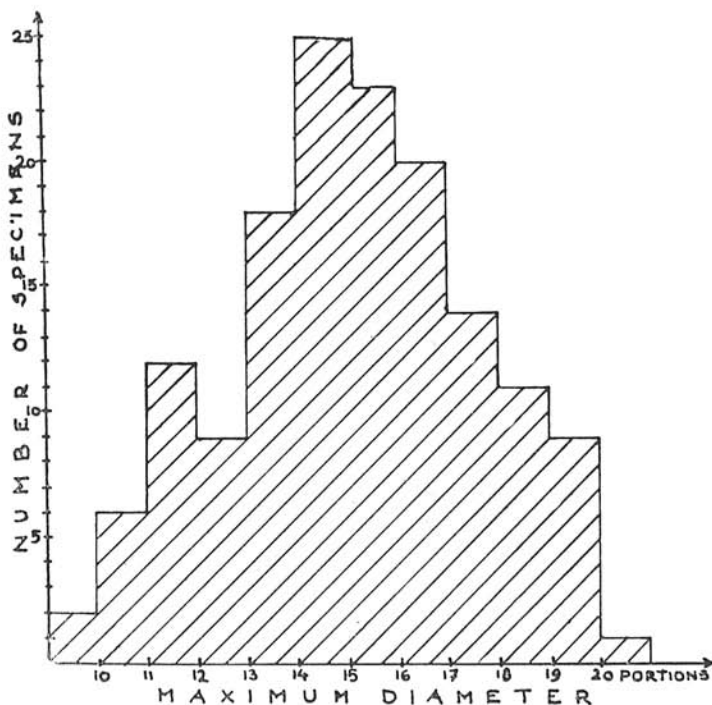


Fig. 45. Histogram showing the maximum diameter of shells of *Praeglobotruncana imbricata* (Mornod), higher horizon. In all graphs 1 portion = 0,025 mm. Based on 153 specimens.

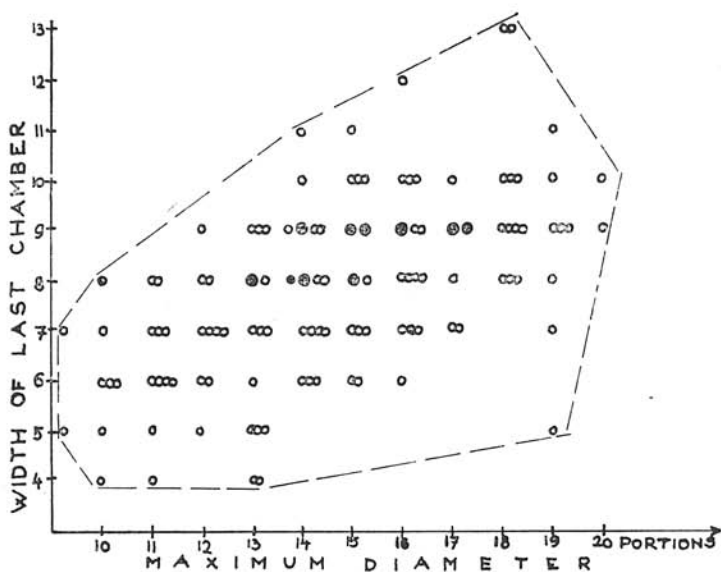


Fig. 46. Maximum diameter plotted against the width of the last chamber of shells of *Praeglobotruncana imbricata* (M o r n o d), higher horizon. Based on 153 specimens.

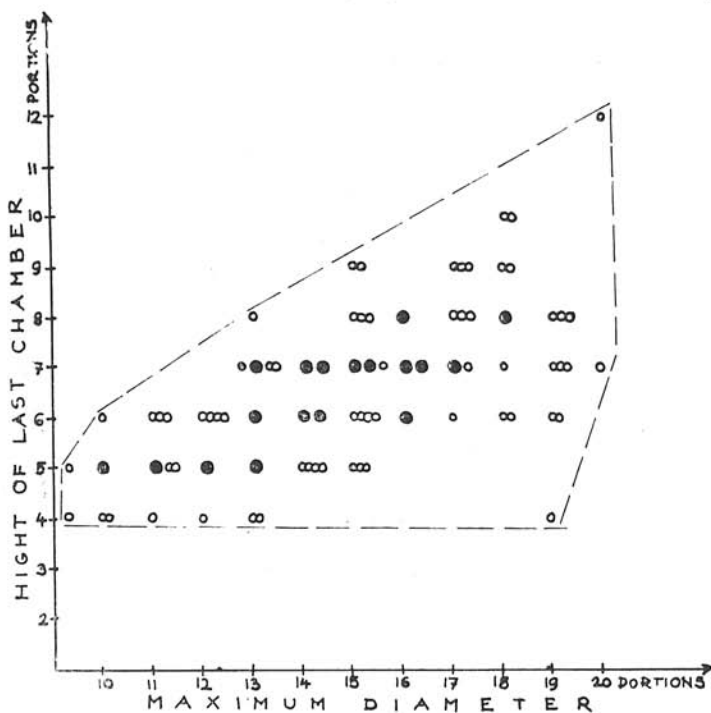


Fig. 47. Maximum diameter plotted against the hight of the last chamber of shells of *Praeglobotruncana imbricata* (M o r n o d), higher horizon. Based on 153 specimens.

Measurements: diameter; 0,28 mm, thickness: 0,15 mm.

Stratigraphical distribution: in the studied region was found in the Coniacian of the klippen belt of West Carpathians.

Genus *Globotruncana* Cushman, 1927

Globotruncana linneiana linneiana (d'Orbigny, 1831)

Textfig. 62a-c

- 1831 *Rosalina linneiana*, d'Orbigny, in Ramon de la Sagra, Hist. physique, politique et naturelle de l'île de Cuba, Paris, p. 101, Pl. 5, Figs. 10-12 (fide Ellis-Messina, Catalogue of Foraminifera).

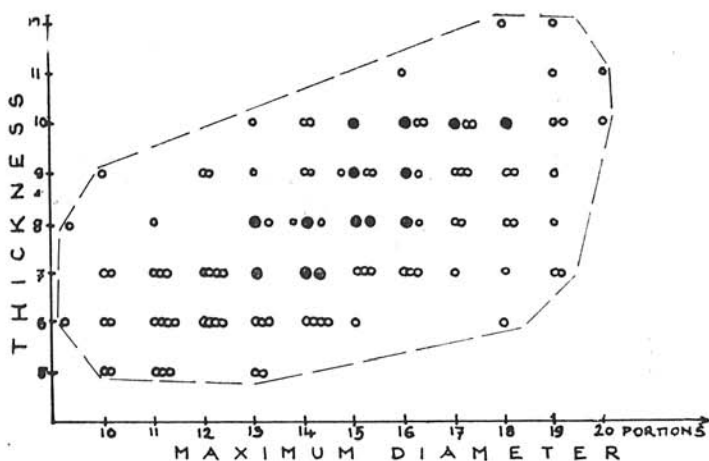


Fig. 48. Maximum diameter plotted against thickness of shells of *Praeglobotruncana imbricata* (Mornod), higher horizon. Based on 153 specimens.

