

The new and renamed genera of agglutinated foraminifera published between 2008 and 2012

MICHAEL A. KAMINSKI^{1,2}

1. King Fahd University of Petroleum & Minerals, College of Petroleum Engineering and Geosciences, PO Box 701, Dhahran, 31261, Saudi Arabia, email: kaminski@kfupm.edu.sa

2. AGH University of Science and Technology, Faculty of Geology, Geophysics and Environmental Protection, al. Mickiewicza 30, 30-059 Kraków, Poland

Abstract

During the four-year period since the publication of the *Proceedings of the Eighth International Workshop on Agglutinated Foraminifera*, some 19 genera of agglutinated foraminifera have been described as new. Additionally, three previously described genera of agglutinated foraminifera were found to be junior homonyms and renamed.

INTRODUCTION

The purpose of this paper is to continue the compilation of validly described and reinstated genera of agglutinated foraminifera published after Loeblich & Tappan's (1987) book "Foraminiferal Genera and their Classification". The current work is a continuation of previous compilations of newly described or reinstated genera (Kaminski, 2000, 2004, 2008, 2011), and encompasses the years 2008 to 2011 inclusive.

In this paper, I provide a list of the newly described genera of agglutinated foraminifera published in the accessible literature, as well as those that have been newly renamed owing to the fact that the original names were pre-occupied by other animal taxa, and are therefore regarded as junior homonyms. In total, 207 genera of agglutinated foraminifera have been renamed, reinstated, reassigned to the Foraminifera, or described as new since the publication of Loeblich & Tappan's (1987) book.

RENAMED GENERA

The following genera were renamed by Özdikmen (2009) owing to the fact that they were junior homonyms of other animal taxa:

NEOCATENA Özdikmen, 2009, nom. nov. pro *Catena* Schroeder, Mediolini & Scott, 1989;

AKCAYA Özdikmen, 2009, nom. nov. pro *Sabaudia* Charollais & Brönnimann, 1966;

PALMIERINA Özdikmen, 2009, nom. nov. pro *Teichertina* Palmieri, 1999.

Özdikmen, H. 2009. Substitute names for some unicellular animal taxa (Protozoa). *Munis Entomology & Zoology*, **4** (1), 233-256

NEW GENERA PUBLISHED SINCE 2008

GOODAYIA Sergeeva & Anikeeva, 2008

Type species. *Goodayia rostellatum* Sergeeva & Anikeeva, 2008, OD(M).

Goodayia Sergeeva & Anikeeva, 2008, p. 86.



Figure 1. *Goodayia rostellatum* Sergeeva & Anikeeva. Modern, Black Sea (44°17.03' N — 34° 58.88' E, 160 m depth and 44° 16.88' N — 34° 58.73' E; 150 m). Holotype (FAG – 001), size 325 x 115 µm, (from Sergeeva & Anikeeva, 2008).

Description. Test 210–465 µm long and 50–150 µm wide, thin-walled, flexible. Test is elongate in form and expands from the middle to the apertural end. Test wall has two transparent proteinaceous membranes, and the cytoplasm is more or less separated from the inner layer of the wall. The cytoplasm is finely granular, homogeneous, usually without foreign inclusions. Single terminal apertural structure is asymmetrical, beak-like, with the apertural opening under

the beak. Single nucleus situated more or less in the middle of the test. Black Sea, Adriatic (A. Gooday, pers. comm.).

Remarks. Differs from *Gloioquillmia* in lacking agglutinated particles and in having a relatively small aperture hidden under a beak-shape apertural structure. *Goodayia rostellatum* is a eurybiont species that inhabits a wide range of water depths as well as different regions of the Black Sea. It is found in coastal sediments (4–19 m depth) of the Sevastopol area (Kazach'ya, Kruglaya, Balaklavskaya, Uchkuevka, Laspi Bays), and the Crimean, Caucasian and Bulgarian shelf in the depth range of 105–160 m. The holotype (44° 17.03' N; 34°58.88' E, 160 m depth) and the paratypes are from the Black Sea (44°17.03' N; 34 °58.88' E, 160 m depth and 44°16.88' N; 34° 58.73' E; 150 m). The holotype (1 FAG–001) and five paratypes (1 FAP–002 to FAP–006) are mounted in water-glycerol preparations and housed in the Institute of Biology of the Southern Seas NASU (Sevastopol, Ukraine).

Goodayia rostellatum gen. n., sp. n. (Protozoa) – a monothalamous foraminiferan from the Black Sea. *Vestnik Zoologii*, **42** (5), 85–89.

NELLYA Gooday, Anikeeva & Pawłowski, 2010

Type species. *Nellya rugosa* Gooday, Anikeeva & Pawłowski, 2010, OD(M).

Nellya rugosa Gooday, Anikeeva & Pawłowski, 2010, p. 4.

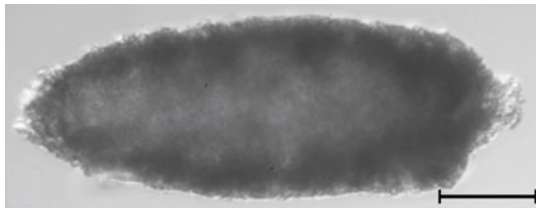


Figure 2. *Nellya rugosa* Gooday, Anikeeva & Pawłowski. Modern, Black Sea, Balaklava Bay, Crimea, Ukraine, side view of holotype (BMNH ZF 5244), scale = 50 microns (from Gooday *et al.*, 2010).

Description. Test free, monothalamous, elongate, more or less oval in shape; proximal end rounded to bluntly pointed, distal end often rather truncated; length <400 μm. Cytoplasm without stercomata. Aperture single, associated with transparent, roughly rectangular, nipple-like projection located at distal end. Test wall almost opaque, whitish flecked with darker grains, somewhat flexible and rough on a scale of tens of microns; composed of inner organic layer overlain by jumble of mineral grains, most of them ~10 μm in size or smaller.

Remarks. *Nellya* differs from *Saccamina* and *Leptamina* in the shape of the test (elongated rather than approxi-

mately spherical) and the presence of a nipple-like apertural structure, which is quite unlike the simple round opening that characterises these two genera. *Conqueria* has a more elongate test, a finely agglutinated wall and an aperture located at the end of a short tube. The test shape, apertural structure and the absence of intracellular mineral grains distinguishes *Nellya* from *Psammophaga*. The general shape of the test is similar to that of *Vellaria*, but the apertural structure is completely different. The holotype is mounted on a glass slide in glycerol, is deposited at the Natural History Museum (London) under reg. no. ZF5244. One paratype also mounted on a glass slide, is deposited under reg. no. ZF5245; 16 paratypes preserved in a vial in 10% formalin, are deposited under reg. nos. ZF5246–5260.

