

## The New and Reinstated Genera of Agglutinated Foraminifera published between 1986 and 1996

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### ABSTRACT

In the 10 years following the publication of "Foraminiferal Genera and their Classification" by Loeblich & Tappan (1987), some 91 new genera of agglutinated foraminifera have been proposed by various authors. Additionally, at least four of the genera listed by Loeblich & Tappan as junior synonyms have been resurrected by subsequent authors. This compilation is an attempt at bringing together the nomenclatorial changes to the agglutinated foraminiferal genera that have appeared in the accessible literature.

### INTRODUCTION

The agglutinated foraminifera constitute a large and morphologically diversified group of organisms. In their monumental classification of foraminiferal genera, Loeblich & Tappan (1987) listed 2,455 genera that they considered as valid. Out of this number, 624 belonged to the agglutinated foraminifera. This makes the agglutinated foraminifera one of the largest and most diverse groups of the Foraminiferida.

In the 10 year period following the publication of Loeblich & Tappan's book the amount of information published on the agglutinated foraminifera has increased markedly, owing in part to the series of International Workshops on Agglutinated Foraminifera. The IWAF serves as a convenient venue to discuss taxonomy and topics dealing with the ecology and geological history of this group of organisms. A large amount of basic taxonomic work that has been carried out on the agglutinated foraminifera over this period. Most importantly, new ideas have been proposed regarding the suprageneric classification of the group (e.g., Loeblich & Tappan, 1989; 1992; Lee, 1990; Bender, 1995; Mikhalevich, 1998), a consequence of which is that the classification published by Loeblich & Tappan (1987) is now in need of updating and revision. In particular, (1) the composition of the agglutinated cement and (2) the presence of pores, canaculi, and/or alveoles are now universally accepted as having significance for the generic (and suprageneric) classification of the group. In 1987, Loeblich & Tappan still regarded some calcareous-cemented and organically-cemented forms as belonging in a single genus, and the taxonomic work connected with separating the canaliculate forms from the noncanaliculate ones was still in an early stage. The

task of investigating the wall structure of the agglutinated foraminifera is immense, as is the task of classifying the deep sea forms such as the komokiaceans, which are comparatively new to science. As this work is incrementally carried out, inevitably new foraminifera are discovered and described.

As we enter the post - Loeblich & Tappan era, there will eventually be a need to compile together the various descriptions of new genera (and emendations of existing genera) into a single database of current taxonomy. Once such list of post-1987 genera was compiled by Haman (1992), but this work needs to be continued. The current compilation is at least a first step towards this idea. In this catalogue, I provide a database of the newly described genera of agglutinated foraminifera published in the accessible literature, as well as several genera that were synonymised by Loeblich & Tappan, but have been newly reinstated. In the case of generic descriptions that were originally written in a language other than English the translations are my own, and I assume full responsibility for any inconsistencies or omissions. In the case of four genera that were originally published as *nomen nudum*, the original author of the genus names (M. Septfontaine) has kindly provided full generic descriptions for this paper.

It is my intention to update these "appendices" to Loeblich & Tappan (1987) approximately every four years as a regularly occurring chapter in future IWAF proceedings volumes. The main purpose of this work is to review recent changes and updates to the taxonomy with the goal of stabilising the generic nomenclature of the agglutinated foraminifera.

### Format of the Descriptions

The descriptions are given in the format of Loeblich & Tappan (1987), but additionally an illustration of the type species of the genus and the suggested supra-generic group (family or subfamily) that contains this genus is also given. The full literature citation is also provided. For the sake of brevity, in the event a literature citation can be found in Loeblich & Tappan (1987), it is not repeated here. The genera are reported below in approximately systematic order.

## Part 1: Genera reinstated since the publication of Loeblich & Tappan (1987)

### CAUDAMMINA Montanaro-Gallitelli, 1955

#### Figure 1

*Type species: Saccammina? caudata* Montanaro-Gallitelli, 1955 OD. [= junior synonym of *Reophax ovulum* Grzybowski, 1896].

*Carpathiella* Mjatluk, 1966, p. 262.

*Rothina* Hanzlíková, 1966, p. 104.

*Caudammina* Montanaro-Gallitelli, 1955, p. 178. SD Rögl, 1995, p. 254.



**Figure 1.** Type figures of *Reophax ovulum*, from Grzybowski (1896).

Test flask-like to subspherical, originally multilocular, provided with a tubular neck and a similar tubular basal projection. Wall thick, finely agglutinated, with organic cement, surface smooth. Tithonian to Lower Eocene; Alps, Carpathians, DSDP-ODP Sites, Cosmopolitan.

**Remarks.** Loeblich & Tappan (1964) originally regarded *Caudammina* as a synonym of *Pelosina* Brady, 1879 and later as a "genus of uncertain status" (Loeblich & Tappan, 1987). According to Kuhnt & Kaminski (1990), the type species of *Caudammina* (*S. caudata*) is conspecific with *R. ovulum* Grzybowski. Rögl (1995) reinstated the genus *Caudammina* for the Late Cretaceous forms belonging to the *C. ovulum* (Grzybowski) group.

Mjatluk (1966) designated *Reophax ovulum* the type species of *Carpathiella*, which was distinguished solely on the basis of its cryptocrystalline siliceous wall (a diagenetic feature). *Carpathiella* was included with "genera of uncertain status" by Loeblich & Tappan (1987, p. 696). *Rothina* Hanzlíková, 1967 is also regarded to be a junior synonym based on synonymy of the type species *Rothina silesica* Hanzlíková, 1967 with *Caudammina crassa* (= *Hormosina crassa* Geroch, 1960). Detailed observations of the type specimens of *R. silesica* by Bubík (1997) confirmed

that the individual chambers are not internally subdivided. Both *Carpathiella* and *Rothina* are here regarded to be fully synonymous with *Caudammina* based on the synonymy of their respective type species.

Rögl, F. 1995. A Late Cretaceous flysch-type agglutinated foraminiferal fauna from the *Trochamminoides proteus* type locality (Wien - Hütteldorf, Austria). *Grzybowski Foundation Special Publication*, 3, 249-263.

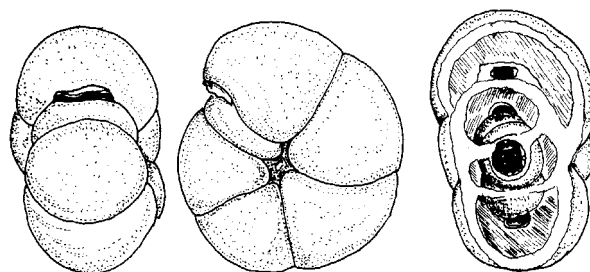
Bubík, M. 1997. What is *Rothina silesica*? A taxonomic revision of the genus *Rothina* (Foraminifera). *Annales Societatis Geologorum Poloniae*, 67, 175-182.

### RECURVOIDELLA Uchio, 1960

#### Figure 2

*Type species: Recurvoidella parkerae* Uchio, 1960, OD [= junior synonym of *Trochammina bradyi* Robertson, 1891].

*Recurvoidella* Uchio, 1960, p. 53; SD Charnock & Jones, 1990, p. 173.



**Figure 2.** Specimens of *Recurvoidella bradyi*, drawn from photographs taken by J.E. Whittaker. Right: dissected specimen showing asymmetry of coiling.

Test free, tightly coiled, comprised of several whorls. The whorls are planispiral, but the axis of coiling of previous whorls is slightly oblique to that of later whorls. As a result, one umbilicus is more evolute than the other. Wall finely agglutinated, simple, with organic cement. Aperture interiomarginal, with a lip, not symmetrical with respect to the plane of coiling of the last whorl. Palaeogene, Carpathians; Recent, Cosmopolitan.

**Remarks.** Originally regarded as a synonym of *Thalmanammina* Pokorný, 1951 by Loeblich & Tappan (1964), and later as a synonym of *Haplophragmoides* Cushman, 1910, by Loeblich & Tappan (1987). Charnock & Jones (1990) separated this genus from *Haplophragmoides* based on the slightly streptospiral coiling of the early whorls. It differs from *Recurvoides* Earland 1934 by its slightly oblique mode of coiling (rather than coiling at right angles) and its interiomarginal aperture. Subfamily: *Recurvoidinae*.

Charnock, M.A., & Jones, R.W. 1990. Agglutinated foraminifera from the Paleogene of the North Sea. In Hemleben, C., Kaminski, M.A., Kuhnt, W., & Scott, D.B. (eds), *Paleoecology, Biostratigraphy, Paleoceanography and Taxonomy of Agglutinated Foraminifera*, NATO ASI Series C327, Kluwer Acad. Publ., 139-244.