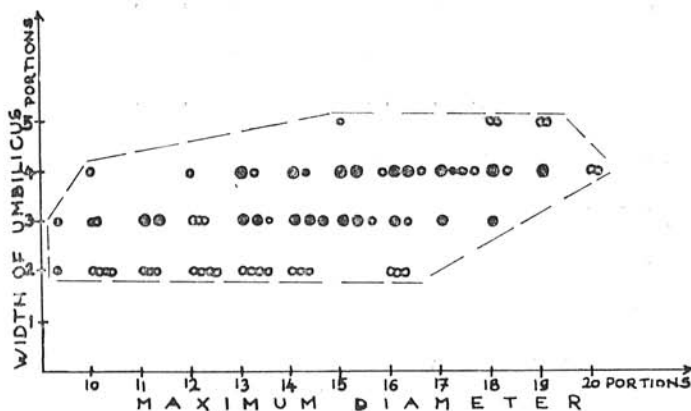


Fig. 49. Maximum diameter plotted against the width of umbilicus of shells of *Praeglobotruncana imbricata* (Mornod), higher horizon, based on 153 specimens.

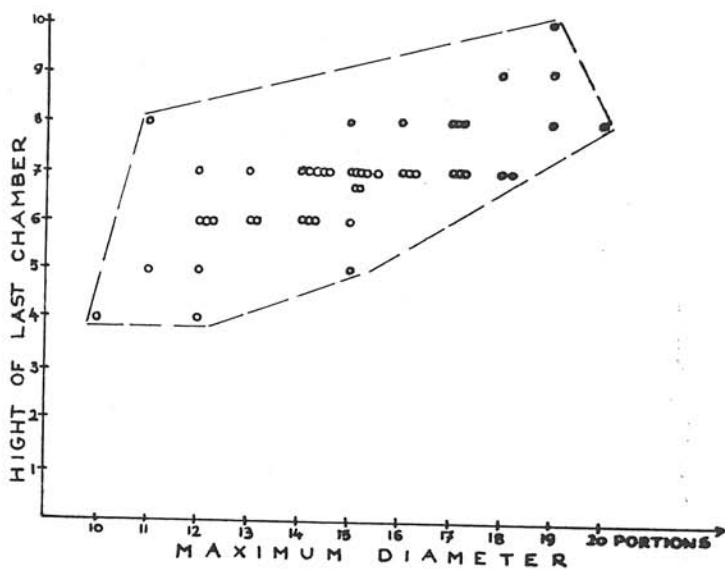


Fig. 50. Maximum diameter plotted against the height of the last chamber of shells of *Praeglobotruncana imbricata* (Mornod), higher horizon, based on 153 specimens.

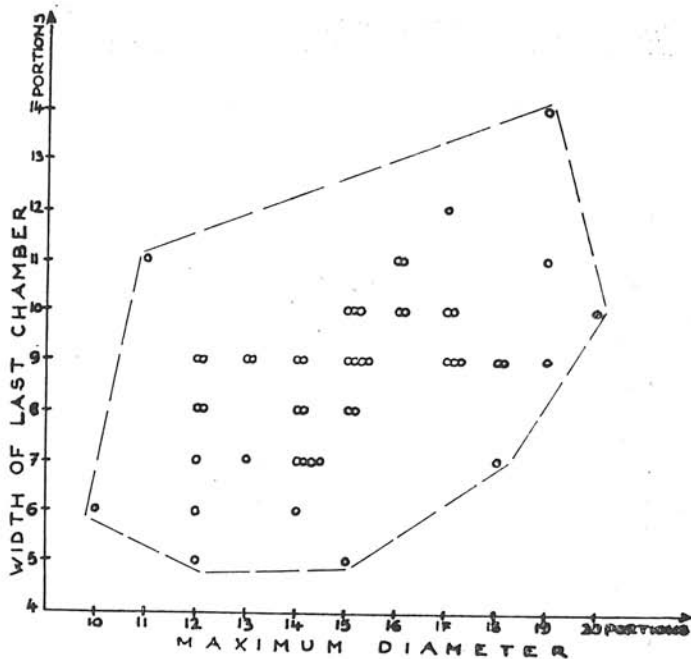


Fig. 51. Maximum diameter plotted against the width of the last chamber of shells of *Praeglobotruncana imbricata* (Mornod), lower horizon, based on 47 specimens.

1936 *Globotruncana lapparenti*, Brotzen, p. 175.

1942 *Globotruncana linnei*, Gandolfi, p. 125-130, Pl. 3, Fig. 2-3, Pl. 4, Fig. 16-17, 30-32, Pl. 7, Fig. 1-2, Pl. 10, Fig. 7, Pl. 12, Fig. 7-8.

1944 *Globotruncana lapparenti lapparenti*, Bolli, p. 230, Pl. 10, Fig. 11.

1949 *Globotruncana (Globotruncana) lapparenti*, Reichel, p. 540-542, Pl. 20, Fig. 13-17, Pl. 21, Fig. 16-18.

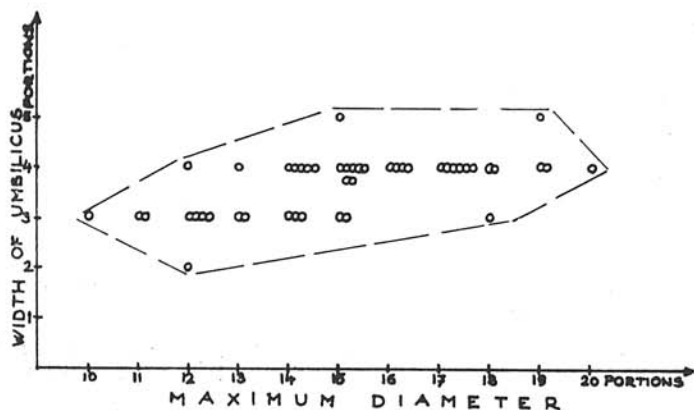


Fig. 52. Maximum diameter plotted against the width of umbilicus of shells of *Praeglobotruncana imbricata* (Mornod), lower horizon, based on 51 specimens.

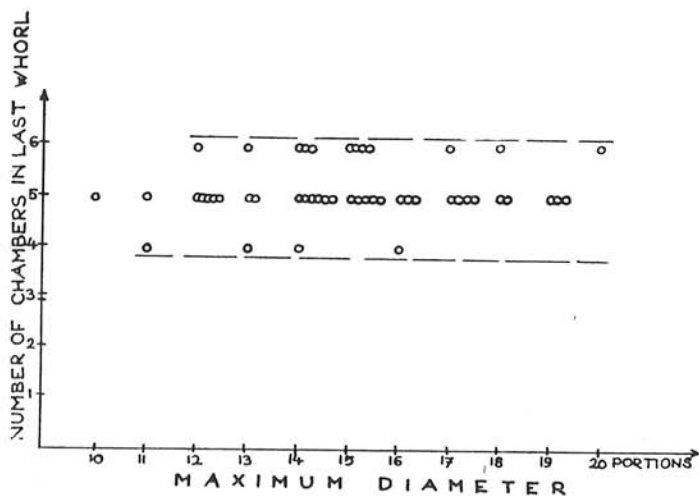


Fig. 53. Maximum diameter plotted against the number of chambers in the last whorl of shells of *Praeglobotruncana imbricata* (Mornod), lower horizon, based on 49 specimens.

