

## Chapter 20

### PROBLEMATICA

WILLIAM A. BERGGREN<sup>1,2</sup> AND BRIDGET S. WADE<sup>3</sup>

<sup>1</sup>Department of Earth and Planetary Sciences, Busch Campus, Rutgers University, Piscataway, NJ 08854, U.S.A.

<sup>2</sup>Department of Geology and Geophysics, Woods Hole Oceanographic Institution, Woods Hole, MA 02543, U.S.A. Email: wberggren@whoi.edu

<sup>3</sup>Department of Earth Sciences, University College London, Gower Street, London, WC1E 6BT, U.K. Email: b.wade@ucl.ac.uk

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#### ABSTRACT

The taxonomy of Oligocene planktonic foraminifera of uncertain affinity are discussed and reviewed in this chapter. The following taxa are considered Problematica: *Acarinina inaequiconica* Subbotina, *Globigerina brevis* Jenkins, *Globigerina? grata* Todd, *Globigerina khadumica* Bykova, *Globigerina postcretacea* Myatliuk, *Globigerina pseudoedita* Subbotina, *Globigerina spirata* Bornemann, *Globigerina stainforthi* Hofker, *Globigerinella evoluta* Subbotina, *Globigerinella liverovskae* Bykova, *Globigerinella*

*praemicra* Subbotina, *Globigerinella subangulata* Ivanova, *Globigerinoides inusitatus* Jenkins, *Globorotalia denseconnexa* Subbotina, *Globorotalia hexacamerata* Subbotina, *Globorotalia tetracamerata* Subbotina, *Guembelina plana* Ivanova, *Guembelina pseudostrata* Ivanova, *Subbotina droogeri* Myatliuk, *Subbotina vialovi* Myatliuk, *Turborotalia bannerblowi* Blaicher, and *Turborotalia czeczvaensis* Myatliuk. Our understanding of each of these taxa, along with many new SEMs of the holotypes, are presented.

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#### INTRODUCTION

The following “species” of Oligocene planktonic foraminifera have been validly described but are not incorporated/included in the range charts and phylogenetic relationships of the preceding chapters because of their uncertain affinity, either because type material has been lost, they are inherently indeterminate, or require further study; or because they lack type designation(s) and are judged to be of questionable affinities and thus unworthy of retention. They are considered Problematica and are included in this chapter for completeness. We have made an effort to obtain type material to determine the attribution of these enigmatic species, but they remain “problematica”. New SEMs of type specimens of

the following species are shown: *Acarinina inaequiconica* Subbotina, *Globigerina brevis* Jenkins, *Globigerina? grata* Todd, *Globigerina postcretacea* Myatliuk, *Globigerina pseudoedita* Subbotina, *Globigerinella evoluta* Subbotina, *Globigerinella subangulata* Ivanova, *Globigerinoides inusitatus* Jenkins, *Globorotalia denseconnexa* Subbotina, *Globorotalia tetracamerata* Subbotina, *Guembelina plana* Ivanova, and *Guembelina pseudostrata* Ivanova.

#### Part A: Soviet/Russian Taxa

A survey of the literature (see Fig. 1.1, this volume) serves to remind us that Russian/Soviet micropaleontologists were among the earliest (i.e., “pioneers”)

investigators of, and had recognized the importance of, planktonic foraminifera in mid-late Paleogene (essentially Oligocene) biostratigraphy over a half century ago. However, some of the literature has been inaccessible or poorly known by western biostratigraphers, and the material was poorly preserved and/or poorly illustrated, and thus some portion of the taxonomic works were never widely adopted. We have recognized a total of 17 taxa described from the Carpathians of Ukraine by Myatliuk (1950, 1970), Subbotina (1960) and Ivanova (1960), from the northern Caucasus and from southern Mangyshlak, Kazakhstan by Bykova (1960). Due to their unknown generic classifications, we have used the original genus. The following taxonomic discussion is alphabetically by species to simplify taxonomic organization.

***bannerblowi*, *Turborotalia* Blaicher, 1970**

PLATE 20.1, FIGURES 1-2

*Turborotalia bannerblowi* Blaicher, 1970:151, 152, pl. 4, figs. 1a-c (holotype) [lower Oligocene, upper part of Sub-Menilite *Globigerina* Marls, near Niebobosko-Szopowski due east of Krosno, Rzeszów province, southeastern Poland]. Holotype (no. 9/63-25476) deposited in the collections of the Stratigraphic Section, Carpathian Branch of the Institute of Geology, Krakow, Poland (*vide* J. Blaicher, personal communication to Ellis and Messina Catalogue editors, Supplement for 1974, no. 1; not seen).

DISCUSSION.— We were unable to obtain SEM images of ‘*Turborotalia*’ *bannerblowi* as part of this investigation and therefore we have re-illustrated the original light microscope images of the umbilical and spiral view in Plate 20.1, Figs. 1, 2. The morphology of this form bears close resemblance to and may be a junior synonym of *Tenuitella gemma* (Jenkins) or possibly *Tenuitella angustiumbolicata* (Bolli) but this cannot be confirmed without new examination of the holotype. We retain the species in Problematica pending further investigations.

***czeczvaensis*, *Turborotalia* Myatliuk, 1970**

PLATE 20.1, FIGURES 3, 4 and 8

*Turborotalia czeczvaensis* Myatliuk, 1970:185, pl. 45, figs. 3a-c (holotype); figs. 2a-5c (paratypes) [lower Oligocene (Rupelian), Lopyanetskaya Fm., *Cibicidoides lopjanicus* Zone, Chechva (Czeczva) River, Pokut’ye, eastern Carpathians, Ukraine]. [Holotype not seen.]

DISCUSSION.— The illustrations and description of this poorly preserved taxon indicate a moderately reticulate, finely perforate test with a broad, shallow umbilicus suggesting possible synonymy with *Turborotalia increbescens* Bandy (with which Myatliuk, in fact, compared her new taxon *czeczvaensis*). However, the holotype illustration (figs. 3a-c) does not appear to correspond to the other illustrations of Myatliuk, which indeed resemble *increbescens* (holotype not seen).