**ZANINETTIA** Brönnimann & Whittaker, 1983

## Figure 3

Type species: *Zaninettia manaarensis* Brönnimann & Whittaker, 1983, OD.

*Zaninettia* Brönnimann & Whittaker, 1983, p. 15.

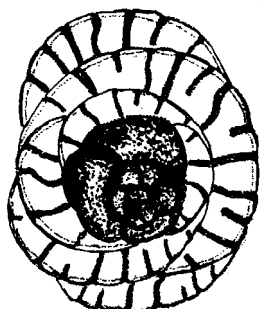


Figure 3. Specimen of *Zaninettia conica*, redrawn from Brönnimann & Whittaker (1983).

Test free or attached. Coiling trochospiral in early stage, later irregular. Aperture in the early stage is single, interiomarginal, axial to extra-axial; in the adult stage single or multiple, interiomarginal, axially-directed. Adult chambers with internal secondary septa formed by infoldings of organic inner layer of spiral chamber wall. Wall agglutinated imperforate, with spicules. Attachment to substratum by umbilical spicular mass or by sheet-like peripheral spicular flange. Recent; Indo-Pacific.

**Remarks.** Regarded by Loeblich & Tappan to be a synonym of *Carterina* Brady, 1884. Brönnimann & Whittaker (1983) and Brönnimann *et al.* (1989) regarded them as distinct genera, with *Zaninettia* the type genus of the subfamily Zaninettiinae Brönnimann & Whittaker, 1983, which is characterised by the presence of secondary septa and the absence of infoldings of the umbilical chamber wall.

Brönnimann, P., Van Dover, C.L., & Whittaker, J.E., 1989.

*Abyssotherma pacifica* n.gen. n.sp., a Recent remaneicid (Foraminiferida, Remaneicacea) from the East Pacific Rise. *Micropaleontology*, **35**, 142-149.

**SPIRORUTILUS** Hofker, 1976

## Figure 4

Type species: *Textularia carinata* d'Orbigny, 1846, p. 247; OD.

*Spirorutilus* Hofker, 1976 (\*1525), p. 69.

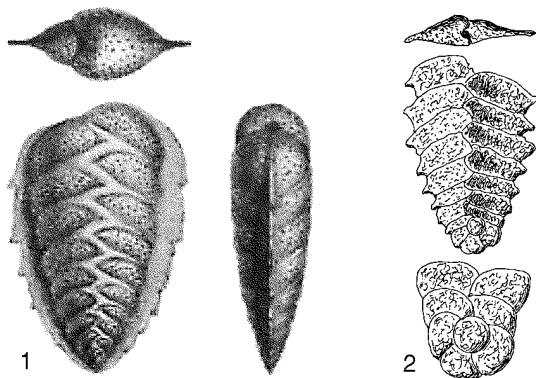


Figure 4. 1. type figure of *T. carinata*, from d'Orbigny (1946); 2. type figure of *Spirorutilus denticulatus* from Hofker (1978).

Test free, with early planispiral coil at least in the microspheric stage, followed by biserial adult stage that increases in breadth distally, is lozenge shaped in section, with a marginal keel; wall agglutinated with calcareous cement, canaliculate, interior fine grained with inner organic lining, outer part of wall more coarsely agglutinated; aperture a low arch at the base of the apertural face. Oligocene to Holocene; cosmopolitan.

**Remarks.** Originally regarded a synonym of *Spiroplectinella* by Loeblich & Tappan (1987). The genus was shown by Hottinger *et al.* (1990) to differ in its canaliculate wall structure. Hottinger *et al.* regarded it as belonging in a new (unnamed) family of the Textulariaceae, which according to them should be emended to include the initially planispiral genera.

Hottinger, L., Halicz, E., & Reiss, Z. 1990. Wall structure of *Spirorutilus*. *Journal of Foraminiferal Research*, **20**, 65-70.

## Part 2: New Genera described in the 10 years following the publication of Loeblich & Tappan (1987)

Suborder ALLOGROMIINA Loeblich&Tappan, 1961

**HETEROTHECA** Grell, 1988

## Figure 5

Type species: *Heterotheca lobata* Grell, 1988, OD(M).

*Heterotheca* Grell, 1988, p. 73.



Figure 5. Holotype of *Heterotheca lobata* redrawn from Grell (1988).

Test of different shape and size in two alternate generations; gamonts multilobed as adults, as large as 2 mm in diameter; agamonts globular as adults, as large as 300 µm in diameter. Theca formed by a thin, elastic, "pseudochitinous" membrane. Aperture in adults single with a rim turned inside to form a "stomostyle". Granular reticulopoda arise from the aperture and extramural protoplasmic layer. Test usually attached by reticulopoda. Colour variable (red, orange, brown), arising from pigment (carotin

wax) in lipid droplets distributed evenly throughout the cytoplasm. Holocene; Great Barrier Reef, N. Queensland.

**Remarks.** The distinct heteromorphy distinguishes *Heterotheca* from other allogromids in which the life cycle is known. Its description is based on the different life stages observed in laboratory culture. Family: Lagynidae.

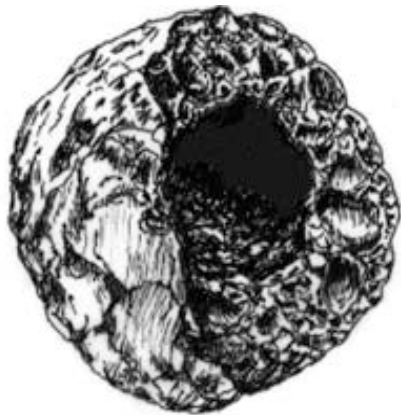
Grell, K.G. 1988. The life cycle of the monothalamous foraminifer *Heterotheca lobata*, n.gen., n.sp. *Journal of Foraminiferal Research*, **18**, 54-74.

#### BLYSMASPHAERA Brönnimann, 1988

##### Figure 6

*Type species: Blysmasphaera brasiliensis* Brönnimann, 1988, OD(M).

*Blysmasphaera* Brönnimann, 1988, p. 34.



**Figure 6.** Holotype of *Blysmasphaera brasiliensis*, redrawn from Brönnimann (1988).

Test free or attached, typically unilocular, subspherical to hemispherical (flattened on the side of attachment). Interior a single cavity that is occasionally filled with vacuoles of various size. Wall relatively thick, comprised of an organic substance, soft and flexible, without agglutinated material. Wall is comprised of three layers: a thin sheet-like outer layer, a thick vacuolar inner layer, and a thin sheet-like inner layer. No distinct aperture, but numerous irregularly distributed minute pits on outer and inner surfaces communicating through pores with vacuoles of the intermediate layer serve as an apertural system. Holocene; Brazil, brackish water mangrove swamps.

**Remarks.** The type of gametes are unknown, and this genus is only provisionally placed in the Lagynidae. Subfamily: Blysmasphaerinae Brönnimann, 1988.

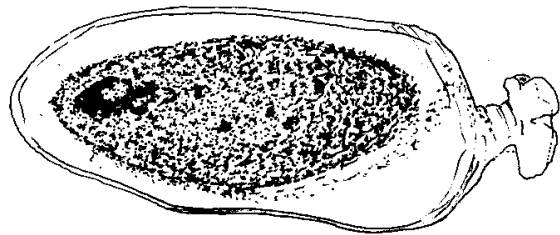
Brönnimann, P. 1988. Two new Recent Allogromiine and Textulariine genera (Protozoa: Foraminiferida) from the Brazilian Shelf. *Revue de Paléobiologie*, **7** (1), 33-42.

#### VELLARIA Gooday & Fernando, 1992

##### Figure 7

*Type species: Vellaria pellucida* Gooday & Fernando, 1992, OD.

*Vellaria* Gooday & Fernando, 1992, p. 233.



**Figure 7.** Holotype of *Vellaria pellucida* redrawn from Gooday & Fernando (1992).

Test less than 1 mm in length, symmetrically oval with a thin proteinaceous wall, in one species overlain by a thin veneer of finely agglutinated particles, in another without agglutinated particles. Apertural end produced into flaired, approximately conical or bowl-shaped structure. Cytoplasm finely granular with single large nucleus. Holocene; Vellar Estuary, India.

**Remarks.** Differs from *Allogromia* and similar genera by the presence of a flaired apertural extension. Subfamily: Allogrominae.

Gooday, A.J. & Fernando, O.J., 1992. A new allogromiid genus (Rhizopoda: Foraminiferida) from the Vellar Estuary, Bay of Bengal. *Journal of Micropalaeontology*, **11**, 233-239.

