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FORAMINIFERA FROM THE TRANSITION BEDS BETWEEN
LOWER AND UPPER CRETACEOUS IN THE UKRAINIAN
CARPATHIANS

(Pl. XLVI)

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Фораминиферы из пограничных слоев верхнего и нижнего мела
в Украинских Карпатах

(Табл. XLVI)

Basic paleogeographic changes in the Carpathian geosyncline occurred on the boundary between Early and Late Cretaceous. They resulted in considerable differences in lithological and facial development of Lower and Upper Cretaceous deposits. Consequently in general the Lower Cretaceous complex is developed as black sandy and argillaceous flysch deposits (Spas and Shipot suites)¹ whilst the Upper Cretaceous one — as gray flysch sediments, often with variegated shales in the base. Nearly everywhere at the contact between these two complexes there occurs rather thin (4—15 meters) but from stratigraphic point of view very constant horizon of green shales and marls containing characteristic foraminiferal fauna, giving some data on the age of these rocks. In the majority of cross-sections sediments of this horizon contain only arenaceous foraminifera but in some sections calcareous planktonic forms have also been found. Irrespective of different assemblages of species in green shales and marls, some forms occur in all the investigated cross-sections. They are: *Hormosina ovulum* (G r z y b o w s k i) var. *crassa* G e r o c h, *Ammodiscus tenuissimus* (G ü m b e l), *Recurvoides imperfectus* H a n z l i k o v á, *Plectorecurvoides alternans* N o t h, *Haplophragmoides gigas* C u s h m. var. *minor* N a u s s, *Thalmannammina neocomiensis* G e r o c h.

It would be difficult to determine the age of these green shales and marls basing on the above species only, if they were not accompanied locally by Vraconian ammonites, belemnites and *Aucellinae*. So e.g. in the „Skole”² unit in the lower part of green shales *Neohibolites* ex gr. *minimus* L i s t has been found. Moreover in the deposits representing stratigraphic equivalents of the horizon of green shales and marls in the Rakhov unit following fossils have been found and identified by S. I. P a s t e r n a k (in K u l c h i c k i j et al., 1966): *Parahibolites tourtiaei* (W e i g e l t), *Puzosia planulata* (S o w e r b y), *Sciponoceras baculoides* M a n t e l and *Aucellina gryphaeoides* (S o w e r b y).

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¹ Suite — is used here in the meaning of the Russian term „свита”.

² Skole unit sensu lato.

Within the „Skole” unit the horizon of green shales and marls has been investigated in the Skole scale along the Dnestr river between villages Tershov and Spas (Vialov et al., 1967). In this region the deposits under consideration in the northern scale of this cross-section are approximately 2 meters thick and consist of green shales with scarce intercalations of black silicified shales rich in Radiolaria. Following Foraminifera have been found here: *Hormosina ovulum* (Grzybowski) var. *crassa* Geröch, *Ammodiscus tenuissimus* (Gümbel), *A. cretaceous* (Reuss), *Recurvoides imperfectus* Hanžliková, *Plectorecurvoides alternans* Noth, *Haplophragmoides gigas* Cushman var. *minor* Nauss, *Thalmannammina neocomiensis* Geröch. In the southern scale of this cross-section these green shales and marls contain a small intercalation (approximately 50 cm thick) of red shales containing Radiolaria only.

The horizon of green shales and marls is overlying the deposits of the Spas suite (Jankov sub-suite) developed in their upper part as black or dark gray finely rhythical silicified flysch sediments (alternation of sandstones, mudstones and shales), resembling the Upper Shipot sub-suite of the Chernogora unit. In shales of the upper part of the Spas suite *Thalmaninella ticinensis* (Gandolfi) has been found, being the index form for Upper Albian.

In the bore-hole „Vola Blazhevskaja — II” situated within the Dnestr valley near Spas i.e. along the same key cross-section, the horizon of green shales and marls is already 30 meters thick and contains the same species: *Hormosina ovulum* (Grzybowski) var. *crassa* Geröch, *Haplophragmoides gigas* Cushman var. *minor* Nauss and *Thalmannammina neocomiensis* Geröch.

