BIOSTRATIGRAPHY OF PALEOGENE THE SOUTHERN UKRAINE BY SMALL BENTHIC FORAMINIFERA: RETROSPECTIVE VIEW

The article deals with history of small benthic foraminifera biostratigraphy of Paleogene deposits the southern Ukraine. The significance of O.K. Kaptarenko-Chernousova, A.M. Voloshina, M.V. Yartseva, Ye.Ya. Kraeva, A.P. Pechenkina, N.G. Savenko and I.D. Konenkova’s works on study foraminifera is shown. Due to their investigations the sequence and space-time relationships of Paleogene small benthic foraminifera assemblages have been determined in the southern Ukraine. Comparison foraminifera assemblages of Paleogene the southern Ukraine with intergerional benthic foraminifera zones of the Crimea-Caucasus Region is given. The article provides full references to previous literature on Paleogene foraminiferal biostratigraphy of the northern Peri-Black Sea Region and the southern slope of Ukrainian Shield. Up to the beginning the seventies years of the last century the researchers had distinguished and had described foraminifera assemblages characterizing Series and regional units of Paleogene the southern Ukraine. Taxonomic composition of benthic foraminifera assemblages was defined. Their spreading in Paleogene section of the northern Peri-Black Sea Region, the southern slope of Ukrainian Shield and adjacent part the Azov Crystalline Massif was studied. For some foraminifera assemblages the regional significance has been proved. Other assemblages are important for characterizing and dating suites, members, stratum and beds of the local stratigraphic schemes. Foraminifera associations of relatively deep-water depositional environments of the south of the northern Peri-Black Sea Region include species of zonal assemblages of interregional benthic foraminifers zones the Crimea-Caucasus Region. The most of distinguished benthic foraminifera assemblages are characteristic for shallow- and marginal-marine sediments of Paleogene basin in the northern Peri-Black Sea Region and its peripheral facies within depressions the southern slope of Ukrainian Shield. The space-time relations of benthic foraminifera assemblages are defined for Paleogene regional stages of the southern Ukraine section.

Key words: benthic foraminifera, Paleogene, biostratigraphy, southern Ukraine.

Introduction. Biostratigraphic units of foraminifera, namely zones and beds with fauna according to Stratigraphic Code of Ukraine [12, 92] and of the former Soviet Union [116], are among subdivisions grounded the Regional Stratigraphic Scheme of Paleogene deposits the southern Ukraine. Characteristic assemblages of zones and beds with foraminifera of the Scheme [64, 90, 91] include small benthic foraminifera (BF). Biostratigraphic units of small BF presented in the modern Regional Stratigraphic Scheme of Paleogene the southern Ukraine are compared to zonal associations of planktic and large foraminifera, calcareous nannofossils and dinoflagellate cysts.

Most of stratigraphically important small BF assemblages of the Paleogene the south Ukraine had been distinguished by O.K. Kaptarenko-Chernousova, M.V. Yartseva, A.M. Voloshina, Ye.Ya. Kraeva, A.P. Pechenkina, N.G. Savenko and I.D. Konenkova in the 50-60s years of XX century. Due to the further investigations of mentioned researchers and others the temporal and spatial distribution of these assemblages in Paleogene sediments of the northern Peri-Black Sea Region and adjacent areas of the Ukrainian Shield has been studied. For some of them regional significance has been proved, others have remained as local biostratigraphic subdivisions important for dating and characterizing suites (formations), members, stratum and beds. At the same time the current state of development zonal foraminiferal biostratigraphy of Paleogene deposits the southern regions of former Soviet Union (the Crimea-Caucasus Region) (CCR here, and in later text) [9, 39] allows more precise determination the stratigraphic position of small BF assemblages in Paleogene section the southern Ukraine.

The article deals with history of small BF biostratigraphy of Paleogene deposits the southern Ukraine, i.e. the northern Peri-Black Sea Region (NPBSR here, and in later text) and adjacent parts of the Ukrainian Shield (US here, and in later text) and Azov Crystalline Massif (ACM here,
The main aim of the article is to show significance of foraminifera study by O.K.Kaptarenko-Chernousova, M.V. Yartseva, Ye.Ya. Kraeva, A.P. Pechenkina, A.M. Voloshina, N.G. Savenko, I.D. Konenkova for Paleogene biostratigraphy the southern Ukraine.

Notes on modern state of Paleogene stratigraphy of the southern Ukraine. The Ukraine sedimentary cover is divided into regional units. By the National Stratigraphic Code of Ukraine [12, 92] the main stratigraphic unit is a Regional Stage (Regiostage; syn.: Regional Horizon, Stratohorizon) regarding as reflection of stages of sedimentary basin’ geological history, i. e. its peculiarities sedimentation, transgressive-regressive cycles, (sequence) evolution of fauna or/and flora and others.

The Stratigraphic Scheme of Paleogene the southern Ukraine includes the general, regional and local parts [64, 90, 91]. The first, general, part includes Series, Subseries and Stages of Paleogene International Stratigraphic Scale (ISS here, and in figures). The second part, Regional Scale, presents stratigraphic sequence of Regional Stages of Paleogene the southern Ukraine. The third, local, part of the Scheme reflects stratigraphic sequence and correlation of suites, members, stratum and beds of the structural-facial districts of the southern Ukraine.

Regional Stages of the Paleogene of southern Ukraine have rather interesting and long history of distinguishing, definition and ratification by Commission on Paleogene Stratigraphy of Interdepartmental Stratigraphic Committee of the former Soviet Union and by Regional Interdepartmental Stratigraphic Committee of Ukraine up to the end of XX century. Brief description of Paleogene Regiostages the southern Ukraine and special literature on that question are in the article [115]. All Paleogene Regiostages of the Southern Ukraine are identified as valid (real) stratigraphic units according to Stratigraphic Code of Ukraine [12, 92]. They have been accepted in following official stratigraphic schemes of Ukraine: “Regional Stratigraphic Schemes of Paleogene Deposits the South Ukraine Oil and Gas Area” [91], “Stratigraphic Scheme (Unified) of the Ukraine Paleogene Deposits” [64], “Stratigraphic Scheme of Paleogene Deposits of the Southern Regions of Ukraine” [90].

Succession of regional stages in official Regional Stratigraphic Scale (Regional SS here, and in figures) of the Paleogene of southern Ukraine (including the Crimea) is as follows: Paleocene – the Belokamenskian (Danian – lower part of Selandian) and Kachian (Selandian – Thanetian); Eocene – the Bakhchisaraian (lower Ypresian), Simferopolitan (upper Ypresian – lower Lutetian), Novopavlovkian (Lutetian), Kumian (Bartonian), Almian (Priaabonian); Oligocene – the Planorbellian (lower Rupelian), Molochnian (middle Rupelian) and Kerleutian (upper Rupelian – Chattian). Paleogene regiostages of the southern Ukraine, except the Molochnian, are defined or characterized by regional or provincial biozones of planktic and benthic foraminifera (table).

Biostratigraphic Scheme of Paleogene the southern Ukraine includes three kinds of biostratigraphic units of foraminifera, namely lone (= provincial biozone), biozone (assemblage-zone) and beds with foraminifera.

Most of suites, members, stratum and beds of Local Stratigraphic Schemes of Paleogene of the southern Ukraine [64, 67, 90, 91] are characterized by BF biozones, mainly assemblage-zones, and beds with foraminifera. Biostratigraphic zone (biozone) is a rock association contained the zonal assemblage of fossils (foraminifera). But according to the Stratigraphic Code of Ukraine [12] in the cases of undivided on zones deposits or in one geological section an auxiliary biostratigraphic unit the beds with fauna (or flora) are distinguished.

Materials and methods, research area. All published works on small BF including data on their distribution in sections, description of associations, intra- and interregional correlation based on foraminifera study, and also on corresponding beds with small BF to other associations of fossils, especially planktic and large foraminifera, calcareous nannofossils, organic-walled microphytoplankton have been analyzed. Presented in the article biostratigraphic generalization of the half past of XX century is based mainly on scientific elaborations of Ye.Ya. Kraeva [41-62 et al.], M.V. Yartseva [104-108 et al.], A.M. Voloshina [4, 10, 102, 103], A.P. Pechenkina [40, 59, 72, 73], I.D. Konenkova [21-37 et al.], N.G. Savenko [70, 82-84,101]. Also some works of O.K. Kaptarenko-Chernousova [16-19], E.K. Schutzkaya [89] and others [6, 63, 74-78] have been
| System | Stage | Regional Stage | Biostratigraphic units: Iones (provincial zones), regional zones [64, 91] | Regional Stratigraphic Scheme of Paleogene the Southern Ukraine |
|--------|-------|----------------|--------------------------------------------------------------------------------|------------------------------------------------------------------|
| Oligocene | Chattian | Kerchian | Porosonion dendricus, Elphidium onerosum | *Porosonion dendricus* (Chal.), *Cribronion onerosum* Bogd., *Cibicidoides ornatus* (Bogd.), *Nionion granosus* Orb., *Quinqueloculina aff. seifae* (Karr.), *Spiroplectammina caucasica* Djan., *Bolvina aff. goudkoffi* (Rank.) |
| | Miochellician | Rupelian | Sphaeroidina variabilis | *Sphaeroidina variabilis* Reuss, *Haplophragmoides kerleuticus* Kosir (msc.), *Spiroplectammina terektensis* Bogr., *Uvigerinella californica* Cushman., *Cibicidoides nefastus* (J.Nik.) |
| Paleogene | Albian | Pliocenian | Spiroplectammina oligocenica | *Spiroplectammina oligocenica* (J.Nik.), *Cylammina contrictamargo* Srev. et Stew., *Neogyroidea membrana* Subb., *Causina schischkinskyae* (Saml.), *Uvigerinella majocipica* Kraeva |
| | | | Lenticulina hermani | *Lenticulina hermani* (Andr.), *Heterolepa almaenia* (Saml.), *Cibicidoides extremus* Schutz., *Bolvina mississippiensis* Cushman., *Gaudyrynopsis gracilis* Cushman. et Lain. |
| | | | Bolivina antgressa and large globigerinids | *Bolvina antgressa* Subb., *Marsonella indentata* (Cushm. et Jarv.), *Vulvulina spinosa* Cushman., *Marginalina beimi* (Reuss), *Marginalinopsis infracompressa* (Thalm.), *Robulus kubinyi* (Hantk.), *Uvigerina jacksonensis* Cushman., *Cibicidoides kasinaensis* (Schutz.), *Cjankulaensis* (Schutz.), *Rectuviarian lacera* (Subb.) |
| Eocene | Bartonian | Kumian | Subbotina typica, Subbotina instabilis | *Baggina valvulineriiformis* (N.Byk.), *Brotzenella acuta taurica* (Saml.), *Heterolepa pygmeiformis* Kraeva, *Causina eocaenica* Chal. |
| | | | | (for the northern Peri-Black Sea Region) |
| | | | Globigerinathekta subconglobata, Hantkenina alabamensis | *Spiroplectammina cariniformis* Mor., *Falsoplanulina ammophila* (Guemb.), *Heterolepa eocaena* (Guemb.), *Uvigerina costellata* Mor., *Paragaudryina dalmatina* (Lieb.) |
| | | | Acarinina rotundimarginata | *Pseudogaudryina pseudonavarroana* (Bal.), *Clavulinaoides golubiatnikovi* (Schutz.), *Hydromulinella iljini* (N.Byk.), *Heterolepa eocaena* (Gumb.) |
| | | | | (for the northern Peri-Black Sea Region) |
| | | | Acarinina bullbrooki | *Vaginulinopsis eofragaria* Bal., *Falsoplanulina ammophila* (Gumb.), *Pseudogaudryina pseudonavarroana* (Bal.) |
| | | | Morozovella aragonensis s.l. | (for the northern Peri-Black Sea Region) |
| | | | Morozovella subbotinae s.l. | *Pseudogaudryina externa* Bugr., *Vaginulinopsis eofragaria* Bal., *Cibicidoides beatas* (Martin) |
| | | | | (for the northern Peri-Black Sea Region) |
| | | | Acarinina acarriata | *Anomalina nova* Schutz. |
| | | | Acarinina subsphearaica | |
| | | | Igorina dianensis | |
| | | | Morozovella angulata | *Gaudryina gigantica* Subb., *Anomalina danica* Brotz., *Falsoplanulina ekbloni* (Brotz.), *Cibicidina bundensis* (van Bell.) |
| | | | Praemuricula inconstans | *Arenobuliminia dubia* Wolosch., *Cibicidoides burlingtonensis* (Jenn.), *Anomalina danica* Brotz., *Stensioina caucasia* (Subb.) |

Тектоніка і стратиграфія, 2019, вип. 46
taken into account. Author’s materials on foraminifera from outcrops and boreholes sections of central and eastern part of the NPBSR, the southern part of the US and the western ACM Region are also taken into account. The article is accompanied by a complete list of references on Paleogene foraminiferal biostratigraphy the studying region.

Fig.1. Research area of the southern Ukraine
The Peri-Black Sea Region: 1 - the south-western part; 2 - the western (central) part; 3 – the eastern part; 4 - the Near Sivach

Presented in the article author’s bistratigraphic interpretation of BF assemblages of the southern Ukraine is based on modern foraminiferal zonation of the Paleogene of the south Russia, Crimean Peninsula, Central Asia and the Kazakhstan [9, 38, 39]. Yu.P. Nikitina’s study of BF distribution in Paleogene of the south-east the Russian Platform and Skythian Plate [66] is also taken into account. The investigations are based on actualizes Regional Stratigraphic Scale of the southern Ukraine worked out by author in common with B.F. Zernetskiy and S.A. Lulyeva [115].

In the describing part of article the term the beds with foraminifera is used in informal significance.

Because of the need to revise the systematic composition of Paleogene foraminifera the southern Ukraine, the table on small BF distribution is not given in the article. For the same reason, the names of foraminifera species are given in the wording of the authors of publications.

In the article BF associations are described from Paleogene deposits of the northern slope of Peri-Black Sea Depression more known in literature on stratigraphy as the NPBSR (Northern Prichernomorye), the southern slope of the US, the western, eastern and southern slopes of the ACM (Priazovie) (fig. 1). BF assemblages from Paleogene deposits of the Crimean Plain and foothills of the Crimean Mountains are not considered in the article.

**Brief history of foraminifera studying of Paleogene the southern Ukraine.** Due to investigations of O.K. Kaptarenko-Chernousova, M.V. Yartseva, Ye.Ya. Kraeva, A.M. Voloshina,
A.P. Pechenkina, N.G. Savenko and I.D. Konenkova the taxonomic composition of small foraminifera of Paleogene deposits the NPBSR and adjacent area of the US had been identified by the end of the seventies of the last century. Researchers have determined foraminifera associations of Paleocene, Eocene and Oligocene Subseries and those of regional stages (regional horizons) and have distinguished characteristic species and biostratigraphic units by small foraminifera for different regions.

Study of small foraminifera for stratification of Paleogene sections in the NPBS and manganese-ore deposits of the US was started by O.K. Kaptarenko-Chernousova and M.V. Yartseva in the fortifith of the last century.

In her works “Stratigraphy of Paleogene deposits of the Peri-Black Sea Depression (by foraminifera fauna)” [17], “About Lower Oligocene horizon with arenaceous foraminifera of the Peri-Black Sea Depression” [19] O.K. Kaptarenko-Chernousova (foto 1) mentioned BF “horizon with arenaceous foraminifera” and “horizon with Spiroplectammina” for the region.

The most known and non-losing stratigraphic significance M.V. Yartseva’s publications (foto 2) are “About Upper Eocene Miliolida of the Nikopol area and their habitat” [105], “To stratigraphy of Oligocene deposits of the south-eastern slope of Ukrainian Crystalline Shield (by foraminifera fauna)” [107], “Paleogene deposits of the southern slope of Ukrainian Crystalline Massif” [71]. She distinguished and determined stratigraphic position of some BF assemblages presenting in Local Stratigraphic Scheme of the south of US, namely “beds with miliolids, polymorphinids, Epistomaria rimosae”, “beds with Nummulites variolarius, Cibicides carinatus, Rotalia armata”, “beds with large lagenids, buliminids and Clavulina”, “beds with Caucasina schischinskyae, Spiroplectammina oligocenica”.

It should be mentioning A.M. Voloshina’s works of the sixtieth of the last century on foraminifera assemblages of Danian and Paleocene sediments of the Crimean Plain and adjacent part of the NPBSR [4, 102, 103]. She also distinguished deposits of Paleocene, Lower, Middle and Upper Eocene, Oligocene based on foraminifera in the south of NPBSR [10].

A.P. Pechenkina was the first who described in detail small foraminifera distribution on Paleogene section of the Odessa area (the south-western part of NPBSR) [40]. She distinguished foraminifera assemblages for Paleogene Series and Subseries according to point on view on Paleogene stratigraphy of that time. She noted that Paleocene foraminifera association includes species Bolivinopsis spectabilis (Grzyb.), Anomalina danica (Brotz.), A. praecuta Vass., Eponides lunatus Brotz., Siphonina prima Plum., Gyroidina globosa (Hag.), Angulogerina wilcoxensis (Cushm. et Pont.) be known from Paleocene deposits of the Dnieper-Donets Depression, Crimean Peninsula and Caucasus. Lower-Middle Eocene deposits are characterized by two foraminifera complexes. The first one with numerous nummulitids, orbitoides, Pulvinulinella granulosa Moroz. (msc.), Asterigerina norvaugi Brotz., she considered be
analogue of the Lower Eocene “beds with *Pulvinulina granulosa* Moroz.” of the West Crimea (today: Ypresian clays with *Morozovella subbotinai* (Moroz.)). The second association with *Heterostomella dalmatina* (Liebus), *H. pseudonavarroana* Balakhm., *Clavulina golubjatikovi Schutzkr., Cl. aff. szaboi* Hantks., *Uvigerinella kiewensis* Kapt. (msc.), *Trinitaxilina identata* (Cushm. et Janv.) A.P. Pechenkina regarded as analogous the lower part of “zone Globorotalia crassaeformis” of the North Caucasus and Crimean Peninsula.

From the Upper Eocene section of the Odessa area A.P. Pechenkina described the following succession of four foraminifera associations (from older to younger):

- association with dominating *Globorotalia*, presence of typical *Clavulina szaboi* Hantks., appearance of *Hantkenina alabamensis* Cushm., which she compared with upper part of “zone Globorotalia crassaeformis” of the Crimea and Northern Caucasus;
- association with numerous *Globorotalia crassaeformis* (Gall. et Wiss.), *Glia penracamerata* Subb. and Globigerinidae;
- association with small-size planktic foraminifera correlating with the same zone of planktic foraminifera of the Northern Caucasus and with “zone of small Bolivina and Bifarina millepuctata” of the Crimean Peninsula;
- association with rare *Cristellaria cultrata* (Montf.), *Bolivina reticulata* Hantks., *B. pusilla* Schw., *Uvigerina asperula* Cz., *Uv. auberaiana* Orb., *Uv. jacksonensis* Cushm., *Uv. cocoaeensis* Cushm., transition form from *Bulimina truncana* Guemb. to *Bul. scupltulus* Cushm., *Anomalina praecacta* J. Nik. et Moroz. *dampelae* J. Nik. in litt., *Cibicides pseudoungerianus* Cushm., which she considered similar the Northern Caucasus “zone of large Globigerina”.