#### ASTRORHIZACEA Brady, 1881

#### CYSTINGARHIZA Bell, 1996

##### Figure 8

*Type species: Cystingarhiza mawsonae* Bell, 1996, OD.

*Cystingarhiza* Bell, 1996, p. 81.



**Figure 8.** Type specimens of *Cystingarhiza mawsonae* redrawn from Bell (1996).

Test free, small, globular to ovate, consisting of a single spherical or subspherical chamber with few (2-6) radiating tubular extensions, not all in the same plane. Wall agglutinated, of small to medium-sized sand grains with little cement visible. Apertures at

the open ends of the tubular extensions. Lower Devonian (Emsian); Eastern Australia.

**Remarks.** Differs from the modern genus *Astrammmina* Rhumbler, 1931 in its much smaller size (one-quarter to one-tenth the size) and in having stolons usually not in one plane. Family: Astrorhizidae.

Bell, K.N. 1996. Early Devonian (Emsian) agglutinated foraminiferans from Buchan and Bindi, Victoria, Australia. *Proceedings of the Royal Society of Victoria*, **108** (2), 73-106.

#### CYLINDRAMMINA Bell, 1996

##### Figure 9

*Type species: Cyindrammina stolonifera* Bell, 1996, OD(M).

*Cyindrammina* Bell, 1996, p. 84.



**Figure 9.** Type specimens of *Cyindrammina stolonifera* redrawn from Bell (1996).

Test free, consisting of an inflated tubular chamber usually slightly curved, from which protrude several (2-10) thin short stolons. Wall composed of fine grains, thin, with a slightly rough exterior but smooth interior. Aperture simple, at the end of each stolon. Lower Devonian (Emsian); Eastern Australia.

**Remarks.** Differs from both *Astrorhiza* Sandahl, 1858 and *Cystingarhiza* in the tubular shape of the test, which can be quite variable in the degree of curvature and amount of inflation. Differs from *Astrorhizoides* Shchedrina, 1969 in being more slender, with short thin stolons. Family: Astrorhizidae.

Bell, K.N. 1996. Early Devonian (Emsian) agglutinated foraminiferans from Buchan and Bindi, Victoria, Australia. *Proceedings of the Royal Society of Victoria*, **108** (2), 73-106.

#### CLADOS Schröder, Medioli & Scott, 1989

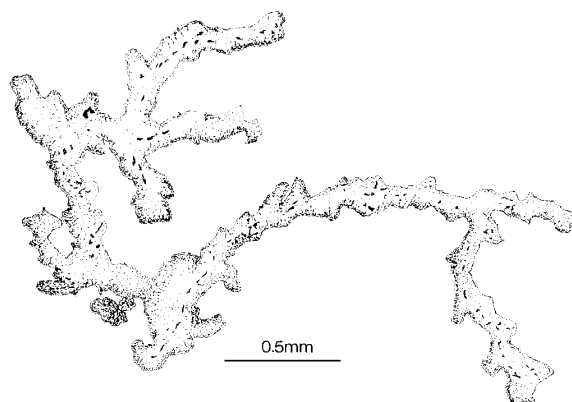
##### Figure 10

*Type species: Clados floridus* Schröder, Medioli & Scott, 1989, OD.

*Clados* Schröder, Medioli & Scott, 1989, p. 15.

Test branch-like, ramose, unconstricted, 2 to 3 mm in length. Section of branches regularly subcylindrical. Branching of three orders: third order branches incompletely developed and left as short, sturdy

stubs at the nodes on first and second order branches. Random pattern of growth. Agglutinated particles comprised of mud. Holocene; North Atlantic, at 5,775 m.



**Figure 10.** Holotype of *Clados floridus* from Schröder *et al.* (1989).

**Remarks.** Test is opaque, large stercomata form a bead-like structure throughout the test. Differs from *Arbor* Schröder, Medioli & Scott, 1989, in its branching pattern and in having a subcylindrical cross section throughout the test. Subfamily: Astrorhizinae.

Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropaleontology*, **35**, 10-48.

#### GLOBODENDRINA

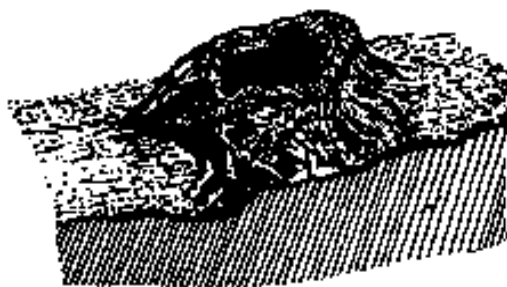
Plewes, Palmer & Haynes, 1993.

##### Figure 11

*Type species: Globodendrina monile* Plewes, Palmer & Haynes, 1993, OD(M).

*Globodendrina* Plewes, Palmer & Haynes, 1993, p. 83.

Test small (1 to 2 mm across), boring in carbonate substrate, consisting of a fan-like tunnel system issuing from one side of a globular chamber. Main branches are more or less circular in cross section and subtend finer branches, of which upward-directed ones open onto substrate surface. Main chamber with single opening to surface, surrounded by a conical agglutinated chimney of well-sorted fine silt particles in cement. Upper Jurassic, Oxford Clay; England, France.







**Figure 11.** Specimens of *Globodendrina monile* redrawn from Plewes *et al.* 1993. Above - external view; below - Branching specimen is a resin cast.

**Remarks.** Resembles the Holocene genus *Notodendroides* in possessing a bulbous central portion and tree-like branches, but differs in being excavated by boring rather than being buried in soft sediment. The presence of the agglutinated chimney and their small size suggests the borings were produced by foraminifera. Because of the presence of an agglutinated chimney in well-preserved specimens, they were described as body fossils rather than as ichno-fossils. Their morphology is best observed in epoxy moulds. Family: Astorhizidae.

Plewes, C.R., Palmer, T.J., & Haynes, J.R. 1993. A boring foraminiferan from the Upper Jurassic of England and northern France. *Journal of Micropalaeontology*, **12**, 83-89.

#### CRESPINITELLA Rauser and Reitlinger, 1993

Figure 12

Type species: *Hippocrepinitella biaperta* Crespin, 1958 OD(M).

*Crespinitella* Rauser and Reitlinger, 1993, p. 19.



**Figure 12.** Paratypes of *Hippocrepinitella biaperta*, modified from Crespin (1958).

Test tubular or roller shaped, straight, with both ends broadly rounded. Surface smooth, with irregular narrow constrictions, comprised of fine siliceous material. Apertures broad round openings at constricted ends of the test, with thickened lips. Permian; Western Australia and Tasmania.

**Remarks.** Differs from *Hippocrepinitella* in the thickened rim around the apertures and in its broad circular apertural opening. Family: Bathysiphonidae.

Vdovenko, M.V., Rauzer-Chernousova, D.M., Reitlinger, E.A., & Sabirov, A.A. 1993. Spravochnik po sistematike melkikh foraminifer Paleozoya (za isklyucheniem endotiroidey I permskikh mnogokamernykh lagenoidy. [A reference-book on the systematics of Paleozoic Foraminifera (excluding endothyrids and Permian multichambered lagenids)] Izdat. Nauka, Moscow, 1-125.

Crespin, I. 1958. Permian foraminifera of Australia. *Bureau of Mineral Resources, Geology and Geophysics Bulletin* 58, 1-207.

#### LINEA Schröder, Medioli & Scott, 1989

Figure 13

Type species: *Linea simplex* Schröder, Medioli & Scott, 1989, OD.

*Linea* Schröder, Medioli & Scott, 1989, p. 16.

Test string-like, a thin unbranching flexible tube of consistent diameter (80 µm), several centimetres long, with no visible proloculus. Dark material, probably stercomata, fills the tube. Agglutinated grains comprised of silt. Holocene; North Atlantic, at 5,775 m.



**Figure 13.** Holotype of *Linea simplex* from Schröder *et al.* (1989).

**Remarks.** This form is reminiscent of *Dendrophrya* Wright, but differs in being unbranched. It differs from *Bathysiphon* in its smaller diameter and thinner wall. Subfamily: Rhabdammininae.

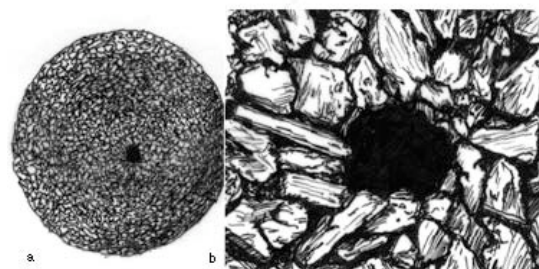
Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropalaeontology*, **35**, 10-48.