In the „Skole” unit the horizon of green shales and marls is overlain by silicified marls of the Golovnia suite of Cenomanian age. We have to say, however, that in the lowermost part of these beds (in the black shale intercalations) the present writer has found: *Globigerinelloides breggiensis* (Gandolfi), *Hedbergella infracretacea* (Glaessner), *Planogyrina globigerinellinoides* (Subbotina) characteristic for the uppermost Albian or Vraconian. It is quite probable that the boundary between the Lower and Upper Cretaceous passes within the Golovnia suite.

In the Silesian unit (Krosno zone) within the basin of the Goliatinka river, the Upper Shipot subsuite developed as very characteristic facies of glassy sandstones and black shales are overlain by a 20 meters thick member, composed of alternating gray-greenish shales and mudstones with black and distinctly green silicified shales and marls in the top. In the above member following species have been found: *Hormosina ovulum* (Grzybowski), *H. ovulum* (Grzybowski) var. *crassa* Geröch, *Plectorecurvoides alternans* Noth and *Thalmannammina neocomiensis* Geröch. These green shales and marls in the environs of the Goliatinka river are overlain by Ialovets suite. Its lower part consist of (carbonate-free) red shales of Cenomanian-Turonian age (horizon with *Uvigerinammina jankoi* Majzon).

In the Dukla unit (basin of the Luta river), the 5—10 meters thick horizon of green shales and marls containing *Hormosina ovulum* (Grzybowski), *H. ovulum* (Grzybowski) var. *crassa* Geröch, *Haplophragmoides gigas* Cushman var. *minor* Nauss and *Plectorecur-*

voides alternans Noth overlies glassy sandstones and black shales of the Upper Shipot subsuite (Upper Albian). In the top it is overlain by red (carbonate-free) shales of the lower part of the Iankov suite containing Cenomanian-Turonian Foraminifera (horizon with *Uvigerinammia jankoi* Majzon).

In the Chernogora unit (basin of the rivers Black and White Cheremosh in the top of the Upper Shipot subsuite (Upper Albian) there occurs a 10—15 metres thick member of finely rhythmical flysch deposits, developed as gray-greenish silicified, locally dark gray nearly black shales, resembling very much previously described rocks of the Skole unit, overlying there the Spas suite. Gray-greenish shales contain an assemblages comparatively rich in species of arenaceous Foraminifera: *Ammodiscus tenuissimus* (Gümbel), *Glomospirella gaultina* (Berthelin), *Hormosina ovulum* (Grzybowski), *H. ovulum* (Grzybowski) var. *crassa* Geroch, *Haplophragmoides gigas* Cushman var. *minor* Nauss, *Plectorecurvoides alternans* Noth, *P. irregularis* Geroch, *Thalmanammia neocomiensis* Geroch, *Trochammia globigeriniformis* (Parker and Jones), *Recurvoides imperfectus* Hanzliková.

The horizon of green shales and marls in the Chernogora unit is overlain, similarly to the Silesian and Dukla units, by red (carbonate-free) shales of the lower part of the Iankov suite (horizon with *Uvigerinammia jankoi* Majzon).

Recently a new facial Sukhov sub-unit has been distinguished within the Rakhov unit (Dabagian et al., 1967). In this sub-unit (cross-section of the stream Pliniak, basin of the Bronka river) a rock complex, occurring on the boundary of the Lower and Upper Cretaceous is assigned to the lower part of the Sukhov suite (Kulchitskij et al., 1965). It consists of green and brownish-red (carbonate-free) shales containing *Hormosina ovulum* (Grzybowski), *H. ovulum* (Grzybowski) var. *crassa* Geroch, *Glomospirella gaultina* (Berthelin), *Ammodiscus tenuissimus* (Gümbel), *Bathysiphon taurinensis* Sacco, *Spiroplectammia laevis* (Roemer) var. *cretacea* Cushman, *Clavulinoides gaultinus* (Morosova), *Plectorecurvoides alternans* Noth, *Haplophragmoides gigas* Cushman var. *minor* Nauss, *Thalmanammia neocomiensis* Geroch. Moreover *Parella cretacea* Carbonier, *Gyroidina infracretacea* Morosova and *Planogyrina globigerinellinoides* (Subbotina) have been found.