In Oligocene part of the Odessa section, according to point of view on Paleogene stratigraphy of that period, A.P. Pechenkina identified the following foraminifera assemblages (from older to younger):

- association with numerous nummulitids and dominating buliminids (*Bolivina, Uvigerina*) which she correlated with “zone Bolivina” of the Northern Caucasus;
- association with rare *Nummulites* and numerous Anomaliniidae (*Anomalina affinis* (Hantks.), *An. alazanensis* Nutts., *An. grosserugosa* (Guemb.)) and Lagenidae, frequent *Haplophragmoides aff. deforme* Andrs., *Heterostomella* sp., *Cristellaria cultrata* (Montf.), *Cr. cultrata* (Montf.) *arcuato-stratiata* (Hantks.), rare *Nonion umbilicatum* (Montf.), *N. labradoricus* (Daws.), *N. aff. schaphum* (Fich. et Moll.), *Uvigerina pygmea* Orb., *Uv. tenustratiata* Nutt. (non Reuss), *Valvulineria iphigenia* Sam., *Eponides ex gr. umberatus* (Reuss), *Pulvinulina altaensis* Sam., *Cibicides pygmeus* Hantks., *C. ungerianus* Cushm., *C. ungerianus* (Orb.), *C. lobatulus* (Walk. et Jac.), *Rhabdammina eocaenica* Cushm. et Hanna, *Saccammina spheraica* M.Sars., *Proteonia difflugiformis* (Brady);
- association with arenaceous foraminifera and rare calcareous forms;
- association with non-numerous calcareous BF.

It is necessary to note the A.P. Pechenkina’s publications of foraminifera assemblages of transition Eocene-Oligocene and Lower Oligocene of the NPBSP in which she has described “zone of arenaceous foraminifera and Haplophragmoides deformabilis” and “zone Asterigerina lucida and Cibicides salensis” [72, 73].

The main contribution into working out Paleogene foraminifera biostratigraphy of the southern Ukraine belongs Ye.Ya. Kraeva (foto 3). In her work “Foraminifera of Upper Eocene and Oligocene deposits the northern side of the Peri-Black Sea Depression” [44] she proposed the first zonal division of Eocene-Oligocene sections for different parts of the region. In section of the Tokmak-Melitopol area (the eastern part of the NPBSP) she distinguished the following foraminifera associates (from older to younger):

- Upper Eocene “lagenids-globorotaliids zone” with numerous *Lenticulina romeri* (Reuss), *Marginulina fragaria* (Guemb.) and rare *Lenticulina laticostata* (Tutkov.), *L. pseudomamilligera* (Plum.), *L. arcuato-stratiata* (Hantks.), different *Dentalina* and *Nodosaria*, numerous *Globorotalia pentacamerata* Subb. (5-chamber *Acarinina*). Among characteristic species are *Hydromylinea rutteni* Puyt., *Uvigerina proboscidea* Schwag., *Valvulineria texana* Howe et Wall., *V. palmarealensis* (Nutt.), *Asterigerina stelligera* Kraeva;
- Upper Eocene “lagenids-globigerinids zone” with less various and numerous but larger in size lagenids (\textit{Lenticulina romeri} (Reuss), \textit{Robulus inornatus} Orb., \textit{Marginulina fragaria} (Guemb.)), Nodosariidae, disappearance \textit{Globorotalia}, presence Globigerinidae (\textit{Globigerinella micra} (Cole), \textit{Globigerina bulloides} Orb.), appearance \textit{Bolivina antegressa} Subb. costifera Kraeva, \textit{Planulina costata} (Hantk.), \textit{Pl. aff. venezuelana} Nutt., \textit{Anomalina alazanensis} Nutt., \textit{An. acutiformis} Moroz. (msc.);
- Upper Eocene “buliminids zone” with various Buliminidae; among characteristic species are \textit{Marginulina} \textit{infracompressa} Thalm., \textit{Turrilina alatica} Andr., \textit{Bulimina sculptilis} Cushm., \textit{B. aksuatica} Moroz., \textit{Bolivina nobilis} Hantk., \textit{Uvigerina jacksonensis} Cushm., \textit{Uv. jacksonensis} Cushm var. \textit{denticulata} Kraeva, \textit{Uv. costellata} Moroz.;
- Lower Oligocene “zone with arenaceous foraminifera” with various primitive agglutinated forms \textit{Rhabdammina cylindrica} Glæssn., \textit{Proteonina fusiformis} Will., \textit{Reophax scalaria} Grzyb., \textit{Haplophragmoides kiewensis} Kapt., \textit{Cyclammina cancellata} Brady, \textit{Spiroplectammina carinata} (Orb.), etc.
- Lower Oligocene “zone Spiroplectammina carinata” with numerous specimens of index-species and \textit{Caucasia schischkinskii} (Sam.), \textit{Bolivina mississippiensis} Cushm., less numerous \textit{Uvigerinella majkopica} Kraeva, \textit{Cibicides oligocenicus} (Sam.), \textit{C. pseudoungerianus} Cushm., etc.

For the section of the Odessa-Kherson area (the central part of NPBSR) Ye.Ya. Kraeva introduced the following succession of foraminifera assemblages (from older to younger):
- Upper Eocene “zones with Hantkenina alabamensis” (“globorotaliids zone”) with dominating planktic foraminifera; among characteristic benthic species are \textit{Nodosaria bacinum} Defr., \textit{N. bulbosa} Halk., \textit{Robulus kulturatus} Montf., \textit{R. arcuto-striata} Hantk., \textit{Planularia infans} Kraeva, \textit{Hydromylinia} ? \textit{rutteni} Puyt., \textit{Anomalina pseudoacuta} Moroz., \textit{An. acuta} Plumm. \textit{discoidea} Balakhm., \textit{An. affinis} (Hantk.), \textit{Cibicides ungerianus} (Orb.), \textit{Asterigerina stelligera} Kraeva, \textit{Valvulineria palmaraleensis} (Nutt.), \textit{Siphonina kaptarenkae} Kraeva, \textit{Kolesnikovella elongata} (Halk.), \textit{Angulogerina proprius} Kraeva,;
- Upper Eocene “zone with Globigerina aperture” (“globigerinids zone”) with dominating \textit{Globigerina}, \textit{Globigerinella}; among characteristic BF are \textit{Planulina} aff. \textit{venezuelana} Kraeva, \textit{Siphonina praereticulata} Kraeva, \textit{Valvulineria texana} Howe et Wall., \textit{Bolivina antegressa} Subb. \textit{costifera} Kraeva and also \textit{Lenticulina limbosa} Reuss, \textit{Nodosaria exilis} (Neugeb.), \textit{Bolivina pusilla} Schwag., \textit{B. arca Mact.}, \textit{B. aff. microlancetiformis} Subb., \textit{Uvigerina jacksonensis} Cushm., \textit{Uv. costellata} Moroz., \textit{Uv. densecostata} Kapt. (msc.), \textit{Baggina iphigenia} (Sam.);
- Upper Eocene “zone with Marginulina infracompressa” or “middle zone” characterizing by impoverished foraminifera association with \textit{Marginulina infracompressa} Thalm., \textit{Anomalina grosserugosa} (Guemb.), \textit{Eponides jacksonensis} Nutt., \textit{E. perlata} Andr., \textit{Gyroidina soldanii} Orb., \textit{Pullenia quinqueloba} Reuss, \textit{Asterigerina bracteata} Cushm., \textit{Uvigerina densecostata} Kapt. (msc.), \textit{Turrilina alatica} Andr., \textit{Bolivina antegressa} Subb., \textit{Cassidulina globosa} Hantk.;
- Upper Eocene “zone with Asterigerina and Nonion” distinguishing by very impoverished complex of small BF with numerous \textit{Eponides stellatus} Kraeva, \textit{Asterigerina ambiqua} Kraeva, \textit{Nonion umbilicatus} (Montf.), \textit{Cibicides aff. oligocenicus} Sam., \textit{C. aff. pseudoungerianus} Cushm., \textit{Turrilina alatica} Andr.;
- Lower Oligocene “complex with Spiroplectammina carinata” (see above);
- Middle Oligocene “zone with Sphaeroidina variabilis” with numerous \textit{Spiroplectammina carinata} Orb. \textit{follis} Kraeva, \textit{Cibicides pseudoungerianus} Cushm., \textit{C. oligocenicus} Sam., \textit{Nonion umbilicatus} (Montf.), \textit{Uvigerinella majkopica} Kraeva, \textit{Sphaeroidina variabilis} Reuss.

In the Razdelnaya area section (the south-western part of the NPBSR) Ye.Ya. Kraeva distinguished the following succession of foraminifera assemblages (from older to younger):
- Upper Eocene “zone with Hantkenina alabamensis and Globigerina aperture” or “globorotaliids-globigerinids zone” marking by appearance \textit{Planulina costata} (Hantk.), \textit{Bulimina sculptilis} Cushm., \textit{Uvigerina hispida} Schwag.; among characteristic BF are \textit{Planularia infans} Kraeva, \textit{Hydromylinia rutteni} Puyt., \textit{Planulina} aff. \textit{venezuelana} Nutt., \textit{Siphonina kaptarenkae} Kraeva, \textit{Uvigerina jacksonensis} Cushm., \textit{Uv. hispida} Schwag., \textit{Bolivina antegressa} Subb., \textit{Angulogerina proprius} Kraeva and others;
Upper Eocene “zone with Globigerinoides conglobatus” characterizing by *Marginulina infracostata* Thalm., numerous index-species, *Bulimina sculptilis* Cushm., *Uvigerina densecostata* Kapt. (msc.), *Uv. costellata* Moroz., etc.;

Upper Eocene “zone with Globigerina bulloides and arenaceous foraminifera” distinguishing by numerous agglutinated foraminifera *Reophax* ex gr. *nodulosus* Brady, *R. plana* Halk., *R. scalaria* Grzyb., *Proteonina fusiformis* Will., *Haplophragmoides eggeri* Cushm., *Clavulina szaboi* Hantk., *Heterostomella dalmatina* Liebus, impoverished association with calcareous forms *Frondicularia budensis* (Hantk.), *Robulus carinatus* Kraeva, *Uvigerina densecostata* Kapt. (msc.), *Cassidulina globosa* Hantk., *Bifarina millepunctata* Tutkow., *Lingulina* sp.

Ye.Ya. Kraeva also distinguished the Paleocene “anomaliniids complex” [58], the Middle Eocene “beds with *Hopkinsina bykovae ukrainica*” [97], the Upper Oligocene “zone Sphaeroidina” and “nonionids complex” [41, 61] in the NPBSR.

I.D. Konenkova (foto 4) in her work “Foraminifera biostratigraphy of Danian and Paleocene deposits of the Northern Peri-Black Sea Region” [26] has proved by planktic and benthic foraminifera the presence of the Lower and Upper Paleocene deposits in the region. She has determined the following succession of shallow-water BF associations: “complex with *Cibicidoides commatus*”, “complex with *Anomalina burlingtonensis*” and “complex with *Cibicides bundensis* and *Nonion multisuturatum*” in Lower Paleocene deposits and “complex with anomalinids” and “complex with *Bolivinopsis spectabilis*” in Upper Paleocene. Also she described Lower Eocene foraminifera association in the south of NPBSR [27, 33]. Doubtless interests has her articles devoted to description foraminifera associations of the Priabonian of the southern part of US [36] and the NPBSR [22], transitional Eocene-Oligocene interval of the eastern part of the NPBSR [30] and the eastern part of Near-Azov Region [31].

N.G. Savenko (foto 5) in her dissertation “Biostratigraphy of Upper Eocene deposits the Peri-Black Sea Depression by small foraminifera” [83] and other works [11, 100, 101] has proved presence of foraminifera assemblages of the Kuberla, Keresta, Kuma and Alma Stratohorizons of the CCR in the NPBSR. She also described in detail foraminifera associations of those horizons for different parts of the NPBSR. N.G. Savenko grounded presence of three biostratigraphic zones in Priabonian deposits of the NPBSR connecting with different facies, namely “zone Nonion, Asterigerina and Nummulites” characterizing shallow-water sediments in central part of the region, “zone Asterigerina lucida and Cibicides salensis” of more deep-water sediments of the north-western part of the region and “zone Globigerinoids conglobatus and Bolivina antegressa” of the most deep-water sediments of the north-eastern and southern parts of the NPBSR.

Present state of benthic foraminifera biostratigraphy of Paleogene deposits of the northern Peri-Black Sea Region, adjacent areas of the Ukrainian Shield and Azov Crystalline Massif. This part of article deals with retrospective view on distinguishing
associations of small BF in Paleogene deposits of the NPBSR and adjacent areas of the US and ACM, author’s opinion on their stratigraphic position and correlation with interregional BF zones of the CCR [9, 38, 39].

**Paleocene.** Up to beginning the sixties years of the last century deposits of Paleocene age had been proved by foraminifera in narrow coastal zone along the northern Black Sea, Sivash Gulf and Azov Sea [10]. After A.M. Voloshina the Paleocene BF assemblage of the region includes *Ataxophragmium variabile* ( Orb.)*, *Spiroplectammina variata Vass.*, *Textularia ex gr. baudoniana* (Orb.), *Gaudryina retusa Cushman.*, *Marsonella aff. oxycoxa (Reuss)*, *Dorothia buletta Carsey*, *Arenobulimina mohreni Brotz.*, *Ar. dubia Wolosh.*, *Ataxophragmium depressaeformis* Ploth., *At. frankei* (Brotz.)*, *Eponides saginarsis N.Byk.*, *Anomalina danica* (Brotz.), *An. ekkblomi* (Brotz.), *An. aff. praecacuta Vass.*, *Valvulineria allomorphoides* Reuss, *Gyroidina umbilicata* (Orb.), *Cibicides hemicompressus* Moroz.*, *C. incognitus Vass.*, *C. lectus Vass.*, *C. commatus Moroz.*

**Author’s notes.** According to modern biostratigraphic ideas [9, 39] this assemblage corresponds to Danian interregional zone *Anomalina danica* s. l. of the CCR (fig. 2). This conclusion is grounded on presence characterizing species of the zone marked by (*) in the list.

Due to further foraminifera study of A.M. Voloshina, I.D. Konenkova, Ye.Ya. Kraeva, E.K. Schutzkaya the Paleocene section of the NPBSR was subdivided into lower (now = Belokamenskian Regiostage) and upper (now = Kachian Regiostage) Subseries.

**Belokamenskian Regional Stage.** A.M. Voloshina [4, 102] has described shallow-water “danian-paleocene” BF assemblage in borehole of the south-western part of Near-Azov Region. She indicated *Arenobulimina mohreni Brotz.*, *Ar. cuskleyae Jenn.*, *Triloculina aff. inflata Orb.*, *Quinqueloculina aff. inflata Orb.*, *Guttulina ipatoveci Vass.*, *G. aff. austriaca Orb.*, *G. lidiae Vass.*, *Globulina amygdaloides* Reuss, *Gl. gibba Orb.*, *Gl. rotundata* (Born.), *Anomalina danica* (Brotz.)*, *Cibicides simplex* Brotz.*, *C. reinholdi* ten Dam, *C. ekkblomi* Brotz.*, *C. favorabilis* Vass., *Gyroidina octocamerata* Cushman. et Hanna, *Globorotalites lobata Brotz.*, *Glob. aff. toulmini* (Brotz.)*, *Coleites crispus* Vass., *Elphidiella prima* (ten Dam), *Nonion aff. graniferum* (Terq.), *Buliminella parvula* Brotz.*, *Bolivina aff. odumi* Brotz., *Allomorphina halli* Jenn.* et others.

**Author’s notes.** This assemblag also corresponds to Danian interregional zone *Anomalina danica* s. l. of the CCR [9] (characterizing species are marked by (*) in the list).

Later I.D. Konenkova [26, 27] distinguished three BF assemblages in Lower Paleocene section of the NPBSR: “complex with *Cibicides commatus*, “complex with *Anomalina burlingtonensis*” and “complex with *Cibicides bundensis* and *Nonion multisuturatum*”. She also described BF association of shallow-water peripheral facies of the Paleocene sea in Belokamenskian time.

**Beds with Cibicidoides commatus** were distinguished by I.D. Konenkova in boreholes 52 (Novokievka) and 72 (Novaya Mayachka) drilled in the Kherson area, the south of eastern part of the NPBSR. The BF association includes *Ataxophragmium frankiei Brotz.*, *Arenobulimina presli* Reuss, *Ar. dubia Wolosch.*, *Anomalina danica Brotz.*, *An. burlingtonensis* (Jenn.), *An. ekkblomi* (Brotz.), *An. umbilicata* Majtl., *Cibicides invisus* Vass., *C. commatus Moroz.*, *C. spiropunctatus* Gall., *Coleites reticulosus* (Plumm.), *Gyroidina umbilicata* Orb., *Eponides frankei* Brotz., *Globorotalites perforatus* Vass., *Pulsipionina elegans* Brotz. These layers corresponds to Danian planktic foraminifera zone Globoconusa daubjergensis [26, 27] and calcareous nanofossils zone NP 3 [5, 6], characterizing the Lower Belokamenskian Regional Substage of the southern Ukraine.

I.D. Konenkova [26, 28] has noted that BF assemblage of beds with *Cibicidoides burlingtonensis* in comparison with the same of beds with *Cibicides commatus* is some shallower and differs on appearance *Anomalina midwayensis* (Plumm.), *Cibicides sahlstromi* Brotz., *C. neumanae* Plumm., *Gyroidina octocamerata* (Cushman. et Hanna), *Mississippina binkhorstii* (Reuss), *Reussella paleocenica* (Brotz.), *Rosalina selandiana* Poz. et Szcz., *Pararotalia globigeriniformis* (van Bell). Researcher conditionally correlated these beds to planktic foraminifera Praemurica inconstans zone. Taking into account data on planktic foraminifera [4, 26, 102], beds with *Cibicidoides burlingtonensis* should be corresponded Danian lonic Globoconusa daubjergensis – Praemurica inconstans.

48
In the southern part of Molocha river basin (the south-western part of the Near-Azov Region) I.D. Konenkova [25, 34, 35, 37] described the most shallow-water BF association of the beds with *Cibicidoides burlingtonensis*, which is distinguished by predominance of *Anomalina danica* Brotz., *Cibicides* *burlingtonensis* Jenn., *C. neumanae* Plumm., *C. sahliostomi* (Brotz.), numerous *Nonion* ex gr. *graniferum* (Terq.), *Protelphidium* ex gr. *sublaeve* (ten Dam) and less numerous polymorphinids and miliolids.