***denseconnexa*, *Globorotalia* Subbotina, 1960**

PLATE 20.1, FIGURES 5-7

(Pl. 20.1, Figs. 5-7: new SEMs of holotype of *Globorotalia denseconnexa* Subbotina)

*Globorotalia denseconnexa* Subbotina, 1960:67, pl. 13, figs. 3a-c (holotype), figs. 4a-6c (topotypes) [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Cis-carpathian region, Ukraine].

DISCUSSION.— The holotype figure shows a 6 chambered form with weakly pustulose (? secondary overgrowth), and early whorl(s) depressed. It is not possible to ascertain with certainty that the topotype specimens illustrated by Subbotina (1960, pl. 13, figs. 4a-6c) are referable to the same taxon as the holotype. Possibly a tenuitellid (? *T. gemma* (Jenkins)) or more likely a dipsidripellid. We consider *denseconnexa* a questionable senior synonym of *Dipsidripella liquanyui* Huber and Pearson.

Plate 20.1 Problematica

1, 2, *Turborotalia bannerblowi* Blaicher (holotype, no. 9/63-25476), lower Oligocene, Rzeszów province, southeastern Poland; 3, 4, 8, *Turborotalia czeczvaensis* Myatliuk (reproduced holotype drawing), lower Oligocene, Lopyanetskaya Fm., eastern Carpathians, Ukraine; 5-7, *Globorotalia denseconnexa* Subbotina (holotype), upper Oligocene, Polyanitsa Fm., Ukraine; 9-11, *Subbotina droogeri* Myatliuk (reproduced holotype drawing), upper Oligocene, Polyanitsa Fm., Ukraine; 13-15, *Globigerinella evoluta* Subbotina (holotype), upper Oligocene, Polyanitsa Fm., Ukraine; 12, 16, *Globorotalia hexacamerata* Subbotina (reproduced holotype drawing), upper Oligocene, Polyanitsa Fm., Ukraine. Scale bar: 1-11 (estimated in 3, 4 and 8) = 100  $\mu$ m, 12-16 = 20  $\mu$ m.

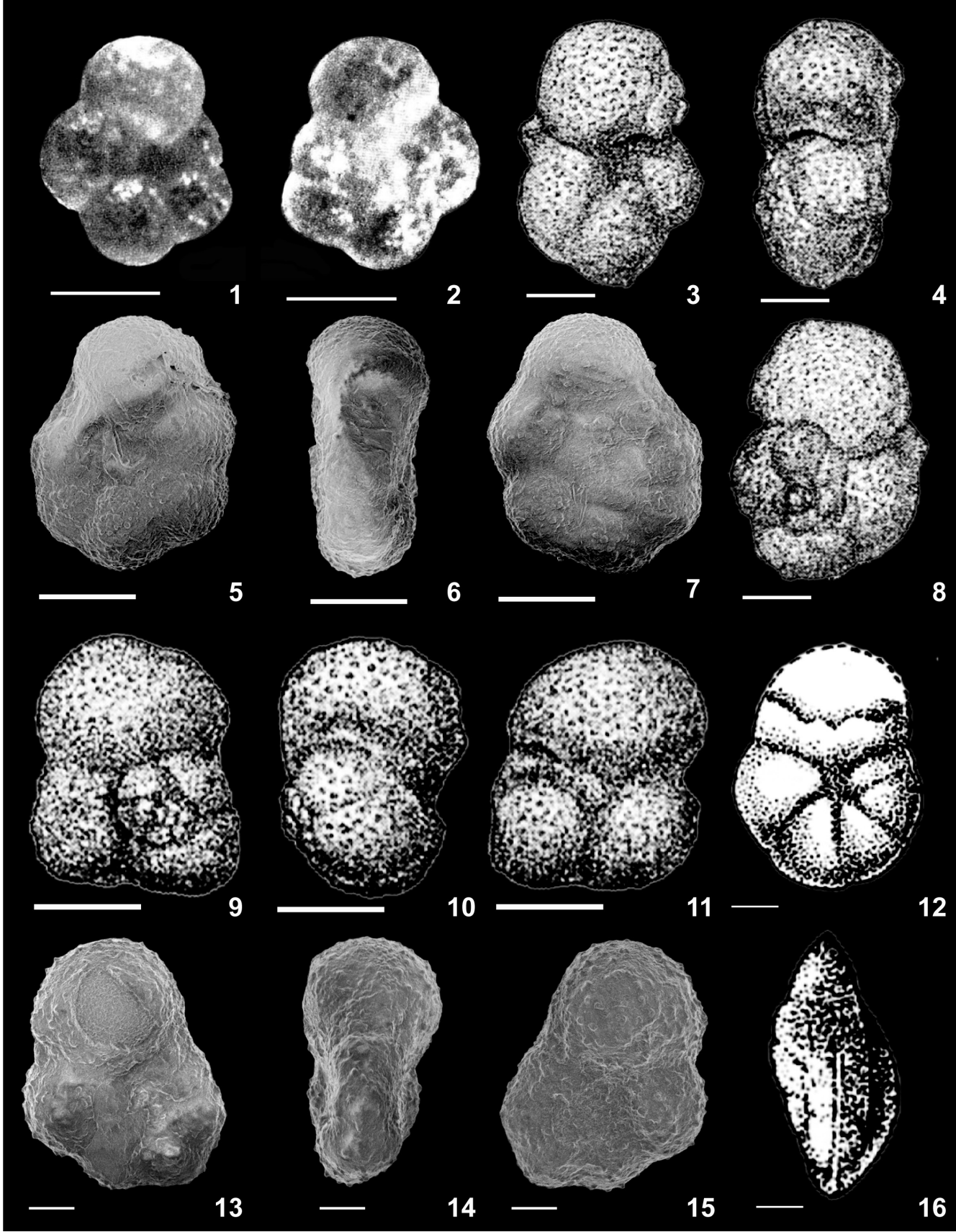


PLATE 20.1 Problematika

***droogeri*, *Subbotina* Myatliuk, 1970**

PLATE 20.1, FIGURES 9-11

*Subbotina droogeri* Myatliuk, 1970:196, pl. 52, fig. 4a,b (holotype, no. 433-243, Micropaleontology Collections of VNIGRI, St Petersburg, Russia) is lost; *vide* Tatiana Dimitrieva, Collections Curator at VNIGRI, 4/22/09 [upper Oligocene (Chattian), Polyanitsa Fm., 45.65 m in borehole no. 3, Nebylov, eastern Carpathians].