The variegated shales pass into the facies of dark gray and black soft marls and sandy shales in the cross-section of Pavlik stream basin of the Pinia river and of Porkulec stream, basin of the Tershov river. The latter rock contain Vraconian ammonites — *Puzosia planulata* (Sowebby), *Sciponoceras baculoides* (Mantel), belemnites — *Parahibolites tourtia* (Weigelt) and pelecypods — *Aucellina gryphaeoides* (Sowebby). In these marls only planktonic Foraminifera have been found: *Planogyrina gaultina* (Morosova), *Planogyrina globigerinellinoides* (Subbotina), *Globigerinelloides breggiensis* (Gandolfi), *Hedbergella delrioensis* (Carsey), *H. (Asterohedbergella) asterospinosa* Hammaoui, *Clavihedbergella simplex* (Morrow), *Thalmaninella ticiensis* (Gandolfi).

These marls and shales are overlain by greenish-gray marls with

abundant Cenomanian planktonic Foraminifera *Thalmaninella deecke* (Frank e), *Rotalipora cushmani* (Morrow) etc.

Red shales and marls of the Vraconian age are reported from Rumanian Carpathians (Sandulescu, 1968) within the Curbicortical Flysch zone, analogous to the Sukhov sub-unit. They contain *Stoliczkaja notha* and the following Foraminifera: *Haplophragmoides kirki* Wicken den, *Plectorecurvoides irregularis* Geroch, *P. alternans* Noth. *Thalmanammia neocomiensis* Geroch, *Hyperammia grzybowskii* Dylążanka, *Hormosina ovulum* (Grzybowski), *Recurvoides imperfectus* (Hanzliková), *Trochammia quadriloba* (Grzybowski). The assemblage is fairly analogical with that occurring in the Ukrainian Carpathians.

Lithological equivalents of the horizon of green shales under consideration in the Polish Carpathians are so called „green shales with Radiolaria and manganese shales” (Bieda et al., 1963). The latter are assigned by the Polish geologists to the Middle-Upper Cenomanian and not to Vraconian as in the Ukrainian Carpathians. It should be emphasized that the foraminiferal assemblage of the green shales and marls in the Ukrainian Carpathians (*Plectorecurvoides alternans* Noth, *Haplophragmoides gigas* Cushman var. *minor* Nauss etc.) corresponds rather to that found by Geroch (1966) in the so called „Mikuszowice Beds” (upper part of the Lgota Beds) of the Subsilesian and Silesian tectonic units and in the upper part of Verovice Beds in the Skole unit.

Stratigraphic equivalents of the horizon of green shales and marls in the Silesian unit (Godula sub-unit) of the Czechoslovakian Carpathians are the transition beds between the Lgota (= Lhoty) Beds and the Variegated Godula Beds. In Czechoslovakia the Lgota Beds are assigned to the Albian (Hanzliková 1966) whilst the Godula Beds with variegated sediments at the base — to the Cenomanian — Turonian. No separate horizon of radiolaria-bearing shales has been distinguished by Czechoslovak geologists.

Closing these considerations we have to note, that on the boundary between Lower and Upper Cretaceous monotypic rocks with similar foraminiferal assemblage have been deposited in nearly all the Carpathian geosyncline. Thus, in the present writer's opinion the rock complex under consideration may be recommended as key boundary between the Lower and Upper Cretaceous in the Carpathians.

PALEONTOLOGICAL PART

The present chapter contains a short description of the most characteristic species of Foraminifera occurring in the horizon of green shales and marls (Vraconian) in the Ukrainian Carpathians.

No special investigations of microstructure of the walls of arenaceous tests have been carried out by the present writer. Thus all the necessary data on this subject are due to other authors. The drawings of Foraminifera have been prepared by V. I. Fonareva.