**Author’s notes.** BF assemblages of beds with *Cibicidoides commatus* and beds with *Cibicidoides burlingtonensis* contain characterizing species of the Lower Belokamenskian Regional Substage of the southern Ukraine, namely *Arenobulimina dubia* Wolosh., *Anomalina danica* Brotz., *Cibicidoides burlingtonensis* (Jenn.), *Pararotalia globigeriniformis* (van Bell.) (see table). Also taxonomic composition of BF of the beds is close to that of Danian interregional zone Anomalina danica s. l. of the CCR [9] and zone Cibicidoides lectus characterizing the Pselian Regional Stage of the Dnieper-Donets Depression [80]. This is proved by presence *Arenobulimina presti* Reuss., *Ataxophragmium frankei* Brotz., *Anomalina danica* Brotz., *Gavelinella umbilicata* Brotz., *Cibicides commatus* (Moroz.), *Intricatus spirupunctatus* (Gall. et Morr.), *Gyroidinoides octocameratus* (Cushm. et Hanna), *Pulsipholina elegans* Brotz., *Falsoplanulina ekbloimi* (Brotz.), *Pararotalia globigeriniformis* (van Bell.), *Coelites reticulosus* (Plumm.), *Rosalina selandiana* Poz. et Szcz., *Reussella paleocenica* (Brotz.), *Mississippina binkhorsti* (van Bell.) and others in BF assemblages of the beds. On my opinion the described BF associations of beds with *Cibicidoides commatus* and beds with *Cibicidoides burlingtonensis* should be defined as assemblage-zone Anomalina danica and Cibicidoides commatus characterizing lower part of the Belokamenskian Regiostage in the NPBSR (see fig. 2). Authorship of this zone is preserved after I.D. Konenkova.

BF association of beds with *Cibicidina bundensis* and *Nonion multisuturatum*, distinguished by I.D. Konenkova [23, 25, 26, 35, 37] in the south of the eastern and western parts of the NPBSR, reflects shallow-marine depositional environments of peripheral parts of Paleocene sea in late Belokamenskian time. Differing by numerous anomalinids, polymorphinids, rotaliids and miliolids, the complex includes *Anomalina danica* (Brotz.)*, *An. burlingtonensis* (Brotz.), *An. ekbloimi* (Brotz.)*, *An. simplex* (Brotz.), *Cibicides sahliostomi* Brotz., *C. bundensis* van Bell.* C. succeedens* Brotz., *Nonion graniferum* (Terq.), *Nonion multisuturatum* van Bell., *Eponides toulmini* Brotz., *Globorotalites lobata* Brotz., *Rosalina koeneni* Brotz., *R. selandiana* Poz. et Szcz., *Rotalia lithothamnica* Uhlig. *katchanensis* Schütz., *Pararotalia globigeriniformis* (van Bell.), *P. machelli* Loebl. et Tapp., *P. scabrosa* Konen., *Proteelphidium sublaeve* (ten Dam.), *Elphidiella prima* (ten Dam.), *Lamarckina rugulosa* (Plumm.), *Reussella paleocenica* (Brotz.) and others. This assemblage contains characterizing species of the Upper Belokamenskian Regional Substage of the southern Ukraine (marked by (*) in the list). The beds also contain calcareous nanoplankton of zone NP 5 [5, 6], characterizing the same stratigraphic level.

**Author’s notes.** Taking into account stratigraphic position of beds with *Cibicidina bundensis* and *Nonion multisuturatum* in the Lower Paleocene section of the south of NPBSR and data on calcareous nanofossils, these beds should be considered as the most shallow-water layers of the Upper Belokamenskian Regional Substage (see fig. 2) and probable stratigraphic analogue of Selandian interregional zone Pyramidina crassa of in the CCR [9].

**Belokamenskian Regional Stage.** A.M. Voloshina [4, 102] has described shallow-water “danian-paleocene” BF assemblage in borehole of the south-western part of Near-Azov Region. She indicated *Arenobulimina mohreni* Brotz., *Ar. cuskleyae* Jenn.*, Triloculina* aff. *inflata* Orb., *Quinqueloculina* aff. *inflata* Orb., *Guttulina ipatovcevi* Vass., *G. aff. austriaca* Orb., *G. lidiae* Vass., *Globulina amygdaloides* Reuss., *G. gibba* Orb., *G. rotundata* (Born.), *Anomalina danica* (Brotz.)*, Cibicides simplex* Brotz.*, C. reinhoeld* ten Dam, *C. ekbloimi* Brotz.*, C. favorabilis* Vass., *Gyroidina octocamerata* Cushm. et Hanna, *Globorotalites lobata* Brotz.*, Glob. aff. toulmini* (Brotz.)*, Coelites crispus* Vass., *Elphidiella prima* (ten Dam)*, Nonion aff. *graniferum* (Terq.), *Bulimina parvula* Brotz.*, Bolivina aff. *odumi* Brotz., *Allomorpha hali* Jenn.* et others.

**Author’s notes.** This assemblage also corresponds to Danian interregional zone Anomalina danica s. l. of the CCR [9] (characterizing species are marked by (*) in the list).
Later I.D. Konenkova [26, 27] distinguished three BF assemblages in Lower Paleocene section of the NPBSR: “complex with Cibicides commatus”, “complex with Anomalina burlingtonensis” and “complex with Cibicides bundensis and Nonion multisuturatum”. She also described BF association of shallow-water peripheral facies of the Paleocene sea in Belokamenskian time.

Beds with Cibicidoides commatus were distinguished by I.D. Konenkova in boreholes 52 (Novokievka) and 72 (Novaya Mayachka) drilled in the Kherson area, the south of eastern part of the NPBSR. The BF association includes Ataxophragmium frankei Brotz., Arenobulimina presli Reuss, Ar. dubia Wolosch., Anomalina danica Brotz., An. burlingtonensis (Jenn.), An. ekkloi (Brotz.), An. umbilicata Mjatl., Cibicides invisus Vass., C. commatus Moroz., C. spiropectus Gall., Coleites reticulosus (Plumm.), Gyroidina umbilicata Orb., Eponides frankei Brotz., Globorotalites perforatus Vass., Pulsiphonina elegans Brotz. These layers corresponds to Danian planktic foraminifera zone Globoconusa daubjergensis [26, 27] and calcareous nannofossils zone.
NP 3 [5, 6], characterizing the Lower Belokamenskian Regional Substage of the southern Ukraine.

I.D. Konenkova [26, 28] has noted that BF assemblage of beds with *Cibicidoides burlingtonensis* in comparison with the same of beds with *Cibicidoides commatus* is some shallower and differs on appearance *Anomalina midwayensis* (Plumm.), *Cibicides sahlstromi* Brotz., *C. neumanae* Plumm., *Gyroidina octocamerata* (Cushm. et Hanna), *Mississippiina binkhorsti* (Reuss), *Reussella paleocenica* (Brotz.), *Rosalina selandiana* Poz. et Szc., *Pararotalia globigeriniformis* (van Bell.). Researcher conditionally correlated these beds to planktic foraminifera Praemurica inconstans zone. Taking into account data on planktic foraminifera [4, 26, 102], beds with *Cibicidoides burlingtonensis* should be corresponded Danian lone Globoconusa daunbjergensis – Praemurica inconstans.

In the southern part of Molochna river basin (the south-western part of the Near-Azov Region) I.D. Konenkova [25, 34, 35, 37] described the most shallow-water BF association of the beds with *Cibicidoides burlingtonensis*, which is distinguished by predominance of *Anomalina danica* Brotz., *An. ekblomi* (Brotz.), *Cibicides burlingtonensis* Jenn., *C. neumanae* Plumm., *C. sahlstromi* (Brotz.), numerous *Nonion* ex gr. *graniferum* (Terq.), *Protelphidium* ex gr. *sublaeve* (ten Dam) and less numerous polymorphinids and miliolids.

Author’s notes. BF assemblages of beds with *Cibicidoides commatus* and beds with *Cibicidoides burlingtonensis* contain characterizing species of the Lower Belokamenskian Regional Substage of the southern Ukraine, namely *Arenobulimina dubia* Wolosh., *Anomalina danica* Brotz., *Cibicidoides burlingtonensis* (Jenn.), *Pararotalia globigeriniformis* (van Bell.) (see table). Also taxonomic composition of BF of the beds is close to that of Danian interregional zone Anomalina danica s. 1. of the CCR [9] and zone Cibicidoides lectus characterizing the Pselian Regional Stage of the Dnieper-Donets Depression [80]. This is proved by presence *Arenobulimina prestli* Reuss., *Ataxophragmium frankei* Brotz., *Anomalina danica* Brotz., *Gavelinella umbilicata* Brotz., *Cibicidoides commatus* (Moroz.), *Intricatus spiropunctatus* (Gall. et Morr.), *Gyroidinoides octocameratus* (Cushm. et Hanna), *Pulsiphonina elegans* Brotz., *Falsoplanulina ekblomi* (Brotz.), *Pararotalia globigeriniformis* (van Bell.), *Coeities reticulosus* (Plumm.), *Rosalina selandiana* Poz. et Szc., *Reussella paleocenica* (Brotz.), *Mississippiina binkhorsti* (van Bell.) and others in BF assemblages of the beds. On my opinion the described BF associations of beds with *Cibicidoides commatus* and beds with *Cibicidoides burlingtonensis* should be defined as assemblage-zone Anomalina danica and Cibicidoides commatus characterizing lower part of the Belokamenskian Regiostage in the NPBSR (see fig. 2). Authorship of this zone is preserved after I.D. Konenkova.

BF association of beds with *Cibicidina bundensis* and *Nonion multisuturatum*, distinguished by I.D. Konenkova [23, 25, 26, 35, 37] in the south of the eastern and western parts of the NPBSR, reflects shallow-marine depositional environments of peripheral parts of Paleocene sea in late Belokamenskian time. Differing by numerous anomalinids, polymorphinids, rotaliids and miliolids, the complex includes *Anomalina danica* (Brotz.)*", *An. burlingtonensis* (Brotz.), *An. ekblomi* (Brotz.)*", *An. simplex* (Brotz.), *Cibicides sahlstromi* Brotz., *C. bundensis* van Bell.*", *C. succeedens* Brotz., *Nonion graniferum* (Terq.), *Nonion multisuturatum* van Bell., *Eponides toummini* Brotz., *Globorotalites lobata* Brotz., *Rosalina koeneni* Brotz., *R. selandiana* Poz. et Szc., *Rotalia lithothamnica*Uhlig. katchanensis Schutzk., *Pararotalia globigeriniformis* (van Bell.), *P. macheili* Loebl. et Tapp., *P. scabrosa* Konen., *Proteelphidium sublaeve* (ten Dam.), *Elphidiella prima* (ten Dam.), *Lamarkina rugulosa* (Plumm.), *Reussella paleocenica* (Brotz.) and others. This assemblage contains characterizing species of the Upper Belokamenskian Regional Substage of the southern Ukraine (marked by (*) in the list). The beds also contain calcareous nanoplankton of zone NP 5 [5, 6], characterizing the same stratigraphic level.

Author's notes. Taking into account stratigraphic position of beds with *Cibicidina bundensis* and *Nonion multisuturatum* in the Lower Paleocene section of the south of NPBSR and data on calcareous nanofossils, these beds should be considered as the most shallow-water layers of the Upper Belokamenskian Regional Substage (see fig. 2) and probable stratigraphic analogue of Selandian interregional zone Pyramidina crassa of in the CCR [9].

Тектоніка і стратиграфія, 2019, вип. 46
**Kachian Regional Stage.** Up to the sixties years of the last century in the NPBSR the Paleocene deposits had been considered as undivided [10, 18, 40, 58]. Further Ye.Ya. Kraeva, I.D. Konenkova and A.M. Voloshina’s investigations have proved Upper Paleocene by small foraminifera in the region. These researchers distinguished two separate foraminifera associations characterizing the section: the first known as “anomalinids complex” (beds with *Anomalina fera* and *Pulsiphonina prima* below in the text) and the second — “complex with arenaceous foraminifera” (beds with *Bolivinopsis spectabilis* below in the text).

Beds with *Anomalina fera* and *Pulsiphonina prima*. A.P. Pechenkina [40] was the first who determined Paleocene foraminifera assemblage with dominating anomalinids and *Siphonina* from borehole 1 (Mirnoe) drilled not far from Odessa (the southwestern part of the NPBSR). She noted that this assemblage is distinguished by numerous *Anomalina danica* (Brotz.), *An. acuta* Plumm., frequent *An. praeacuta* Vass., *Siphonina prima* Plumm., rare *An. grosserugosa* (Guebm.), *Eponides uombonatus* (Reuss), *Angulogenera wilcoxensis* (Cushman et Pont.) and sporadic Ammodiscus incertus (Orb.), *Bolivinopsis spectabilis* Grzyb., Nodosaria affinis Orb., *Dentalina approximata* Reuss, *Eponides lunatus* Brotz., *Gyroidina globosa* (Hag.), *Pullenia quinqueloba* Reuss, *Asterigerina norvaugi* Brotz., *Cibicides favorabilis* Vass., *C. aff. incognituss* Vass., etc.

In boreholes drilled in the western part of the NPBSR Ye.Ya. Kraeva [58] described Paleocene “anomalinids complex” consisting of *Heterostomella gigantica* Subb., *Anomalina danica* Brotz., *Cibicides proprius* (Brotz.), *C. favorabilis* Vass., *Siphonina prima* Plumm., *Alabamina wilcoxensis* Toulm., etc.

For Upper Paleocene deposits of the Near-Sivash area A.M. Voloshina [103] indicated BF assemblage with numerous large arenaceous foraminifers *Litulobula taylorensis* paleocenica Wolosh., *Paragaudryina gigantica* (Subb.) and secreted foraminifers *Cibicides hemicompressus* Moroz., *C. commataeformis* N. Byk. (msc.), *Karreria fallax* Reuss.

I.D. Konenkova [21, 24, 27, 28] gave detailed description the “anomalinids complex” and its distribution in Upper Paleocene of the NPBSR. According her this BF assemblage is distinguished by numerous anomalinids *Anomalina fera* Schutz., *An. danica* Brotz., *Cibicides proprius* Brotz., *C. aff. fanaonis* Le Roy, *C. sahlistromi* Brotz., *C. hemicompressus* Moroz., *Gavelinella limbata* Olss., and also *Heterostomella gigantica* Subb., *Vaginulina robusta* Plumm., *Pulsiphonina prima* (Plumm.), *P. elegans* Brotz., *Parella convexa* Olss., *Globorotalites lobata* Brotz., *Pseudoparella minuta* Olss., *Steniosina caucasica* (Subb.), *Buliminella parvula* Brotz., *Bolivina selmensis* Cushman., *Spirobolivina scanica* (Brotz.). She described two foraminifera associations characterizing “anomalinids complex”: the first with dominating *Pulsifonina* and numerous *Anomalina, Cibicides*; the second with dominating *Anomalina* and *Cibicides*, numerous *Pulsiphonina*, few agglutinated forms.

In the NPBSR the beds with “anomalinids complex” correspond to planktic foraminifera zone Acarinina subsphaerica [24, 26, 27] and calcareous nanofossils of zonal interval NP 6–NP 8 [5, 6] characterizing the Kachian Regiostage.

**Author’s notes.** These BF assemblages contain index-species *Anomalina fera* Schutz. of the Kachian Regiostage the southern Ukraine. I propose to rename the “anomalinids complex” as assemblage-zone Anomalina fera and Pulsiphonina prima and preservate authorship I.D. Konenkova. Small BF of zone Anomalina fera and Pulsiphonina prima, characterizing the Kachian of the NPBSR, are known from Paleocene deposits of the CCR [9, 66]. But such species as *Anomalina fera* Schutzk., *Asterigerina norvangi* Brotz., *Angulogenera wilcoxensis* Cushman et Appl., *Sporobolivina scanica* (Brotz.) permit to define Thanetian zone Anomalina fera of the Bakhchisarai stratotype region in Crimea Peninsula [9]. Thus, according to modern biostratigraphic ideas [9, 39] zone Anomalina fera and Pulsiphonina prima of the NPBSR should be regarded as stratigraphic analogue of Thanetian interregional zone Karreriella zolkiewska of the CCR (see fig. 2).

Beds with *Bolivinopsis spectabilis*. From Upper Paleocene deposits in borehole 2-p Chaplinka (the Near-Sivash area) A.M. Voloshina [103] reported arenaceous foraminifera assemblage similar to that in the Kerch Peninsula. It consists of *Rhabdammina maxima*
On my opinion BF association of the beds should be considered as
anomalotids complex (zone Anomalina fera and Pulsiphonina prima here) I.D. Konenkova [21, 24, 27, 35] distinguished association with dominating but non numerous arenaceous foraminifera
Rhabdaminna indivisa Brady, Rh. cylindrica Glaessn., Ammodiscus incertus (Orb.),
Haplophragmoide kubanensis Schutzk., H. tenuis Cushman., Glomospira
charoides (Park. et JIn.), Bolivinopsis spectabilis (Grzyb.), Matanzia paleocenica (Hofk.), others.

At the same time in the Upper Paleocene section of the NPBSR above the beds with
another anomalies complex (zone Anomalina fera and Pulsiphonina prima here) I.D. Konenkova [21, 24, 27, 35] distinguished association with dominating but non numerous arenaceous foraminifera
Rhabdaminna indivisa Brady, Rh. cylindrica Glaessn., Ammodiscus incertus (Orb.),
Haplophragmoide kubanensis Schutzk., H. tenuis Cushman., Glomospira
charoides (Park. et JIn.), Bolivinopsis spectabilis (Grzyb.), rare sporadic secreted foraminifera
Anomalina fera Schutzk., Cibicides proprius Brotz., Pulsiphonina prima (Plumm.),
Pulienia quinqueloba Reuss, Spirobolivina scanica Brotz., etc. She named this association as “complex
with Bolivinopsis spectabilis” [26, 27].

In the NPBSR the described beds correspond to planktic foraminifera zone Acarinina
acarinata [26, 27] and calcareous nannofossils zone NP 9 [5, 6], characterizing upper part of the
Kachian Regiostage the southern Ukraine.

Author’s notes. On my opinion BF association of the beds should be considered as
assemblage-zone Bolivinopsis spectabilis characterizing the upper Kachian Regiostage in the
NPBSR (see fig. 2). Authorship of this zone is preserved after I.D. Konenkova. Due to presence
Rhizammina indivisa Brady, Bathysiphon nodosariaformis Subb., Nodellum velascoense
(Cushm.), Haplophragmoide kubanensis Schutzk., H. tenuis Cushman., H. tenuis Cushman.,
Repmannina charoides (Park. et JOn.), Trochamminoides irregularis White, Bolivinopsis spectabilis
(Grzyb.), Bol. kurtishensis Balakhm., Marsonella indentata (Cushman. et JOn.), Anomalina fera
Schutzk., Cibicides proprius (Brotz.), Pulsiphonina prima (Plumm.), Stensioina caucasia
(Grzyb.), Reussellia paleocenica Brotz., Sporobolivina scanica Brotz., the zone Bolivinopsis
spectabilis of the NPBSR is regarded as stratigraphic shallow-water analogue of Thanetian
interregional zone Karrierella zolkaensis of the CCR [9].

Eocene. A.M. Voloshina, A.P. Puchenkina, Ye.Ya. Kraeva, N.G. Savenko and I.D. Konenkova’s
investigations had proved the Lower, Middle and Upper Eocene by small foraminifera up to the
middle seventies of the last century in the NPBSR. M.V. Yartseva had done the Middle and Upper
Eocene by BF in depressions of the southern slope the US up to the sixties years of the last
century. The most rich, various and numerous BF assemblages characterize the Middle
(Novopavlovkian Regiostage) and Upper (Almian Regiostage) Eocene deposits of the region. In
the NPBSR the deposits of upper part of Kumian Regiostage contain, in the main, radiolarians,
spouge spicules and rare, sporadic BF shells Baggina iphigenia (Sam.), Planulina aff.
venezuelana Nutt., Spiroplectammina vicina Erem. and small arenaceous foraminifers [64]. This
association do not considers in the article.