- 1956 *Globotruncana lapparenti lapparenti*, Said et Kenawy, p. 150, Pl. 5, Fig. 14.
 1960 *Globotruncana lapparenti lapparenti*, Tollmann, p. 192–193, Pl. 20, Fig. 10–11.
 1961 *Globotruncana linneiana linneiana*, Scheibnerová, p. 65–66, Pl. 11, Fig. 2a–c.

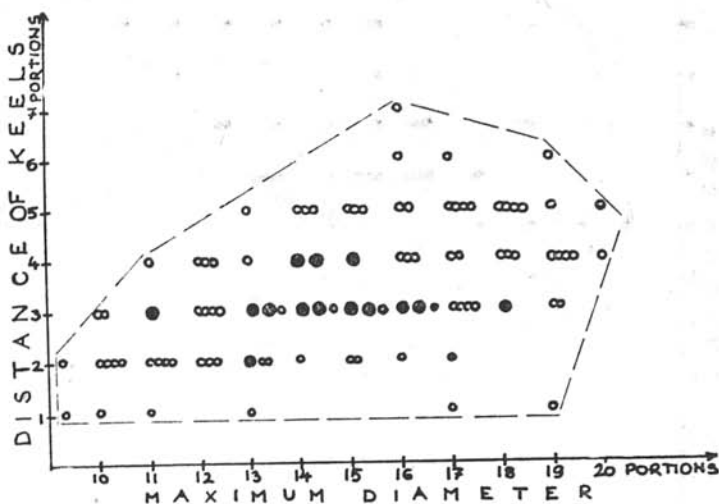


Fig. 56. Maximum diameter plotted against distance of keels of shells of *Praeglobotruncana imbricata* (M o r n o d), higher horizon, based on 153 specimens.

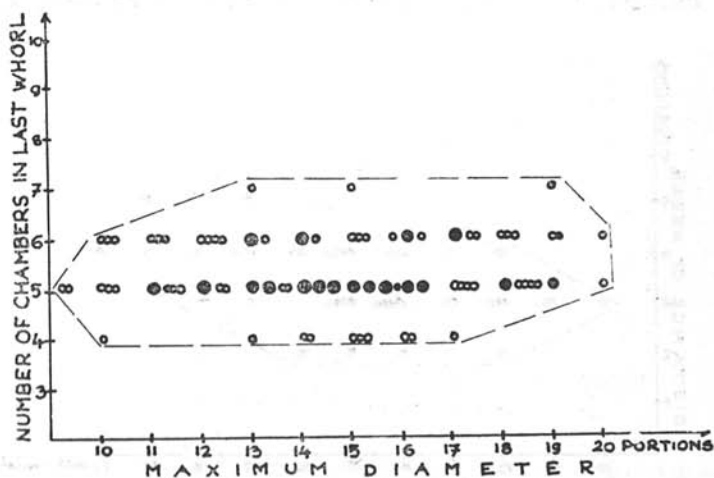


Fig. 57. Maximum diameter plotted against the number of chambers in the last whorl of shells of *Praeglobotruncana imbricata* (M o r n o d), higher horizon, based on 153 specimens.

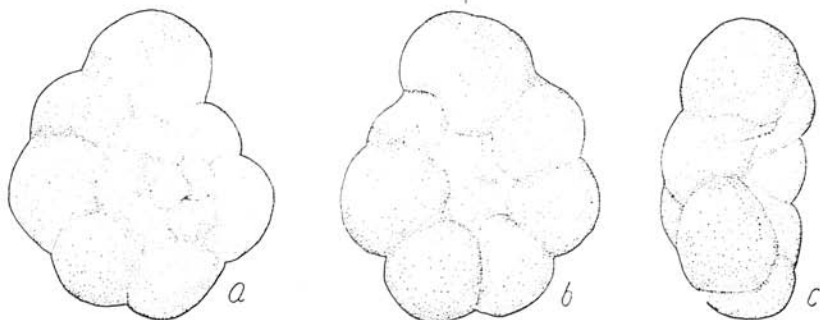


Fig. 61. *Praeglobotruncana* sp., a — spiral view, b — umbilical view, c — apertural view. KPUK 0700.



Fig. 62. *Globotruncana linneiana linneiana* (d'O r b.), a — spiral view, b — umbilical view, c — apertural view. KPUK 0767.

Description of the test: low trochospiral test with flat spiral side and slightly inflated and convex umbilical one. In the last whorl 6–8 flattened or moderately inflated chambers. Sutures sigmoidal and limbate. Aperture at the base of the last chamber, with an apertural lip. Accessory apertures at adumbilical portions of chambers. KPUK 0767.

Measurements: longer diameter: 0,6 mm, shorter diameter: 0,5 mm, thickness: 0,27 mm.

Stratigraphical distribution: this species occurs from the Lower Turonian to Maestrichtian inclusively.

Globotruncana linneiana tricarinata (Quereau, 1893)

Textfig. 63a–c

1893 *Pulvinulina tricarinata*, Quereau, Beitr. Geol. Karte Schweiz. 33, Lief., p. 89, Pl. 5, Fig. 3a (fide H. Bolli, 1944, p. 232).

1936 *Globotruncana linnei*, Renz, Pl. 6, Fig. 28–34, Pl. 8, Fig. 7.

- 1944 *Globotruncana lapparenti tricarinata*, Bolli, p. 232, pl. 23, Fig. 13, Fig. 1, Fig. 19–20.
 1956 *Globotruncana lapparenti tricarinata*, Said et Kenawy, p. 150, Pl. 5, Fig. 20.
 1960 *Globotruncana lapparenti tricarinata*, Tollmann, p. 193–194, Pl. 21, Fig. 1.
 1961 *Globotruncana linneiana tricarinata*, Scheibnerová, p. 66–67, Pl. 11, Fig. 4a–c.

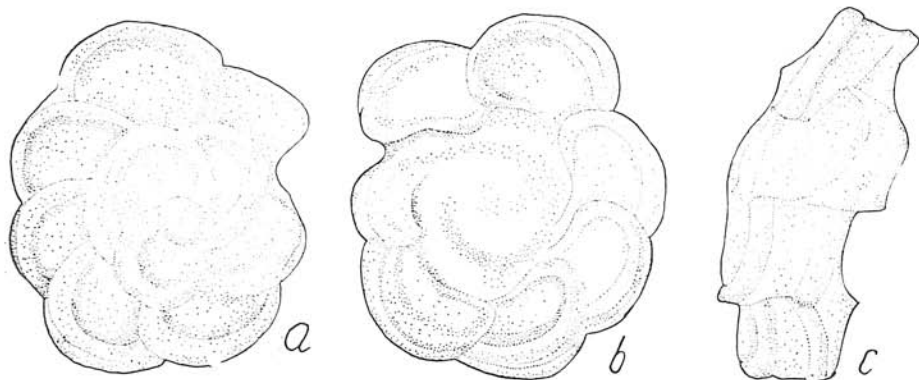


Fig. 63. *Globotruncana linneiana tricarinata* (Quereau), a – spiral view, b – umbilical view, c – apertural view. KPUK 0768.