Family: Reophacidae Cushman, 1927

Genus: *Hormosina* H. B. Brady, 1879

Hormosina ovulum (Grzybowski) ssp. *crassa* Geroch
Pl. XLVI, fig. 1a, b

1960 *Hormosina ovulum* Geroch; Geroch: p. 43, Pl. 2, Fig. 20.

1966 *Hormosina ovulum crassa* Geroch; Geroch: p. 439, Fig. 6 (19, 21—26), Fig. 7 (21—23).

H o l o t y p e: from black siderite-bearing marly Verovice Shales (Barremian-Aptian) of the Subsilesian tectonic unit of the Polish Carpathians.

S p e c i m e n s: No 1050 in the Collection of Ukr. N.I.G.R.I., borehole „Vola Blazhevska-II” near village Spas, depth 260—262 m, horizon of green shales and marls, Vraconian, Skole unit.

D e s c r i p t i o n: Small, pear-shaped chambers represent fragments of a linear multichambered test. Peripheral outline of chambers broadly rounded and even. Large apertural necks occur on both ends of the chamber. Embryonic chambers possess only one aperture on the end of the neck. In some transparent tests the opaque interior is distinctly marked. The walls of the test is very smooth, greenish in colour. In immersion white thread-like inclusions are observed, resembling spicules of sponges. The latter have been previously observed by the present writer in the walls of the genus *Bogdanowiczia* Pishvanova et Vialov, 1967 and of *Saccamina* M. Sars, 1869. As follows from thin section examination (by L. N. Stoliar) the wall is composed of quartz-siliceous cement with some clay admixture and individual quartz grain inclusions. According to S. Geroch's data (1966), the wall of the test consists of siliceous cement and scarce quartz grains.

D i m e n s i o n s: length 0.45 mm; width 0.38 mm; thickness 0.28 mm.

V a r i a b i l i t y: The surface of walls varies from polished in appearance to slightly roughened one. The length of tubular neck changes very little, its width being constant. Numerous flattened tests probably due to post-mortal deformation, have been found, since the majority displays spherical form. Some specimens contain thin white threadshaped inclusions resembling spicules of sponges.

C o m p a r i s o n: It does not differ in any detail from the holotype *Hormosina ovulum crassa* Geroch from the Verovice Beds of the Subsilesian unit. When compared with *Hormosina ovulum ovulum* (Grzybowski) it differs in considerable width of the apertural neck and from *Hormosina ovulum gigantea* Geroch in smaller dimensions (0.45 mm instead of 0.60—0.85 mm) and in the larger width of the apertural neck.

O c c u r r e n c e a n d a g e: In the Polish Carpathians occurs in the Verovice Beds (Barremian-Aptian) and in the Lgota Beds (Albian-Lower Cenomanian). In the Ukrainian Carpathians — in the upper part of the Spas and Shipot suites (Upper Albian), in the lower part of the Sukhov suite (Vraconian) and in the horizon of green shales and marls (Vraconian).

F a m i l y: Ammodiscidae Rumbler, 1895

S u b f a m i l y: Ammodiscinae Rumbler, 1895

G e n u s: *Ammodiscus* Reuss, 1861

Ammodiscus tenuissimus (Gümbel)

Pl. XLVI, fig. 2 a, b

1862 *Spirillina tenuissima* Guembel; Guembel p. 214, Pl. 4, fig. 12 a, b.

1892 *Ammodiscus tenuis* Chapman; Chapman p. 326, Pl. 6, fig. 12.

1937 *Ammodiscus tenuissimus* Guembel; Paalzow p. 216, Pl. 2, fig. 4, 5, 5.

1939 *Ammodiscus tenuissimus* Guembel; Miatluk p. 39, Pl. 2, fig. 14.

1951 *Ammodiscus tenuissimus* Guembel; Bartenstein et Brand p. 267, Pl. 1, fig. 14.

1966 *Ammodiscus tenuissimus* Guembel; Geroch, p. 437, fig. 4 (1, 4).

1967 *Ammodiscus tenuissimus* Guembel; Hofman p. 51, Pl. 14, fig. 4.

Holotype from the Lower Oxfordian deposits of the environs of Streitberg, Bayern (southern Germany).