Bakhchisarai Regional Stage. In the south of NPBSR three BF assemblages are known from the
Lower Ypresian.

From borehole Chaplinka (the Near-Sivash area) A.M. Voloshina [10] described association
consisting of predominately arenaceous foraminifera Rhabdaminna indivisa Brady, Proteinina
complanata (Fr.), Reophax duplex Grzyb., Ammodiscus glabrus Cushm., Spiroplectammina
clitho Grzyb., Sp. rosula Her., Sp. aff. dentata (Alth.), Frankeina aff. taylorensis Cushm. et Wall.,
Textularia agglutinans Orb., Trochammina advena Cushm., Gaudryina rugosa Orb.,
Heterostomella giganta Subb., Clavulina angularis Orb., Karreriella eggeri Finlay and non
numerous secreted forms Bulimina aksuatica Moroz., Bolivina antegressa Subb., Angulogerina
angulosa (Will.). From the same stratigraphic interval in borehole 1-p Armyansk (the north of
Crimean Plain) E.K. Schutzkaya [89] also reported Ammomarginulina sp., Sp. eocaenica Cushm.,
Reophax sp., Haplophragmoide sp., Glomospira charoides (Park. et JOn.).

Another, the second, BF assemblage was determined by I.D. Konenkova [27, 33] in
boreholes drilled near Novo Kievka village and Mayachka of the Kherson area. It includes
Ammodiscus incertus (Orb.), Glomospira charoides (Park. et JOn.), Textularia varians Glaessn.,
Gaudryina navarroana Cushm.*, Dorothis postbuletta Balakhm., Marginulina eotragaria

53
Balakhm.*, M. mexicana Cushman., Nodosaria affinis Reuss, N. latejugata (Guemb.), Anomalina granosa (Hantk.), An. acuta Plumm., Cibicides beatus Martin*, C. eocaenus (Guemb.), Asterigerina bartoniana (ten Dam). Previously similar BF association O.K. Kaptarenko-Chernousova had identified in borehole near Novo-Alekseyevka of the Henichesk area [15, 33]. This BF assemblage includes characterizing species, marked by (*) in the list, of the Bakhchisarai Region Stage of the southern Ukraine.

Deposits with the described BF assemblage correspond to planktic foraminifera of zone Morozovella subbotinae s. l. [27, 33] and calcareous nannofossils zone NP 11 [5, 6], characterizing the Bakhchisarai Region Stage.

From beds with Assilina placenta E.K. Schutzkaya [89] determined shallow-water BF association with Marginulina fragaria (Guemb.), Cibicides beatus Martin, C. productus (Terq.). Planktic foraminifera of the beds, indicating the uppermost part of zone Morozovella subbotinae s. l., and calcareous nannofossils, corresponding to zone NP 12 [5, 6], characterize upper part of Bakhchisarai Region Stage.

Author's notes. BF association of the Bakhchisarai deposits of the NPBSR consists of species known from Paleocene of the CCR and those ones appearing in Eocene, namely Marginulinaopsis eofragaria Balakhm., Nodosaria affinis Reuss, Heterolepa eocaena (Guemb.), Cibicidoides beatus (Martin), Asterigerina bartoniana (ten Dam), Bulimina aksuatica Moroz. Also this association includes index-species of Lower Ypresian interregional zone Pseudogaudryina externa of the CCR [9] (see fig. 2), which was previously defined as Gaudryina navarroana Cushman. [9]. Species Pseudogaudryina externa Bugr., Marginulinaopsis eofragaria Balakhm. and Cibicidoides beatus (Martin) constitute characteristic BF association the Bakhchisarai Region Stage in the NPBSR [64, 90] (see table).

Simferopolitan Regional Stage. Up to the seventies of XX century from Simferopolitan deposits of the NPBSR three foraminifera assemblages, from deep-water to the most shallow-water, had been distinguished.

The first BF assemblage from Simferopolitan deposits of the region is connected with beds with large foraminifers, Acarinina bullbrooki, Morozovella aragonensis [64]. Due to investigations of A.M. Voloshina [10], A.P. Pechenkina [40], I.D. Konenkova [27], E.K. Schutzkaya [89] the complex with dominating planktic foraminifera of zonal interval Morozovella aragonensis – Acarinina bullbrooki and accompanying benthic species Clavulina golubjatnikovi Schutzk., Pseudogaudryina pseudonavarroana (Balakhm.), Heterostomella dalmatina (Liebus), Marsonella indentata (Cushman. et Jarv.), Spiroplectammina cariniformis Moroz., Gyroidina micheliniana Orb., Anomalina acuta Plumm., An. granosa (Hantk.), An. ammoniphila Guemb., Cibicides perlucides Nutt., C. eocaenus Guemb., C. ungerianus Orb. was determined in the south of NPBSR.

Author's notes. Includes characterizing species of the Simferopolitan Region Stage of the southern Ukraine (see table), namely Pseudogaudryina pseudonavarroana (Balakhm.), Falsoplanulina ammonifila (Guemb.), and characterizing species of upper Ypresian – lower Lutetian interregional superzone Pseudogaudryina pseudonavarroana of the CCR [9], namely Spiroplectammina cariniformis Moroz., Pseudogaudryina pseudonavarroana (Balakhm.), Clavulinoides golubjatnikovi Schutzk., Paragaudryina dalmatina (Liebus), Heterolepa eocaena (Guemb.) (see fig. 2).

The second BF assemblage. Relatively more shallow-water foraminifera associations characterize beds with Nummulites distans widely spreading in the NPBSR [18, 23, 34, 35, 40, 52, 100]. Ye.Ya Kraeva [49] gave detailed characteristic the associations with BF prevailing over planktic foraminifera. She noted that foraminifera complex of the nummulitic beds are changeable both systematic composition and number of specimens of each species. The complex includes Clavulinoides australis Balakhm. et Sapers., Articulina terquemi Cushm., Marginulinosis decoratus (Reuss), Lenticulina laticostata (Tutkow.), L. arcuto-striata (Tutkow.), Dentalina bulbosa Halk., Anomalina acuta acuta (Plumm.), Heterolepa eocaena (Guemb.), Asterigerina rotula Kaufm., As. stelligera Kraeva, Siphonina lamarckana Cushm., S. kaptarenkae Kraeva, Alabamina tonica Kraeva, Al. wilcoxensis Toulm., Sivrattkina perlata (Andr.), Cibicides westi arguta
(N. Byk.), _C. hadjibulakensis_ N. Byk., _C. carinatus_ (Terq.), _C. disjunctus_ (Terq.), _Hanzawaia producta_ (Terq.), _Karreria fallax_ Rzeh., _Nonion ex gr. graniferum_ (Terq.), _Pararotalia trochidiformis_ (Lam.), _Reusella limbata_ (Terq.), _Uvigerina proboscidea_ Schwag., _Angulogerina muralis_ Terq., _Bolivina brabantica_ Kaasch., etc. In the NPBSR the beds with _Nummulites distans_ are characterized by planktic foraminifera of zonal interval Morozovella aragonensis (upper part) – Acarinina bullrooki [27, 45] and calcareous nannofossils of NP 13 and NP 14 zones [6, 113], defining the Simferopolitan Regiostage of the southern Ukraine.

The third BF assemblage has been described by Ye.Ya. Kraeva [49], who marked that the most shallow-water BF associations of simferopolitan nummulitic beds in the NPBSR differ by pure systematic composition but abundant specimens _Cibicidina disjunctus_ (Terq.), _Asterigerina rotula_ Kaufm., _As. stelligera_ Kraeva, _Alabamina tonica_ Kraeva, _Rotalia ex gr. trochidiformis_ (Lam.), _Reussella limbata_ (Terq.), others.

**Author’s notes.** The small BF assemblages of the beds with _Nummulites distans_ of Simferopolitan Regiostage the NPBSR I propose to distinguish as assemblage-zone Vaginulinopsis decorata, Asterigerina stelligera (see fig. 2). The zone includes characteristic BF species, determining this regiostage in the region (see table). Due to presence _Robulus laticostatus_ (Tutkow.), _Vaginulinopsis decorata_ (Reuss), _Cibicidina dampelae_ (N. Byk. et Chram.), _Falsoplanulina ammophila_ (Guemb.), Asterigerina stelligera Kraeva, _Siphonina kaptarenkae_ Kraeva, _Eponides polygonus_ (Le Calvez), _Alabamina tonica_ Kraeva, _Baggina valvulineriaformis_ (N. Byk.), _Cancris plana_ (Balakhm.), _Bulimina aksuatica_ Moroz., _Kolesnikovella elongata_ (Halk.) this zone Vaginulinopsis decorata, Asterigerina stelligera should be considered shallow-water stratigraphic analogue of upper Ypresian – lower Lutetian interregional superzone Pseudogaudryina pseudonavarroana of the CCR [9].

**Novopavlovkian Regional Stage.** Beds with _Robulus kublerinus_ and _Uvigerina bykovea ucrainica_. These beds were firstly distinguished by Ye.Ya. Kraeva [97] as “zone Hopkinsinsa bykovea ucrainica” corresponding to sediments of the Kuberla Horizon of the NPBSR and spreading into the southern slope of US. In the Stratigraphic Scheme of Ukraine [64, 90] the described BF assemblage is named beds with _Lenticulina kuberlina_ and _Hopkinsinsa bykovea ucrainica_ of the lower Novopavlopian Regional Subhorizon.

In the mentioned article Ye.Ya. Kraeva [97] gave detailed description of zonal BF assemblage consisting _Paragaudryina pseudonavarroana_ Balakhm., _Heterostomella dalmatina_ (Liebus), _Clavulina cylindrica_ Hantk., _Cl. szaboi_ (Hantk.), _Lenticulina romeri_ (Reuss), _L. laticostata_ Tutkow., _L. kuberlina_ J. Nik., _Anomalina acuta acuta_ Plumm., _An. neelyi_ Jenn., _Cibicoides biumbonatus_ A. et K. Furs., _Alabamina wilcoxensis_ Toull., _Pseudoparella culter_ (Park. et Jon.), _Siphonina kaptarenkae_ Kraeva, _Cibicides ammophylos_ (Guemb.), _C. westi_ westi _Howe, C. ungerianus_ (Orb.), Asterigerina stelligera Kraeva, _As. rotula_ Kaufm., _Bifarina millepunctata_ Tutkow., _Bulimina arostrata_ Balakhm., _Bul. aff. mitigarziana_ Balakhm., _Hopkinsinsa bykovea ucrainica_ Kraeva, _Uvigerina proboscidea_ Schwag., _Angulogerina elongata_ (Halk.). She marked [97] that the most of foraminifera of the beds with _Hopkinsinsa bykovea ucrainica_ are known from Simferopolitan Horizon and Kuberla Horizon (now Lower Novopavlovian Regional Substage). She determined lower limit of the beds by appearance of _Hopkinsinsa bykovea ucrainica_ Kraeva, _Bulimina arostrata_ Balakhm., _Siphonina kaptarenkae_ Kraeva [52, 93]. To my mind in some sections the lower part of beds may correspond to upper part of Simferopolitan Regiostage. In borehole Mirnoe, drilled not far from Odessa, Ye.Ya. Kraeva and T.A. Menkes [109] determined foraminifera assemblage of the Kuberla Horizon in interval 452-448 m from sandy marls containing large foraminifera of beds with _Nummulites distans_ indicating Simferopolitan Regiostage. Upper limit of the beds with _Hopkinsinsa bykovea ucrainica_ Ye.Ya. Kraeva determined by appearance _Textularia carinatiformis_ Moroz., _Bulimina sculptilis_ Cushm., _Uvigerina hispida_ Schwag, and planktic foraminifera _Globigerinoides subconglobatus_ Schutzk., _Hantkenina alabamensis_ Cushm. marking the Keresta Horizon (now the Upper Novopavlovian Regional Substage).

Researchers also noted increasing thickness of beds with _Hopkinsinsa bykovea ucrainica_ of the Kuberla Horison from the south to north in the NPBSR [52, 67, 97].
It is interesting to note that in Ye.Ya. Kraeva’s publications of middle 50-s – beginning 60-s years of the XX century this BF assemblage has not been distinguished. It was included into “lagenids-globorotaliids zone” in the Tokmak-Melitopol area of the eastern part of the NPBSR, “zone Hantkenina alabamensis (globorotaliids)” in the Odessa-Kherson area of the western part of the NPBSR [41, 43, 44] or has been considered in Middle Eocene deposits (now Simpheropolitan Regiostage).

N.G. Savenko [83] distinguished foraminifera assemblage of the Kuberla Horizon in the NPBSR as biostratigraphic “zone Lenticulina kuberlinia, Acarinina pentacamerata” in boreholes of the central and eastern parts of the region, “zone Acarinina pentacamerata, Acarinina interposita” of the south-west of the region. She determined that in foraminifera assemblages of the Kuberla Horizon in the north of NPBSR the secreted benthic species prevail over planktic and arenaceous ones. Among BF representatives Nodosariidae, Asterigerinidae and Buliminidae dominate. The most numerous are Textularia pishvanovae A. et K. Furs., Lenticulina kuberlinia J. Nik., Cibicides perlucides Nutt. var. kasahstanensis J. Nik., Bulimina arostrata Balakhm., Hopkinsina bykovae ukrainica Kraeva, Uvigerina proboscidea Schwag.

Due to investigations of Ye.Ya. Kraeva [45, 55, 85], Yu.P. Nikitina [65], N.G. Savenko [11, 82, 83, 100, 101] and I.D. Konenko [22, 35] systematic composition of the beds was completed by Marsonella indentata (Cushm. et Jarv.), Hydromylinula rutteni Puyt., Anomalina postvulgaris J. Nik., Cibicides perlucides (Nutt.), Heterolepa pygmeaformis (Kraeva), H. porosus (Kraeva), Eponides jacksonensis Cushman., Virgulina diboliensis Cushman. et Appl., Sporobulina eocaena N. Byk., Buliminia mitgarziana Balakhm., Candella ignara N. Byk.

As a result restudying samples from boreholes drilled on the Odessa area Ye.Ya. Kraeva and T.A. Menkes [109] redefined BF of the Kuberla Horizon and supplemented the species composition with Textularia pishvanovae (A. et K. Furs.), Clavulinoides golubjatnikovi Schutzk., Marginulina fragaria (Guemb.), Lenticulina dimorpha (Tutkow.), Anomalina granosa (Hantk.), Brotzenella pseudoacuta (Nakk.), Cibicidoides hadjibulakensis (N. Byk.), Heterolepa eocaena (Guemb.), Eponides subumbonatus Mjatl., Alabamina tonica Kraeva, Cibicides lobatulus (Walk. et Jac.), Trifarina bradyi Cushman., Dymia idnara N. Byk.

These beds spread on the south of US where they are known as “light marls with large lagenids, buliminids and Clavulina”. Previously this BF assemblage was described firstly by M.V. Yartseva as “complex with large lagenids, buliminids, anomalinids and rotaliids” from light-yellow marls of the middle part of the Kiev Suite in the Ingulets river basin [71]. Researcher noted that planktic foraminifera association of the marls is characteristic for “zone Globigerinoides conglobatus” of the northern Fore-Caucasus (now – Globigerinatheka subconglobata, Hantkenina alabamensis Zone of the Upper Novopavlovkian Regional Substage in the southern Ukraine). Later Ye.Ya. Kraeva [111] attributed the light marls with Spiroplectammina cariniformis Mor., large lagenids, buliminids of the south of the US to the Keresta Horizon.

M.V. Yartseva, Ye.Ya. Kraeva [108] have revised foraminifers of Eocene sediments the southern slope of US. They distinguished the described BF association with the four complex with numerous and diverse lagenids and buliminids, large arenaceous Clavulina and Clavulinoides. Researchers correlate it with Globigerina turkmenica and Globigerina instabilis Zone of the Kuma Horizon and perhaps with upper part of lune Globigerapsis subconglobatus and Hantkenina alabamensis of the Keresta Horizon.

Based on planktic foraminifera of zone Globigerinatheka subconglobata T.S. Ryabokon [75] precised stratigraphic position of that BF complex and attributed the beds to the Keresta Horizon (now the Upper Novopavlovkian). So, in the NPBSR the beds with Robulus kuberlinus, Uvigerina bykovae ukrainica correspond to planktic foraminifera zone Acarinina rotundimarginata [52, 55, 97]. On the southern slope of US the beds are some younger and correspond to zone Globigerinatheka subconglobata, Hantkenina alabamensis [75, 108]. In the lower part of the beds’ section the large foraminifera beds with Nummulites variolarius are distinguished. Calcareous nanofossils of zonal interval NP 15-NP 16 characterize beds with Robulus kuberlinus, Uvigerina bykovae ukrainica.
Author's notes. Small BF assemblage of the described beds should be considered as assemblage-zone Robulus kuberlinus, Uvigerina bykovae ukrainica, characterizing the Novopavlovkian Regiostage in the NPBSR (fig. 3). Due to presence Spiroplectammina cariniformis Moroz., Sp. pishvanovae A. et K. Furs., Paragaudryina dalmatina (Liebus), Pseudogaudryina pseudonarvaroana Balakhm., Robulus kuberlinus (J.Nik.), R. dualis Bugr., R. laticostatus (Tutkow.), Marginulinopsis fragaria (Guemb.), Cibicoides biunbonatus A. et K. Furs., Cib. hadjubilakensis (N. Byk.), Heterolepa eocaena (Guemb.), Alammina tonica Kraeva, Siphonina kaptarenkae Kraeva, Falsoplanulina ammoniphila (Guemb.), Asterigerina stelligera Kraeva, Sporobulimina eocaena N. Byk., Uvigerina hapsida Schwag., Uv. costellata Moroz., Trifarina bradyi Cushm., Dymia labrum (Subb.), Loxostomoides millepunctatus (Tutkow.), zone Robulus kuberlinus and Uvigerina bykovae ukrainica of the NPBSR corresponds to Lutetian interregional zone Uvigerina costellata of the CCR [9]. On my opinion deposits of this zone reflects certain shelf facies of the Eocene basin within the NPBSR in Lutetian time.

Fig. 3. Sequence and space-time relationships of small benthic foraminifera assemblages in Middle Eocene of the southern Ukraine

A - interregional benthic foraminifera zones of the Crimea-Caucasus Region [9, 39]: 1 - zone Pseudogaudryina pseudonarvaroana; 2 - zone Haplophragmoides orfaensis

Small BF assemblages of beds with Nummulites variolarius. The first mentions about small BF of Eocene deposits of the southern slope of US are in articles of O.K. Kaptarenko-Chernousova [16] and M.V. Yartseva [104]. M.V. Yartseva [104] described distribution of foraminifera in Eocene section of the Nikopol area. She noted that beds with Ostrea are characterized by abundant Cibicides carinatus (Terq.), Rotalia armata (Orb.), decreasing quantity of miliolids and discorbiids, mass Camerina sp. (= Nummulites sp.). She correlated these beds with Ledian stage of Europe. In her later publications [71, 106] M.V. Yartseva gave more detailed characteristic of Eocene deposits with small nummulitids of the southern slope of US (basins of the Basavluk, Solenaia and Ingulets rivers). After M.V. Yartseva the characteristic feature of the beds is the presence large foraminifera Nummulites variolarius Lam., Num. incrassatus de la Harpe. In general, the small BF assemblage of these beds is distinguished by Asterigerina, Anomaliniidae, C. carinatus (Terq.), C. sassei (Cole), Rotalia armata (Orb.).