DISCUSSION.— Myatliuk (1970:196) indicated that this species is conspecific with the form identified as/ referred to *Globigerina globularis* Roemer by Drooger (1956) (which was originally introduced by Roemer (1838) as *Globigerina globularis* d'Orbigny from the "Tertiary of West Germany" but not with the original form described from the Recent of the Indian Ocean). Our evaluation of the description and illustrations of Myatliuk (1970) suggest that this taxon may have been referable to, and a senior synonym of *Subbotina angiporoides* (Hornibrook, 1965) or *S. utilisindex* (Jenkins and Orr). In view of the fact that the holotype has been lost, we recommend that *Subbotina droogeri* Myatliuk be considered *nomen dubium non conservandum*.

***evoluta*, *Globigerinella* Subbotina, 1960**

PLATE 20.1, FIGURES 13-15

(Pl. 20.1, Figs. 13-15: new SEMs of holotype of *Globigerinella evoluta* Subbotina)

*Globigerinella evoluta* Subbotina, 1960:58, pl. 8a, b (holotype); 9a, b (topotype) [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine].

DISCUSSION.— The 5-6 chambered test is a small, distinctly low trochospiral (not planispiral) and strongly pustulose that may be referable to *Dipsidripella danvilensis* (Howe and Wallace); see Chapter 16, this volume.

***hexacamerata*, *Globorotalia* Subbotina, 1960**

PLATE 20.1, FIGURES 12, 16

*Globorotalia hexacamerata* Subbotina, 1960:66, pl. 13, fig. 2a-c (holotype) [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine].

DISCUSSION.— Weakly biconvex scituloid test, 6 chambers, maximum diameter: 0.08-0.13 mm; possibly a benthic form.

***inaequiconica*, *Acarinina* Subbotina, 1960**

PLATE 20.2, FIGURES 1-3

(Pl. 20.2, Figs. 1-3: new SEMs of holotype of *Acarinina inaequiconica* Subbotina)

*Acarinina inaequiconica* Subbotina, 1960:202, pl. 7, fig. 13a-c (holotype), fig. 14a-c (topotype) [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine].

DISCUSSION.— Distinctly pustulose, strongly recrystallized 5 chambered test, with incised sutures. Minute in size (0.10-0.11 mm diameter).

Subbotina (1960) placed *inaequiconica* in her genus *Acarinina* and described a wall texture consistent with a muricate wall. However, the original drawing simply shows a small, low trochospiral form, and does not detail the wall texture. Other workers (e.g., Reuter and others, 2007), have considered this species to belong in *Paragloborotalia*. Our new SEMs of the holotype (Plate 20.2, Figs. 1-3) reveal a muricate wall, consistent with the original placement in *Acarinina*. The figured specimen superficially resembles *Acarinina collactea* (Finlay), but further evaluation is required to determine if this form is a junior synonym.

## Plate 20.2 Problematica

1-3, *Acarinina inaequiconica* Subbotina (holotype), upper Oligocene, Polyanitsa Fm., Ukraine; 5-7, *Globigerina khadumica* Bykova (reproduced holotype drawing), lower Oligocene, Kazakhstan; 4, 8, *Guembelina plana* Ivanova (holotype), upper Oligocene, Polyanitsa Fm., Ukraine; 9-11, *Globigerinella liverovskae* Bykova (reproduced lectotype drawing), lower Oligocene, northern Caucasus; 12, 16, *Globigerinella praemicra* Subbotina (reproduced holotype drawing), upper Oligocene, Nizhnevorotyshche Fm., Ukraine; 13-15, *Globigerina pseudoedita* Subbotina (holotype), upper Oligocene, Nizhnevorotyshche Fm., Ukraine. Scale bar: 4, 8, 12, 16 = 50  $\mu$ m, 1-3, 13-15 = 20  $\mu$ m, 5-7, 9-11 = no scale.