Specimens: No. 1051 in the collection of Ukr. Nigri, Dnestr river near Spas village, horizon of green shales and marls (Vraconian), Skole unit.

Description: Test very flat, consisting of two chambers. The first chamber rather large, opaque and flat, the second tubular, forming 6 rather thin flattened whorls. Spiral suture distinct and transparent. Aperture rounded at the end of the tube. Wall siliceous, smooth, transparent. Peripheral margin angled.

Dimensions: diameter 0,38 mm; thickness 0,09 mm.

Variability: Not numerous tests of *A. tenuissimus* found by the writer did not allow to trace the intraspecific variability.

Comparison: As compared with holotype it differs slightly only in larger thickness (0,09 instead of 0,007 mm) and in larger size of the first chamber.

Occurrence and age. Oxfordian and Upper Valanginian in Germany, Callovian of the Volga region and of Caucasus. Lower Cretaceous of the Silesian unit in the Polish Carpathians. In the Ukrainian Carpathians occurs in the lower part of the Spas suite (Barremian, Aptian), in the upper part of the Spas and Shipot suites (Upper Albian) and in the horizon of green shales and marls (Vraconian).

Family: Lituolidae, Reuss, 1861

Subfamily: Lituolinae, Reuss, 1861

Genus: *Haplophragmoides* Cushman, 1910

Haplophragmoides gigas Cushman var. *minor* Nauss

Pl. XLVI, fig. 5 a, b, c; 6 a, b, c

1947 *Haplophragmoides gigas* Cushman var. *minor* Nauss; Nauss, p. 338, Pl. 49, fig. 10 a, b.

1968 *Haplophragmoides gigas minor* Nauss; Geroch p. 441, fig. 10 (1—3).

Holotype: No. 7042 in the collection of the Stanford University, California, Menville formation, Cenomanian (Alberta, Canada).

Specimens: NoNo 1054, 1055 in the collection of Ukr. Nigri, Dnestr river, near Spas village, horizon of green shales and marls (Vraconian) Skole unit and Pliniak stream (basin of the Bronka river) near Sukha village, lower part of the Sukhov suite (Vraconian) Sukhov sub-unit, Rakhov unit.

Description:

Test of medium size, oval or roundish, biconvex, involute and symmetrical. The last-formed whorl consists of triangularly elongated gently curved chambers. The last and sometimes also the one before last chambers more convex than the foregoing ones. In some specimens the last chamber considerably inflated. Sutures distinct, limbate, transparent and gently curved. Slit-like aperture on the base of the apertural face. Periphery broadly keeled. Wall siliceous, smooth, transparent, containing white thread-like inclusions in some specimens.

Dimensions: diameter 0,48—0,64 mm; thickness 0,24—0,26 mm.

Variability: The form of the last chamber varies. Usually it is semispherical, showing no keeled periphery, as in the holotype. Nevertheless in numerous specimens the last chamber is slightly angled and terminated by a rostriform-like process. The convexity in the central part of the last and fore-last chambers is considerably developed in some tests, but usually it is a negligible one. Other features constant.

Comparison: The test, presented in Pl. XLVI, fig. 6a, b, c is in all details identical with the holotype. Some specimens, as e.g. those presented in Pl. XLVI, fig. 5 a, b, c differ from the holotype in keeled, rostriform shape of the last chamber and in considerable convexity in the centre of the test. No similar species are known to the writer. The species characteristic in its features and easy to determine.

Occurrence and age: Cenomanian deposits in Canada. In the Polish Carpathians — Lgota Beds (Albian, Lower Cenomanian). In the Rumunian Carpathians — zone of *Plectorecurvoides alternans* and *Haplophragmoides gigas minor* (Albian). In the Ukrainian Carpathians in the Shipot and the upper part of the Spas Suites (Upper Albian), horizon of green shales and marls (Vraconian) — lower part of the Sukhov suite (Vraconian).

Genus: *Plectorecurvoides* Noth, 1952, emend. Geroch, 1962.

Plectorecurvoides alternans Noth

Pl. XLVI, 4 a, b

1952 *Plectorecurvoides alternans* Noth; Noth p. 117—119, fig. in the text 1, 2.