Gooday, A.J., Anikeeva, O.V. & Pawłowski, J. 2010. New genera and species of monothalamous Foraminifera from Balaklava and Kazach'ya Bays (Crimean Peninsula, Black Sea). *Marine Biodiversity*, DOI 10.1007/s12526-010-0075-7, 14 pp.

BOWSERIA Sinniger, Lecroq, Majewski, & Pawłowski, 2008

Type species. *Bowseria arctowskii* Sinniger, Lecroq, Majewski, & Pawłowski, 2008, OD(M).

Bowseria Sinniger, Lecroq, Majewski, & Pawłowski, 2008, p. 8.

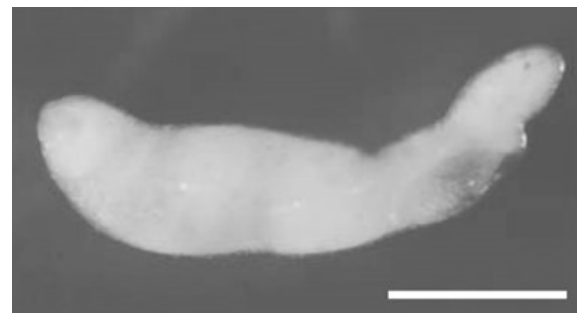


Figure 3. *Bowseria arctowskii* Sinniger, Lecroq, Majewski, & Pawłowski. Modern, Admiralty Bay, King George Island, station KG10 (S 62°09.584', W, 58°34.287', 107 m depth), Holotype, MHNG 2008–1, scale = 0.5 mm (from Sinniger *et al.*, 2008).

Description. Test free, monothalamous, elongate, tubular, up to 2 mm in length and 0.5 mm in width. Wall is transparent, organic, with smooth outer surface; cytoplasm granular, white or yellow in colour, without stercomata. The aperture is single, terminal, small and rounded, without gromiids-like oral capsule.

Remarks. *Bowseria* differs from gromiids in having a very thin, often curved and wrinkled theca, less prominent aperture, finely granular white to yellowish cytoplasm, and the absence of stercomata. The theca is often wrinkled and becomes easily distorted due to shrinkage, particularly in

specimens preserved in alcohol.

Bowseria arctowskii was found at six locations in Admiralty Bay (King George Island, West Antarctica), below 100 m depth. The type specimens are deposited in the Museum of Natural History in Geneva.

Sinniger, F., Lecroq, B., Majewski, W. & Pawłowski, J. 2008. *Bowseria arctowskii* gen. et sp. nov., new monothalamous foraminiferan from the Southern Ocean. *Polish Polar Research*, **29** (1), 5–15.

XIPHOPHAGA Goldstein, Habura, Richardson & Bowser, 2010

Type species. *Xiphophaga minuta* Goldstein, Habura, Richardson & Bowser, 2010, OD.

Xiphophaga Goldstein, Habura, Richardson & Bowser, 2010, p. 13.



Figure 4. *Xiphophaga minuta* Goldstein, Habura, Richardson & Bowser. Modern, Sapelo Island, Georgia, holotype (USNM 539774), length = 203 μm , (from Goldstein *et al.*, 2010).

Description. Test monothalamous, spherical to ovate, translucent in living individuals and flexible, test consists of an agglutinated layer comprised mainly of clay platelets underlain by an organic inner layer, without an outer organic lining. Cement organic, non-mineralised. Aperture at the end of a short neck. Holocene, Sapelo Island, Georgia (USA).

Remarks. Differs from *Psammophaga* in its smaller dimensions (ca. 200 μm , compared with 400–500 μm), in possessing an apertural neck, and in lacking the numerous ingested sand grains for which the genus was named. Instead, both known species of *Xiphophaga* pack the interior of their test with numerous pennate diatoms. *Niveus* Altin, Habura & Goldstein, 2009 differs in possessing a thinner outer agglutinated layer, a thicker inner organic lining, and a crenulated outer test surface. Living individuals of *Xiphophaga*

are translucent and golden-brown in colour, reflecting the large number of ingested diatoms. The type specimens were found on backbarrier mudflats of the Mud River Estuary, Sapelo Island, Georgia, and are housed in the Department of Paleobiology, National Museum of Natural History, Smithsonian Institution. Subfamily Saccammininae.

Goldstein, S.T., Habura, A., Richardson, E.A. & Bowser, S.S. 2010. *Xiphophaga minuta*, and *X. allominuta*, nov. gen, nov. spp., new monothalamid foraminifera from coastal Georgia (USA): Cryptic species, gametogenesis, and an unusual form of chloroplast sequestration. *Journal of Foraminiferal Research*, **40** (1), 3–15.

NIVEUS Altin, Habura & Goldstein, 2009

Type species. *Niveus flexilis* Altin, Habura & Goldstein, 2009, OD(M).

Niveus Altin, Habura & Goldstein, 2009, p. 82.

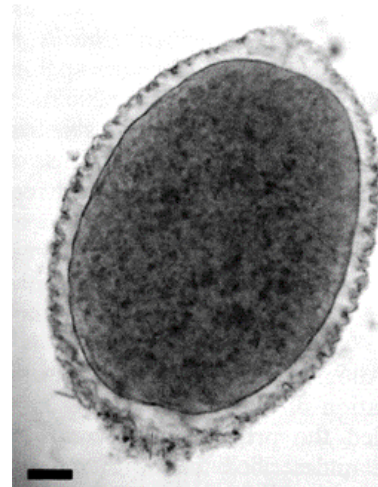


Figure 5. *Niveus flexilis* Altin, Habura & Goldstein. Modern, *Juncus* salt marsh at Darien, Georgia, USA Holotype (USNM 538118a), specimen embedded in epoxy resin, scale = 50 μm (from Altin *et al.*, 2009).

Description. Test free, monothalamous, round to ovate in shape, finely agglutinated, with a single aperture, a flexible collar, and lacking any internal septae. The outer agglutinated layer is thin (0.4–0.7 μm), and primarily composed of clay with occasional fragments of diatom frustules, cemented by an organic matrix. Viewed in transmitted light the test is translucent and underlain by a thicker (3–8 μm) transparent inner organic lining. Test is free of perforations in all stages of reproduction.

Remarks. Differs from *Psammophaga* Arnold, 1982 in the round to ovoid shape, the presence of a collar, and in lacking minerals within the cytoplasm. *Ovamina* Dahlgren, 1962 differs in possessing an entosolenian tube

and accessory pores for gamete release. The cytoplasm of *Niveus* is opaque white in the vegetative stage as observed in direct light, except when feeding when it may adopt the colour of its food.