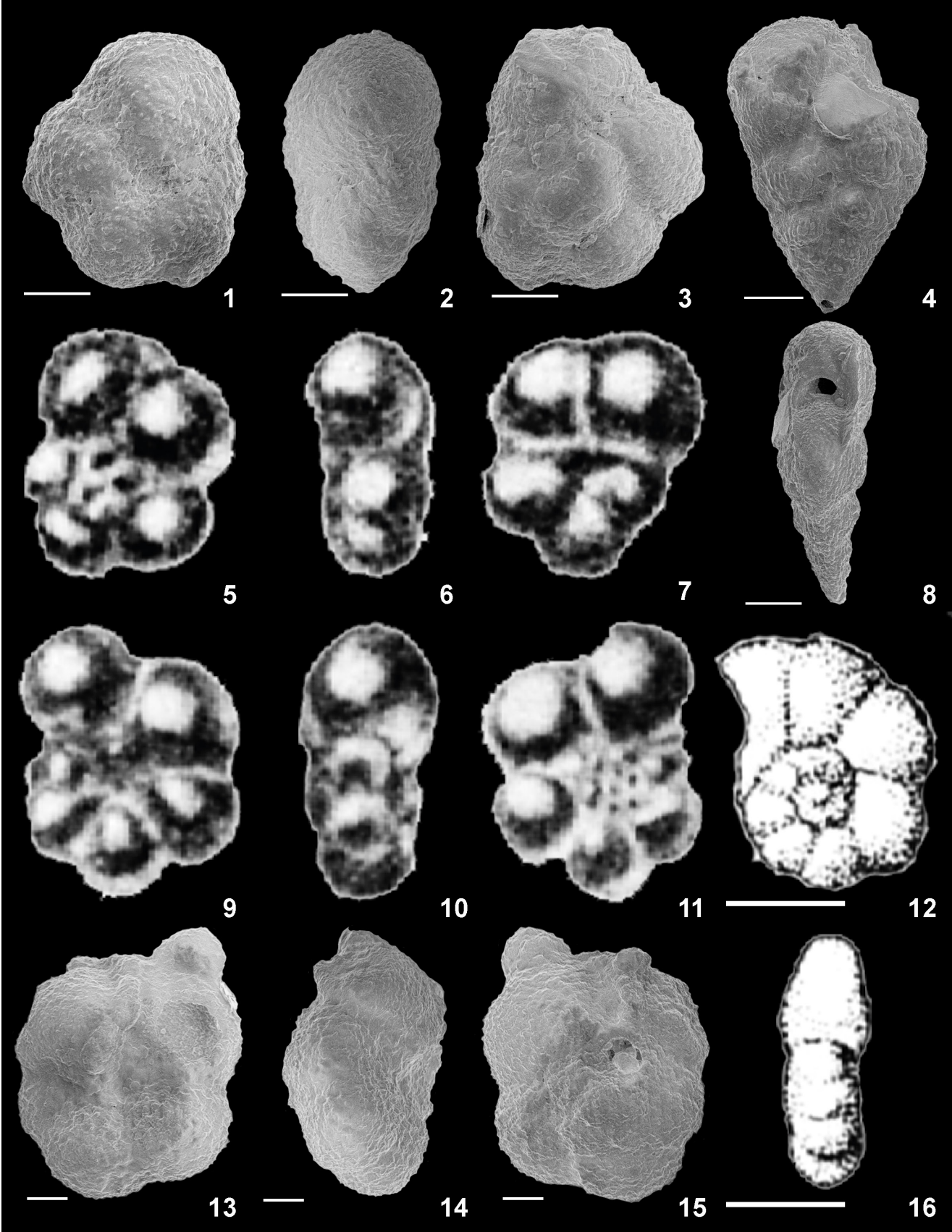


PLATE 20.2 Problematika

***khadumica*, *Globigerina* Bykova, 1960**

PLATE 20.2, FIGURES 5-7

*Globigerina khadumica* Bykova, 1960:322, pl. 7, figs. 4-7 [lower Oligocene (Rupelian), *Globigerinella liverovskae* Zone (PG<sub>3</sub>), southern Mangyshlak, Kazakhstan].

DISCUSSION.— No holotype or repository was given by Bykova; this species has been considered as a junior synonym of *Globigerinella liverovskae* Bykova by Samuel and Salaj (1968, *q.v.*; see also *liverovskae* below; *nomen dubium non conservandum*).

***liverovskae*, *Globigerinella* Bykova, 1960**

PLATE 20.2, FIGURES 9-11

*Globigerinella liverovskae* Bykova, 1960:322, pl. 7, figs. 1a-2c, 3a-c (lectotype designated by Samuel and Salaj, 1968:122); also Subbotina, 1953:60, pl. 2, figs. 16a-20c from Dzagal-Don, Ossetia, northern Caucasus referred to *Globigerina postcretacea* Myatliuk but referable to *liverovskae* according to Bykova, 1960:322 [lower Oligocene (Rupelian), *Globigerinella liverovskae* Zone (Pg3), type locality not designated, Bykova's and Subbotina's figured specimens from Kazakhstan and northern Caucasus, respectively].

DISCUSSION.— Bykova, 1960:322 recognized a group of minute 5-6 chambered, weakly hispid/pustulose forms in basal Oligocene strata from southern Mangyshlak, Kazakhstan which she referred to her new taxon *Globigerinella liverovskae*. She noted that there was a gradation in assemblages between involute, symmetrical tests (pl. 7, fig. 1a-c) and weakly evolute tests (pl. 7, fig. 2a-c) which suggests to us that she was including pseudohastigerinid specimens from the terminal part of their range as well as tenuitellids in her concept of *liverovskae*. In including a suite of specimens illustrated by Subbotina (1953) from the northern Caucasus it is clear that Bykova (1960) had in mind predominantly forms with low trochoid tests in her concept of *liverovskae*. Bykova (1960) did not designate a holotype for her new

taxon (nor for the related, if not conspecific) *khadumica*, nor was a depository for her material specified. The specimen designated as lectotype for *liverovskae* by Samuel and Salaj (1968) may be presumed lost, and thus we recommend that *liverovskae* like *khadumica* be considered *nomen dubium non conservandum*. Hamrsmid and Rögl (2000:41, pl. 1, figs. 6-8) identified low-trochoid 5 chambered forms as *Tenuitella liverovskae* from marls assigned to Zones NP24/P20 (upper Rupelian) in the Pabdel Formation, near the town of Baba Heydar, Zagros Mountains, Iran. Examination of the illustrations and descriptions of these taxa suggest that they may have been identifications/references to *Tenuitella gemma* (Jenkins) and/or *T. patefacta* (Li).

***plana*, *Guembelina* Ivanova, 1960**

PLATE 20.2, FIGURES 4, 8

(Pl. 20.2, Figs. 4, 8: new SEMs of holotype of *Guembelina plana* Ivanova)

*Guembelina plana* Ivanova, 1960:118, pl. 5, fig. 6a, b [upper Oligocene (Chattian), Polyanitsa Fm., village of Naguyevichi, along Radychev River, Ciscarpathian region, Ukraine].

DISCUSSION.— The holotype of this taxon is damaged. The test is compressed/flattened, the symmetrical aperture and weak striations are reminiscent of a biserial heterohelcid and suggest that it may be reworked from the Cretaceous (see also comments under *Guembelina pseudostrata* Ivanova).

***postcretacea*, *Globigerina* Myatliuk, 1950**

PLATE 20.3, FIGURES 1-3, 5-7

(Pl. 20.3, Figs. 1-3 and 5-7: new SEMs of syntypes of *Globigerina postcretacea* Myatliuk)

*Globigerina postcretacea* Myatliuk, 1950:280, pl. 4, fig. 3a-c (holotype, lost) [Oligocene, Kosmach Series, Chechva River, northern Carpathians, Ukraine].