1955 *Plectorecurvoides alternans* Noth; Homola, Hanzliková, p. 389, Pl. 7, fig. 6.

1957 *Globivalvulinella grossheimi* Bukalova; Bukalova, p. 186, fig. 2 in the text.

1960 *Plectorecurvoides alternans* Noth; Geroch p. 54, Pl. 7, fig. 4.

1962 *Plectorecurvoides alternans* Noth; Geroch p. 285, fig. 3 (11, 15).

Holotype from the flysch deposits of the environs of Kirchdorf in Austria, Gaultian.

Specimens: NoNo 1052, 1053 in the collection of Ukr. Nigri, Dnestr river near Spas village, horizon of green shales and marls (Vraconian), Skole unit and Pliniak stream (basin of the Bronka river) near Sukha village, lower part of the Sukhov suite (Vraconian), Sukhov sub-unit, Rakhov unit.

Description: Test of oval or spherical form close coiled involute, often flattened. Chambers of the last whorl deltoidal in outline and arranged biserially. Sutures rather indistinct, the peripheral one forming a zig-zag line. Apertural face protruding, aperture slit-like at the base of the former. Wall siliceous, smooth, somewhat roughened, transparent. Periphery broadly rounded.

Dimensions: diameter 0,40—0,48 mm, thickness 0,33—0,36 mm.

Variability: The form of tests varies from roundish to elliptical. Apertural face in some specimens very large. External appearance of tests from polished to somewhat roughened.

Comparison: Investigated specimens of *P. alternans* differs from the holotype only in having more chambers.

Occurrence and age: Gaultian, Cenomanian in Austria. In the Czechoslovakian Carpathians in the Lgota Beds (Albian) and in the Variegated Godula Beds (Cenomanian-Turonian). In the Polish Carpathians in Albian and Cenomanian. In the Ukrainian Carpathians upper part of the Spas and Shipot suite (Upper Albian), lower part of the Sukhov suite horizon of green shales and marls (Vraconian), lower part of the Golovnia and Ialovets suites (Cenomanian).

Genus: *Thalmannammina* Pokorný 1951, Geroch, 1962

Thalmannammina neocomiensis Geroch

Pl. XLVI, fig. 7 a, b; 8 a, b

1962 *Thalmannammina neocomiensis* Geroch; Geroch p. 282, fig. I, fig. 3 (5—8).

Holotype: No 6/59 in collection of the Geology Dept., Jagellonian University in Cracow, locality Lipnik near Bielsko, Grodiszcze Beds (Hauterivian).

Specimens: No No 1056, 1057 in the collection of Ukr. Nigri, bore-hole „Vola Blazhevskaja-II”, near Spas village, cross-section of the Dnestr river, horizon of green shales and marls (Vraconian), Skole unit.

Description:

Test small, subglobular, resembling raspberry fruit, close coiled, involute. The outer part of the spiral consists of up to 20 spherical chambers. In immersion the connection of chambers by short tubes is clearly visible. Arrangement of chambers zig-zag-like, individual arms of meanders being oriented at approximately right angles. Sutures depressed. Elliptical aperture at the base of the last chamber, often invisible. Periphery broadly rounded. Walls siliceous slightly roughened, transparent.

Dimensions: diameter 0,36—0,40 mm; thickness 0,28—0,33 mm.

Variability: In the investigated material the tests of *Thalmannammina neocomiensis* are constant in their features.

Comparison: Differs from the holotype only in the larger number of chambers (20 instead of 12—15 forming the outer part of the test) and in their more convex forms.

Occurrence and age: In the Polish Carpathians in the Upper Cieszyn, Grodiszcze, Verovice and Lgota Beds (Valanginian-Cenomanian?). In the Rumanian Carpathians from Barremian to Cenomanian. In the Ukrainian Carpathians in the upper part of the Spas and Shipot Beds (Upper Albian), in the lower part of the Sukhov suite (Vraconian), horizon of green shales and marls (Vraconian), lower part of the Ialovets suite (Cenomanian).