The type specimens of *Niveus flexilis* were collected from a hyposaline salt marsh adjacent to the Rod and Gun Marina in Darien, Georgia, USA, and are deposited in the Smithsonian Institution, Washington, D.C. Altin *et al.* (2009) assigned the genus to the family Saccamminidae.

Altin, D.Z., Habura, A. & Goldstein, S.T. 2009. A new allogromiid foraminifer *Niveus flexilis* nov. gen., nov. sp., from coastal Georgia, USA: fine structure and gametogenesis. *Journal of Foraminiferal Research*, **39** (2), 73-86.

CEDHAGENIA Gooday, Anikeeva & Pawłowski, 2010

Type species. *Cedhagenia saltatus* Gooday, Anikeeva & Pawłowski, 2010, OD(M).

Gooday, Anikeeva & Pawłowski, 2010, p. 487.



Figure 6. *Cedhagenia saltatus* Gooday, Anikeeva & Pawłowski. Modern, Black Sea, Balaklava Bay, Crimea, Ukraine, side view of holotype (BMNH ZF 5261), scale = 50 microns (from Gooday *et al.*, 2010).

Description. Test free, monothalamous, approximately lenticular in shape with curved sides and more or less pointed ends; length 150-300 μm . Cytoplasm finely granular, without stercomata. Aperture single, sometimes associated with short, delicate, transparent, slightly flared test extension. Test collapses when dried. Wall flexible, whitish, translucent with shiny highlights; composed of inner organic layer overlain by small (usually <5 μm in size) plate-like mineral grains. Black Sea.

Remarks. *Cedhagenia* is most similar to *Vellaria*, notably in the presence in some specimens of a delicate, flared apertural extension. However, this structure is not as well developed as in *Vellaria* and the overall test shape is also more lenticular. Molecular analyses indicate that *Cedhagenia* is not related to *Vellaria pellucidus*, a typical representative of the genus. Rather, these analyses suggest that the new genus is most closely related to *Ovammina*. Morphologically, it differs from the type species, *Ovammina*

opaca, in having a much thinner wall and a more or less distinct apertural structure.

The holotype from Balaklava Bay, Crimea, mounted on a glass slide in glycerol, is deposited in the Natural History Museum (London) under reg. no. ZF5261. Three paratypes also mounted on a glass slide, are deposited under reg. nos. ZF5262-ZF5264; 34 paratypes preserved in a vial in 10% formalin, are deposited under reg. nos. ZF5265-5298.

Gooday, A.J., Anikeeva, O.V. & Pawłowski, J. 2010. New genera and species of monothalamous Foraminifera from Balaklava and Kazach'ya Bays (Crimean Peninsula, Black Sea). *Marine Biodiversity*, **41**, 481-494.

BITHEKAMMINA Aranda da Silva, Gooday, Pearse & Cunha, 2011

Type species. *Bithekammina occulta* Aranda da Silva, Gooday, Pearse & Cunha, 2011, OD(M).

Bithekammina Aranda da Silva, Gooday, Pearse & Cunha, 2011, p. 51.

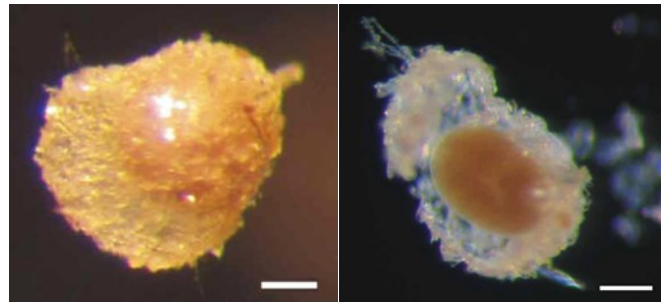


Figure 7. *Bithekammina occulta* Aranda da Silva, Gooday, Pearse & Cunha. Modern, Station 56859#2 in the Nazaré canyon, 4400 m off Portugal. Left – Holotype (ZF5241), Right – Partially dissected paratype showing the internal test, scale = 100 microns (from Aranda da Silva *et al.*, 2011).

Description. Test free, monothalamous, spherical to ovate in shape, and generally 200–400 μm in size. Test surface very smooth, translucent with diffuse silvery highlighted in reflected light. Single aperture forms round opening with slightly raised rim but otherwise without any associated structures. Wall thin and composed largely of tiny (usually 1–2 μm) plate-like clay particles overlying organic lining. Cell body with large nucleus, but without any other obvious inclusions. Test typically enclosed within larger, more coarsely agglutinated case ('secondary test'), which gives rise to a long, narrow tubular extension that corresponds to the aperture of the primary test.

Remarks. The test of *Bithekammina* is enclosed in an outer agglutinated case, a feature not present in any other

known 'saccamminid'. Monothalamous foraminifera are known to inhabit pre-existing structures, including the empty tests of other foraminifera (Gooday, 1986). However, because all the available specimens of the type species were found inside a casing, and the base of the tubular extension of the casing corresponds closely with the test aperture, it is likely that this structure is a kind of secondary test made by the foraminifer itself. The outer case is fragile, breaking easily when poked with a needle. It is composed mainly of irregularly-shaped grains, 10–50 μm in size which yield X-ray spectra dominated by Si and are presumably composed of quartz. The tubular extension is composed mainly of smaller ($< 10 \mu\text{m}$) grains. The cell body is well defined and either fills the test cavity almost completely, or is separated from the wall by a narrow space, which is apparently empty. The test itself resembles that of *Niveus* Altin, Habura & Goldstein, 2009 (type species *N. flexilis*) in being rather small, flexible, and ovate in shape with an outer surface composed of tiny, flake-like clay particles. In *N. flexilis*, however, these particles overlie a much thicker inner organic lining, so that the test appears to have an organic wall. *Leptammina* Cedhagen, Gooday & Pawłowski, 2009 (type species *L. flavofusca*), is much larger (up to 2 mm diameter) than *Bithekammina* and has a thicker test wall. It also has a clearly developed endosolenial tube, a feature absent in *Bithekammina*. It differs from *Ovammina* (type species *O. opaca* Dahlgren, 1962) in the presence of a secondary agglutinated case, and in having an oval rather than egg-shaped to fusiform shape, a much thinner and more finely agglutinated test wall, and in lacking a well-developed endosolenial tube. The type specimens are deposited in the Natural History Museum, London.

Aranda da Silva, A., Gooday, A.J., Pearse, R.B. & Cunha, M.R. 2011. A new 'saccamminid' genus (Rhizaria: Foraminifera), from 4400 m water depth in the Nazaré Canyon (NE Atlantic). *Zootaxa*, 2912, 49–58.