## Plate 20.3 Problematica

1-3, 5-7, *Globigerina postcretacea* Myatliuk (syntypes), Oligocene, Chechva River, Ukraine; 4, 8, *Guembelina pseudostrata* Ivanova (holotype), Nizhnevorotyshe Fm., Ukraine; 9-11, *Globigerinella subangulata* Ivanova (holotype), upper Oligocene, Polyanitsa Fm., Ukraine; 13-15, *Globorotalia tetracamerala* Subbotina (holotype), upper Oligocene, Polyanitsa Fm., Ukraine; 12, 16, *Subbotina vialovi* Myatliuk (reproduced holotype drawing), lower Oligocene, Nizhnemenilitovaya Fm., Ukraine. Scale bar: 4, 8, 13-15 = 50 µm, 1-3, 5-7, 9-11 = 20 µm, 12, 16 = no scale.

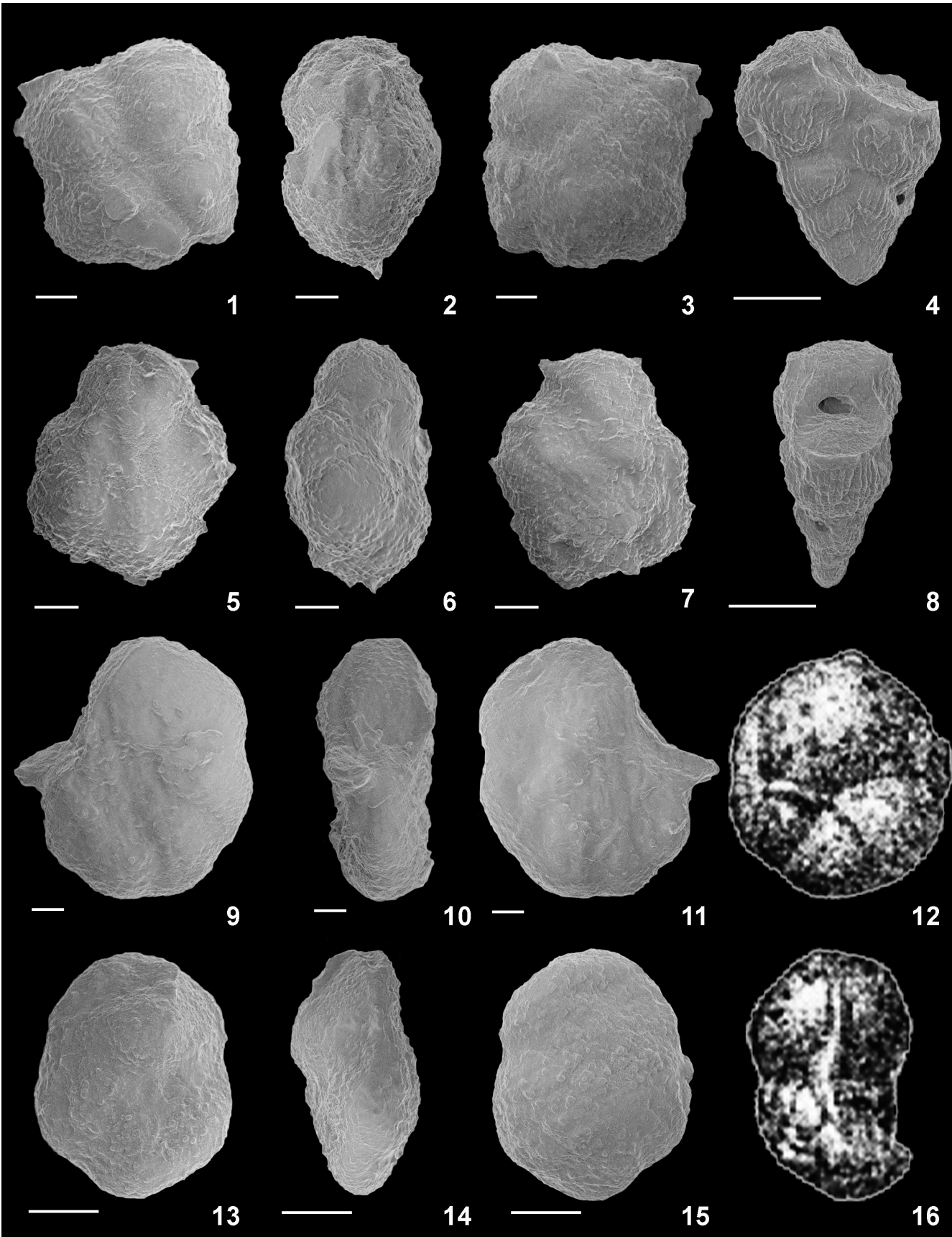


PLATE 20.3 Problematika

DISCUSSION.— The original drawing resembles *Ciperoella ciperoensis* (Bolli), and the SEM indicates a possible muricate wall texture, but the preservation is too poor to confirm this. In view of the fact that the holotype of this taxon is lost, and that the SEM images of two syntypes illustrated herein (Pl. 20.3, Figs. 1-3 and 5-7) are damaged, poorly preserved, and strongly recrystallized, we recommend that this form be considered *nomen dubium non conservandum*.

***praemicra*, *Globigerinella* Subbotina, 1960**

PLATE 20.2, FIGURES 12, 16

*Globigerinella praemicra* Subbotina, 1960:59, pl. 11, figs. 10a-b (holotype), figs. 11a-12b (topotypes) [upper Oligocene (Chattian), Nizhnevorotyshche Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine], figs. 14a-15b [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine], fig. 13a, b [middle Miocene, Balichchiskaya Fm., Velikiy Lukavets River, Ukraine].

DISCUSSION.— We have not been able to examine the holotype of this species; however, figured specimens by Subbotina (1960) suggest a small, low trochospirally coiled (nearly planispiral) test with indistinct morphologic features. Hamrsmid and Rögl (2000:41) considered *praemicra* to be a valid senior synonym of *Pseudohastigerina barbadoensis* Blow, which we consider to be a junior synonym of *Pseudohastigerina naguiewichiensis* (Myatliuk) (see Chapter 14, this volume). This taxon requires further study to ascertain its identity.

***pseudoedita*, *Globigerina* Subbotina, 1960**

PLATE 20.2, FIGURES 13-15  
(Pl. 20.2, Figs. 13-15: new SEMs of holotype of *Globigerina pseudoedita* Subbotina)

*Globigerina pseudoedita* Subbotina, 1960:55, pl. 11, figs. 1a-c (holotype), figs. 2a-3c (topotypes) [upper Oligocene (Chattian), Nizhnevorotyshche Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine].