Description of the test: from *Globotruncana linneiana linneiana* (d'Orb.) this species differs in having more closely spaced kells and adumbilical „third“ keel. KPUK 0768.

Measurements: longer diameter: 0,72 mm, shorter diameter: 0,67 mm, thickness: 0,25 mm.

Stratigraphical distribution: the species occurs in the klippen belt of West Carpathians from the Lower Turonian to the Upper Maastrichtian.

Globotruncana sigali Reichel, 1949
 Textfig. 64a–c

- 1949 *Globotruncana sigali*, Reichel, p. 610–612, Fig. 5, 6, Pl. 16, Fig. 7, Pl. 17, Fig. 7.
 1952 *Globotruncana sigali*, Sigal, p. 33, Fig. 33.
 1954 *Globotruncana sigali*, Hagn et Zeil, p. 35–36, Pl. 2, Fig. 1, Pl. 6, Fig. 2.
 1961 *Globotruncana sigali*, Scheibnerová, p. 67–68, Pl. 12, Fig. 1a–c.

Description of the test: trochospirally coiled test with more convex spiral side. In the last whorl 6–7 chambers, inflated on the umbilical side. Sutures distinctly sigmoidal. Periphery with one keel. Aperture at the base of the last chamber. Accessory apertures at the adumbilical portions of the chambers. KPUK 0766.



Fig. 64. *Globotruncana sigali* Reichel, a — spiral view, b — umbilical view, c — apertural view. KPUK 0766.

Measurements: longer diameter: 0,5 mm, shorter diameter: 0,555 mm,

Stratigraphical distribution: the species was found in the Lower Turonian (resp. Upper Cenomanian — Lower Turonian) and on the other hand in the Coniacian of the klippen belt, West Carpathians. KPUK 0709.

Globotruncana schneegansi Sigal, 1952
Textfig. 65a—c

1952 *Globotruncana schneegansi*, Sigal, p. 23, Textfig. 34.

1960 *Globotruncana schneegansi*, Tollmann, p. 192, Pl. 20, Fig. 7.

Description of the test: the species resembles to some degree *Globotruncana sigali* Reichel. In accordance with F. Dalbierz (1955) there are transitional forms between two species. The chambers are strongly overlapping. KPUK 0719.

Measurements: longer diameter: 0,5 mm, shorter diameter: 0,5 mm, thickness: 0,3 mm.

Stratigraphical distribution: the species was found in the klippen belt of West Carpathians in the Coniacian.

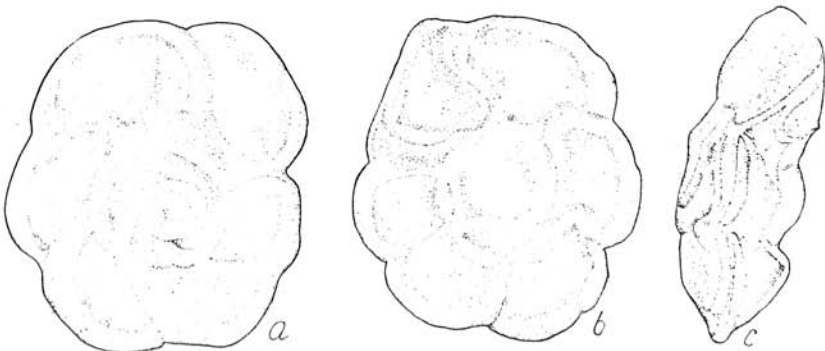


Fig. 65. *Globotruncana schneegansi* Sigal, a — spiral view, b — umbilical view, c — apertural view. KPUK 0719.

Globotruncana spinea Kikoïne, 1947

Textfig. 66a-c

1947 *Globotruncana spinea*, Kikoïne, p. 21, Fig. p. 21.1958 *Globotruncana* cf. *spinea*, Książkiewicz, Fig. 13-15.1960 *Globotruncana* aff. *spinea*, Tollmann, p. 196, Pl. 21, Fig. 8-9.

Description of the test: the species resembles *Globotruncana linneiana* linneiana, from which differs in having distinct, sometimes very long spines at the periphery of chambers in the final whorl.

Measurements: longer diameter: 0,5 mm, shorter diameter: 0,4 mm, thickness: 0,25 mm.

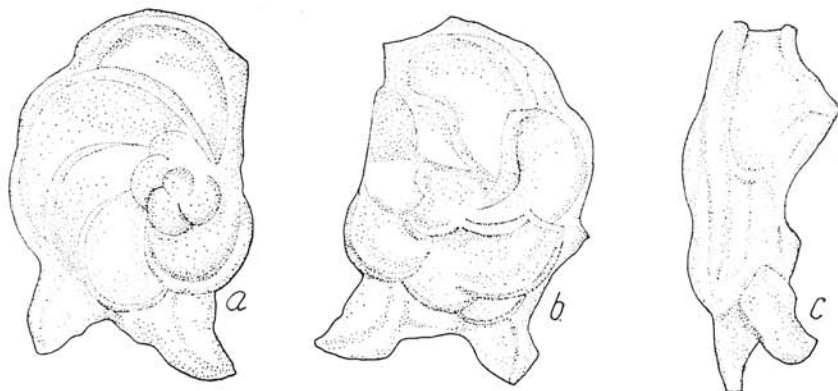


Fig. 66. *Globotruncana spinea* Kikoïne, a - spiral view, b - umbilical view, c - apertural view. KPUK 0707.

Stratigraphical distribution: the species was firstly described by Kikoïne (1947) from the Campanian. By the other authors it was described from the Coniacian. In the studied region was found in the Coniacian. KPUK 0707.

Globotruncana concavata concavata (Brotzen, 1934)

Textfig. 75a-c

1934 *Rotalia concavata*, Brotzen, Zeitschr. Deutsch. Ver. Palaestinas, v. 57, p. 66, Pl. 3, Fig. b (fide F. Dalbiez, 1955, p. 168).1952 *Globotruncana symetrica*, Sigal, p. 35, Fig. 35.1955 *Globotruncana (Globotruncana) ventricosa ventricosa*, Dalbiez, 1. 168. Fig. 7a-d.1958 *Globotruncana ventricosa*, Książkiewicz, Fig. 10.**non** 1958 *Globotruncana* cf. *concavata*, Książkiewicz, Fig. 7.1960 *Globotruncana ventricosa ventricosa*, Tollmann, p. 195-196, Pl. 21, Fig. 6-7.**non** 1961 *Globotruncana concavata*, Scheibnerová, p. 67-68, Pl. 12, Fig. 1a-c.