LEPTAMMINA Cedhagen, Gooday & Pawłowski, 2009

Type species. *Leptammina flavofusca* Cedhagen, Gooday & Pawłowski, 2009, OD.

Leptammina Cedhagen, Gooday & Pawłowski, 2009, p. 11.

Description. Test free, monothalamous, more or less spherical, up to 2 mm diameter. Wall delicate, flexible, with inner organic layer overlain by fine, loosely agglutinated mineral grains. Aperture single, circular, may protrude slightly from the test surface. Cell body with well-developed peduncular sheath. Modern, Southern Ocean.

Remarks. *Ovammina* (synonym *Dahlgrenia* Lena, 1974) resembles *Leptammina* in having an agglutinated test wall

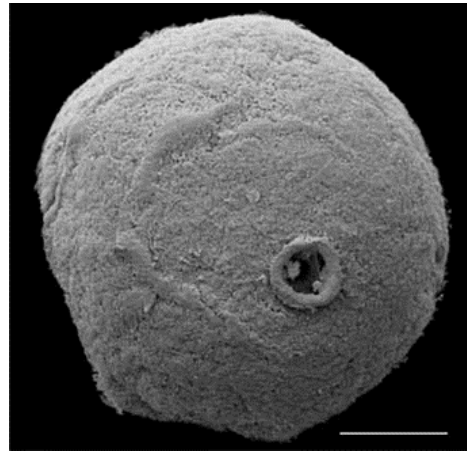


Figure 8. *Leptammina flavofusca* Cedhagen, Gooday & Pawłowski. Modern, Weddell Abyssal Plain, Southern Ocean, Polarstern sta. 102-13. Top view (SEM) of paratype, scale = 200 μm (from Cedhagen *et al.*, 2009).

resembles *Leptammina* in having an agglutinated test wall made of minute mineral particles underlain by an organic layer. Both genera also have an entosolenian tube. It differs from *Leptammina* in being smaller (length 130–700 μm) and ovoid, egg-shaped, or fusiform rather than rounded. There is no evidence in *Leptammina* for the ring of accessory apertures around the main aperture that develop in *Ovammina* during gametogenesis.

Psammophaga (type species *P. simplora* Arnold, 1982) resembles *Leptammina* in having an outer finely agglutinating test layer and an inner organic wall. Both genera also have an entosolenian tube. One obvious difference is that *Psammophaga* ingests large quantities of mineral particles (Arnold, 1982), a feature never observed in *Leptammina*. *Psammophaga* also has a much thicker inner organic layer.

Pilulinella was described by Loeblich & Tappan (1987) as being 'spherical', 1–2 mm in diameter with a single rounded terminal aperture and a wall composed of 'fine clay' particles on an organic base. The aperture in *Pilulinella* is reported to be a kind of double structure, although this could indicate the presence of a peduncular sheath. Unfortunately, not enough information is currently available about *Pilulinella* to determine how close it is to *Leptammina*. However, the greater size of the aperture may be a distinguishing feature. The diameter of the rim of the aperture is about one third of the test diameter in *Pilulinella* and about a fifth to a tenth of the test diameter in *Leptammina*.

The holotype from Polarstern Station 102#11 and paratypes from Stations 102#11, 102#13, 110#8, and 133#2, Weddell Sea Abyssal Plain, are deposited in the Forschungsinstitut Senckenberg, Frankfurt am Main, and are registered as SMF XXVII 7537. Family Saccamminidae.

Cedhagen, T., Gooday, A.J. & Pawłowski, J., 2009. A new genus and two new species of saccamminid foraminiferans (Protista, Rhizaria) from the deep Southern Ocean. *Zootaxa*, **2096**, 9-22.

CAPSAMMINA Gooday, Aranda da Silva, Koho, & Lecroq, 2010

Type species. *Capsammina patelliformis* Gooday, da Silva, Koho, & Lecroq, 2010, OD.

Capsammina Gooday, Aranda da Silva, Koho, Lecroq & Pearce, 2010, p. 348.

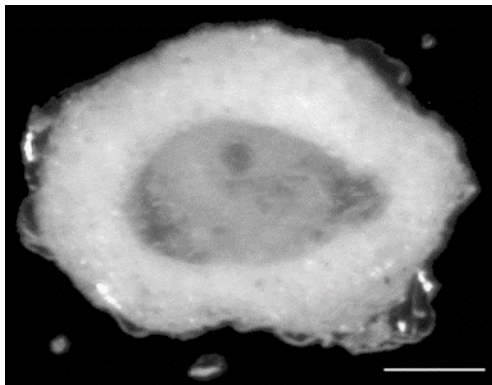


Figure 9. *Capsammina patelliformis* Gooday, Aranda da Silva, Koho, Lecroq. Modern, RRS *James Cook* station 127, 3535 m, Nazaré Canyon, Portugal. Top view of holotype, (BMNH ZH5210), scale=100µm (from Gooday *et al.*, 2010).

Description. Test monothalamous, compressed, composed of typically two large plate-like grains of mica forming a sandwich-like structure, separated by a thick rim of white agglutinated material ('mortar') composed of fine mineral grains and enclosing the cell body. No obvious aperture(s). Nazaré submarine canyon, 3536 m, off Portugal.

Remarks. *Capsammina* is distinguished by the structure and composition of its test from other monothalamous foraminifera that lack an obvious aperture. *Psammosphaera* is larger and has a test composed of quartz grains. *Crithionina* has a more rounded shape and the test does not incorporate mica plates. Molecular evidence indicates that the type species of *Capsammina* forms a clade together with three species of *Crithionina*. However, divergences between *Capsammina* and its closest relatives are >20%. *Psammosphaera bowmani* is probably congeneric.

A minority of specimens incorporate three or more mica plates. Sometimes there are two overlapping plate-like grains on one side of the test with a double ring of white mortar developed between the grains. In a few cases, 3-4 plates are arranged to form a more three-dimensional, triangular test. Occasionally, more plates are present, forming a polygonal test. The type specimens, from *Isis Dive 57*

(*James Cook* Station 127; 39°29.756', 9°56.041', 3536m water depth), are deposited in the Natural History Museum, London and registered as ZF5210 (holotype), ZF5211 (1 paratype) and ZF5212-5229 (18 paratypes).

Gooday, A.J., Aranda da Silva, A., Koho, K.A., Lecroq, B. & Pearce, R.B. 2010. The 'mica sandwich'; a remarkable new genus of Foraminifera (Protista, Rhizaria) from the Nazaré Canyon (Portuguese margin, NE Atlantic). *Micropaleontology*, **56** (3-4), 345-357.