#### MARSUPULINOIDES Brönnimann, 1988

Figure 14

Type species: *Marsupulinoides ovatus* Brönnimann, 1988, OD(M).

*Marsupulinoides* Brönnimann, 1988, p. 38.



**Figure 14.** Holotype of *Marsupulinoides ovatus*, redrawn from Brönnimann (1988). a. whole specimen; b. detail of aperture.

Test free, monothalamous, spherical to subspherical, ellipsoid, ovoid, often irregularly deformed. Wall thin, agglutinated, with organic cement, and inner and outer organic linings. Aperture either missing, or a single irregularly rounded opening, not produced. Holocene; Brazilian Shelf, normal marine.

**Remarks.** Differs from *Saccammina* Carpenter, 1869 in possessing either no distinct aperture or a single irregularly rounded opening whose border is flush with the surface of the test, whereas *Saccammina* always has a single aperture produced on a short neck. Subfamily: Saccamininae.

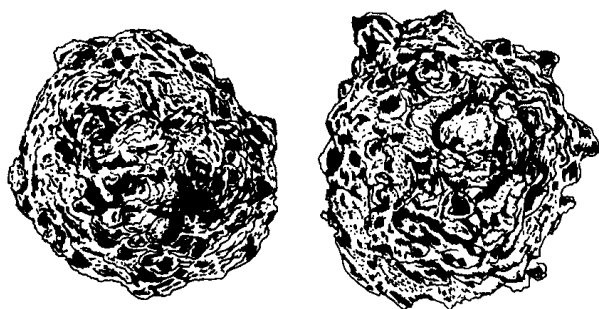
Brönnimann, P. 1988. Two new Recent Allogromiine and Textulariine genera (Protozoa: Foraminiferida) from the Brazilian Shelf. *Revue de Paléobiologie*, 7(1), 33-42.

**SACCAMMINELLA** Brönnimann, Whittaker, & Zaninetti, 1992

Figure 15

*Type species: Saccaminella salsa* Brönnimann, Whittaker, & Zaninetti, 1992, OD(M).

*Saccaminella* Brönnimann, Whittaker, & Zaninetti, 1992, p. 42.



**Figure 15.** Type specimens of *Saccaminella salsa*, redrawn from Brönnimann *et al.* (1992).

Test free or attached, irregularly subglobular to ovoid in shape, occasionally with solid spine-like protuberances. Aperture a single minute opening, flush with surface, or no opening visible. Wall agglutinated, thin. Holocene; Kumbuna River, Fiji.

**Remarks.** This brackish water genus is close to the marine *Saccammina* from which it differs in the thin wall and minute pore-like single aperture. Subfamily: Saccamininae.

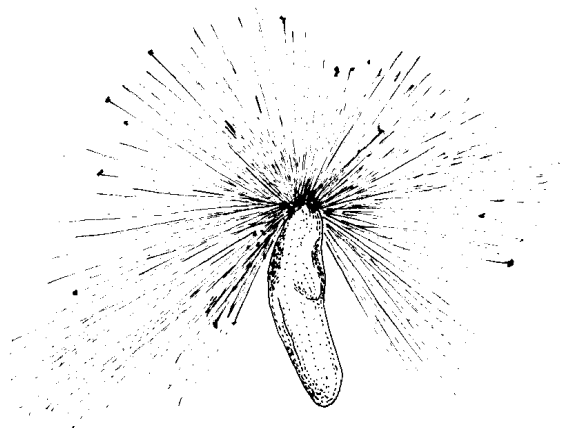
Brönnimann, P. Whittaker, J.E. & Zaninetti, L. 1992. Brackish water foraminifera from mangrove sediments of southwestern Viti Levu, Fiji Islands, southwest Pacific. *Revue de Paléobiologie*, 11, 13-65.

**CRIBROTHALAMMINA** Goldstein & Barker, 1988

Figure 16

*Type species: Hippocrepinella alba* Heron-Allen & Earland, 1932, OD(M).

*Cribrothalammina* Goldstein & Barker, 1988, p. 135.



**Figure 16.** Specimen of *Hippocrepinella alba*, redrawn from Goldstein & Barker (1988, pl. 1, fig. 1).

Test free, finely agglutinated, flexible in living individuals, composed of agglutinated materials, organic cement and inner organic lining. Test ovoid to fusiform. Aperture single, simple, at the end of a short neck, may have an external agglutinated collar. Pores form in a regular array over the entire gamontic test during gametogenesis. Holocene; Georgia USA, South Georgia, California, Scandinavia, marsh to deep water.

**Remarks.** Distinguished by the presence of pores formed in a regular array over the entire gamontic test during gametogenesis. Subfamily: Saccamininae.

Goldstein, S.T. & Barker, W.W. 1988. Test ultrastructure and taphonomy of the monothalamous agglutinated foraminifer *Cribrothalammina* n.gen., *alba* (Heron-Allen & Earland). *Journal of Foraminiferal Research*, 18, 130-136.

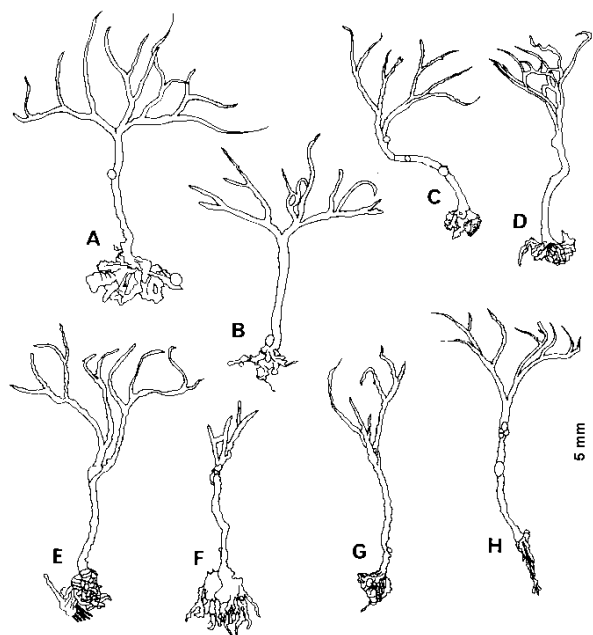
**ARBORAMMINA** Shires, Gooday & Jones, 1994

Figure 17

*Type species: Arborammina hilaryi* Shires, Gooday & Jones, 1994, OD(M).

*Arborammina* Shires, Gooday & Jones, 1994, p. 150.

Test large (1.5 - 2 cm), flexible, arborescent with a basal swelling buried in the sediment, and an erect parallel-sided stem which projects up into the water and divides distally into a semicircular crown of branching arms. All parts of the test are composed of fine mineral and biogenic particles held together by a system of organic fibrils and an extensive network of possibly organic cement or protoplasmic material which penetrates and covers large portions of the test. The bulk of the protoplasm probably resides within one or more large globigerinacean tests which are incorporated into the basal swelling and/or stem, with one typically found just below the branching complex. Holocene; northeast Atlantic.



**Figure 17.** Type figures of *Arborammina hilaryi* from Shires, Gooday & Jones (1994).

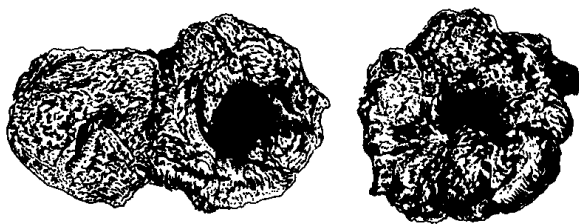
**Remarks.** Differs from *Notodendrodes* DeLaca, Lipps, & Hessler, 1980, with which it bears external similarity, in lacking a well-developed root system and chamber lumen. In *Notodendrodes* the basal bulb, root stem, and branches are hollow and the bulb has a double layered structure. Family: Arboramminidae Shires, Gooday & Jones, 1994.

Shires, R., Gooday A.J., & Jones, A.R. 1994. A large new agglutinated foraminifer (Arboramminidae n.fam.) from an oligotrophic site in the abyssal northeast Atlantic. *Journal of Foraminiferal Research*, **24**, 149-157.

#### PATELLAMMINA Bell, 1996

Figure 18

Type species: *Patellammina prona* Bell, 1996, OD(M).  
*Patellammina* Bell, 1996, p. 97.