In following years, mention and description of BF assemblage of beds with Nummulites variolarius, Num. incrassatus of the region are present in publications of Yu.P. Nikitina [65], Ye.Ya. Kraeva [111], I.D. Konenkova [7] and others.

Yu.P. Nikitina [65] for the southern slope of US reported two shallow-water associations: the first with Rotalia armata (Orb.), large Anomaliniidae, Asterigerinidae; the second with numerous Lenticulina inornata (Orb.), Cibicides kashestanensis J. Nik., C. ex gr. sassei Cole, C. ex gr. rzehaki (Grzyb.), Nonion umbilicatum (Walk. et Jack.), Rotalia armata (Orb.), Asterigerina sp., Virgulina dibollensis Cushm. et Appl. She correlated these BF associations with "lagenids-
globorotaliids zone” of the Tokmak-Melitopol area (the eastern part of the NPBSR) [41, 44] and with the Keresta Horizon of Crimean Peninsula.

Ye.Ya. Kraeva [111] described the assemblage under consideration of the southern slope of the US as rich association of shallow-water foraminifers with abundant miliolids, nonionids, Pararotalia armata (Orb.), Cibicides sp., nummulitids.

Based on restudying foraminifers of Eocene deposits of the southern slope of the US, M.V. Yartseva, Ye.Ya. Kraeva [108] identified BF association of beds with Nummulites variolarius as “the third complex” with numerous small Num. gandinus Rz. (= Num. variolarius var gandina Rz.). In this association along with many species of “the second complex” (assemblage with miliolids and Epistomaria semi-marginala) are constantly present Clavulina parisienensis Orb., Eponides polygonus Le Calv., Pararotalia armata (Orb.), Cibicides robustus Le Calvez, Cycloloculina costellata (Terq.), Asterigerina sp., Robertina ovigera (Terq.), Angulogenera muralis (Terq.), rare miliolids. For “the third complex” M.V. Yartseva, Ye.Ya. Kraeva also designated Quinqueloculina nicopolica Jarz., Triloculina trigonula (Lam.), Tr. soljenica Jarz., Spiroloculina carinata Le Calvez, Sp. contorta Le Calvez, Discorbis rotata (Terq.), Eponides schreibersi (Orb.), Rosalina limbata (Orb.), Cancris subconicus (Orb.), Cibicides carinatus (Terq.), Nonion affine (Reuss), N. commune (Orb.), Elphidium hiltermanni Hagn., Tubuligenerina tubulifera (Park. et Jon.), Bolivina crenulata Cushman, others. Researchers considered deposits containing “the third complex” of BF an analogue the Lutetian and dated them middle Eocene.

I.D. Konenkova [13], L.A. Digas [63], T.S. Ryabokon [74, 76, 77, 114], T.A. Ivanova [7] also have studied taxonomic composition of association of small BF of the beds with Nummulites variolarius of the southern slope of US. They supplemented the species composition of beds with Nummulites variolarius with Textularia conica Orb., Spiroplectammina haueri (Orb.), Robulus crassus (Orb.), R. inornatus (Orb.), R. laticostatus (Tutkow.), Dentalina acuta Orb., D. badenensis (Orb.), D. inornata Orb., Nodosaria spincens Reuss, Anomalinoidea alazanensis (Nutt.), Cibicoides aff. extremus (Schutzk.), Cib. karpaticus Mjatl., Cib. ex gr. sassei (Cole), Cib. hadijubalakensis (N.Byk.), Heterolepa eocaena (Guemb.), H. pygmea (Hantk.), H. porosa (Kraeva), Hanzawaia producta (Terq.), Cyclococula eocaenica Terq., C. punctata Terq., C. flabellum Terq., Melonis umbilicatus (Orb.), M. dosularensis (Chalil.), Pullenia quinqueloba Reuss, Valvulineria palmalealensis (Nutt.), Asterigerina rotula Kaufm., As. stelligera Kraeva, As. jartzevae Konen, Eoeponidella lobata Sztrakos., Ammonia stellata (Kraeva), Am. propringua (Reuss), Pararotalia spinigera Le Calvez, P. audouini (Orb.), Porozononion subnodosum (Munst.), Canalifera aff. microgranulosa (Gall. et Wiss.), Bulimina woodwardi Tutkow., Fursenkoina dibollensis (Cushman et Appl.), Kolesnikovella ignara N.Byk., Reussella terquemi Cushman., R. obtusa (Terq.), Lamarckina ovula Le Calvez, etc. T.S. Ryabokon [75-77] described diversity of small BF associations of these beds differing by common Pararotalia, Melonis, Robulus, Polymorphinidae, Cibicidae.

**Author’s notes.** Small BF assemblages of beds with Nummulites variolarius on the southern slope of US should be regarded as assemblage-zone Pararotalia armata, Cibicoides ex gr. sassei. Due to presence Robulus laticostatus (Tutkow.), Cibicoides carinatus (Terq.), Cib. hajibulakens N. Byk., Heterolepa eocaena (Guemb.), Hanzawaia producta (Terq.), Asterigerina rotula Kaufm., A. stelligera Kraeva and other species, BF assemblages of beds with Num. variolarius (zone Pararotalia armata, Cibicoides ex gr. sassei) of depressions of the southern slope of US are similar to BF complex of beds with Num. distans (zone Vaginulinopsis decorata, Asterigerina stelligera of the Simpheropolitan Regiostage in the article). But deposits of zone Pararotalia armata, Cibicoides ex gr. sassei are some younger because they contain middle-upper Lutetian large foraminifera of zone Num. variolarius [112], rare planktic foraminifera of zone Acarinina rotundimarginata [7] and calcareous nannofossils of zonal interval NP 15-NP 16 [7, 76, 94], detemining the Novopavlovkian Regiostage of the southern Ukraine. Marking shallow-marine depositional environments of the Eocene basin within the southern slope of US in the Novopavlovkian time (middle Eocene), zone Pararotalia armata, Cibicoides ex gr. sassei is an stratigraphic analogue of zones Robulus kuberlinus, Uvigerina bykovae ukrainica of the NPBSR (see fig. 3). This conclusion is proved by common species Spiroplectammina pishvanovae A. et
K. Furs., *Robulus crassus* (Orb.), *R. laticostatus* (Tutkow.), *R. inornatus* (Orb.), *R. pseudoromeri* Schwemb., *Anomalinoideas alazanensis* (Nutt.), *Cibicidoides karpcaticus* Mjatl., *C. biumbonatus* A. et K. Furs., *C. hadjubulakensis* N.Byk., *Heterolepa eocaena* (Guemb.), *H. porosa* (Kraeva), *Melonis umbilicatus* (Orb.), *M. affine* (Reuss), *Pullenia quinqueloba* Reuss, *Ammonia ?stellata* (Kraeva), *Asterigerina stelligera* Kraeva, *Sporobulimina eocaena* N. Byk., *Fursenkoina dibollensis* (Cushm. et Appl.).

Beds with *Miliolidae* and *Epistomaria rimos a*. M.V. Yartseva [104-106] was the first who described association with large and various miliolids, polymorphinids from upper part of “sub-ostrea beds” in the Nikopol section on the southern slope of US. She noted predominance *Miliolidae*, presence *Epistomaria semimarginata* (Orb.), *Discorbis aff. limbatus* (Terq.), *Dis. parisiensis* (Orb.) in the complex. So M.V. Yartseva [71] named it as “assemblage with abundant miliolids and polymorphinids, with *Ep. semimarginata d'Orb*” or “grey calcareous clays with *Ep. semimarginata*”.

Later as a result of restudying foraminifera from Eocene deposits of the southern slope of US, M.V. Yartseva and Ye.Ya. Kraeva [108] have distinguished the mentioned BF association as “the second complex” characterizing by abundance *Miliolidae* and permanent presence *Epistomaria rimos a* (Park. et Jon.). This complex includes *Quinqueloculina nicopolica* Jarz., *Q. carinata* Orb.*., *Triloculina angularis* Orb.*., *Tr. gibba* Orb.*., *Tr. trigonula* (Lam.)*., *Tr. soljenica* Jarz., *Spiruloculina carinata* Le Calvez*, Sp. tricarinata* Terq.*, *Sp. contorta* Le Calvez*, *Sp. perforata* Orb.*, *Sp. cf. cylindrica* Lam.*, *Sp. cf. pedum* Orb., *Articulina ferussaci* (Orb.*)*, *Ar. cf. nitida* Orb.*, *Vertebralina contracta* Terq.*, V. ex gr. striata Orb.*, *Biloculina bulboides* (Orb.*)*, *B. ringans* Orb.*, *Nodobacculariella jartzevae* Bogd., *Fissurina orbignyana* (Seg.) *tricarinata* (Terq.),* Globulina gibba* Orb.*, *Guttulina irregularis* (Orb.*)*, *Anomalina auris* Le Calvez*, *Hanzawaia producta* (Terq.), *Cibicides carinatus* (Terq.), *Discorbis alata* Le Calvez*, *Dis. vesicularis* Lam.*, *Dis. rotata* (Terq.),* Eponides schreibersii* (Orb.), *Rosalina limbata* Terq.*, *R. ex gr. humilis* Le Calvez*, *Cancris subconicus* (Terq.),* Valvulina ex gr. lamellosa* Terq.*, *Nonion labradoricus* Davs., *N. ex gr. commune* (Orb.), *Elphidium hiltermanni* Hagn.*, *El. ex gr. laeve* (Orb.*)*, *Pararotalia armata* (Orb.),* P. inermis* (Terq.),* Epistomaria rimos a* (Park. et Jon.),* Bulimina ovigera* Terq.*, *Bul. elongata* Le Calvez, non Orb.*, *Buliminella pulchra* Terq.*, *Reussella terquemi* Cushm.* Researchers dated the second BF complex late Lutetian based on similar composition of species with the Paris basin (marked by * in the list).

T.S. Ryabokon [75-77] gave historical review of stratigraphical interpretation of beds with miliolids. She supplemented the species composition of the beds with *Robulus inornatus* (Orb.), *Nonion commune* (Orb.), *Melonis affine* (Reuss), *M. umbilicatus* (Orb.), *Cibicidoides karpcaticus* Mjatl., *Eponides polygonus* (Le Calv.), *Baggina subconica* (Terq.),* Neoconorbina orbignyana* (Brady), *Asterigerina stelligera* Kraeva, *Cribrononoin onerosum* (Bogd.), *Porosonion subnodosum* (Munst.), *Reussella terquemi* Cushm., *Tubulogenerina tubulifera* (Park. et Jon.),* Robertina germanica* Cushm. et Park., *Bolivina crenulata* Cushm., etc. Researcher described variety of BF associations namely complex with *Miliolidae*, complex with *Ammonia*, complex with Polymorphinidae, complex with *Lobatula*. T.S. Ryabokon [75] compared the beds with *Miliolidae* and *Epistomaria rimos a* the Kuberla Horizon (= Lower Novopavlovkian Regional Substage) of the southern Ukraine. She also confirmed correlation the beds with *Miliolidae* and *Epistomaria rimos a* of the Basavluk depression of the southern slope of US with middle-upper Lutetian of the Paris basin. T.S. Ryabokon noted that by taxonomic composition the BF assemblages of the beds differ sharply from known BF associations of middle Eocene deposits the NPBSR and the Dnieper-Donets Depression. After her the common species with BF association of the Novopavlovkian of the NPBSR are *Lenticulina rostellata* Kraeva, *Cibicidoides hagibulakensis* N. Byk., *Heterolepa porosa* Kraeva, *Asterigerina stelligera* Kraeva, *As. jartzevae* Konen., *Cibicidina arguta* (N. Byk.), *Hanzawaia producta* (Terq.), *Ammonia ?stellata* (Kraeva), *Kolesnikovella ignara* N. Byk., *Bolivina arta* Mact. Also she noted the predominance *Miliolidae*, *Polymorphinidae*.

**Author’s notes.** Beds with *Miliolidae* and *Epistomaria rimos a* characterize shallow-marine depositional environments of the Eocene sea within depressions on the southern slope of US in middle Lutetian time (see fig. 3).
Novopavlovkian – Kumian Regional Stages. BF assemblages with Robulus dualis Bugr., Uvigerina costellata Moroz., Pseudoclavulina subbotinai J. Nik. are connected with marls and clay limestones in the upper part of the NPBSR. These deposits are accompanied with planktic foraminifera of zone Globigerinatheca subconglobata, Hantkenina alabamensis characterizing Upper Novopavlovkian Regional Substage. Aslo the associations are known from lithologically similar grey-greenish marls with Subbotina turcmenica (Chal.), Acrorhipa bullbrooki (Boll) marking the lower part of the Kumian Regiostage in the region. As biostratigraphic unit (zones or beds with foraminifera) these assemplages were not distinguished by previous researchers. But similar associations of small BF were described by Ye.Ya. Kraeva [41, 44] in sections of the NPBSR as “lagenids-globigerinids zone” in the Tokmak-Melitopol area, as “zone Globigerina apertura and Hantkenina alabamensis” in the Razdelnaya area and as “globigerinids zone” in the Odessa-Kherson area. Information about taxonomic composition of BF associations of the Keresta and Kuma Horizons also presents in publications of N.G. Savenko [82, 83, 101] and Ye.Ya. Kraeva [53, 55].

The assemblage, be named in the article as beds with Robulus dualis, Uvigerina costellata, Pseudoclavulina subbotinai, includes Spiroplectammina cariniformis Mor., Sp pishvanovae (A. et K. Furs.), Paragaudryina dalmatina (Liebus.), Gaudryina asiphonia Andr., Clavulinozoides szaboii (Hantk.), Pseudoclavulina subbotinai J. Nik., Robulus dualis Bugr. (= dimorpha (Tutkow.)), R. limbosus (Reuss), R. laticostatus (Tutkow.), R. grodnensis (A. et K. Furs.), Lenticulina parvula Kraeva, Marginuliniopsis fragaria (Guemb.), M. pseuodosetosa (Moroz.), Frondiculina tenuissima Hantk., Nodosaria bacillum Defr., Siphonodosaria annulifera (Cushm. et Berrm.), Anomalinozoides affinis (Hantk.), A. alazensis Nurt., Brotzenella acuta taurica (Sam.), Br. turkmenica Bugr., Cibicidoids parallelus (Nutt.), Cib. ungerianus (Orb.), Heterolepa pygmea (Hantk.), H. eocaena (Guemb.), H. biunbonata (A. et K. Furs.), Valvulineria palmarealensis Nurt., Gyroidinozoides soldani (Orb.), Svatkinia perlatla (Andr.), Oridoralsis umbonatus (Reuss), Siphonina kaptarenkae Kraeva, S. subreaticulata Mjt., Alabamina almacensis (Sam.), Al. wilcoxensis Touml., Falsoplanulinaammphila (Guemb.), F. cachmani (Nutt.), Planulina costata (Hantk.), Bulimina sculptilis Cushm., Bul. aksuatica Moroz., Bul. inflata Seg., Globobulimina ovata (Subb., non Orb.), Fursenkoine dibollensis (Cushm. et Appl.), Uvigerina proboscidea Schwag., Uv. hispida Schwag., Uv. costellata Mor., Uv. jacksonensis Cushm., Uv. cocoensis Cushm., Bolivina pusilla Schw., B. antegressa Subb., B. microlancetiformis Subb., B. asiatica Moroz., Trifarina bradiy Cushm., Candella labrum (Subb.), Kolesnikovella elongata (Halk.), Angulogerina wilcoxensis Cushm. et Appl., Loxostomoides millepunctatus (Tutkow.), etc.

Author’s notes. Presence Spiroplectammina pishvanovae A. et K. Furs., Spiroplectammina cariniformis Moroz., Pseudoclavulina subbotinai J. Nik., Robulus dualis Bugr., R. laticostatus (Tutkow.), R. grodnensis (A. et K. Furs.), Turkmenikaellafa infans (Kraeva), Brotzenella turkmenica Bugr., Cibicidoids biunbonatus (A. et K. Furs.), Siphonina kaptarenkae Kraeva, Falsoplanulinaammphila (Guemb.), Uvigerina costellata Moroz., Bulimina sculptilis Cushm., B. aksuatica Moroz., Bolivina microlancetiformis Subb., Dymia labrum (Subb.), Trifarina bradiy Cushm., Loxostomoides millepunctatus (Tutkow.) and others proves correspondence the beds with Robulus dualis, Uvigerina costellata, Pseudoclavulina subbotinai to middle Eocene interregional zone Uvigerina costellata of the CCR and regional zone Robulus dualis of the Russian Platform [9] (see fig. 3).

Almian Regional Stage. Despite numerous and good works on identification and description Upper Eocene foraminifera assemblages of the NPBSR the BF biostratigraphy of Priabonain section remains still non clear and sometimes confuse due to facies diversity of sediments. Ye.Ya. Kraeva [41, 44], N.G. Savenko [83] have identified three foraminifera assemblages in Upper Eocene of the region. The first complex is connected with relatively deep-water marls and calcareous clays, the second one do with relatively shallow-water clay-silty deposits and the third one – the most shallow-water silty-sandy sediments. But as in these publications and as in others [30, 31, 35, 43, 52, 56, 65, 72, 88, 100, 101, 111] similar BF associations present under different names for various areas. Moreover, foraminifera associations with dominating arenaceous species from the upper part of the Eocene section previously as usual were attributed
to Lower Oligocene. New data on calcareous nannofossils and dinocysts be obtained from the sections up to the end of XX century have not lead to revision and redefinition stratigraphical position of the foraminifera assemblages.

Due to Ye.Ya. Kraeva, N.G. Savenko, A.P. Pechenkina and I.D. Konenkova’s investigations the following BF assemblages may be distinguished today in the Almian Regiostage of the NPBSR, namely the beds with Marginulinopsis infracompressus, the beds with Asterigerina, Nonion, Bolivina, the beds with Eoeponidella lucida and Cibicidoides salensis, the beds with Anomalinaacea, Miliolidae, Asterigerina, Pararotalia, the beds with arenaceous foraminifera, the beds with Gaudryinopsis gracilis and Heterolepa almaensis and the beds with Angulogerina transscaqiensis.

Beds with Marginulinopsis infracompressus. Ye.Ya. Kraeva [41, 44] was the first who identified foraminiferal assemblage of relatively deep-water marls of Upper Eocene of the region as “zone with Globigerinoidea conglobatus” in sections of the Razdelnaya area (the southwestern part of the NPBSR), the Novo-Aleksseevka (the near Sivash) and Akimovka (the eastern part of the NPBSR). She described these deposits as those with numerous foraminifera, radiolarians and diatoms. After her it is characterized by numerous Globigerinoides conglobatus (Brady) and permanent presence Marginulina infracompressa (Thalm.), Bulina sculpitlis Cushman., Uvigerina densecostata Kapt. (msc.). Uv. costellata Moroz. Later N.G. Savenko [83] has confirmed Kraeva’s results and also has marked numerous Bolivina antegressa Subb., various and numerous Nodosaria, Lenticulina, Buliminidae, Anomaliniidae for the complex.