Not *Tenuitellina* cf. *T. pseudoedita* (Subbotina).—Li, 1987:312, pl. 3, figs. 1-5 [lower Miocene *Catapsydrax dissimilis* Zone, Cipro Fm., Trinidad], pl. 4, figs. 11-13, pl. 5, figs. 1, 4, 7, 11 [upper Oligocene *G. ciperoensis* Zone, Cipro Fm., Trinidad].

Not *Tenuitellinata pseudoedita* (Subbotina).—Li, Radford,

and Banner, 1992:579, pl. 3, figs. 2, 3 [lower Miocene, ODP Hole 747A, Kerguelen Plateau, southern Indian Ocean].

Not *Tenuitella* cf. *T. pseudoedita* (Subbotina).—Li, McGowan, and James, 2003:16, pl. 2, fig. 9 [lower Oligocene Zone P18/P19, ODP Hole 1134A, Great Australian Bight].

DISCUSSION.— The broken and poorly preserved holotype figured here with a circum-umbilical rim/ridge and damaged antepenultimate chamber bears little resemblance to the holotype drawings of Subbotina (1960, pl. 11, figs. 1a-c). Subbotina's illustration(s) suggest a 5 chambered microperforate tenuitellid, although the aperture is indistinct. Berggren (1969:148) suggested that *pseudoedita* may be a senior synonym of *Globigerina* (= *Tenuitella*) *munda* or related to *Globigerina officinalis* or *Tenuitella angustiumbilocata* as suggested by Blow and Banner (1962:88). Blow (1979:808) subsequently suggested that it may be a junior synonym of *Tenuitella angustiumbilocata* (Bolli). Li and others (1992) provide SEM images of several specimens attributed to *Tenuitellinata pseudoedita*, however, the concept is not consistent with the holotype shown here; thus we suggest this form is a *nomen dubium non conservandum*.

***pseudostriata*, *Guembelina* Ivanova, 1960**

PLATE 20.3, FIGURES 4, 8  
(Pl. 20.3, Figs. 4, 8: new SEMs of holotype of *Guembelina pseudostriata* Ivanova)

*Guembelina pseudostriata* Ivanova, 1960:119, pl. 5, fig. 5a,b (holotype) [upper Oligocene (Chattian), Nizhnevorotyshche Fm., village of Naguyevichi, along the Radychev River, Ciscarpathian region, Ukraine].

DISCUSSION.— Poorly preserved, but distinctly striate, test is referable to a biserial heterohelicid and is probably reworked from Upper Cretaceous strata; indeed, Ivanova (1960:120) indicates that this form is markedly similar to *Planoheterohelix striata* (Ehrenberg, 1854).

***subangulata*, *Globigerinella* Ivanova, 1960**

PLATE 20.3, FIGURES 9-11  
(Pl. 20.3, Figs. 9-11: new SEMs of holotype of *Globigerinella subangulata* Ivanova)



*Globigerinella subangulata* Ivanova, 1960:60, pl. 11, fig. 16a, b (holotype), fig. 17a, b (topotype) [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine].

DISCUSSION.— This 5-6 chambered, planospiral test is reminiscent of, and probably referable to, the benthic taxon *Almaena*, a common component of upper Oligocene strata in the Tethyan region. Alternatively it may be a junior synonym of *Pseudohastigerina micra* (Cole, 1927).

***tetracamerata*, *Globorotalia* Subbotina, 1960**

PLATE 20.3, FIGURES 13-15

(Pl. 20.3, Figs. 13-15: new SEMs of holotype of *Globorotalia tetracamerata* Subbotina)

*Globorotalia tetracamerata* Subbotina, 1960:65, pl. 13, fig. 1a-c (holotype) [upper Oligocene (Chattian), Polyanitsa Fm., Velikiy Lukavets River, Ciscarpathian region, Ukraine].

DISCUSSION.— Plano-convex, 4 chambered scitulaoid test, pustulose (secondary overgrowth), umbilicus indistinct, original illustration (drawing) and it shows an “acute peripheral margin” (keel) that is weakly discernible on the holotype illustration. This form could be a senior synonym of the Eocene species *Turborotalia cunialensis* (Toumarkine and Bolli, 1970), but the age of the Polyanitsa Formation is inconsistent with the range of this form, Alternatively this may be a benthic form.

***vialovi*, *Subbotina* Myatliuk, 1970**

PLATE 20.3, FIGURES 12, 16

*Subbotina vialovi* Myatliuk, 1970: 282, pl. 52, fig. 1a-c (holotype, no. 433-242), fig. 2a, b (paratype) [lower Oligocene (Rupelian), lower part of Nizhnemenilitovaya (Lower Menilite) Formation, 2797.5-2800.6 m in borehole 482, village of Bitkov, eastern Carpathians, Ukraine].

DISCUSSION.— Minute in size (figured specimens 0.15-0.21 mm in diameter), 4 chambers, terminal chamber occupies entire width of test above 3 essentially equal-sized chambers in last whorl, cancellate, primary aperture a low, lipped slit along the base of the terminal chamber. Uncertain affinity, probably benthic; requires further study (holotype not found).

**Part B: Non-Soviet/Russian Taxa**

***brevis*, *Globigerina* Jenkins, 1965**

PLATE 20.4, FIGURES 1-3

(Pl. 20.4, Figs. 1-3: new SEMs of holotype of *Globigerina brevis* Jenkins)

*Globigerina brevis* Jenkins, 1965:1100, fig. 7, nos. 58-63 [lower Oligocene, Kakanui River, lower part of Whaingaroan Stage, New Zealand].

*Subbotina brevis* (Jenkins).—Huber, 1991:440, pl. 5, fig. 8 [lower Oligocene Zone AP13, ODP Hole 738B, Kerguelen Plateau, south Indian Ocean].

Not *Globigerina* cf. *brevis* Jenkins.—Quilty, 1976:637, pl. 1, figs. 18, 19 [lower Oligocene Zone P19, DSDP Site 321, Nazca Plate, southeastern Pacific Ocean] = *Subbotina utilisindex*.