SHINKAIYA Lecroq, Gooday, Tsuchiya, & Pawłowski, 2009

Type species. *Shinkaiya lindsayi* Lecroq, Gooday, Tsuchiya, & Pawłowski, 2009

Shinkaiya Lecroq, Gooday, Tsuchiya, & Pawłowski, 2009, p. 457.



Figure 10. *Shinkaiya lindsayi* Lecroq, Gooday, Tsuchiya, & Pawłowski. Modern, North Pacific. Holotype, side view of specimen. Scale = 15 mm (from Lecroq *et al.*, 2009).

Description. Test free, monothalamous, round to ovate in shape, finely agglutinated, with a single aperture, a flexible collar, and lacking any internal septae. The outer agglutinated layer is thin (0.4–0.7 µm), and primarily composed of clay with occasional fragments of diatom frustules, cemented by an organic matrix. Viewed in transmitted light the test is translucent and underlain by a thicker (3–8 µm) transparent inner organic lining. Test is free of perforations in all stages of reproduction.

Remarks. *Shinkaiya* is characterised by a relatively thick wall that is soft (rather than brittle), and consists mainly of clay-sized sediment particles. The lumen of the test includes scattered internal xenophyae. The single specimen was recovered from a push core from the North Pacific, east of the Japan Trench, and is deposited in the National Museum of Nature and Science, Tokyo.

Lecroq, B., Gooday, A.J., Tsuchiya, M. & Pawłowski, J. 2009. A new genus of xenophyophores (Foraminifera) from Japan Trench: morphological description, molecular phylogeny and elemental analysis. *Zoological Journal of the Linnean Society*, **156**, 455–464.

NAZAREAMMINA Gooday, Aranda da Silva & Pawłowski, 2011

Type species. *Nazareamina tenera* Gooday, Aranda da Silva & Pawłowski, 2011, OD(M).

Nazareamina Gooday, Aranda da Silva & Pawłowski, 2011, p. 2412.

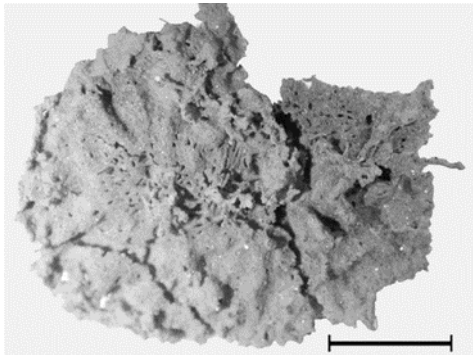


Figure 11. *Nazareamina tenera* Gooday, Aranda da Silva & Pawłowski. Modern, Discovery Station 15765#2 (39.58331 N, 10.31731 W, 4336m water depth; 11 August 2005); scale = 10 mm, top view of holotype, BMNH 2010:1:19:10. (from Gooday *et al.*, 2011).

Description. Test delicate, very thin, more or less plate-like, with oval to elongate outline and irregular periphery. Away from periphery, test is perforated by oval spaces, which typically merge into system of bar-like features; irregular excrescences sometimes developed. Wall rather finely agglutinated but including some larger particles. Interior with branched stercomare strings and branches of the granellare system that contain numerous mineral grains, including titanium-bearing particles. Offshore Portugal, deep water.

Remarks. *Nazareamina* most closely resembles xenophyophores of the genus *Psammmina*. This genus is characterised by a plate-like test (Tendal, 1972), and in at least one species (*Psammmina delicata* Gooday & Tendal 1988), test fragments are punctuated by an open space (Gooday & Tendal, 1988). *Nazareamina* differs in being thinner than any

known species of *Psammmina*, and typically has a more complex structure with numerous perforations and in some cases, excrescences. Also, according to the original diagnosis of *Psammmina*, pillar-like arrangements of internal xenophyae are developed between the upper and lower plates and round ‘pores’ (apertures) interrupt the periphery (Tendal, 1972). These features are not present in *Nazareamina*. Type specimens are deposited in the Natural History Museum (London).

Gooday, A.J., Aranda da Silva, A., Pawłowski, J. 2011. Xenophyophores (Rhizaria, Foraminifera) from the Nazaré Canyon (Portuguese margin, NE Atlantic). *Deep Sea Research II*, **58** (23-24), 2410-2419.

GERACIA Lewis, 2009

Type species. *Geracia bahamensis* Lewis, 2009, OD(M).

Geracia bahamensis Lewis, 2009, p. 618.

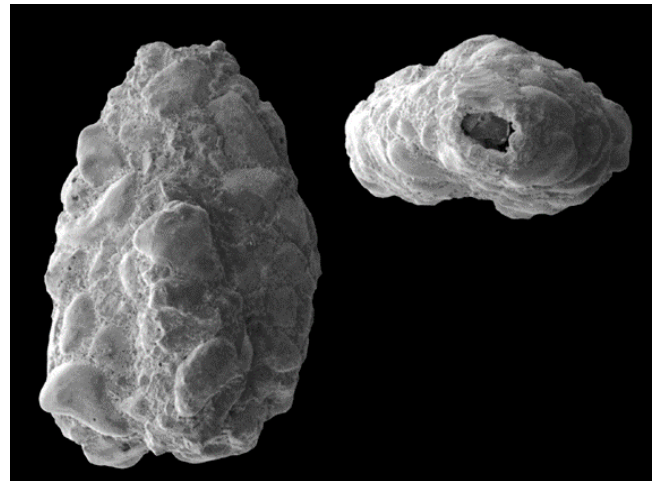


Figure 12. *Geracia bahamensis* Lewis. Holocene, near Sandy Point, San Salvador, Bahamas, depth 43m, side and top view of holotype (USNM 538748), x 70 (from Lewis, 2009).

Description. Test free, subtriangular, flask-shaped, consisting of tubular chambers in a triloculine arrangement, with a bilobed base and convex sides. Wall coarsely agglutinated, one to a few grains in thickness, bound by an organic matrix. Aperture an elongate oval opening at the end of the final chamber, lacking any internal tooth or flap.

Remarks. Larger specimens of *Geracia bahamensis* lack a neck, but smaller specimens have a distinct neck. Because of its triloculine chamber arrangement, *Geracia* was placed in the family Trilocularenidae Mikhalevich & Kaminski, 2008, but the genus differs from other genera in the family (*Trilocularena* and *Falsagglutinella*) by lacking a tooth. Type specimens are housed in the US National Museum and at the Natural History Museum, London.

Lewis, R. 2009. *Geracia bahamensis*, new genus and species, a Recent agglutinated foraminifer from the platform margin at San Salvador, Bahamas. *Micropaleontology*, **55** (6), 617-622.

CARTERIELLA Haig & McCartain, 2010

Type species. *Carteriella manelobasensis* Haig & McCartain, 2010, OD(M).

Carteriella Haig & McCartain, 2010, p. 376.