Description of the test: trochospirally coiled test with concave spiral side and moderately to strongly convex umbilical side. Periphery with two closely

spaced keels. Sutures radial, or very slightly sigmoidal. Chambers of the final whorl sometimes strongly overlapping. Umbilicus deep, broad. KPUK 0691.

Measurements: longer diameter: 0,375 mm, shorter diameter: 0,375 mm, thickness: 0,175 mm.

Stratigraphical distribution: in accordance with F. Brotzen (personal communication) the species is characteristic for the Coniacian and Santonian. After others this species is characteristic for the Coniacian and its variety „*carinata*“ for the Santonian. In the studied region was found in the Coniacian.

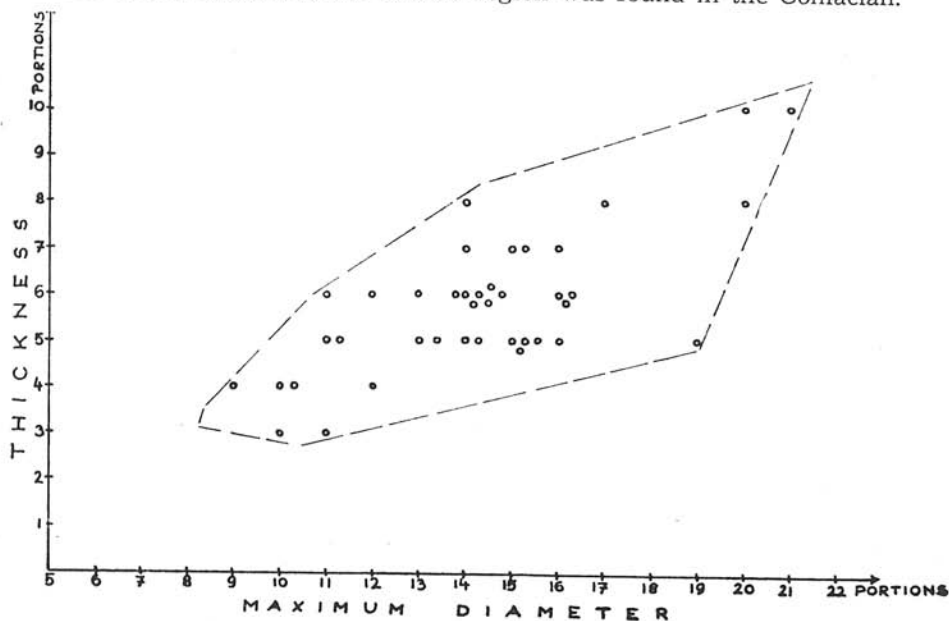


Fig. 67. Maximum diameter plotted against thickness of shells of *Globotruncana spinea* Kikoïne, based on 40 specimens.

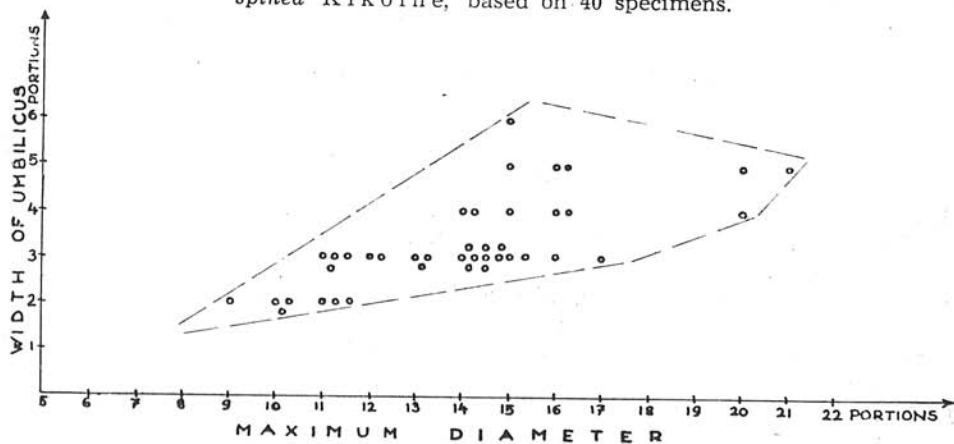


Fig. 68. Maximum diameter plotted against the width of umbilicus of shells of *Globotruncana spinea* Kikoïne, based on 40 specimens.

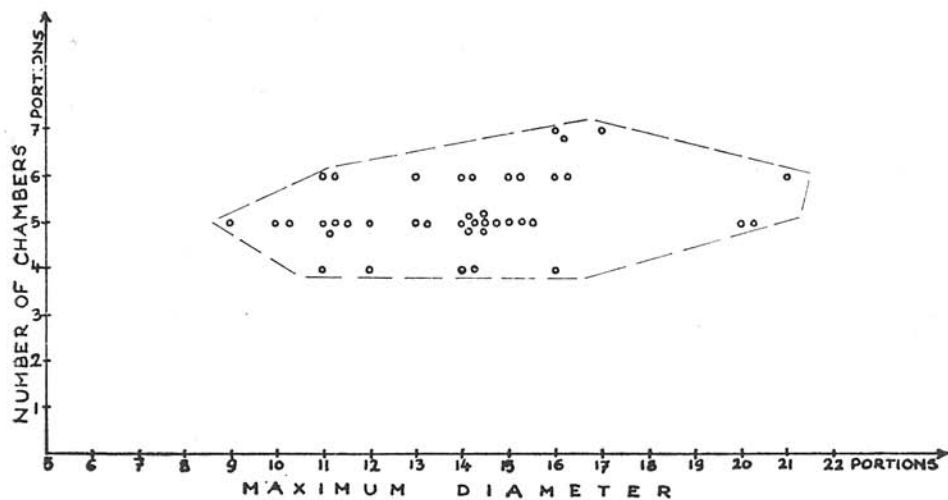


Fig. 69. Maximum diameter plotted against the number of chambers of shells of *Globotruncana spinea* Kikoïne, based on 40 specimens.