**Figure 18.** Type specimen of *Patellammina prona* redrawn from Bell (1996).

Test apparently free, multilocular, up to three chambers joined in an irregular series. Chambers are flattened, disc-like, with a floor. In section the chambers are miniscus shaped. Aperture an irregular hole, usually subcircular, in the concave (?basal) face. Test coarsely agglutinated with a rough surface. Lower Devonian (Emsian); Eastern Australia.

**Remarks.** Differs from both *Hemisphaerammina* Loeblich & Tappan, 1957 and *Webbinelloidea* Stewart & Lampe, 1947 in being very flattened and not hemispherical, and from both *Hemisphaerammina* and *Colonammina* Moreman, 1930 in the occurrence of not only single chambered but multiple chambered tests. Additionally, *Colonammina* and *Ammopemphix* have an aperture on the upper, convex surface. Subfamily: Hemisphaerammininae.

Bell, K.N. 1996. Early Devonian (Emsian) agglutinated foraminiferans from Buchan and Bindi, Victoria, Australia. *Proceedings of the Royal Society of Victoria*, **108** (2), 73-106.

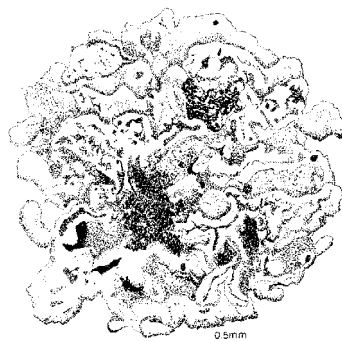
KOMOKIACEA Tendal & Hessler, 1977

#### CEREBRUM Schröder, Medioli & Scott, 1989

Figure 19

Type species: *Cerebrum coralliformis* Schröder, Medioli & Scott, 1989, OD.

*Cerebrum* Schröder, Medioli & Scott, 1989, p. 22.



**Figure 19.** Holotype of *Cerebrum coralliformis* Schröder et al. (1989),

Test varies from cerebral to bush-like ramose, spread out or tightly packed around the centre, with all intermediate degrees of spreading. Fistulae large, numerous, dichotomous or trichotomous. Wall loosely cemented, agglutinated material consists of mud. Holocene; North Atlantic, at 5,775 m.

**Remarks.** Differs from *Lana* Tendal & Hessler, 1977 in being markedly less tumultuous and in the larger diameter of the fustulae, which are 75-100 µm in diameter in the type species. Stercomata are clearly lined up in one row of beads in the centre of the fistulae. The test is fairly flexible. Family: Komokiidae.

Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropaleontology*, **35**, 10-48.

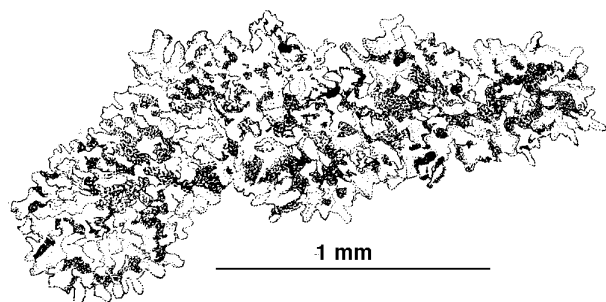
#### RETICULUM Schröder, Medioli & Scott, 1989

Figure 20

Type species: *Reticulum pingue* Schröder, Medioli & Scott, 1989, OD.

*Reticulum* Schröder, Medioli & Scott, 1989, p. 31.





**Figure 20.** Holotype of *Reticulum pingue* Schröder *et al.* (1989).

Test sponge shaped, multiramose, tumultuose, reticulate, thoroughly anastomosed, forming a complex dense reticular trellis. Short fistulae branch irregularly in three dimensions at every node, then anastomose with other fistulae to form irregular polygonal rings. Agglutinated material comprised of clay. Holocene; North Atlantic, at 5,775 m.

**Remarks.** Differs from *Lana* in being less tumultuose and in its three-dimensional reticulate structure. Because of its spongy nature, *Reticulum* traps mud particles, making detailed observation of its inner structure problematic. Family: Komokiidae.

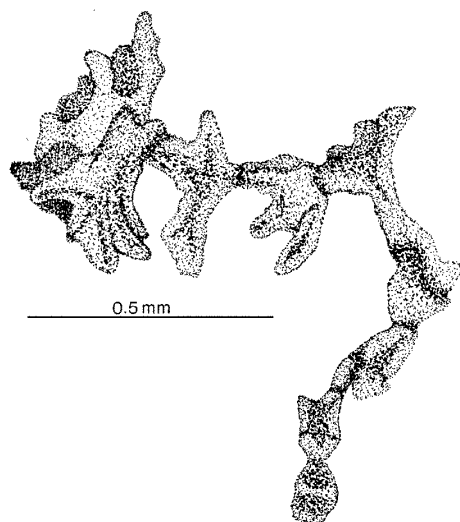
Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropaleontology*, **35**, 10-48.

#### ARBOR Schröder, Medioli & Scott, 1989

##### Figure 21

*Type species: Arbor cuspidata* Schröder, Medioli & Scott, 1989, OD.

*Arbor* Schröder, Medioli & Scott, 1989, p. 36.



**Figure 21.** Holotype of *Arbor cuspidata* Schröder *et al.* (1989).

Test tree-like, simple to complex, ramose, vertebral, spinose, multiconstricted. Branching of first and second order only. Cross section of branches rather irregular. Test may be straight or bent to form an

irregular ring which collects sediment particles to form a mud ball. Segments between nodes thin and fairly long, nodes dichotomous to polychotomous. Holocene; North Atlantic.

**Remarks.** Differs from *Baculella* Tendal & Hessler, 1977 in possessing well developed side branches with a tendency to increase in size towards one end. Differs from *Clados* in having only two orders of branches and in its irregular cross section through the test. Specimens have a tendency to curl their tests into irregular rings which collect sediment particles to form mud balls. Family: Baculellidae.

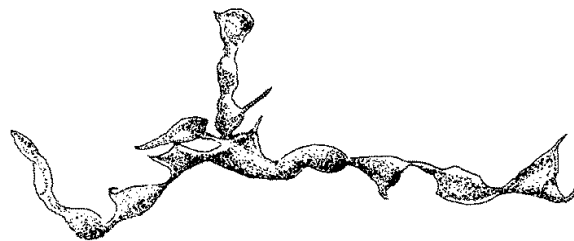
Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropaleontology*, **35**, 10-48.

#### CATENA Schröder, Medioli & Scott, 1989

##### Figure 22

*Type species: Catena piriformis* Schröder, Medioli & Scott, 1989, OD.

*Catena* Schröder, Medioli & Scott, 1989, p. 40.



**Figure 22.** Type specimen of *Catena piriformis* redrawn from Schröder *et al.* (1989).

Test chain-like, ramose, catenulate, compressed. Dichotomously ramose with irregular chambers separated by well-marked constrictions. Test flexible, transparent when not filled with stercomata, chambers irregularly pyriform, separated by well-marked constrictions. Agglutinated material consists of clay. Holocene; North Atlantic, at 5,775 m.

**Remarks.** Gooday (1983) illustrated a "tectinous chain" from the northeast Atlantic which probably belongs in this genus. Family: Baculellidae.

Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropaleontology*, **35**, 10-48.

#### CHONDRODAPIS Mullineaux, 1988

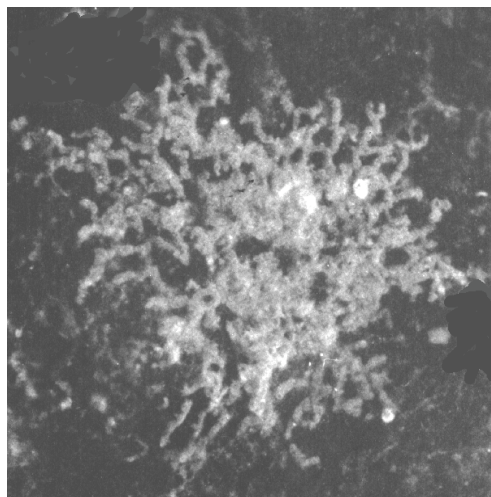
##### Figure 23

*Type species: Chondrodapis hessleri* Mullineaux, 1988, OD.

*Chondrodapis* Mullineaux, 1988, p. 47.

Test encrusting, covering up to 10 mm<sup>2</sup> of substrate area. Tubules 50-150 µm in diameter, attached to nodule at center of test and upright or pseudo-attached along length of tubule as it radiates from center. Wall composed of fine particles, mostly clay, in a flexible organic matrix, taking on the colour of

nearby sediment. Interstices between tubules filled with sediment in some specimens. Apertures not apparent under light microscope. Protoplasm and stercomata present along entire length of tubules, with stercomes concentrated along center of tubules. Holocene; North Pacific, at 4,500 m.