DISCUSSION.— Subspherical chambers coiled in a moderately high trochospire, oval in outline, 13 chambers arranged in 3 whorls, increasing slowly in size, umbilical sutures radial, deeply incised, spiral sutures weakly depressed, aperture umbilical, deep. Maximum diameter of holotype 0.44 mm. Deposited at the New Zealand Geological Survey Register No. TF 1498.

This species was described from the lower Oligocene, though it ranges from the upper Eocene to the lower Oligocene, with extinction prior the *Subbotina angiporoides* last appearance datum (Jenkins, 1965). Jenkins (1985) considered this to be a useful biostratigraphic species in high latitudes ranging across the Eocene-Oligocene Transition, with a short stratigraphic range, hence the name *brevis*. Through our investigations, we have been unable to determine the taxonomic assignment of *Globigerina brevis*. Jenkins (1965) did state that the population of this species exhibits a wide variation in test morphology. The new SEMs of both the holotype and paratype have not clarified the concept of this species.

Jenkins (1985) discussed the similarity between *brevis* and *tapuriensis* Blow and Banner. Based on the wall texture we do not consider this form to be affiliated with *Dentoglobigerina*, instead *Globoturborotalita* is a more likely affinity. This species has not been utilized by Oligocene workers, with the exception of Quilty (1976), who illustrated forms of cf. *brevis* which we consider to be more akin to *Subbotina utilisindex*. Huber (1991) illustrated a very cancellate form (pl. 5, fig. 8) which is likely to be a *Globoturborotalita*.

There is some resemblance between *brevis* and *paracancellata* n. sp. Olsson and Hemleben (Chapter 8, this volume). However, *brevis* is more compact and tightly coiled than *paracancellata*, which is more lobulate and the ultimate chamber is more elevated. *Globigerina brevis* shows almost 4 chambers in umbilical view whereas *paracancellata* n. sp. shows 3 to nearly 3½ chambers. We have been unable to find forms consistent with *G. brevis* and therefore place this species in Problematica pending further investigations from high latitude sites.

***grata, Globigerina?* Todd, 1957**

PLATE 20.4, FIGURES 5-7

(Pl. 20.4, Figs. 5-7: new SEMs of holotype of *Globigerina? grata* Todd)

*Globigerina? grata* Todd, 1957:300, pl. 74, fig. 4 [upper Oligocene Fina-sisu Fm., southern Saipan].

DISCUSSION.— This species consists of 4-6 chambers, of equal size, with distinct, radial, and deeply incised sutures. The outline is lobate, the test wall appears smooth, and the aperture is intra-extraumbilical. Diameter of holotype: 0.30-0.45 mm. Holotype deposited at the Smithsonian Museum of Natural History, Washington, D.C. (USNM 623949).

Todd questioned the generic assignment to *Globigerina* due to the smooth wall. This form has not been utilized by Oligocene workers and no consensus was reached within the Working Group regarding its affinity, which to date is restricted to the type sample. There is a resemblance to *Tenuitella gemma* (Jenkins), however, this form has a different rate of chamber size increase. Possibly a benthic form.

***inusitatus, Globigerinoides* Jenkins, 1965**

PLATE 20.4, FIGURES 9-11

(Pl. 20.4, Figs. 9-11: new SEMs of holotype of *Globigerinoides inusitatus* Jenkins)

*Globigerinoides inusitatus* Jenkins, 1965:1108, fig. 9, nos. 72-80 [lower Miocene, Waitakian Stage, Landon Series, New Zealand].

Not *Globigerinoides inusitatus* Jenkins.—Jenkins and Srinivasan, 1986:807, pl. 2, fig. 2 [upper Oligocene *G. euapertura* Zone, Hole 593A, Tasman Sea, South Pacific Ocean].—Spezzaferri, 1994:39, pl. 15, figs. 5a-c [lower Miocene Subzone N4b, DSDP Hole 588C, Tasman Sea, South Pacific Ocean].

DISCUSSION.— Low trochospiral, consisting of about 3 whorls, ovate, compact to slightly lobate in outline, chambers globular; 3½-4 subspherical chambers in the last whorl, increasing rapidly in size. Sutures depressed, straight to slightly curved on both sides, umbilicus narrow. Primary aperture is an umbilical-extraumbilical elongated low arch tending to become a slit. Supplementary aperture is usually a high arch over the sutures separating the last and the penultimate chamber, it is bordered by a very thick rim. Wall is normal perforate, spinose, *sacculifer*-type. Maximum diameter of holotype 0.40 mm. Holotype deposited at the New Zealand Geological Survey, Lower Hutt, New Zealand (TF 1501).

*Globigerinoides inusitatus* was described from the lower Miocene, Landon Series, lower Waitakian Stage by Jenkins (1965). We have placed this morphospecies into Problematica for several reasons. Firstly, the original drawing shows a thick rim bordering the supplementary aperture that is supposed to be diagnostic; however, our new SEMs of the holotype (Pl. 20.4, Figs. 9-11) do not show a thick rim. Secondly, we have doubts as to whether the holotype and paratype are conspecific. Finally, we do not consider the SEM images in Jenkins and Srinivasan (1986) and Spezzaferri (1994) to be consistent with the holotype. Jenkins (1965) proposes a close relationship between this species and *Globigerina bulloides*. However, the difference in the wall texture of these species, cancellate and *sacculifer*-type wall in *G. inusitatus*, suggests a close relationship with the genus *Globoturborotalita*.

Plate 20.4 Problematica

1-3, *Globigerina brevis* Jenkins (holotype), lower Oligocene Kakanui River, New Zealand; 5-7, *Globigerina? grata* Todd (holotype), upper Oligocene, Fina-sisu Fm., southern Saipan; 9-11, *Globigerinoides inusitatus* Jenkins (holotype, TF 1501), lower Miocene, Landon Series, New Zealand; 4, 8, 12, *Globigerina spirata* Bornemann (reproduced holotype drawing), mid-Oligocene (Rupelian), Hermsdorf, Germany; 13, 14, *Globigerina stainforthi* Hofker, 1956 (reproduced drawing, Hofker, 1956), upper Eocene, Ecuador. Scale bar: 1-3, 5-7, 9-11 = 100 µm, 4, 8, 12-14 = no scale.