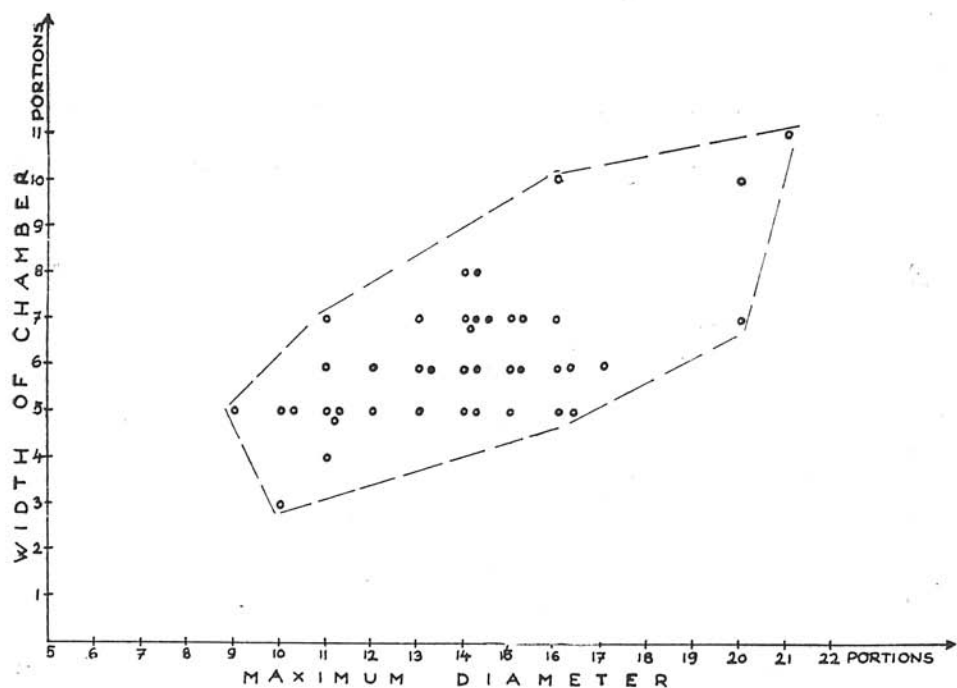


Fig. 70. Maximum diameter plotted against the width of chambers of shells of *Globotruncana spinea* Kikoïne, based on 40 specimens.

Globotruncana concavata primitiva Dalbiez, 1955
Textfig. 76a-c

1955 *Globotruncana ventricosa primitiva*, Dalbiez, p. 168, Textfig. 6.

Description of the test: spiral side of the test strongly concave, the umbilical one moderately convex. Chambers are strongly overlapping. Sutures radial, or

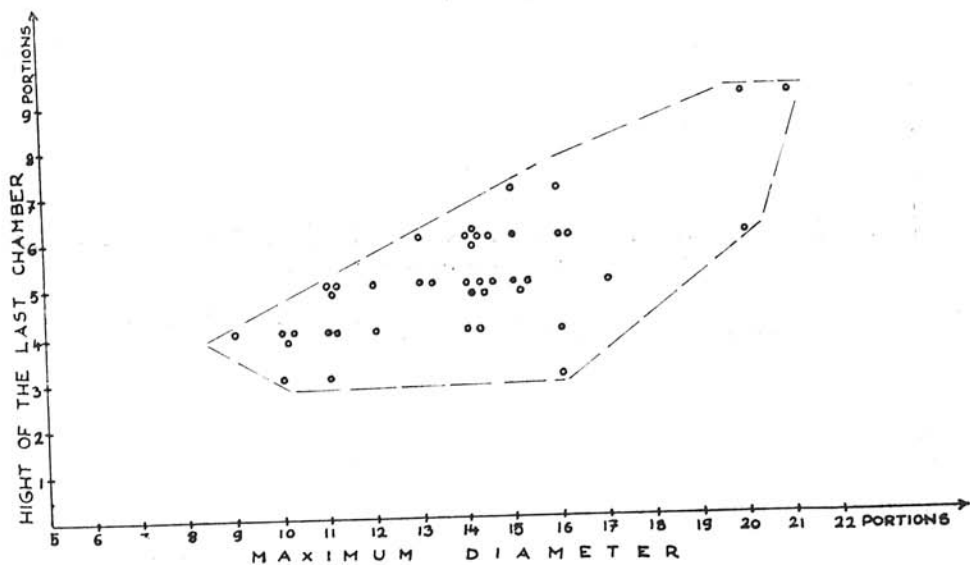


Fig. 71. Maximum diameter plotted against the height of the last chamber of shells of *Globotruncana spinea* Kikoïne, based on 40 specimens.

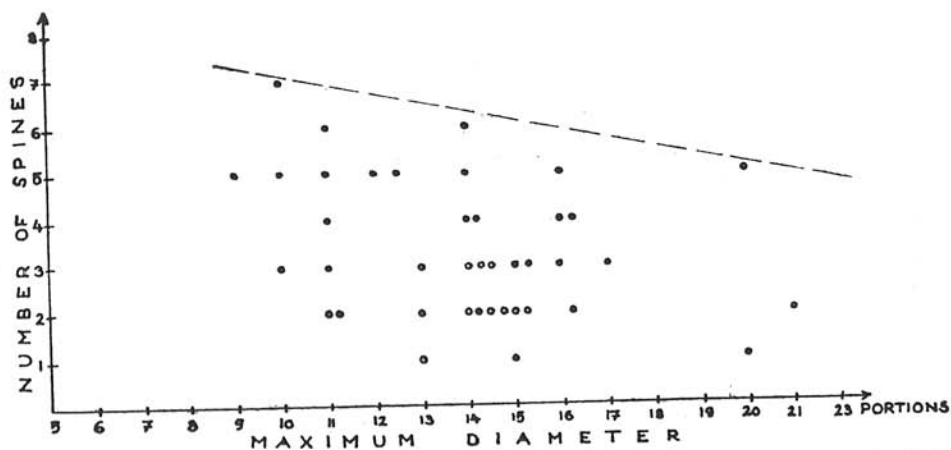


Fig. 72. Maximum diameter plotted against the number of spines of shells of *Globotruncana spinea* Kikoïne, based on 40 specimens.

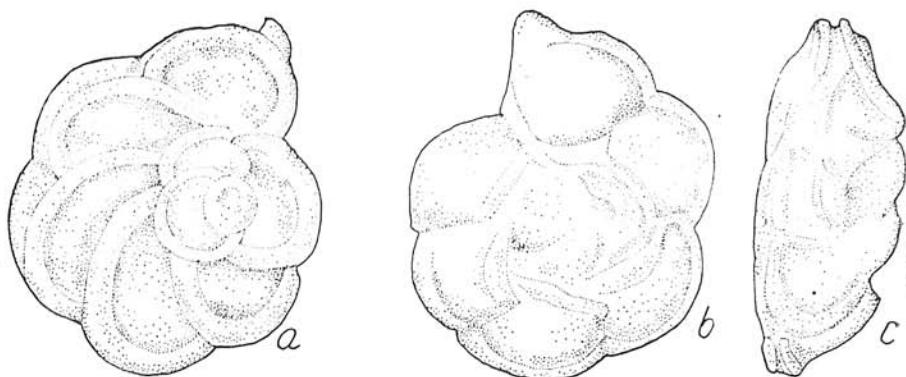


Fig. 75. *Globotruncana concavata concavata* (Brotzen), a — spiral view, b — umbilical view, c — apertural view. KPUK 0691.