**Figure 23.** Type specimen of *Chondrodapis hessleri* from Mullineaux (1988).

**Remarks.** *Chondrodapis* is distinguished by its attached test, body composed of tubules constricted at intervals. Constrictions near ends of tubules delimit terminal bead-like sections, imparting a granular appearance to the surface. It differs from other genera in the family Baculellidae by its encrusting growth form. It differs from encrusting foraminifera in the family Telamminidae (e.g., *Tumidotubus* Gooday & Haynes, 1983 and *Telammina* Gooday & Haynes, 1983) in having regular constrictions of the tubules and in its flexible, unmineralised test wall. Family: Baculellidae.

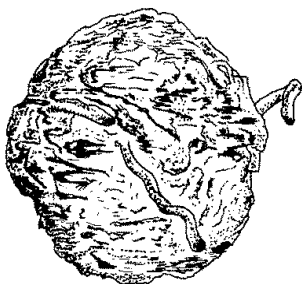
Mullineaux, L.S. 1988. Taxonomic notes on large agglutinated foraminifera encrusting manganese nodules, including the description of a new genus, *Chondrodapis* (Komokiacea). *Journal of Foraminiferal Research*, **18**, 46-53.

#### GLOBIPELORHIZA Cedhagen & Mattson, 1991

##### Figure 24

*Type species: Globipelorhiza sublittoralis* Cedhagen & Mattson, 1991, OD(M).

*Globipelorhiza* Cedhagen & Mattson, 1991, p. 210.



**Figure 24.** Type specimen of *Globipelorhiza sublittoralis* redrawn from Cedhagen & Mattson (1991).

Test free, agglutinated. The body consists of a central, compact, spherical part and several long outer branches. The central body consists of randomly winding, anastomosing protoplasmic strings in a matrix of agglutinated clayey sediment. Protoplasmic strings very thick, up to 150 µm in diameter. No bead-like structures present. Holocene; Kosterfjorden, Sweden, at 60-721 m.

**Remarks.** *Globipelorhiza* resembles *Cerebrum* in having thick branches, but differs in having a clearly defined central body, in which the interspaces are infilled with agglutinated sediment. It resembles *Edgertonina* Tendal and Hessler, 1977 in general shape, but differs in lacking bead-like structures and stercomata in the protoplasm, and in having fewer and wider branches. It differs from *Staphylion* in having outer branches, and in lacking a mucilaginous layer and grape-like (diffugiform) bodies.

Cedhagen, T., & Mattson, S. 1991. *Globipelorhiza sublittoralis* gen. et sp.n., a komokiacean (Protozoa: Foraminiferida) from the Scandinavian sublittoral. *Sarsia*, **76**, 209-213.

#### AMMODISCACEA Reuss, 1862

#### RECTOAMMODISCUS Reitlinger, 1993

##### Figure 25

*Type species: Involutina longexsertus*, Gutschick & Treckman, 1959, OD.

*Ammodiscus* (*Rectoammodiscus*) Reitlinger, in Vdovenko *et al.* (1993), p. 49.



**Figure 25** Type specimens of *Involutina longexsertus*, modified from Gutschick & Treckman (1959).

"Differs from the nominal genus [*Ammodiscus*] in its elongated rectilinear terminal part." Mississippian; Indiana.

**Remarks.** Originally defined as a subgenus of *Ammodiscus*, this taxon is here elevated to generic rank. Although the type species was originally placed in the genus *Involutina*, the test is agglutinated, described by Gutschick & Treckman (1959) as "composed of fine sand which is fairly well cemented". In both of the species described by Gutschick & Treckman as *Involutina*, (*I. exsertus* and *I. longexsertus*) the rectilinear part turns away from the coiled portion at right angles. Family: Ammodiscidae.

Vdovenko, M.V., Rauzer-Chernousova, D.M., Reitlinger, E.A., & Sabirov, A.A. 1993. Spravochnik po sistematike melkikh foraminifer Paleozoya (za isklyucheniem endotiroidey I permskikh mnogokamernykh lagenoidy. [A reference-book on the systematics of Paleozoic Foraminifera (excluding endothyrids and Permian multichambered lagenids)] Izdatelstvo "Nauka", Moscow, 1-125.

### SATURNELLA Hedinger, 1993

Figure 26

Type species: *Saturnella brookae* Hedinger, 1993, OD.  
*Saturnella* Hedinger, 1993, p. 33.

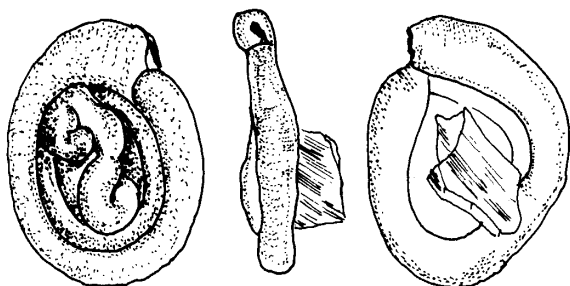


Figure 26. Holotype of *Saturnella brookae* redrawn from Hedinger (1993).

Test attached to free or isolated detrital particle (sand grain or foraminiferal test), medium sized, consisting of proloculus followed by undivided tubular second chamber. Initial few whorls coil irregularly on attachment surface, later portion becoming planispiral as in *Ammodiscus*. Aperture at the open end of the tube. Upper Jurassic; Northwest Territories.

**Remarks.** *Saturnella* differs from *Tolypammina sensu* Kosyreva, in Dain *et al.* (1972) in being attached to a free detrital grain rather than to a stable surface, and in its distinctive planispiral coiling in the later portion of the test. Subfamily: Tolypammininae.

Hedinger, A.S. 1993. Upper Jurassic (Oxfordian-Volgian) foraminifera from the Husky Formation, Aklavik Range, District of MacKenzie, Northwest Territories. *Geological Survey of Canada Bulletin*, 439, 173 pp.

### RECTOPILAMMINA Urošević, 1992

Figure 27

Type species: *Rectopilammina editea* Urošević, 1992 OD.

*Rectopilammina* Urošević, 1992, p. 168.

Test attached, rounded to elongate, composed of a small or broad to spherical proloculum and a long, thin, unpartitioned chamber. Coiling in early stage is streptospiral, *Pilammina*-type, later slowly unwinding, alternating its axis at acute angles, up to 90°, forming 12 to 20 coils. Terminal stage is uncoiled and straight, forming a trochospiral, or the tube widens into an irregular tubular chamber. Wall is imperforate, comprised of microgranular calcite with the

addition of agglutinated material. Aperture round, at the open end of the tube. Permian-Triassic (Rhaetian); Serbia.

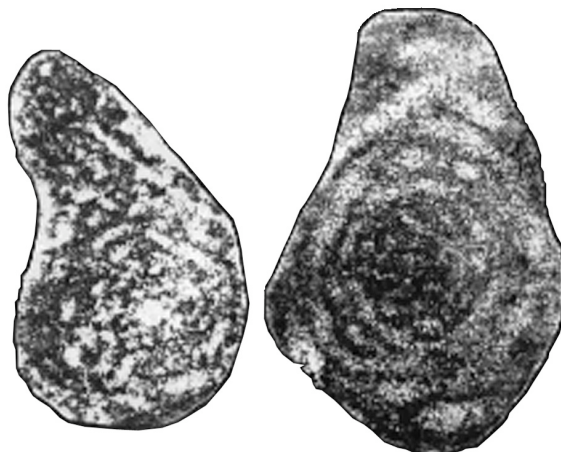


Figure 27 Holotype (left) and paratype (right) of *Rectopilammina editea* from Urošević (1992).

**Remarks.** Differs from *Orthovertella* Cushman & Waters, 1928 in its agglutinated microgranular wall structure. Subfamily: Pilammininae; Family: Ammodiscidae.

Urošević, D. 1992. *Rectopilammina* n.gen. and *Hoheneggerinella* n.gen. (Foraminiferida) from Triassic sediments of Eastern Serbia. *Geoloski Anali Balkanskoga Poluostrova*, 56(2), 163-175.

### PAULBRONNIMANNIA Rettori & Zaninetti, 1993

Figure 28

Type species: *Agathammina judicariensis* Premoli Silva, 1971, OD.

*Paulbronnimannia* Rettori & Zaninetti, 1993, p. 176.