Ye.Ya. Kraeva [41, 44] and N.G. Savenko [83] considered this foraminifera assemblage to be an analogue of “zone with large globigerinids and Globigerinoideae conglobatus” (syn.: zone Globigerinopsis index) of the Alma Regional Horizon of Crimean Peninsula.

Similar BF associations from relatively shallow-water calcareous clay-silty deposits of Upper-Eocene, the researchers have identified under different names, namely “buliminids zone” in the Bolshaya Belozerka section [41, 44], “zone with Marginulina infracompressa” [41, 43, 44, 52], “zone Marginulina behmi” [83], an analogue of “zone Bolivina” or “horizon with Marginulina” [72], “zone Bolivina” [88, 111] and “zone Bolivina antegressa” [31].

The foraminifera assemblage of relatively shallow-water sediments is distinguished by predominance of benthic species and reduction of planktic ones, disappearance of Globigerinoidea conglobatus (= Globigerinatheka tropicalis (Blow et Banner)) upward the section. BF associations of calcareous clay-silty deposits are similar to that of marls.

Ye.Ya. Kraeva [62, p. 7, table] renamed this foraminifera assemblage of Upper Eocene deposits of the NPBSR as “beds with Marginulina infracompressa and Globigerinoidea conglobatus”. Later L.A. Digas [8] has emphasized that “beds with Marginulina infracompressa – Globigerinopsis index” in the central and western parts of the NPBSR occur conformable between “zone of planktic foraminifera” (Subbotina turmenica zone of the Kumian Regional Stage) and “beds with Asterigerina, Nonion, Bolivina, Nummulites” (upper part of the Alman Regional Stage).

Upper Eocene beds with Marginulinosis infracompressus of the NPBSR include Paragaudryina dalmatina (Liebus), Cyclammina pseudocansellata Chalil., Clavulinoides szaboii (Hant.), Cylindroclavulina colomi Haqn, Cyl. rudislosta (Hant.); Marginulinopsis infracompressus (Thalm.), Marginulina behmi Guemb., Brotzenella acuta (Plumm.) taurica (Sam.), Anomalinoidea alazanensis Nutt., Cibicidoides ungerianus (Orb.), Cib. perlucidus Nutt., Cib. biumbonatus (A. et K. Furs.), Alabamina almaensis (Sam.), Oridorsalis jacksonensis (Nutt.), O. umbonatus (Reuss.), Bagmina iphigenia (Sam.), Planulina costata (Hant.); Bulima sculpitlis Cushman., Bul. aksuativa Moroz., Uvigerina jacksonensis Cushman., Uv. costellata Moroz., Uv. pygmea Orb., Uv. dubia Kraeva, Grammmostomum nobilis (Hant.); Bolivina antegressa Subb., Fursenkoina schreibersiana (Cz.), Globocassidulina globosa (Hant.) and others [31, 35, 44, 52, 55, 56, 59, 83, 88, 100, 101].

In the eastern part of the Near-Azov Region [31, 54] BF association of beds with M. infracompressus includes, except mentioned species, Ammobaculites grossecameratus Ter-Grig., Spiroplectammina azovensis J. Nik., Vulvulina eocanena Mont., Frondicularia budensis Hantk., Frondicularia tenuissima (Hantk.); Robulus limbosus (Reuss), Anomalina granosa
In the NPBSR the beds with *M. infracompressus* correspond to Upper Eocene planktic foraminifera zone Globigerinathea tropics s.l. and calcareous nannofossils zonal interval NP 18–NP 19/20 [5, 6, 31, 36, 54, 56, 69, 83, 113] determining the Albian Regiostage of the southern Ukraine.

**Author’s notes.** The described BF assemblage should be considered as an assemblage-zone Marginulinopsis infracompressus as Ye.Ya. Kraeva has proposed previously. Zone Marginulinopsis infracompressus of the NPBSR (fig. 4) is a stratigraphic analogue of Priabonian interregional zone Planulina costata of the CCR [9] due to presence characterizing species Clavulinoides szaboi (Hantk.), Cyclammina pseudocancellata (Hantkl.), Marginulinopsis infracompressus (Thalm.), Marginulina behmi Guemb., Robulus limbosus (Reuss), Turkmenicaella kubinyi (Hantk.), Anomalina granosa (Hantk.), Anomalinooides alazanensis (Hantk.), Brotzenella taurica (Sam.), Cibicoides tachtaensis (Schutzk.), Cib. bionus (Schutzk.), Heterolepa dutemplier (Orb.), H. pygmea (Hantk.), Svratkina perlata (Andr.), Alabamina almaensis (Sam.), Planulina costata (Hantk.), Grammostomum nobilis (Hantk.), Uvigerina jacksonensis Cushm., *Bulimina truncana* Guemb., etc.

Some more shallow-water BF associations of the beds are described in I.D. Konenkova’s works [30, 36]. The first association, the fourth, almian, complex in [36], I.D. Konenkova distinguished from Upper Eocene deposits of depressions of the southern part of US. It includes characterizing species of zone Marginulinopsis infracompressus and also shallow-water taxa *Triloculina tricarinata* (Terq.), *Asterigerina falciculicularis* Subb., *Elphidium subnodosum* (Roem.).

![Fig. 4. Sequence and space-time relationships of small benthic foraminifera assemblages in Priabonian of the southern Ukraine](image)

A - interregional benthic foraminifera zones of the Crimea-Caucasus Region [9];
B - regional benthic foraminifera zone of the Sal-Manych-river interfluve [9]
The second assemblage, “zone Bolivina” in [30], I.D. Konenkova identified in borehole drilled in the Malaya Belozerka area (the north of eastern part of the NPBSR). These associations are characterized by various and numerous BF Anomalina granosa (Hantk.), Cibicides tachtaensis (Schutzk.), C. kugultaensis (Schutzk.), C. biuson Schutzk., C. jankulaensis (Nutt.), C. ungerianus Cushman., Alabamina almaensis (Sam.), Al. perlata (Andr.), Eponides jacksonensis Cushman., Pullenia bulloides Orb., P. quinqueloba Reuss, Baggina ihgenia (Sam.), Oriddorsalis praebunomatus (Mjatl.). Similar BF association from clays and silts of underlying manganese-ore bed of the Nikopol manganese-ore basin was defined by N.G. Savenko [14].

Beds with Asterigerina, Nonionidae, Bolivina, Nummulites. Ye.Ya. Kraeva [41, 43] has described small foraminifera assemblage as “zone Asterigerina and Nonion” from sediments with numerous nummulitids and mollusks of the Odessa-Kherson area section (central part of the NPBSR). She noted that the most abundant and characteristic species for this zone are Eponides stellatus Kraeva, Asterigerina ambiqua Kraeva. After Ye.Ya. Kraeva [43], the zonal association also is distinguished by permanent but not frequent species Cibicides aff. pseudoungerianus Cushman., C. aff. oligocenicus Sam., Nonion umbilicatus Montf., Pullenia quinqueloba Reuss, Eponides perlata (Andr.), Asterigerina bracteata Cushman., Turrilina alsatica Andr., Bolivina reticulata Hantk. In her work [44] Ye.Ya. Kraeva renamed the assemblage as “zone with Asterigerina, Nonion and Nummulites”. Later she renamed it as “zone (beds) with Asterigerina, Nonion, Bolivina, Nummulites” [8, 62: p. 7, tabl.].

Similar BF association has been distinguished by A.P. Pechenkina [72] as “the fifth complex” characterizing interlayers of calcareous clays and aleurolites (silts) in the upper part of Paleogene section of the southwestern part of the NPBSR. She identified it as beds with shallow-water assemblage with calcareous foraminifera Rotalia sp., Asterigerina sp. (aff. ambiqua Kraeva), Cibicides janschini J. Nik., C. sulzenses (Herrm.), C. aff. pseudoungerianus Cushman., C. tachtaensis Schutzk., Melonis ex gr. dozulaensis (Chalil.), Nonion aff. granosus (Orb.), Florilus ex gr. boueanus (Orb.), Baggina ihgenia (Sam.), Bolivina ovataeformis Chalil., B. aff. aenariensisformis Mjatl., Baggatella sp., representatives of Lagenidae, Polymorphinidae, single Nummulites ornignyi (Gal.).

Later N.G. Savenko [82, 83, 100] determined that small BF assemblage of Upper Eocene beds with Nummulites and molluscs of the western part of the NPBSR are characterized by predominance of Asterigerinidae and Nonionidae. Among characteristic species she indicated Cibicidioideis sumsarenis N. Byk. ucrainicus Kraeva, Cib. roulenis Kraeva, Melonis dosularensis (Chalil.), Rotalia lithoathamnica (Uhlgh), Bolivina simplex Balakhm. and Asterigerina stelligera Kraeva.

At the same time I.D. Konenkova [22] published detailed biostratigraphic description “beds with Asterigerina, Nonion and Nummulites” of the same region. She noted that BF assemblage of the beds is distinguished by various species of Asterigerinidae, Nonionidae, Discorbidae and Anomaliniidae. It includes Asterigerina ambiqua Kraeva, A. crassa-suturata Konen., A. praefrackei Konen., A. jartzevae Konen., A. ambiqua Kraeva forma dorsoplana Konen., Melonis rotulus (Chalil.), Nonion nonionoides (Andr.), Baginna ihgenia (Sam.), Eponides stellatus (Kraeva), Cibicides biuson Schutzk., C. kugultaensis Schutzk., C. ex gr. karpcicus Mjatl., Bolivina microlancetiformis Subb., B. ex gr pusilla Schwag. Small BF associations from the Western Near-Black Sea Region also contain Marginulina behmi (Reuss), Cibicides aff. janschini J. Nik., C. dutemplei (Orb.) praecinatus (Karr.), C. jankulaensis Schutzk., C. kugultaensis Schutzk., C. tahtaensis Schutzk., C. carinatus (Terq.), Elphidium rothshauseni (Bandy), Bolivina compla Chalil., B. compla carinata Chalil.

As possible analogue of beds with Asterigerina, Nonion and Nummulites in the eastern part of Near-Azov Region, I.D.Konenkova [31] considers layers of noncalcareous silts containing numerous sponge spicules, radiolarians, diatomea and non numerous foraminifera Ammobaculites grosssecamerata Ter-Grig., Cylindroclavulina rudislosta (Hantk.), Nodosaria exilis (Neug.), Baggina ihgenia (Sam.), Melonis rotulus (Chalil.), Bolivina nobilis Hantk., B. reticulataforma Chalil., B. praebinaensis Chalil. and rare Asterigerina and Nonion.
Author's notes. Small BF of desribed beds with Nummulites of the Almian Regiostage should be considered as assemblage-zone Asterigerina, Nonion, Bolivina as Ye.Ya. Kraeva has proposed previously. This zone corresponds to Priabonain large foraminifera beds with Nummulites litoralis, N. concinnus, N. prestwichianus [112]. Lower part of the nummulits beds is characterized by calcareous nannofossils of zonal interval NP 18–NP 19 [5, 6, 113] characterizing the Almian Regiostage. In Stratigraphic Scheme of Southern Ukraine these nummulits beds are considered to correspond to upper part of the Almian Regional Stage. BF assemblage of zone Asterigerina, Nonion, Bolivina in comparison with that of zone Marginulinopsis infracompressus indicates more shallow-water marine facies of the upper Eocene in the NPBSR (see fig. 4). It should be noted that BF assemblage of zone Asterigerina, Nonion, Bolivina of the western part of the NPBSR includes some characteristic species of zone Priabonian interregional Planulina costata of the CCR [9], namely Marginulina behmi (Reuss), Cibicidoides sulzensis (Herrm.), Cib. tachtaensis (Schultzk.), Cib. bionus (Schultzk.), Turrilina alsatica Andr., Bolivina reticulata (Hantk.), B. compta Chalil., etc.

Beds with Eoeponidella lucida and Cibicidoides salensis. Above marls of “zone Globigerinoides conglomeratus” (= zone Globigerinatha tropicalis; zone Marginulinopsis infracompressus in the article) in the Razdelnaya area section (the southwestern part of the NPBSR), Ye.Ya. Kraeva [41] has described foraminifera assemblage which she has named as “zone with Globigerina bulloides and arenaceous foraminifera”. After her the main peculiarities of this assemblage are as follows: considerable quantity of arenaceous foraminifera Reophax ex gr. nodulosus Br., R. plana Halk., R. scalaria Grzyb., Proteonina fusiformis Will., Haplophragmoides eggeri Cush., Clavulinia szaboi Hantk., Heterostomella dalmatina Liebus and others; impoverishing of specimens quantity and foraminifera species. As characterizing species of the zone she determined Robulus carinatus Kraeva, Frondicularia budensis (Hantk.), Uvigerina densecostata Kapt. (msc.), Cassidulina globosa Hantk., Bifarina millepunctata (Tutkow.), Lingulina sp.

At that time from the same region A.P. Pechenkina [40, 72] described resembling assemblage as “an analogue of zone Asterigerina lucida and Cibicides salensis” being characterized by succession of three foraminiferal complexes. The first complex in the main consists of arenaceous foraminifera with dominating Rhabdammina sp., Saccammina grzybowskii Bogd., S. variabilis Bogd., Reophax sp., Ammobaculites sp., Heterostomella sp., Haplophragmoides stavropolensis Ter-Grig forma micra. Among calcareous foraminifera in the complex, Cibicides aff. dutemplei (Orb.), Melonis aff. anulatum (Chalil.) striata Chalil., Baggatella ? sp., Uvigerina ex gr. tenuistriata Nutt. (non Reuss), Bolivina simplex simplex Bal. are present. In general, A.P. Pechenkina characterized deposits with that assemblage as beds with assemblage of mainly primitive agglutinated foraminifera Rhabdammina, Saccammina and others, single calcareous species (Uvigerina), numerous radiolaria, diatoms and sponge spicules.

After A.P. Pechenkina the second complex of “zone Asterigerina lucida and Cibicides salensis” is distinguished by various agglutinated foraminifera and abundant radiolarians, diatoms and sponge spicules. Among foraminifera the most numerous and characteristic are Saccammina variabilis Bogd., Reophax aff. scalaria Grzyb., Ammodiscus granatus Subb. (msc.), Haplophragmoides stavropolensis Ter-Grig., Ammobaculites sp., Trochammina parva Cushm. et Laim., Tr. sp., Trochamminoides sp., Spiroplectammina praecarinata J. Nik. vislovensis J. Nik. Sometimes single calcareous species Melonis ex gr. dozularensis (Chalil.), Cibicides ex gr. boriavensis Ais. are found.

The third complex of “zone with Asterigerina lucida and Cibicides salensis” consists of calcareous foraminifera Rotalia sp., Asterigerina aff. ambiqua Kraeva, As. lucida Minakova, Melonis ex gr. dosularensis (Chalil.), Cibicides janchini J. Nik., C. sulzensis (Herrm.), C. extremus Schultzk., C. aff. macrurus N. Byk., Baggina iphigenia (Sam.), Nonion aff. granosus (Orb.), Bolivina ovataeformis Chalil., B. aff. aeriensiformis Mjatl. and others, accompanying with single Nummulites orbignyi (Gall.). A.P. Pechenkina noted the more shallow-water character of the third complex.
It is necessary to note that A.P. Pechenkina considered “zone Asterigerina lucida and Cibicides salensis” to be of early Oligocene age and correlated it with the Khadum Horizon of the Northern Fore-Caucasus grounded on stratigraphic views of that period.

The same succession of foraminifera associations was described by Ye.Ya. Kraeva [46] in the Rojlanka borehole section in interval 472.4-351 m. Siltstones and silts (457-351 m) with mollusks and BF Ye.Ya. Kraeva correlated with the Khadum Horizon of Lower Oligocene. But later it was determined that deposits of the same interval include calcareous nanofossils of upper Eocene Zones NP 19/20 and NP 21 [56, 113].

N.G. Savenko [83, 100] considered “zone Asterigerina lucida and Cibicides salensis” Upper Eocene and determined its characteristic association consisting of Haplophragmoides ex gr. rotundidorsatum Hantk., H. eggeri Cush., H. ex gr. kiewensis Kapt., Spiroplectammina azovensis J. Nik., Marginulina behmi (Reuss), Asterigerina lucida Minak., Cibicides salensis J. Nik. and others. Also she noted connections arenaceous foraminifera with layers of non-calcareous silt rocks.

Author’s notes. The described BF assemblage should be considered as assemblage-zone Eoeponidella lucida, Cibicoides salensis as it was proposed by A.P. Pechenkina. Due to presence Haplophragmoides stavropolensis Ter-Grig., Clavulinoides szaboii (Hantk.), Robulus calcariformis Schwemb., Frondicularia budensis (Hantk.), Cibicoides sulzensis (Herrm.), Cib. extremus Schutzk., Melonis dozularensis (Chalil.), Eoeponidella lucida (Minak.), Bagginia iphigenia (Sam.), Loxostomoides millepunctatus (Tutkow.), Globocassidulina globosa (Hantk.) and others known from Upper Eocene interregional zone Planulina costata of the CCR [9] and its stratigraphic analogue in the other areas [66], the zone Eoeponidella lucida, Cibicoides salensis of the southwestern part of the NPBSR should be considered to be of Priabonian age (see fig. 4).

Beds with arenaceous foraminifera. O.K. Kaptarenko-Chernousova, E.S. Lipnik [19] described from hole drilled near Chkalov village in the south-western part of the Near-Azov Region the assemblage with arenaceous foraminifera consisting of numerous Rhabdaminia cylindrica Glaessn., Psammomphaera fusca Schultze., Proteonina fusiformis Will., Pr. amplacea Brady, Ammodiscus incertus (Orb.), Reophax scalaria Grzyb., R. plana Halk., Ammobaculites agglutinans (Orb.), Haplophragmoides kiewensis Kapt., H. rotundidorsatum Hantk., H. sp., Cyclammina cancellata Brady, Spiroplectammina carinata (Orb.), Textularia sp., non-numerous and poor preserved calcareous specimens Spiroloculina sp., Gyroidina soldanii Orb., Cibicides lobatulus (Walk. et Jac.), Anomalina sp. They noted that clays including that BF assemblage overlay marls with foraminifera of “the Kiev Stage” and underlay siliceous clays with abundant radiolarians and sponge spicules, clayey aleurolite with numerous Spiroplectammina carinata (Orb.). Based on comprising the assemblage with arenaceous foraminifera with that of “the Kiev Stage” of the Dnieper-Donets Depression, O.K. Kaptarenko-Chernousova and E.S. Lipnik have corresponded the siliceous clays with arenaceous foraminifera of the Near-Azov Region to Lower Oligocene.

Ye.Ya. Kraeva [41, 44] has considered assemblage with arenaceous foraminifera as zone due to it stratigraphic position between beds with Upper Eocene foraminifera and Oligocene “zone with Spiroplectammina carinata”. She noted that this assemblage was reported by O.K. Kaptarenko-Chernousova and E.S. Lipnik [19] in the south-western part of the Near-Azov Region and A.P. Pechenkina [40] from borehole drilled near Minoe village the Odessa area (the southwestern part of the NPBSR). After Ye.Ya. Kraeva, zonal association consists of representatives of genera Rhabdaminia, Proteonina, Ammodiscus, Reophax, Ammobaculites, Haplophragmoides, Cyclammina, Spiroplectammina, Frankeina. Later in her other publication [96] she concluded that assemblage with arenaceous foraminifera characterizes the Rubanovka Beds in the NPBSR.