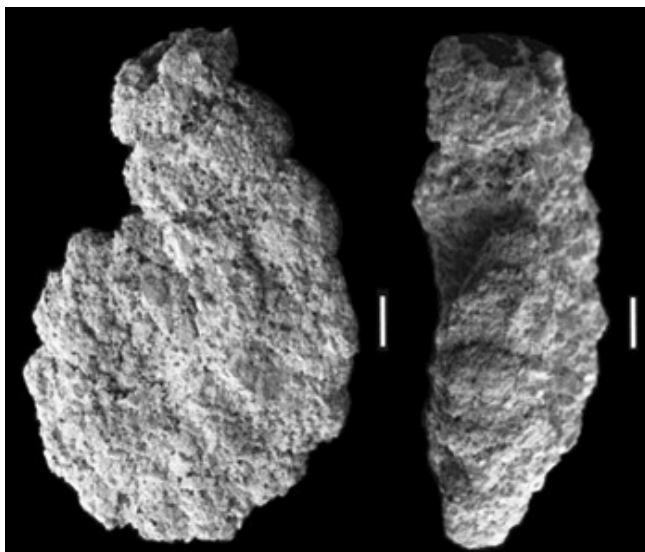


Figure 13. *Carteriella manelobasensis* Haig & McCartain. Triassic, probably Ladinian, Timor. Holotype (CPC40282), side and edge views, scale = 100 microns (from Haig & McCartain, 2010).

Description. Test free, with broad partly evolute planispiral coil and reduced cylindrical uniserial stage developed in few gerontic specimens. Uniserial stage positioned on one side of the initial coil. Wall agglutinated, silicified. Aperture terminal and circular in uniserial stage, a small circular areal opening in the planispiral stage. Triassic, Timor.

Remarks. Differs from *Ammobaculites* in possessing a broad and partly evolute planispiral coil and in its much reduced uniserial stage that is developed in few individuals. It differs from *Sculptobaculites* in having an areal aperture rather than a basal aperture in the planispiral stage. *Kutsevelia* differs in the test compression, final chamber shape, and lack of a cylindrical uniserial stage that rises abruptly from the planispiral coil. In *Kutsevelia*, the short compressed uniserial stage develops through prolongation of the final chambers. The type specimens are housed at the Commonwealth Palaeontological Collections at Geoscience Australia in Canberra.

Haig, D.W. & McCartain, E. 2010. Triassic organic-cemented siliceous agglutinated foraminifera from Timor Leste: Conserva-

tive development in shallow-marine environments. *Journal of Foraminiferal Research*, **40**, 366-392.

CUNEOSPIRELLA Cherchi, Schroeder & Ruberti, 2009

Type species. *Cuneospirella samnitica* Cherchi, Schroeder & Ruberti, 2009, p. 59; OD.

Cuneospirella Cherchi Schroeder & Ruberti, 2009, p. 59.

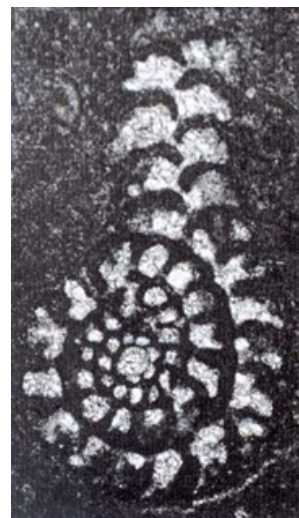


Figure 14. *Cuneospirella samnitica* (Cherchi, Schroeder & Ruberti). Santonian, Matese Mountains (Molise, central Italy). Median section of holotype (SMF XXVII 7563), x60 (from Cherchi *et al.*, 2009).

Description. Test free, microgranular; early stage planispiral and biumbilicate; adult stage rectilinear, cuneiform and biserial; external part of chambers subdivided into chamberlets by partitions in the adult stage; aperture consisting of a single interiomarginal row of openings.

Remarks. Differs from *Spiroplectamina* in its microgranular wall, multiple apertures, and in having chambers subdivided into chamberlets in the adult stage. Cherchi *et al.* only tentatively placed the genus in the Spiroplectaminidae. Type specimens are stored in the Forschungsinstitut Senckenberg, Frankfurt.

Cherchi, A., Schroeder, R. & Ruberti, D., 2009. *Cuneospirella samnitica* gen. n., n.sp. (Foraminiferida) from the Santonian of the Matese Mountains (Molise, central Italy). *Rivista Italiana di Paleontologia e Stratigrafia*, **115** (1), 59-65.

AMMOGLOBOROTALOIDES Kaminski & Contreras, 2011

Type species. *Ammogloborotaloides truncatulinoidiformis* Kaminski & Contreras, 2011.

Ammogloborotaloides Kaminski & Contreras, 2011, p. 11.

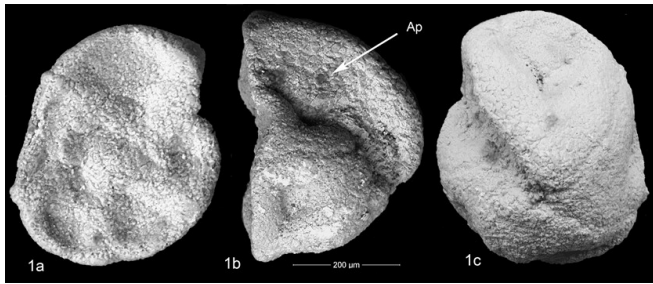


Figure 15. *Ammogloborotaloides truncatulinoidiformis* Kaminski & Contreras. Falcon Basin, Venezuela, INTEVEP Slide 021046, ex PDVSA (La Concepcion) Type Collection, slide 1324, Spiral, edge, and ventral views of Metatype, Arrow notes position of the aperture (from Kaminski & Contreras, 2011).

Description. Test strongly umbilico-convex with circular outline in axial view, and an acute to keeled peripheral margin. Spiral side flat or elevated slightly in the centre, with a depressed coil suture and an elevated peripheral rim or keel. All chambers are visible on the spiral side. Chambers on the spiral side are elongated in the direction of coiling and have radial sutures. The umbilical side is strongly convex, with triangular chambers in umbilical view, depressed sutures, and a closed umbilicus. The apertural face is flat, and the aperture is a small circular areal opening in the middle of the apertural face, midway between the umbilicus and the periphery, surrounded by an elevated rim or neck. The wall is comprised of medium to fine quartz grains, with a smooth surface, and is silicified.