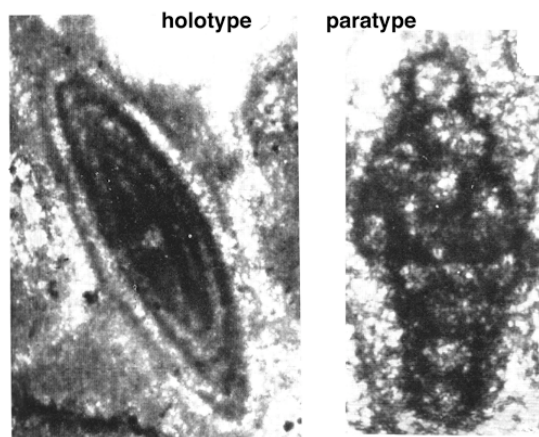


Figure 28. Type specimens of *Agathammina judicariensis* scanned from Premoli Silva (1971).

Test small, early stage fusiform, later may become compressed and slightly twisted. Proloculus followed by an enrolled long narrow undivided tubular second chamber. Early stage involute, coiled in various planes radially arranged, later evolving to



form a sigmoid curve as in *Sigmoilina*, and finally becoming oscillating and planispiral, evolute. Wall calcareous, thin, microgranular, opaque in transmitted light. Aperture simple, terminal. Middle Triassic; Italy. Subfamily: Paulbronnimanninae Rettori & Zaninetti, 1993; Family: Ammodiscidae.

Rettori, R. & Zaninetti, L. 1993. *Paulbronnimannia* n.gen. (Foraminiferida, Ammodiscidae, Paulbronnimanninae, n.subfam., Trias) un nuovo genere per *Agathammina judicariensis* Premoli Silva, 1971. *Revue de Paléobiologie*, 12, 175-177.

#### PAULBRONNIMANNELLA Rettori, 1994

Figure 29

Type species: *Paulbronnimannella whittakeri* Rettori, 1994. OD(M).

*Paulbronnimannella* Rettori, 1994, p. 344.



Figure 29. Specimens of *Paulbronnimannella whittakeri* scanned from Rettori (1994).

Test small, early stage fusiform in shape, later flattened and compressed, may become slightly twisted. Globular proloculus followed by an enrolled long, narrow, undivided tubular chamber. Early stage involute, coiled in various planes radially arranged, later evolving to form a sigmoid curve, and finally a long oscillating to planispiral evolute stage. Wall calcareous, thin, microgranular, opaque in transmitted light. Aperture probably simple, terminal. Middle Triassic; Italy. Subfamily: Paulbronnimanninae.

**Remarks.** *Paulbronnimannella* differs from *Paulbronnimannia* in the smaller size of the enrolled initial portion and in the more developed oscillating to planispiral later stage. It differs from the Triassic genus *Gandinella* Ciarapica & Zaninetti, 1985 in that the latter has several sigmoid stages, each followed by one to 1 1/2 whorl with a 90° change in the plane of coiling.

Zaninetti, L., Rettori, R. & Martini, R., 1994. Paulbronnimanninae Retori & Zaninetti, 1993 (Foraminiferida, Ammodiscidae) and other Anisian foraminifers from the Piz de Peres Section (Valdaora-Olang, Pusteria Valley, Dolomites, NE Italy). *Revista Italiana di Paleontologia e Stratigrafia*, 100, 339-350.

#### HORMOSINACEA Haeckel, 1894

#### CALOS Schröder, Medioli & Scott, 1989

Figure 30

Type species: *Calos chalazius* Schröder, Medioli & Scott, 1989, OD.

*Calos* Schröder, Medioli & Scott, 1989, p. 41.

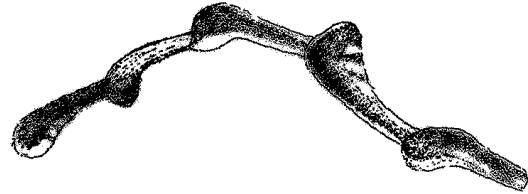


Figure 30. Holotype specimen of *Calos chalazius* redrawn from Schröder *et al.* (1989).

Test subcylindrical, slightly curved, nonbranched, and subdivided into pipe-shaped chambers growing in size very slowly. Overall appearance is knotty, rope-like, catenulate, nodose. A single aperture is observed. Agglutinated material comprised of silt. Holocene; North Atlantic, at 5,775 m.

**Remarks.** Differs from *Aschemonella*, which has a similar chamber arrangement, in possessing a single aperture instead of several. Chambers are filled with stercomata. Family: Aschemocellidae

Schröder, C.J., Medioli, F.S., & Scott, D.B. 1989. Fragile abyssal foraminifera (including new Komokiacea) from the Nares Abyssal Plain. *Micropaleontology*, 35, 10-48.

#### ROPOSTRUM Jonasson & Schröder-Adams, 1996

Figure 31

Type species: *Ropostrum amuletum* Jonasson & Schröder-Adams, 1996, OD(M).

*Ropostrum* Jonasson & Schröder-Adams, 1996, p. 142.

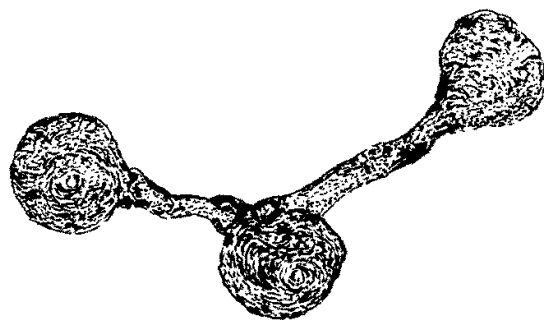


Figure 31. Type specimen of *Ropostrum amuletum* redrawn from Jonasson & Schröder-Adams (1996).

Test agglutinated, attached to substrate, consisting of a few chambers, circular in outline. Chambers connected in series by thin tubes. Aperture not distinguished. Holocene; Juan de Fuca Ridge, at 2412 m.

**Remarks.** *Hormosinella* Shchedrina, 1969 differs in its larger test which is not attached to the substrate. *Telammina* differs in possessing minute chambers from which radiate two to four fine stolon-like tubes.

*Tumidotubus* differs in having oval to elongate chambers forming a chain which may branch. Family: Telamminidae.

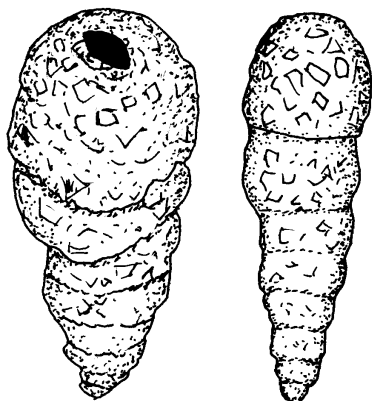
Jonasson, K.E. & Schröder-Adams, C.J. 1996. Encrusting agglutinated foraminifera on indurated sediment at a hydrothermal venting area on the Juan de Fuca Ridge, Northeast Pacific Ocean. *Journal of Foraminiferal Research*, **26**, 137-149.

#### ACOSTATA Brönnimann, Whittaker & Valleri, 1992

##### Figure 32

*Type species: Reophax mariae* Acosta, 1940.

*Acostata* Brönnimann, Whittaker & Valleri, 1992, p. 100, OD.



**Figure 32.** Specimens of *Acostata mariae* (Acosta) redrawn from Brönnimann *et al.* (1992).

Test free, uniserial, rectilinear, chambers radially symmetrical in transverse section. Aperture a single, terminal, lenticular slit with pointed extremities, bilaterally symmetrical. Wall agglutinated, Trochamminina-like. Recent; Venice Lagoon, Italy; Gulf of Santa Maria, Cuba.

**Remarks.** Differs from *Cuneata* Fursenko, 1979 by its uncompressed, radially symmetrical transverse section. Subfamily: Cuneatinae.

Brönnimann, P., Whittaker, J.E., and Valleri, G., 1992. Agglutinated foraminifera from the Lagoon of Venice, Italy. *Revue de Micropaléontologie*, **11**, 97-109.

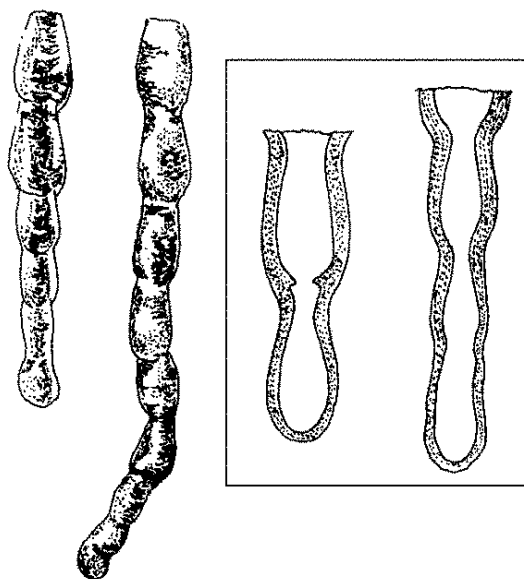
#### ROCKFORDINA Rauser & Reitlinger, 1986

##### Figure 33

*Type species: Reophax lacrymosus* Gutschick & Treckman, 1959, OD.