A.P. Pechenkina, Ye.Ya. Kraeva [59] have examined distribution of arenaceous foraminifers association from the south-western part of the Near-Azov Region to the eastern part of the NPBSR. They have considered the assemblage of arenaceous foraminifera of the NPBSR as an analogue of “zone Haplophragmoides deformabilis” of the Stavropol Region [59, 73]. Researchers considered “zone of arenaceous foraminifers” as beds with mainly agglutinated foraminifera occur.
between Upper Eocene deposits and that of “zone Spiroplectammina carinata”. Zonal association includes Saccammina variabilis Bogd., Saccammina sp., Reophax sp., Ammobaculites sp., Hyperammina sp., Haplophragmoides deformabilis Subb., Trochammina exposed Ter-Grig. (msc.), Ammomarginulina foliacea (Brady), Textularia sp., Spiroplectammina azovensis J. Nik., Gaudryina gracilis (Cushm. et Laim.), also calcareous species Cibicides ex gr. sulzensis (Hermm.), C. pseudoungerianus Cushm., C. extremus Schut., Melonis dozularensis Chalil., Globulina gibba Orb., Pyrulina cylindroides (Roem.).

From the end of sixties, the zone of arenaceous foraminifera was considered as stratigraphic analogue of “beds with Lenticulina herrmanni” of Lower Oligocene in the NPBSR [31, 42, 52, 56, 88, 93, 111]. Zonal BF complex includes agglutinated species Saccammina variabilis Bogd., Rhabdamma aff. cylindrica Glaessn., Reophax aff. elongata Grzyb., Hyperammina cf. caucasica Bogd., Haplophragmoides stavropolensis Ter-Grig., H. deformabilis Subb., Ammomarginulina foliacea (Brady), Spiroplectammina azovensis J. Nik., Gaudryinopsis gracilis (Cushm. et Laim.) and secreted ones Lenticulina ex gr. herrmanni (Andr.), Cibicidoides extremus (Schutzk.), Cib. oligocenicus (Sam.), Melonis affine (Reuss), M. dozularensis Chalil., Brizalina mississippiensis (Cushm.).

I.D. Konenkova [36] described beds with agglutinated foraminifera, numerous sponge spicules and radiolarians from Upper Eocene shallow-water deposits of depressions the southern part of US. The BF association includes species known from “zone of arenaceous foraminifera” of the Northern Near-Black Sea Region, namely Reophax scalaria Grzyb., R. plana Halk., Ammodiscus incertus Orb., Haplophragmoides stavropolensis Ter-Grig., Ammobaculites agglutinans (Orb.), Trochammina ex gr. florata Ter-Grig. and others.

Author’s notes. The described BF assemblage should be regarded as assemblage-zone arenaceous foraminifera as it was proposed by Ye.Ya. Kraeva. Stratigraphic position of zone arenaceous foraminifera today remains still uncertain. In Stratigraphic Schemes of Paleogene deposits of the southern Ukraine [64, 67, 90, 91] the beds with arenaceous foraminifera correspond to the Lower Oligocene and occupy position stratigraphically below zone Spiroplectammina oligocenica. Presence such species as Haplophragmoides deformabilis Subb., H. stavropolensis Ter-Grig., Spiroplectammina azovensis J. Nik., Gaudryinopsis gracilis (Cushm. et Laim.), Cibicidoides extremus (Schutzk.), Cib. oligocenicus (Sam.), Melonis dozularensis (Chalil.), Bolivina mississippiensis (Cushm.) and others identifies the lowest Oligocene regional zones Haplophragmoides fidelis and Haplophragmoides deformabilis of the Stavropol Region (the Central Fore-Ciscaucausus) [9] or zone Cibicidoides salensis of the south-eastern outlying part of Russian Platform and the Skytian Plate after Yu.P. Nikitina [66]. New data on calcareous nanofossils from beds with arenaceous foraminifera of the NPBSR and its analogues in the Crimean Peninsula [3, 56, 94] and other stratigraphical materials [78, 81, 94] show corresponding zone arenaceous foraminifera to Upper Eocene (see fig. 4). But the possibility of transitional Eocene-Oligocene stratigraphic position of the arenaceous foraminifera assemblage in some sections could not be excluded.

Beds with Gaudryinopsis gracilis and Heterolepa almaensis. I.D. Konenkova [30] from borehole drilled near Malaya Belozerka village (on the north of the eastern part of the NPBSR) described interesting BF assemblage consisting of arenaceous species known from “zone of arenaceous foraminifera” (Ammodiscus tenuiculus Subb., Haplophragmoides deformabilis Subb., H. stavropolensis Ter-Grig., Spiroplectammina vicina (Erem.), Gaudryinopsis grasilis (Cushm. et Laim.), Verneuilina rasilis Subb.) and calcareous ones distributed in upper Eocene – lower Oligocene (Guttulina problema Orb., Anomalina munda (N. Byk.), An. munda assakensis Korov., Heterolepa almaensis (Sam.), Cibicidoides oligocenicus (Sam.), Melonis dozularensis (Chalil.), Bagrina iphigenia (Sam.), Caucasina schischkinskayae (Sam.), etc.). She named the assemblage as “zone Gaydriyna gracilis and Heterolepa almaensis” and corresponded it to lower Oligocene. This assemblage also includes Reophax scalaria Cz., Saccammina variabilis Bogd., Trochammina florifera Subb., Ammomarginulina foliacea (Brady), Subtilina aff. fidelis (Ter-Grig.), Pyrulina fusiformis (Roem.), Glandulina laevigata (Orb.), Asterigerina perbona
Konen., A. jucunda Konen., A. jucunda iniqua Konen., Pararotalia canui Bhatia, Bolivina compta carinata Chalil.

Similar BF association in other researchers’ publications of previous years were presented as “beds with Heterolepa almaensis” or “analogue of beds with Lenticulina herrmanni” [88, 93], as “zone with agglutinated foraminifera” [59] and “beds with mixed complex of foraminifers” and “beds with Trifarina transcauspiensis” [31].

Author’s notes. Taxonomic composition of BF of zone Gaudryinopsis gracilis and Heterolepa almaensis is close to zone Cibicoides salensis of the south-eastern outlying part of the Russian Platform and the Skythian Plate [66]. Yu.P. Nikitina considered zone Cibicoides salensis to be of early Oligocene age. But according to publication [94] deposits of zone Cibicoides salensis contain calcareous nannofossils of Zone NP 20 and, thus, should be dated the Priabonian. Thus, based on correlation with zone Cibicoides salensis, zone Gaudryinopsis gracilis and Heterolepa almaensis of the ACM is close to Upper Eocene zone Asterigerina, Nonion, Bolivina, zone Eoeponidella lucida and Cibicoides salensis, zone Gaudryinopsis gracilis and Heterolepa almaensis of the north-eastern part of the NPBSR should be compared with the Priabonian (see fig. 4).

Beds with Angulogerina transcauspiensis. Ye.Ya. Kraeva [54] has described BF “complex with Trifarina transcauspiensis” from the lower part of mainly non calcareous sands, silts and clays of the south eastern part of the Near-Azov Region. These deposits she considered as Lower Oligocene. Except index-species Trifarina transcauspiensis (Moroz.) this assemblage includes Hyperammina sp., Saccammina ex gr. amphilacea (Brady), Ammobaculites foliaceus (Brady), Textularia tuaevi (Moroz.), Gavelinella ex gr. munda N. Byk., Caucasina schischkinskyae (Sam.). C. azididerensis Chalil., Caucasina sp., Bolivina mississippiensis Cushman., Seabrookia sp. After Ye.Ya. Kraeva, the beds with Angulogerina transcauspiensis occur below the beds with Lenticulina herrmanni and arenaceous foraminifera in the Lower Oligocene section of that region.

I.D. Konenkova [31] gave more accurate definition the stratigraphic position of the beds with Angulogerina transcauspiensis. After her these beds occur between the layers containing impoverished BF association of upper part of Upper Eocene zone Bolivina antegressa and the beds with mixed BF assemblage (an analogue of zone Eoeponidella lucida and Cibicoides salensis and zone arenaceous foraminifera in the article). I.D. Konenkova supplemented the species composition of the beds with Angulogerina transcauspiensis with Reophax plana halk., R. nodulosus (Brady), R. scalaria Grzyb., Saccammina fusiformis (Will.), Rhizammina indivisa Brady, Trochammina advena Cushman., Haplophragmoides stavropolensis Ter-Grig.*, Spirolectammina vicina Erem., Martinotella ex gr. communis (Orb.), Frondicularia budensis (Hantk.)*, Alabamina almaensis (Sam.)*, Baggina iphigenia (Sam.)*, Cibicoides aff. pseudoungerianus (Cushman.)*, Cib. tahtaensis (Schutzk.)*.

BF of the beds with Ang. transcauspiensis of the eastern part of the Near-Azov Region contain species (marked by (*) in the list) known from Upper Eocene zone Marginulinopsis infracompressus, zone Asterigerina, Nonion, Bolivina, zone Eoeponidella lucida and Cibicoides salensis of the NPBSR. The species Spirolectammina tuaevi Moroz., Sp. vicina Erem., Brotzenella munda (N. Byk.), Caucasina schischkinskyae (Sam.), Bolivina mississippiensis Cushman. are known from zone Cibicoides salensis of the Sal-Manych-river interflue [9, 66]. But, because of definition calcareous nannofossils of zone NP 20 [94], deposits of zone Cibicoides salensis should be considered the Priabonian.

Common BF species of beds with Ang. transcauspiensis of the eastern part of the ACM and zone Gaudryinopsis gracilis and Heterolepa almaensis of the north of eastern part of the NPBSR [30] are Reophax scalaria Grzyb., Ammomarginulina foliacea (Br.), Haplophragmoides stavropolensis Ter-Grig., Baggina iphigenia (Sam.), Brotzenella munda (N. Byk.), Caucasina schischkinskyae (Sam.).

Author’s notes. Taxonomic composition of BF the beds with Angulogerina transcauspiensis of the eastern part of the ACM is close to Upper Eocene zone Asterigerina, Nonion, Bolivina, zone Eoeponidella lucida and Cibicoides salensis, zone Gaudryinopsis gracilis and Heterolepa almaensis of the eastern part of the NPBSR and zone Cibicoides salensis of the Sal-Manych-river interflue. Thus, on my opinion, the beds with Angulogerina transcauspiensis should be compared with the Priabonian (see fig. 4).
Beds with Anomalinaeae, Miliolidae, Astigerina, Pararotalia. Due to investigations of I.D. Konenkova [36] and N.G. Savenko, it was determined that “beds with Marginulina infracompressa” in depression the southern part of US are replaced by shallow-water BF association consisting of numerous and various Anomalinaeae and Cibicididae, prevalence Rotaliacea, namely Anomalina granosa (Hantk.), An. affinis (Hantk.), An. ex gr. grosserugosa (Hantk.), Heterolepa eocaena (Guent.), H. pygmeus (Hantk.), Cibicides carinatus (Terq.), C. orbicularis (Terq.), C. lobatus (Walker et Jac.), Miliolidae, namely Quiqueloculina soljenica Jartz., Q. circularis Born., Q. seminulum (Linne), Q. austria (Orb.), Spiroloculina costifera Terq., Triloculina trigonula (Lam.), Nodobaculariella contracta (Terq.), N. jartzevae (Bogd.), frequent Eponides stellatus Kraeva, Discoribis orbicularis Terq., Astigerina stelligera Kraeva, As. rotula Kaufm., Melonis umbilicatulus (Montf.), Pararotalia lithothamnica orientalis (Cushm. et Berm.), P. praecalcar (Mjt.), Elphidium latidorsatum (Reuss), Cycloculina annulata Heron-Allen et Earl., Conobrina latdorfiensis Jiess. et Lotsch., Reussella spinulosa (Reuss), Robertina germanica Cushm. et Park., others. According to I.D. Konenkova this BF association is very similar with that of Upper Eocene the Mandrykovka beds of the US. Priabonian age of the beds with Anomalinaeae, Miliolidae, Astigerina, Pararotalia is proved by distinguishing calcareous nannofossils of Priabonian zone NP 19 [36].

Author’s notes. Beds with Anomalinaeae, Miliolidae, Astigerina, Pararotalia characterize shallow-water peripheral facies of the southern Ukraine Eocene basin on the southern slope of US in Priabonian time (see fig. 4).

Oligocene. Up to the beginning of the fifties years of XX century in the NPBSR section only two BF assemblages were known as Oligocene. The first, lower, is “horizon with arenaceous foraminifera” now considering late Eocene age (see above). The second, upper, BF association is “horizon with numerous Spiroplectammina carinata”. Later Ye.Ya. Kraeva identified “complex with Sphaeroidina” from middle Oligocene deposits of the region.

Today the following biostratigraphic units by BF are distinguished in Oligocene section of the NPBSR and adjacent part of the southern slope of US: zone Spiroplectammina oligocenica (lower Rupelian, the Planorbellian Regiostage); zone Sphaeroidina variabilis (Chattian, the Kerleutian Regiostage, Askania Horizon) and zone Elphidium onerosum, Cibicidoides ornatus (Chattian, the Kerleutian Regiostage, Gornostaevka Horizon).

Planorbellian Regional Stage. Zone Spiroplectammina oligocenica. In literature on Paleogene stratigraphy of the southern part of platformian Ukraine “horizon with Spiroplectammina sp.” firstly was reported from upper part of “the Kharkov Stage” in borehole drilled near Stepanovka village (the southwestern part of the Near-Azov Region) in publication [20]. After V.F. Kosireva, the distinguishing species of that horizon are Ammobaculites sp., Haplophragmoides aff. periferoexcavatus Subb. She compared “horizon with Spiroplectammina sp.” with middle Oligocene “subhorizon with Spiroplectammin spar.” of the Alma section of Crimean Peninsula (after P.B. Samoilova) and with “beds with Spiroplectammina sp.” of Paleogene deposits the Nikopol area (after M.V. Yartseva, msc., 1949).

O.K. Kaptarenko-Chernousova and E.S. Lipnik [19] described “horizon with numerous Spiroplectammina carinata (d’Orb.)” in Oligocene section of borehole drilled near Chkalov village (the south of the Molochnaya river basin). Researchers also designated characteristic species for the horizon. There are Cibicides pseudoungerianus Cushm., C. lobatus (Park et Jon.), Gyroidina soldanii (Orb.), Pullenia sphaeroides (Orb.), Buliminia advena Cushm., Uvigerina asperula Cz., deformed Nonion umbilicatulus (Mont.).

Ye.Ya. Kraeva [41, 42, 44] determined the assemblage with Spiroplectammina as “zone with Spiroplectammina carinata” of the Lower Oligocene in the Tokmak-Melitopol and the Near Sivash areas. As the most representative and abundant species of this zone she marked Spiroplectammina carinata (Orb.), Caucasia schischkinskajae (Sam.), Bolivina mississippiensis Cushm. Less numerous species in the complex are Cibicides oligocenicus (Sam.), C. pseudoungerianus Cushm., Neogyroidina memoranda Subb., Uvigerinella majkopica Kraeva [41, 43, 44, 59, 96]. Among other characteristic species of the assemblage she indicated Ammodiscus incertus (Orb.), Cyclammina cancellata Brady, C. ex gr. constictimargo K. E. Stew.,
Miliolina sp., Globulina gibba Orb., Nonion sp., Pullenia bulboides (Orb.), Gyroidina soldanii (Orb.), Uvigerina ex gr. asperula Cz., Angulogerina ex gr. wilcoxensis (Cushman et Pont.).

At the same time M.V. Yartseva [107] described BF distribution in manganese-ore bed, underlying and overlying it beds of the Nikopol manganese-ore basin. From silts and clays withing calcareous manganese-ore bed M.V. Yartseva distinguished BF “complex with Caucasina schischkinskya” regarded by her as an analogue of “horizon with Spiroplectammina” of the Crimea. She indicated [71] Spiroplectammina carinata (Orb.), Sp. ex gr. mayerina Orb., Miliolina ex gr. akneriana Orb., Entosolenia marginata (Walk. et Jac.), Nonion granosum Orb., Asterigerina aff. bracteata Kush., Gyroidina memoranda Subb., Valvulineria iphigenia Sam., Cibicides praeursorius (Schwag.), C. pseudoungerianus Cushman., C. lobatus (Walk. et Jac.), Rotalia ex gr. calcar Orb., Caucasina schischkinskya (Sam.), Angulogerina oligocaenica Andr., Bolivina beyrichi Reuss, B. mississipiensis Cushman., B. microlancetiformis Subb., B. ex gr. elongata Orb., B. aff. advena Cushman., Cassidulina laevigata Orb. On my opinion presence Miliolidae, Asterigerina, Rotaliidae, Cibicidoides lobatus (Walk. et Jac.) indicates more shallow-water conditions of sedimentation in comparison with those in the NPBSR.

From clays of the lower part of over-ore strata in the Bolshoy-Tokmak manganese-ore deposit M.V. Yartseva [86, 87] defined Spiroplectammina carinata (Orb.), Miliolina circularis Born., Cibicides oligocenicus Sam., C. pseudoungerianus Cushman., Gyroidina memoranda Subb., Nonion granosus (Orb.), Pullenia bulboides Orb., Bolivina cf. beyrichi Andr., B. mississipiensis Cushman., Uvigerinella majcopica Kraeva, Angulogerina pulchella Cushman. et Edw., Ang. ex gr. oligocenica Andr., Caucasina schischkinskya (Sam.), others.

Due to Ye.Ya. Kraeva, I.D. Konenkova, N.G. Savenko, Yu.P. Nikitina, A.P. Pechenkina and M.V. Yartseva’s investigations [22, 30-32, 35, 36, 54, 59, 68-71, 73, 87, 88, 99, 107], characteristic features of BF association of zone Spiroplectammina carinata widely distributing in Lower Oligocene deposits of the NPBSR, the southern slope of US and adjacent part of the ACM have been diagnosed. Zone Spiroplectammina oligocenica are distinguished in the s.

Author’s notes. Zone Spiroplectammina oligocenica includes characterizing species of lower Rupelian interregional zone Spiroplectammina oligocenica of the Eastern Paratethys [9], namely Spiroplectammina oligocenica J. Nik., Neogyroidina memoranda (Subb.), Uvigerinella majcopica Kraeva, Bolivina mississippiensis Cushman., etc. In the Stratigraphic Scheme of the Southern Ukraine [64] the described BF assemblage is presented as regional zone Spiroplectammina oligocenica marking Upper Planorbellar Regional Substage of Lower Oligocene in the region (fig. 5). In the southern Ukraine the deposits with that BF association correspond to Rupelian calcareous nanofossils Zone NP 22 [3, 36, 56, 68, 69] and dinocyst zones Phthanoperidinium amoenum/Wetzeliella symmetrica and Wetzeliella gochtii [1, 2].