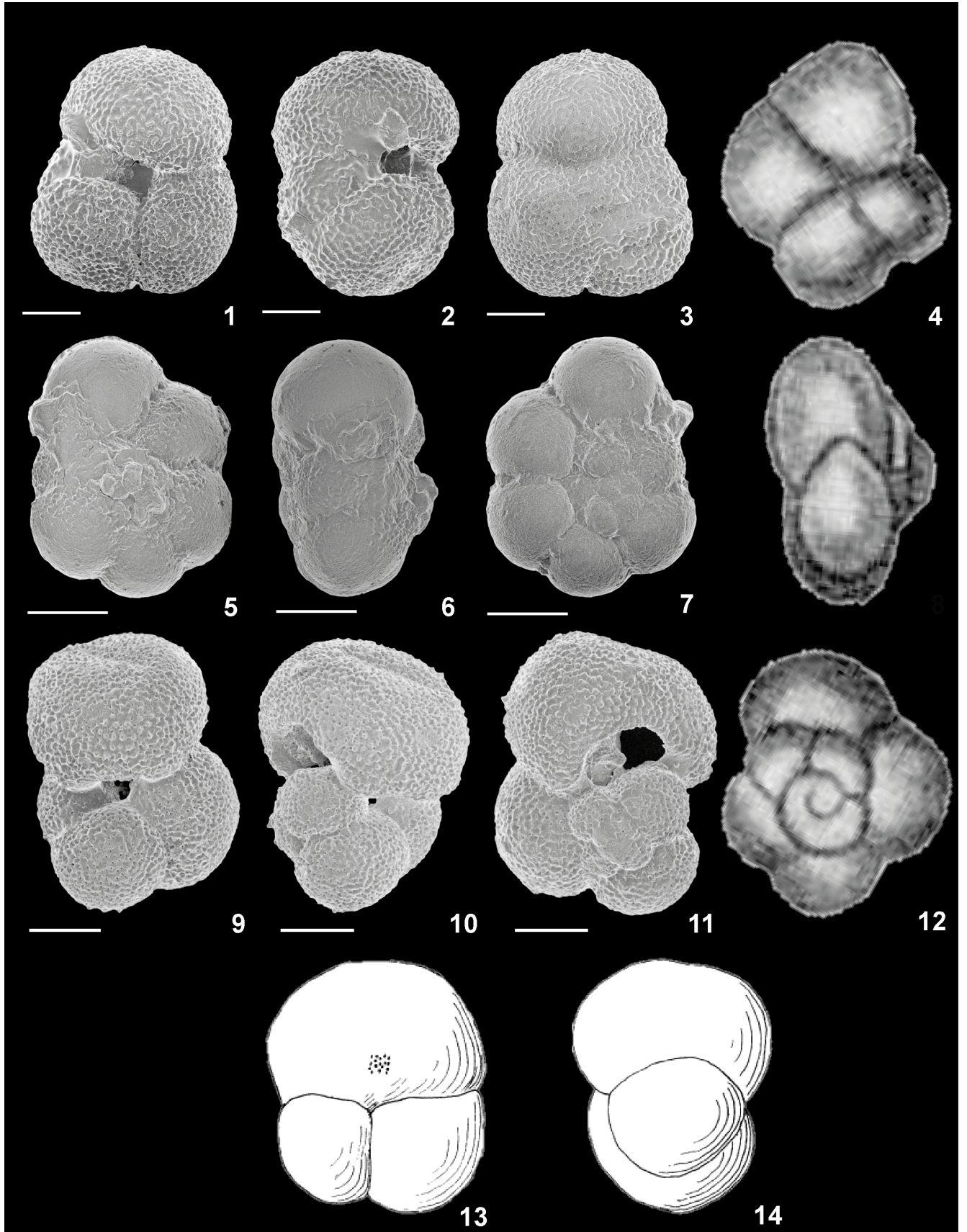


PLATE 20.4 Problematika

*spirata*, *Globigerina* Bornemann, 1855

PLATE 20.4, FIGURES 4, 8, 12

*Globigerina spirata* Bornemann, 1855:342, pl. 16, fig. 9a-c [mid-Oligocene (Rupelian), Septarienthon, Hermsdorf, near Berlin].

DISCUSSION.— Minute, figured specimen only 0.22 mm in diameter, smooth, “shiny” surface, 4 globular chambers, in two visible whorls. No holotype designated, nor repository of type material given; probably a teneutellid; *nomen dubium non conservandum*.

*stainforthi*, *Globigerina* Hofker, 1956

PLATE 20.4, FIGURES 13, 14

*Globigerina stainforthi* Hofker, 1956:955-956, text-figs. 96, 97 (homonym of *Globigerina stainforthi* Brönnimann, 1952 = *Globigerina hofkeri* Bermúdez, 1961, new name for *Globigerina stainforthi* Hofker, 1956, preoccupied by, and a junior synonym of, *Globigerina aequitorialis* Hofker and Thalmann, 1959) [upper Eocene, Seca Formation, sea cliffs west of Punta Mambra, southwestern Ecuador].

DISCUSSION.— Medium to large form (greater diameter 0.36-0.75 mm, lesser diameter 0.30-0.50 mm; thickness: 0.26-0.48 mm); 3 chambers visible on ventral side, strongly inflated on both sides; aperture a narrow slit, often nearly invisible; no umbilical cavity; surface nearly smooth with no reticular ornamentation. The tightly coiled (involute), trilobate chamber disposition and distinct, low/narrow apertural slit are characteristic features of this form.

Six syntype specimens were deposited in the Cushman Collection (USNM P4816), Washington, D.C. (not seen). Illustrated specimens figured in Ellis and Messina Catalogue resemble *Subbotina utilisindex* and, to a lesser extent, *S. linaperta* and/or *S. angiporoides*. These forms range into the lower Oligocene but all have a distinctly reticulate surface ornamentation. An examination of type material at the USNM and selection of a neotype is required before a decision on definitive taxonomic affinity/identity can be made.

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