Remarks. The genus *Ammogloborotalia* Zheng, 2001 (in Zheng & Fu, 2001) is strongly isomorphic to differing by its interiomarginal aperture. The holotype of *Ammogloborotaloides truncatulinoidiformis* was recovered from a well in the Lagomar field in Lake Maracaibo, Venezuela and is from the La Rosa sand member, of early Miocene age. The types are deposited in the Centro de Micropaleontología P.J Bermúdez at PSVSA-INTEVEP (el Instituto Tecnológico Venezolano del Petróleo) in Los Teques, Venezuela and are registered in slides 021045 - 021046.

Kaminski, M.A. & Contreras, J. 2011. The new foraminiferal genus *Ammogloborotaloides* n.gen. and subfamily Ammogloborotaloidinae n.subfam. from the Neogene of Venezuela: An example of isomorphism between agglutinated and planktonic Foraminifera". *Journal of Micropaleontology*, **30** (1), 11-16.

RECTOGEROCHAMMINA Kaminski, Cetean & Neagu, 2010

Type species. *Rectogerochammina eugubina* Kaminski, Cetean & Neagu, 2010.

Rectogerochammina Kaminski, Cetean & Neagu, 2010, p. 122.

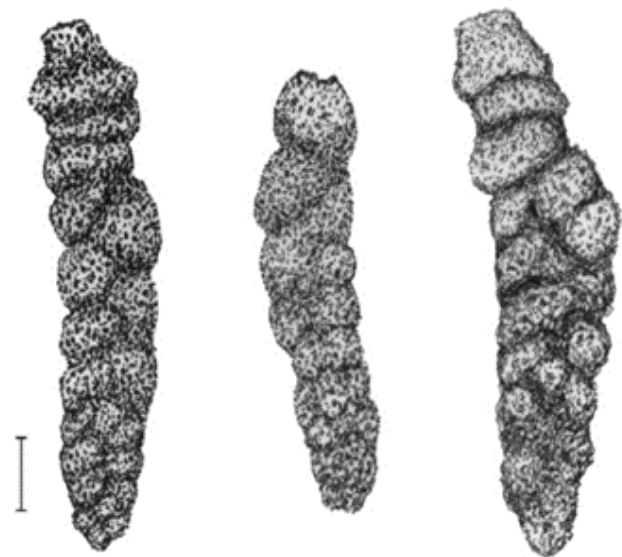


Figure 16. Type specimens of *Rectogerochammina eugubina*, Kaminski, Cetean & Neagu. Campanian, Scaglia Rossa Formation, Contessa Highway Section, near Gubbio, Italy. Specimen on left is the holotype, Scale bar = 100 µm. Other specimens are paratypes.

Description. Test free, elongated, tapered at both ends, with parallel sides. Coiling initially high trochospiral, reducing to biserial, and finally uniserial. Wall agglutinated, non calcareous and imperforate, silicified. Aperture terminal, a round opening.

Remarks: Differs from *Gerochammina* in the presence of a terminal uniserial part. Specimens are fragile, and broken specimens can easily be confused with the terminally biserial species *Gerochammina stanislawi* Neagu, 1990 or *Gerochammina lenis* (Grzybowski, 1896). In the Contessa Section of Italy, both *Gerochammina lenis* and *Rectogerochammina eugubina* were found to co-occur in strata of Campanian age, though the total stratigraphic range of the former species is longer, ranging from lower Campanian to upper Maastrichtian or lower Paleocene (Neagu, 1990). The holotype (PF 68306) and one paratype (PF 68307) have been deposited in the Palaeontology Department of the Natural History Museum, London. Family Prolixoplectidae.

Kaminski, M.A., Cetean, C.G. & Neagu, T. 2010. *Rectogerochammina eugubina*, n.gen., n.sp. a new agglutinated foraminifer from the Upper Cretaceous of Gubbio, Italy. *Revue de Micropaleontologie*, **53**, 121-124.

PLECTOVERNEUILINELLA Cetean & Kaminski, 2011

Type species. *Plectoverneuulinella angolaensis* Cetean & Kaminski, 2011 OD(M).

Plectoverneuulinella Cetean & Kaminski, 2011, p. 257.

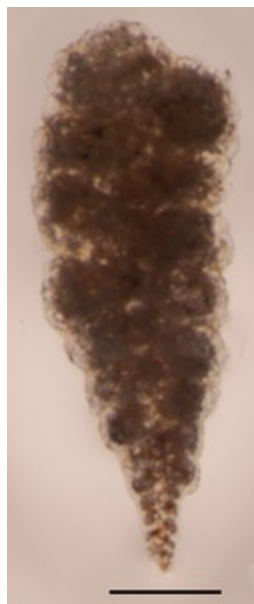


Figure 17. *Plectoverneuulinella angolaensis* Cetean & Kaminski. Oligocene, Block 17, offshore Angola, Well “A” at 2920.36 m, holotype (NHMUK PMPF 70290), side view photographed in immersion, scale = 100 μ m (from Cetean & Kaminski, 2011).

Description. Test elongate, tapered at both ends. Microsphaeric generation initially biserial, later trochospiral with 4 chambers per whorl, abruptly increasing in width at the transition. Macrosphaeric generation with proloculus followed by high trochospiral chamber arrangement comprised of 12 or more whorls with four chambers per whorl. Both generations may become terminally biserial with 1-3 pairs of biserial chambers. Walled thin, imperforate, finely agglutinated, silicified. Aperture a low interiomarginal arch. Chambers are round and inflated, with depressed sutures. Offshore Angola.

Remarks. Differs from *Verneuulinella* Tairov, 1956 in possessing an initial biserial stage in the microsphaeric generation. The type species is often abundant in the upper Oligocene of the Congo River submarine fan, offshore Angola. The types are deposited in the Department of Palaeontology, Natural History Museum, London. Family *Plectoverneuulinellidae* Cetean & Kaminski, 2011.

Cetean, C.G. & Kaminski, M.A. 2011. New deep-water agglutinated foraminifera from the Upper Oligocene of offshore Angola. *Micropaleontology*, **57** (3), 255-262.

DUBROVNIKELLA Schlagintweit & Velić, 2011

Type species. *Dubrovnikella septfontainei* Schlagintweit & Velić, 2011, OD(M).

Dubrovnikella Schlagintweit & Velić, 2011, p. 92.

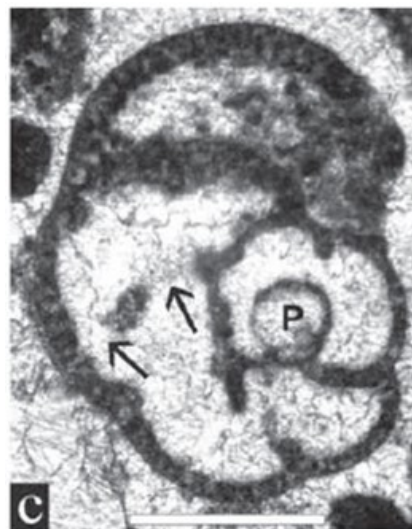


Figure 18. *Dubrovnikella septfontainei* Schlagintweit & Velić. Upper Aalenian-Lower Bajocian of the Croatian Karst Dinarides. Holotype, equatorial section, arrows point to multiple apertures, Thin section SL 2, Croatian geological survey, scale = 0.5 mm (from Schlagintweit & Velić, 2011).