Kerleiutian Regional Stage. Zone Sphaeroidina variabilis. Ye.Ya. Kraeva [41, 42] was the first who distinguished in Oligocene section of the Odessa-Kherson area “zone Sphaeroidina” represented by numerous shells Spiroplectammina carinata Orb. follis Kraeva, Nonion umbilicatus (Montf.), Cibicides aff. pseudoungerianus Cushman., C. oligocenicus Sam., Uvigerinella majcopica Kraeva, Sphaeroidina variabilis Reuss. She also noted that this assemblage’s pecularity is presence Miliolina aff. brauni (Reuss), M. cognata (Born.), M. ex gr. circularis (Born.). Ye.Ya. Kraeva also considered “zone Sphaeroidina” to be younger than “zone with Spiroplectammina carinata”.

69
Fig. 5. Sequence of small benthic foraminifera assemblages in Oligocene of the northern Peri-Black Sea Region

A - interregional benthic foraminifera zones of the Eastern Paratethys and regional zones of the Sal-Manych-river interflue [9]; 1 - planktic foraminifera association with *Globigerina officialis*, *Gl. ciperoensis*, *Gl. ouachitaensis*; 2 - planktic foraminifera association with *Globigerina senilis*, *Gl. praebulloides*, *Gl. ciperoensis*

In following years Ye.Ya. Kraeva [43, 44, 46, 61, 99, 111] and N.G. Savenko [70, 84] studied BF taxonomic composition of the zone, their distribution in Oligocene deposits of the NPBSR. Researchers defined that “zone Sphaeroidina variabilis” determines lower part of the Askania Suite of southern Ukraine. N.G. Savenko [70] considered the zone as an age analogue of “beds with *Haplophragmoides kjurendagensis*” of the upper Kerleut deposits of the Crimean Peninsula.

According to Ye.Ya. Kraeva and N.G. Savenko [51, 95], the common list of foraminifera of “zone Sphaeroidina variabilis” the southern Ukraine includes numerous *Haplophragmoides kjurendagensis* Moroz., *Spiroplectammina terekensis* Bogd. (= carinata follis Kraeva), *Cibicidoides aff. aknerianus* (Orb.) (= nefastus J. Nik.), *Cib. majcopicus* (J. Nik.), *Uvigerinella majcopic Kraeva, Fursenkoina schreibersiana* (Cz.), *Sphaeroidina variabilis* Reuss, non-numerous *Saccammina grzybowskii* Bogd., *Hyperammina* sp., *Ammomdiscus tenuicus* Subb., *Haplophragmoides kjurendagensis* kerleuticus Kosir, *Haplophragmoides* sp., *Ammomarginulina foliaceus* Brady, *Spiroplectammina caucasia* Djän., *Quinqueloculina* ermanni Born., *Q. akneriana* Orb. var., *Saracenina aff. vaginalis* (Reuss), *Lenticulina navis* (Born.), *L. eximia* Reuss, *Nodosaria calomorpha* Reuss, *Fissurina laevigata* Reuss, *Pyrulina fusiformis* (Roem.), *Guttulina problema* Orb., *Globulina gibba* Orb., *Cibicidoides pseudoungerianus* (Cush.), *Cib. oligoceneicus* Sam., *Cib. stavropolensis* (Bogd.), *Cib. ornatus* (Bogd.), *Pullenia bulloides* (Orb.), *Melonis umbilicatulus* (Montf.), *M. dozularensis* (Chalil.), *Nonion granosus* (Orb.), *Neogyroidina memoranda* Subb., *Pseudoparella caucasia* Bogd., *Ammonia proprinqua* (Reuss), *Cribronion onerosum* (Bogd.), *Porosonion dendricus* Bogd., *Caucasina schischkinskyae* Sam., *C. bulimoides* Bogd., *Uvigerinella californica* Cushm., *Uv. californica parva* Kleinp., *Bolivina mississippiensis* Cushm., *Cassidulina subglobosa* Brady, *Sphaeroidina austriaca* Orb., *Robertina declivis* Reuss.

Analyzing taxonomic composition of the zone, Ye.Ya. Kraeva [51] concluded genera congeniality (similarity) and a significant number of common species of zones *Sphaeroidina*
variabilis and Spiroplectammina oligocenica. Also she denoted non numerous number of species known from Chattian foraminifera assemblages of the Western Europe.

Author's notes. In the NPBSR the zone Sphaeroidina variabilis characterizes the lower part of Askania Suite (Lower Kerleutian Regional Substage) (see fig. 5). Deposits of this zone contain dinocyst association of zone Chiropteridium galea [1, 2] and Upper Oligocene planktic foraminifera complex [1, 60, 79]. Due to presence of Spiroplectammina terekensis Bogd., Cibicides nefastus (J. Nik.), Pseudoparella caucasia Bogd., Caucasina buliminoidea Bogd., Uvigerinella californica Cushm., Sphaeroidina variabilis Reuss and others, zone Sphaeroidina variabilis of the NPBSR corresponds to Chattian zone Spheroctammina teregenis of the Northern Fore-Caucasus [9] and Upper Oligocene zone Cibicides nefastus of the Sal-Manych-river interfluve and Ergeny [66].

Zone Cribronion onerosum, Cibicides ornatus. Ye.Ya. Kraeva [61] has indentified “nonionina complex” in silts and silty clays overlaying beds with Sphaeroidina in borehole 1 drilled near Svobodnyi Port village on the interfluve of the Dnieper and Southern Bug rivers. The assemblage consists of Quinqueloculina aff. selena (Karrer), Cibicides ornatus Bogd., Nonion dendricicum Chalil., N. granulosum (Orb.), Elphidium onerosum Bogd. Ye.Ya. Kraeva named the found association after dominated BF group and regarded it to be of early Miocene age conditionally.

Due to further investigations of Ye.Ya. Kraeva and N.G. Savenko [51, 52, 84, 93, 98], taxonomic composition of the “nonionida complex” was determined and variability of its associations in different regions of the southern Ukraine was described.

Ye.Ya. Kraeva [91] renamed “nonionida complex” as “lone Porosononion dendricicus and Elphidium onerosum”. She determined this zone as including in the main endemic foraminifera. Also she marked that besides index-species the most characteristic is Cibicides ornatus (Bogd.).

Common species list of “nonionida complex” of the southern Ukraine includes Hyperammina sp., Sacammina sp., Quinqueloculina ex gr. ermani Born., Q. ex gr. pseudoseminula Bogd., frequent Q. aff. selena (Karrer), Q. ex gr. circularis (Born.), numerous Globulina gibba Orb., Glandulina sp., Guttulina sp., numerous Pseudoparella caucasia Bogd., numerous Cibicides ornatus (Bogd.), Pullenia sp., Porozononion dendricicus (Chalil.), Nonion granulosum (Orb.), numerous Nonion gramosus (Orb.), frequent Melonis dozularensis (Chalil.), Ammonia ex gr. propinqua (Reuss), Cribronion onerosum (Bogd.), Fursenkoina ex gr. schreibersiana (Cz.), Uvigerinella californica Cushm. [95]. Association consisting of Glandulina, Pseudoparella, Cibicides and Nonion, prevalents in the NPBSR. In central part of the Peri-Black Sea Depression the assemblage is supplemented by Quinqueloculina, Fursenkoina, Melonis and Uvigerinella.

Ye.Ya. Kraeva [51] emphasized that in section of the south of former Soviet Union the “nonionida complex” occupies the same stratigraphic position, overlaying the beds with Haplophragmoides kjorendagensis, Sphaeroidina variabilis, Cibicides nefastus and underlaying the beds with Neobulimina elongata.

Author's notes. In the NPBSR the zone Cribronion onerosum and Cibicides ornatus characterizes the Gornostaevka Suite which containing late Chattian dinocysts assemblage of beds with Homotriblium floripes of zone Chiropteridium galea [1] (see fig. 5). BF assemblage of zone Cribronion onerosum and Cibicides ornatus of the NPBSR is similar to that of Upper Oligocene zone Cibicides ornatus of the Sal-Manych-river interfluve and Ergeny [66] due to common species Pseudoparella caucasia Bogd., Cibicides ornatus (Bogd.), Nonion gramosus (Orb.), Porozononion dendricicus (Chalil.), Nonion granulosum (Orb.), Melonis dozularensis (Chalil.), Ammonia ex gr. propinqua (Reuss), Cribronion onerosum (Bogd.), Fursenkoina ex gr. schreibersiana (Cz.), Uvigerinella californica Cushm.

Conclusions. Most of known small BF assemblages of Paleogene deposits of the NPBSR and adjacent parts of the US and ACM had been identified up to beginning the seventies of the last century due to M.V. Jartsteva, V.F. Kosiireva, A.M. Voloshina, O.K. Kaptarenko-Chernousova, E.S. Lipnik, A.P. Pechenkina, Ye.Ya. Kraeva, N.G. Savenko and I.D. Konenkova’s investigations.
Up to the end of XX century the researchers had studied taxonomic composition of the BF assemblages, had described their distinctive features and had defined characterizing species, had studied spreading the BF associations in the region.

As it turned out, the BF assemblages of relatively deep-water marine deposits of south the NPBSR include characterizing species of interregional BF zones of the CCR [9, 39]. But the most of known BF associations relate to the shallow and peripheral facies of the Paleogene sea basin in the south of Ukraine.

As a result, for Paleogene deposits of the NPBSR and adjacent parts of the US and ACM the following sequence and space-time relationships of small BF assemblages could be determined.

Lower Belokamenskian Regional Substage:
- zone Anomalina danica and Cibicidoides commatus (I.D. Konenkova, 1972) [26] considering as stratigraphic analogue of interregional Danian zone Anomalina danica s.l. of the CCR.

Upper Belokamenskian Regional Substage:
- shallow-water beds with Cibicidina bundensis and Nonion multisuturatum (I.D. Konenkova, 1972) [26].

Kachian Regional Stage:
- zone Anomalina fera and Pulsiphonina prima (A.P. Pechenkina, 1953 [40]; amended I.D. Konenkova, 1968, 1972) [21, 26] and zone Bolivinopsis spectabilis (I.D. Konenkova, 1972) [26] considering as stratigraphic analogues of Thanetian interregional zone Karreriella zolkaensis of the CCR.

Bakhchisaraian Regional Stage:
- BF assemblages corresponding to lower Ypresian interregional zone Pseudogaudryina externa of the CCR.

Simferopolain Regional Stage:
- BF association of upper Ypresian – lower Lutetian superzone Pseudogaudryina pseudonavarroana of the CCR and its shallow-water analogue the zone Vaginulinopsis decorata, Asterigerina stelligera.

Novopavlovkian Regional Stage:
- zone Robulus kuberlinus, Uvigerina bykovae ucrainica (Ye.Ya. Kraeva, 1968) [97] considering as stratigraphic analogue of Lutetian interregional zone Uvigerina costellata of the CCR;
- zone Pararotalia armata, Cibicidoides ex gr. sassei (M.V. Yartseva, Ye.Ya. Kraeva, 1983 [108]) and beds with Miliolidae, Epistomaria rimosas (M.V. Yartseva, 1947 [104]; amended M.V. Yartseva, Ye.Ya. Kraeva, 1983 [108]) being shallow-water analogues of zone Robulus kuberlinus, Uvigerina bykovae ucrainica.

Almian Regional Stage:
- zone Marginulinopsis infracompressus (Ye.Ya. Kraeva, 1954) [41] corresponding to Priabonian interregional zone Planulina costata of the CCR;
- zone Asterigerina, Nonion, Bolivina (Ye.Ya. Kraeva, 1954) [41] and zone Eooepidella lucida, Cibicidoides salensis (Ye.Ya. Kraeva, 1954 [41]; amended A.P. Pechenkina, 1964 [72]) considering as shallow-water stratigraphic analogues of Priabonian interregional zone Planulina costata of the CCR;
- zone Gaudryinopsis gracilis, Heterolepa almaensis (I.D. Konenkova, 1987) [30], zone arenaceous foraminifera (O.K. Kaptarenko-Chernousova, E.S. Lipnik, 1951 [19]; amended Ye.Ya. Kraeva, 1954 [41]) and beds with Angulogerina trancaspiensis (Ye.Ya. Kraeva, 1979) [54] correlating with zone Cibicidoides salensis of the south-eastern part of the Russian Platform and Skythian Plate, and zone Eooepidella lucida, Cibicidoides salensis of the NPBSR;
- beds with Anomalinaecea, Miliolidae, Asterigerina, Pararotalia (I.D. Konenkova, 1996) [36] regarding as shallow-water analogues of zone Marginulinopsis infracompressus of the NPBSR.
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Тектоніка і стратиграфія, 2019, вип. 46
У статті наведено історію біостратиграфії палеогенових відкладів Південної України за дрібними бентосними форамініферами. Висвітлено значення праць з вивчення форамініфер О.К. Каптаренко-Черноусової, Г.М. Волошині, М.В. Ярцової, Є.Я. Краєвої, А.П. Печенкіної, Н.Г. Савенко та І.Д. Коненкової. Завдяки їхнім дослідженням визначено послідовність і просторо-часові співвідношення палеогенових комплексів форамініфер у регіоні. Наведено порядок комплексів палеогену Південної України з мікрорегіональними зонами за бентосними форамініферами Кримсько-Кавказького регіону. Статтю супроводжено повним бібліографічним списком з біостратиграфії палеогену Північного Причорномор’я, південного схилу Українського щита за бентосними форамініферами.

На початку 70-х років XX століття дослідники виділили та описали комплекси форамініфер, характерні для підвідділів і регіональних підрозділів палеогену Південної України. Було визначено систематичний склад комплексів бентосних форамініфер, з’ясовано їх поширення в палеогеновому розрізі Північного Причорномор’я, південного схилу Українського щита та прилеглі частини Приазов’я. Для окремих комплексів форамініфер було доведено їхнє рігіональне значення; інші виявилися важливими для характеристики та датування світ, тощо, пачок і верств місцевих стратиграфічних схем. Асоціації форамініфер стосовно глибоководних відкладів півдня Північного Причорномор’я містять види зональних комплексів мікрорегіональних зон за бентосними форамініферами Кримсько-Кавказького регіону. Більшість із відлічених комплексів бентосних форамініфер характерні для порівняно мілководних відкладів палеогенового розрізу Північного Причорномор’я

Ключові слова: бентосні форамініфери, палеоген, біостратиграфія, Південна Україна.

Т.С. Рябоконь
БИОСТРАТИГРАФІЯ ПАЛЕОГЕНА ЮЖНОЇ УКРАЇНИ ПО МЕЛКИМ БЕНТОСНИМ ІДЕНІФЕРАМИ: ІСТОРИЧНИЙ ОБЗОР

В статье изложена история биостратиграфии палеогеновых отложений Южной Украины по мелким бентосным фораминиферам. Показано значение работ по изучению фораминифер О.К. Каптаренко-Черноусовой, А.М. Волошиной, М.В. Ярцовой, Е.Я. Краевой, А.П. Печенкиной, Н.Г. Савенко и И.Д. Коненковой. Благодаря их исследованиям установлены последовательность и пространственно-временные соотношения палеогеновых комплексов фораминифер в регионе. Приведено сопоставление комплексов фораминифер палеогена Южной Украины с межрегиональными зонами по бентосным фораминиферам Крымско-Кавказского региона. Статья сопровождена полным библиографическим списком по биостратиграфии палеогена Южной Украины по мелким бентосным фораминиферам.

К началу 70-х годов прошлого столетия, благодаря исследованиям О.К. Каптаренко-Черноусовой, Е.С. Липник, В.Ф. Козыревой, А.М. Волошиной, М.В. Ярцовой, Е.Я. Краевой, А.П. Печенкиной, Ю.П. Никитиной, Н.Г. Савенко и И.Д. Коненковой, были выделены и описаны комплексы мелких бентосных фораминифер, характерные для региональных подразделений палеогена Южной Украины. Они изучены систематическим состав ассоциаций бентосных фораминифер, прослежено их распространение в палеогеновом разрезе Северного Причорноморья и южного склона Украинского щита, прилегающей части Приазовья. Для некоторых из выделенных комплексов фораминифер было показано их региональное значение; другие сообщества фораминифер оказались важными для характеристики и датирования свит, тощо, пачек и слоев местных стратиграфических схем. Ассоциации фораминифер относительно глубоководных палеогеновых отложений юга Северного Причорноморья содержат виды зональных комплексов межрегиональных зон по бентосным фораминиферам Крымско-Кавказского региона. Большинство из установленных комплексов бентосных фораминифер характерны для относительно мелководных осадков палеогенового бассейна в Северном Причорноморье и фаций его периферии в пределах депрессий южного склона Украинского щита. Определены пространственно-временные соотношения комплексов фораминифер для региорасов палеогена в разрезе...
Южной Украины. Нижний региоподъярус белокаменного региояруса характеризует зона Anomalina danica, Cibicidoides commatus, которая коррелируется с межрегиональной зоной Anomalina danica s.l. Крымско-Кавказского региона; верхний региоподъярус – сплои с Cibicidina bundensis, Nonion multisuturatum. Качинский региоярус – зона Anomalina fera, Pulsipherina prima и зона Bolivinopsis spectabilis, которые сопоставляются с межрегиональной зоной Karreriella zolkaiensis Крымско-Кавказского региона. Комплексы фораминифер бахчисарайского региояруса в Северной Причерноморье отвечают стратиграфическому уровню межрегиональной зоны Pseudogaudryina externa Крымско-Кавказского региона. Симферопольский региоярус характеризует зона Vaginulinopsis decorata, Asterigerina stelligera, которая коррелируется с надзоной Pseudogaudryina pseudonavarroana Крымско-Кавказского региона. Новопавловский региоярус – зона Robulus kubelinus, Uvigerina bykovae ucrainica, которая является стратиграфическим аналогом межрегиональной зоны Uvigerina costellata Крымско-Кавказского региона, и зона Pararotalia armata, Cibicoides ex gr. sassei и сплои с Miliolidae, Epistomaria rimoso. Альминский региоярус – зона Marginulinopsis infracressus, которая соответствует межрегиональной зоне Planulina costata Крымско-Кавказского региона; зона Asterigerina, Nonion, Bolivina и зона Eoeponidella lucida, Cibicidoides salensis, сплои с Anomalina, Miliolidae, Asterigerina, Pararotalia. Зона Gaudryinopsis gracilis, Heterolepa almaensis, зона песчаных фораминифер и сплои Angulogerina truncasiensis коррелируются с зоной Cibicidoides salensis юго-западной окраины Русской платформы и Скифской плиты и полагаются стратиграфическими аналогами зоны Eoeponidella lucida, Cibicidoides salensis Северного Причерноморья. Верхний региоподъярус планорбеллового региояруса характеризует региональная зона Spiroplectammina oligocenica. Верхний региоподъярус керлеутского региояруса – зона Sphaeroidina variabilis, которая коррелируется с зоной Spiroplectammina terekensis Северного Предкавказья и зоной Cibicidoides nefastus Сало-Манычского междуречья; зона Cribrononion onerosum, Cibicidoides ornatus, которая сопоставлена зоой Cibicidoides ornatus Сало-Манычского междуречья.

Ключевые слова: бентосные фораминиферы, палеоген, биостратиграфия, Южная Украина.

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Стаття надійшла: 07.05.2019