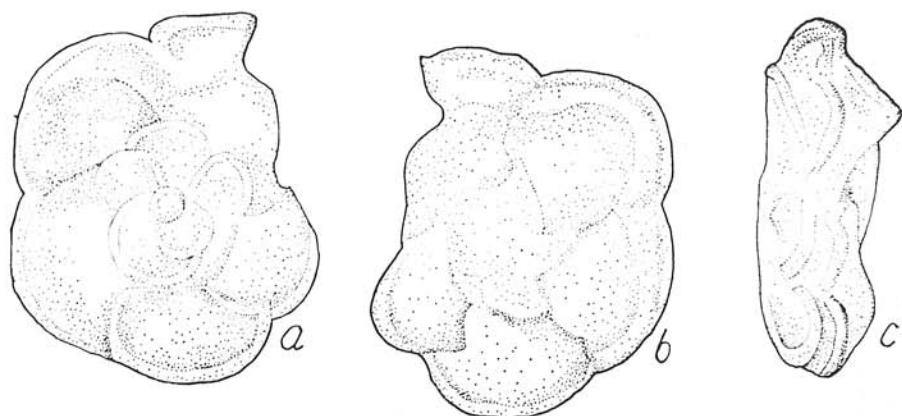


Fig. 76. *Globotruncana concavata primitiva* Dalbierz, a — spiral view, b — umbilical view, c — apertural view. KPUK 0709.

Globotruncana sigmoconcavata n. sp.
Textfigs. 77–78a–c

Holotyp: specimen described and figured in this paper on the Textfig. 7a–c. Deposited in the Micropaleontological collection of the Department of Paleontology of the Faculty of Natural Sciences of J. A. Comenius university in Bratislava, Czechoslovakia. KPUK 0710.

Stratum typicum: Coniacian, Czorsztyn series of the klippen belt of West Carpathians.

Locus typicus: the same as in *Planomalina puchovensis* n. sp.

Derivatio nominis: sigmoconcavata: the species is characteristic by distinct sigmoidal sutures and by the position of chambers in the final whorl (overlapping) resembles *Globotruncana concavata*.

Measurements of holotype: longer diameter: 0,750 mm, shorter diameter: 0,675 mm, thickness: 0,4 mm, 77 a-b - 80 \times , c - 85 \times , 78 a-c - 80 \times .

Diagnosis: trochospiral test with more convex umbilical side, with four chambers in the final whorl and strongly overlapping chambers. Periphery with one distinct keel. Sutures sigmoidal.

Description of the test: trochospirally coiled test with four chambers in the final whorl. Chambers are strongly overlapping. The umbilical side of the test rather convex, the spiral one concave or flattened. Periphery with one distinct keel. The aperture interiomarginal, accessory apertures with lips at the adumbilical portions of the last chambers. Surface smooth.

Remarks: the species to some degree resembles *Globotruncana concavata* (Brotzen), from which it differs in having only one keel.

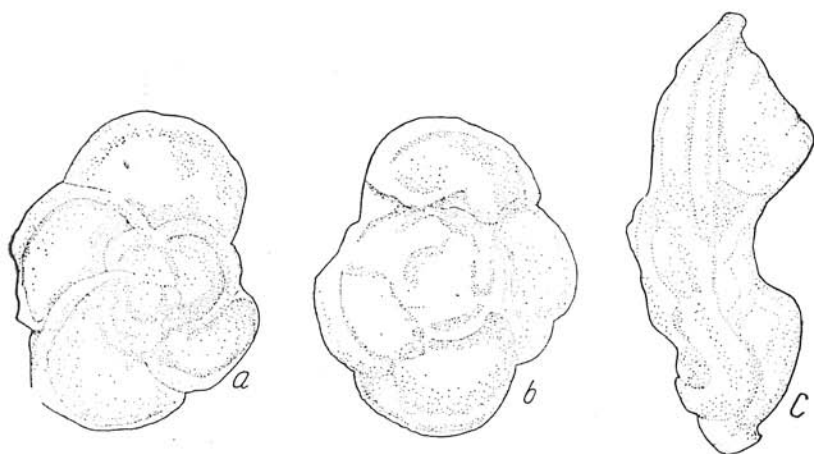


Fig. 77. *Globotruncana sigmoconcavata* n. sp., a - spiral view, b - umbilical view, c - apertural view, holotype. KPUK 0710.

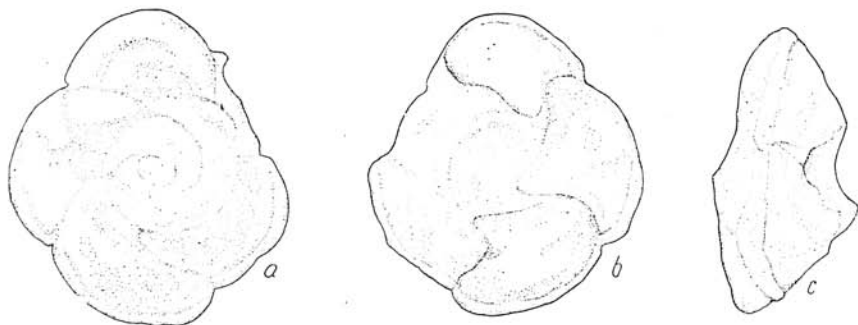


Fig. 78. *Globotruncana sigmoconcavata* n. sp., a - spiral view, b - umbilical view, c - apertural view. KPUK 0691.

Genus *Globorotalites* Brotzen, 1942
Globorotalites micheliniana (d'Orbigny, 1840)
 Textfig. 79a-c

- 1840 *Rotalia micheliniana*, d'Orbigny, Mém. sur les foraminifères de la craie blanche du bassin de Paris, Mém. Soc. géol. Fr., Sér. 1, vol. 4, Pl. 1-3 (fide A. Tollmann, 1960, p. 196).
 1951 *Globorotalia micheliniana*, Noth, Pl. 4, Fig. 24a, b.
 1953 *Globorotalites micheliniana*, Hagn, p. 99, Pl. 8, Fig. 4.
 1960 *Globorotalites micheliniana*, Tollmann, p. 196, Pl. 21, Fig. 10.
 1961 *Globorotalites micheliniana*, Scheibnerová, p. 75-76, Pl. 14, Fig. 3a-c.

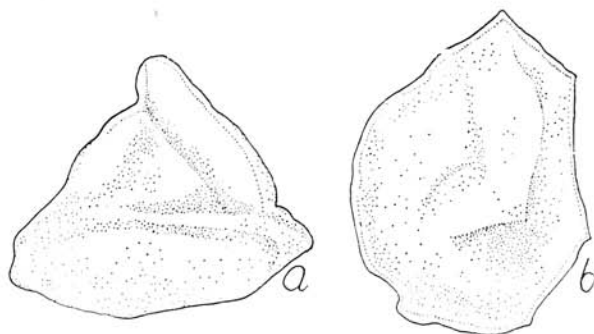


Fig. 79. *Globorotalites micheliniana* (d'Orbigny), a - side view, b - from above. KPUK 0747.

Description of the test: test trochospirally coiled with flattened spiral side and strongly convex umbilical one. Umbilicus deep, narrow. Sutures on the spiral side straight or sigmoidal, on the umbilical side radial and depressed. Periphery sharp or slightly lobulate. The aperture extends along the suture of the last chamber from the umbilicus to the periphery of the test. Surface smooth.

Measurements: diameter: 0,525 mm, thickness: 0,4 mm.

Stratigraphical distribution: the species occurs from the Lower Cretaceous to the end of Maastrichtian. KPUK 0747.