Description. Test free, irregularly planispirally to streptospirally coiled in early stage, nautiloid in form; later a slight tendency to uncoil. Wall thin, finely agglutinated, with inner alveolar layer and outer imperforate epidermis. Alveoli simple, more or less parallel and more or less of equal diameter. Septa short and not alveolar. No endoskeletal structures present. Aperture single, basal in the early stage, later becoming cribrate with only a few large openings. Most likely dimorphic. Megalospheric embryonic stage complex, bilocular, consisting of a large thin-walled subglobular megalosphere and a deuteroconch partially enveloping the former.

Remarks. The pores in the wall of *Dubrovnikella* are coarser than in other representatives of the Biokoviniidae, such as *Bosniella* and *Biokovina*. *Dubrovnikella* and *Bosniella* differ from *Biokovina* in lacking endoskeletal pillars. Both *Bosniella* and *Biokovina* may develop a straight uncoiled test portion, whereas in *Dubrovnikella* only a slight tendency to uncoil is observed in rare specimens. The type specimens are from the thickly bedded limestones deposited in a back-reef setting from the Slano section, northeast of Slano village, about 25 km NW of Dubrovnik on the slopes of Kosmatovica and Kolomnić hills. The specimens are deposited in the collections of the Croatian Geological Survey, Zagreb. Family Biokoviniidae.

Schlagintweit, F. & Velić, I. 2011. New and poorly known Middle Jurassic larger benthic foraminifera from the Karst Dinarides of Croatia. *Geologica Croatica*, **64** (2), 81-99.

OLGIA Mikhalevich, 2011

Type species. *Clavulina pacifica* Cushman, 1924, OD(M).

Olgia Mikhalevich, 2011, p. 175.



Figure 19. *Olgia pacifica* (Cushman). Recent, Samoa, 1.25 fathoms off Utilei Reef, Pago Pago Harbour, side and top views of syntypes, x100 (from Cushman, 1924).

Description. Test rather large, elongated, trihedral throughout, with acute angles and pointed at the base, triangular in section, initial part rather short, triserial, later uniserial, with up to six to seven triangular chambers. Chambers have outgrowths at their angles, in the adult stage these outgrowths are open at their ends, adult shells with rows of openings along the sutures, the lower part of the chamber lumen subdivided by incomplete partitions forming half closed chamberlets at the chamber angles. Wall with large and straight canaliculi, with inner canaliculated openings dense at the wall sides and only rarely dispersed or fully absent at the bottom of the chambers, small and irregular smaller pseudopore openings of the outer wall do not reflect the character of the inner canaliculate openings, the latter being covered from the outside by a layer of flat particles. Aperture with an inner tooth plate, tooth plates of the adjacent chambers interconnected. Tropical and subtropical Pacific.

Remarks. Differs from *Clavulina* to which the type species was previously assigned by the presence of additional openings at the chamber angles and along the sutures as well as by the partially subdivided chamber interior, partitions forming half closed chamberlets. *Olgia* differs from all the other genera of the superfamily Chrysalidininoidea in the presence of an inner tooth and interconnected system of the inner tooth plates, chamberlets and sutural openings; from Pseudodictiopsellinae, Chrysalidininae and Paravalvulininae also by the presence of a uniserial part. From the

representatives of the subfamily Pseudogaudryinidae which also often have shells of triangular form (*Clavulinopsis* Banner & Desai 1985, *Clavulinoides* Cushman 1936, *Pseudogaudryina* Cushman 1936, and *Valvorenussella* Hofker 1957) the new genus differs in the absence of a biserial part and in its apertural structure as well as by the presence of additional chamber subdivision and sutural and angular openings. Species possibly belonging to this genus include *C. parisiensis*, *C. tricarinata* d'Orbigny, 1839, *C. difformis* Brady, 1884, and *C. difformis* Brady, var. *ornate*, Cushman, 1936, all of which are triangular throughout with a triserial initial part followed by a uniserial part, with interconnected inner tooth plates and angular outgrowths of the chambers. The type specimens are deposited in the Cushman Collection, Smithsonian Institution, Washington. Family Olgidae.

Mikhalevich, V.I. 2011. The new genus *Olgia* and new family Olgidae (Textulariana, Foraminifera). *Micropaleontology*, 57 (2), 173-182.

ACKNOWLEDGEMENTS

The revision of agglutinated foraminiferal genera is supported by a consortium of petroleum companies and micropaleontological consultancies (BP, Chevron, Saudi Aramco, Shell, Total, PDVSA, RPS Energy, CCG-Robertson Ltd., Petrobras and Petronas). I thank the members of the "International Working Group on Foraminiferal Classification" for their valuable input. This is contribution nr. 103 of the Deep-Water Agglutinated Foraminiferal Project.

ADDITIONAL REFERENCES

- Kaminski, M.A. 2000. The new and reinstated Genera of agglutinated foraminifera published between 1986 and 1996. In: Hart, M.B., Kaminski, M.A. & Smart, C.W. (eds), *Proceedings of the Fifth International Workshop on Agglutinated Foraminifera*. Grzybowski Foundation Special Publication, 7, 185-219.
- Kaminski, M.A. 2004. The new and revised genera of agglutinated foraminifera published between 1996 and 2000. In: Bubik, M. & Kaminski, M.A. (eds), *Proceedings of the Sixth International Workshop on Agglutinated Foraminifera*. Grzybowski Foundation Special Publication, 8, 257-271.
- Kaminski, M.A. 2008. The new and reinstated genera of agglutinated foraminifera published between 2000 and 2004. In: Kaminski, M.A. & Coccioni, R. (eds), *Proceedings of the Seventh International Workshop on Agglutinated Foraminifera*. Grzybowski Foundation Special Publication, 13, 47-55.
- Kaminski, M.A. 2011. The new and reinstated genera of agglutinated foraminifera published between 2005 and 2008. In: Kaminski, M.A. & Filipescu, S. (eds), *Proceedings of the Seventh International Workshop on Agglutinated Foraminifera*. Grzybowski Foundation Special Publication, 16, 53-59.
- Loeblich, A.R. & Tappan, H. 1987. *Foraminiferal Genera and their Classification*. Van Nostrand Reinhold. 970 pp + 847 pls.