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translated by W. Narębski

РЕЗЮМЕ

На границе ранне- и поздне мелового времени на территории складчатой области Украинских Карпат имела место коренная перестройка бассейна осадко-накопления, которая обусловила наличие резких литолого-фациальных отличий между осадками нижнего и верхнего мела. Нижнемеловой комплекс на большей территории представлен песчано-глинистым флишем (спасская и шипотская свиты), верхнемеловой — обычно сложен серыми флишевыми породами, зачастую

с пестроцветными (красными и зелеными) глинистыми слоями в основании. На контакте этих комплексов почти повсеместно прослеживается маломощный (4—15 м), но стратиграфически очень выдержанный горизонт зеленых аргиллитов и мергелей с характерной фауной фораминифер, проливающей свет на возрастную принадлежность пород. В большинстве разрезов фораминиферы в осадках этого горизонта только с кремневой стенкой, в некоторых же разрезах присутствуют и известковистые (планктонные) формы. Независимо от различного состава видов в зеленых аргиллитах и мергелях некоторые из них являются постоянными для всех изученных разрезов: *Hormosina ovulum* (Grz.) var. *crassa* Geroch, *Ammodiscus tenuissimus* (Guembel), *Recurvoides imperfectus* Hanzliková, *Plectrorecurvoides alternans* Noth, *Haplophragmoides gigas* Cushman var. *minor* Nauss, *Thalmannammina neocomiensis* Geroch. Возраст горизонта зеленых аргиллитов и мергелей определяется вращонским по находкам *Neohibolites* ex gr. *minimus* List. в Скибовой зоне и по *Parahibolites tourtiaie* (Weig.), *Puzosia planulata* (Sow.), *Sciponoceras baculoides* (Mant.) и *Aucellina gryphaeoides* (Sow.) в Суховской подзоне Украинских Карпат и рекомендуется автором как маркирующий горизонт для границы нижнего и верхнего мела в Карпатах.

В палеонтологической части приводится описание наиболее характерных видов фораминифер из горизонта зеленых аргиллитов и мергелей.

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EXPLANATION OF PLATE XLVI

- Fig. 1 a, b. *Hormosina ovulum* (Grzybowski) subsp. *crassa* Gerösch. Specimens No 1050, X60. 1a — side view; 1b — top view, showing aperture; bore-hole „Vola Blazhevskaya — II” depth 260—262 m. near Spas village, Skole unit, horizon of green shales and marls, Vraconian
- Fig. 2 a, b. *Ammodiscus tenuissimus* (Gümbel). Specimens No 1051, X60. 2a — side view; 2b — edge view: Dnestr river, near Spas village, Skole unit, horizon of green shales and marls (Vraconian)
- Fig. 3 a, b. *Recurvoides imperfectus* Hanzliková. Specimen No 1052, X60. 3a — apertural view, 3b — peripheral view: Dnestr river, near Spas village, Skole unit, horizon of green shales and marls. Sukha subzone, Rakhov unit, lower part of the Sukhov Suite, Vraconian.
- Fig. 4 a, b. *Plectorecurvoides alternans* Noth. Specimen No 1053, X60. 4a — apertural view; 4b — peripheral view; Pliniak stream (basin of Bronka river), near Sukha village, Sukha subzone, Rakhov unit, lower part of Sukhov Suite, Vraconian.
- Fig. 5 a, b, c and 6 a, b, c. *Haplophragmoides gigas* Cushman var. *minor* Nauss. Specimens No No 1054, 1055, X60. 5a, 6a, 5b, 6b — side views; 5c, 6c — edge view; Dnestr river, near Spas village, Skole unit, horizon of green shales and marls and Plinyak stream (basin of Bronka river) near Sukha village.
- Fig. 7 a, b, and 8 a, b. *Thalmannammina neocomiensis* Gerösch. Specimens No No 1056, 1057, X60. 7a, b, 8a, b — opposite sides; bore-hole „Vola Blazhevskaya — II”, depth 260—262 m, near Spas village, Skole unit, horizon of green shales and marls and Dnestr river, near Spas village, Skole unit, horizon of green shales and marls. Vraconian.