Family Heterohelicidae

Genus *Heterohelix* Ehrenberg, 1841
Heterohelix globulosa (Ehrenberg, 1839)
 Textfig. 80a-c

- 1839 *Textularia globulosa*, Ehrenberg, p. 135 (fide Ellis-Messina, Catalogue of Foraminifera).
 1928 *Textularia globulosa*, Franke, p. 134, Pl. 12, Fig. 11.
 1951 *Gümbelina globulosa*, Noth, p. 60-61, Pl. 7, Fig. 3, 4.
 1956 *Gümbelina globulosa*, Said et Kenawy, p. 139, Pl. 3, Fig. 29.
 1961 *Gümbelina globulosa*, Scheibnerová, p. 77, Pl. 14, Fig. 4a, b.

Description of the test: biserial test composed of globular chambers. Aperture on the base of the last chamber. Surface smooth. KPUK 0717.

Measurements: length: 0,375 mm, thickness: 0,3 mm.

Stratigraphical distribution: the species occurs in the Middle and Upper Cretaceous of the klippen belt of West Carpathians.

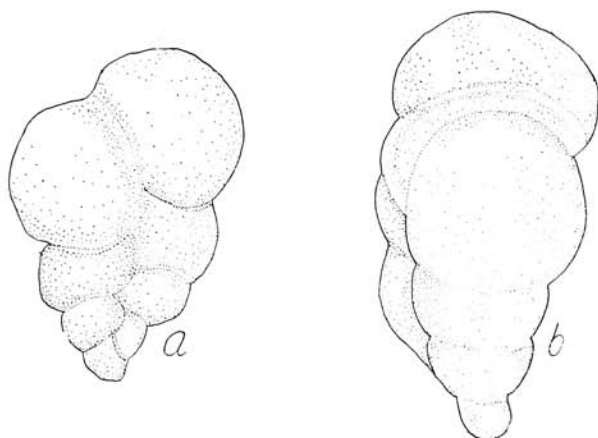


Fig. 80. *Heterohelix globulosa* (Ehrenberg), a — side view, b — apertural view. KPUK 0707.

Genus *Gabonella* Klasz, Marie, Meijer, 1960

Gabonella levis Klasz, Marie, Rérat, 1961

Textfig. 81a, b

1961 *Gabonella levis*, n. sp., Klasz, Marie, Rérat, p. 77–78, Fig. 2a–b.

Description of the test: biserial, elongated test, from both sides slightly compressed. Chambers globular, closely spaced. Sutures distinct, depressed. The aperture at the base of the last chamber. KPUK 0741.

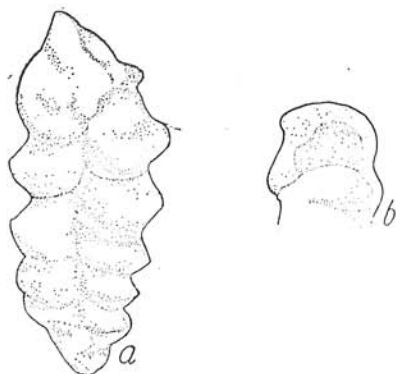


Fig. 81. *Gabonella levis* Klasz, Marie, Rérat, a — lateral view, b — apertural view. KPUK 0741.

Measurements: length: 0,875 mm, thickness: 0,375 mm.

Stratigraphical distribution: the species occurs in the studied region in the Coniacian. Firstly described from the Turonian.

Family Baculogypsiniidae
Genus *Siderolites* Lamarck, 1801
? *Siderolites* sp.
Textfig. 82

In the studied samples occurs this species in few specimens. They represent the first record of this genus in the Coniacian. These forms need further more detailed study. KPUK 0753.

Some notes on the variability of some species of The Coniacian Foraminifera

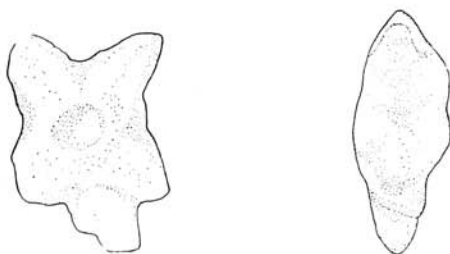


Fig. 82. ? *Siderolites* sp. KPUP 0753.

In some species of the Coniacian Foraminifera from the klippen belt of West Carpathians I made measuring of various values of their shells to study their variability. The most suitable were the species: *Stensiöina* sp., *Praeglobotruncana imbricata* (Mornod) and *Globotruncana spinea* Kikoïne. Measurements in *Stensiöina* sp. were based on 40 specimens, in *Praeglobotruncana imbricata* (Mornod) on 49 specimens (lower horizon) and 153 specimens (higher horizon) and in *Globotruncana spinea* Kikoïne on 40 specimens. Results are figured on graphs (Textfigs. 35–40, 49–62 and 72–76).

In *Stensiöina* sp. we may see that the adult individuals are biggest (Textfig. 40); in ontogenesis does not change width of the last chamber while the diameter is very variable (Textfig. 39). In ontogenesis on a whole does not change the thickness of the shell and bigger individuals are more variable than smaller ones (Textfig. 38). Similarly does not change the number of chambers in the ontogenesis, variability is ± 2 (the mean number 9) (Textfig. 37). Does not change the height of the last chamber (Textfig. 36). The most variable is maximum diameter. Sinistral individuals form 54%, dextral ones 46%.

In *Praeglobotruncana imbricata* (Mornod) (lower horizon) we may see three maximum of size (Textfig. 62). During the ontogenesis distance of keels relatively decreases, but in fact it is uniform in individuals of various ages (Textfig. 59). Similarly does not change the thickness of shell, while the diameter varies in considerable degree (Textfig. 58). The number of chambers in the final whorl is constant (mean number 5, variability ± 1 , Textfig. 57). We

may regard it as diagnostic mark of this species. The width of umbilicus relatively decreases during the orogenesis, while size of the shell increases (Textfig. 56). The width of the last chamber varies, but in the ontogenesis does not change in individuals of different size. Together with maximum diameter represents the most variable feature (Textfig. 55).

In *Praeglobotruncana imbricata* (higher horizon) (Textfigs. 49–53, 60–61) distances of keels percentually do not change (Textfig. 60). The most stable feature is the number of chambers in the final whorl (mean value 5, variability ± 1), (Textfig. 61). Similarly does not change during the ontogenesis the width of umbilicus (Textfig. 53), thickness of shell (Textfig. 52), and height of the last chamber (Textfig. 51). We may see one maximum of size (Textfig. 49).

In *Globotruncana spinea* Kikoine varies a number of spines between 1–6, the mean value 3, but many of them might be broken (Textfig. 76). The height of the last chamber percentually does not change, but in biggest individuals we may see a sudden bound. Similarly the width of the last chamber. The number of chambers in the final whorl is constant (± 2 , the mean value 5) (Textfig. 73). The width of umbilicus on a whole does not change during the ontogenesis. The most variable feature is maximum diameter and number of spines (if we do not take into consideration the possibility of their break).

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