*Rockfordina* Rauser & Reitlinger, 1986, p. 14.

Test tubular, consisting of rectilinear arranged chambers, sometimes slightly curved. Chambers pear-shaped, increase slowly in size, connected by wide stolons. The interior test cavity is not fully divided, with only slight and irregular constrictions in the initial third of the test. Number of chambers up to 10. Wall agglutinated, consisting of fine-grained quartz or other particles with a large amount of siliceous cement. Aperture terminal, end of test open. Carboniferous; Indiana, Kentucky, Ohio, Texas.



**Figure 33.** Type specimens of *Reophax lacrymosus* redrawn from Gutschick & Treckman (1959).

**Remarks.** Differs from the genus *Hormosinella* by the pyriform shape of the chambers and in the hyperamminid type initial part of the test. Family: Hormosinellidae Rauser & Reitlinger, 1986.

Rauser-Chernousova, D.M. & Reitlinger, Ye.A. 1986. On the suprageneric systematics of the Order Hormosinida (Foraminifera). *Paleontologicheskii Zhurnal*, **1986**, 4, 15-20.

#### KUNKLERINA Rauser & Reitlinger, 1986

##### Figure 34

*Type species: Reophax kunklerensis* Conklin, 1961, OD.

*Kunklerina* Rauser & Reitlinger, 1986, p. 15.



**Figure 34.** Type specimen of *Reophax kunklerensis* redrawn from Conklin (1961).

Test consisting of rectilinearly arranged chambers of subspherical or pyriform shape, each enclosing the terminal part of the preceding chamber. Sutures horizontal. Chambers increase in size slowly and are round in transverse section. Number of chambers usually large, 8 or 9, but in some species only 4 or 5. Wall agglutinated, solid, mineralized, with a rough surface. Aperture terminal, central, round, on the projecting part of the chamber or on a short neck. Carboniferous-Permian; Indiana, Texas, Australia.

**Remarks.** Differs from *Scherchorella* Loeblich & Tappan, 1984 in having chambers that are round, not flattened along the axis, their higher, more spherical shape, and in the projecting apertural end of the test. Family: Kunklerinidae Rauser & Reitlinger, 1986.

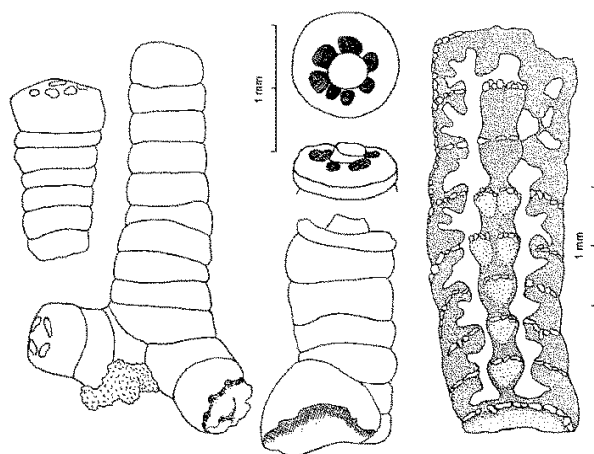
Rauzer-Chernousova, D.M. & Reytlinger, Ye.A. 1986. On the suprageneric systematics of the Order Hormosinida (Foraminifera). *Paleontologicheskii Zhurnal*, 1986, 4, 15-20.

#### AXICOLUMELLA Hercogova, 1988

Figure 35

*Type species: Lituola cylindrica* Perner, 1892, OD.

*Axicolumella* Hercogova, 1988, p. 172.



**Figure 35.** Specimens of *Axicolumella cylindrica*, modified from Hercogova (1988).

Test uniserial with base attached by one or more chambers, later growing free from the sediment, cylindrical, rarely bifurcating. Numerous chambers broader than high, with almost constant shape and size. Terminal face of the last chamber is flat to slightly convex, with 6 to 14 apertural openings in the adult, arranged in a circle, with 1 or 2 openings in the centre. Wall agglutinated, consisting of quartz grains and calcareous cement, alveolar, with three layers. The exostratum is comprised of quartz grains with a small amount of calcareous cement. The mesostratum is made of quartz grains scattered in a large amount of cement. The thin endostratum is composed of microcrystalline calcite. Tubules penetrate the mesostratum and pass into alveoles in its upper layer. Alveoles open out among the quartz grains of the exostratum. Test interior is regularly labyrinthic. In the centre of the test there is an axial column composed of segments which are components of the individual chambers. The segments have the shape of truncated cones, narrower at the base. During ontogeny the cones develop 1 or 2 internal cup-shaped cavities emerging in the centre of the apertural face as one or two central apertural openings. Turonian; Czech Republic.

**Remarks.** The type species, *A. cylindrica*, has up to 23 chambers and reaches a size of 8 mm. Family: Thomasinellidae.

Hercogova, J. 1988. *Acruliammina*, *Bdelloidina* & *Axicolumella* n.gen. (Foraminifera) from the Cretaceous transgressive sediments of the Bohemian Massif. *Sbornik geologických Ved, Paleontologie*, 29, 145-189.

#### LITUOLACEA de Blainville, 1827

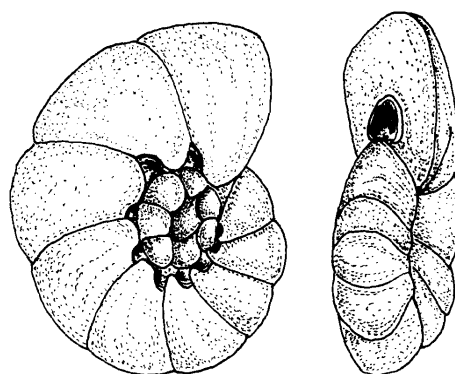
#### TREMATOPHRAGMOIDES

Brönnimann & Keij, 1986

Figure 36

*Type species: Trematophragmoides bruneiensis* Brönnimann & Keij (1986), OD(M).

*Trematophragmoides* Brönnimann & Keij, 1986, p. 14.



**Figure 36.** Holotype of *Trematophragmoides bruneiensis* redrawn from Brönnimann & Keij (1986).

Test free, planispiral. Wall agglutinated, imperforate, with thin inner organic lining. Each adult chamber with three apertures; a single primary opening, a high interiomarginal arch, equatorial in position; and two secondary openings, one at each side of the chamber near the umbilical tips, sutural, posteriorly directed. Holocene; Borneo, mangrove swamps.

**Remarks.** Differs from *Haplophragmoides* Cushman, 1910, by the occurrence of small, posteriorly-directed, pore-like supplementary apertures near the umbilical tips of each chamber; and in possessing a primary aperture in the form of a high arch. Family: Haplophragmoididae.

Brönnimann, P. & Keij, A.J. 1986. Agglutinated foraminifera (Lituolacea and Trochamminacea) from brackish waters of the state of Brunei and of Sabah, Malaysia, northwest Borneo. *Revue de Paléobiologie*, 5, 11-31.

#### OSTIOBACULITES Brönnimann, Whittaker, & Zaninetti, 1992

Figure 37

*Type species: Ostiobaculites salsus* Brönnimann, Whittaker, & Zaninetti, 1992, OD(M).

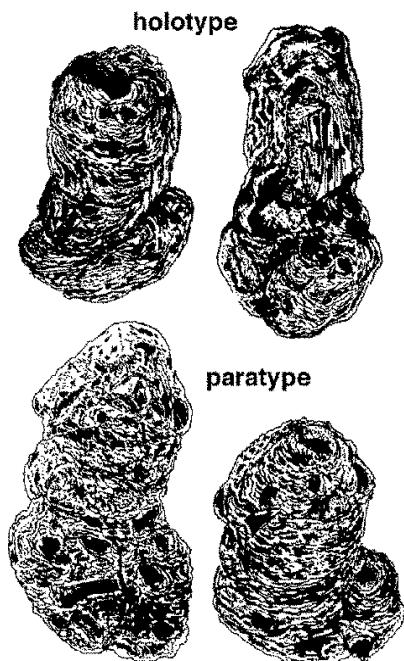
*Ostiobaculites* Brönnimann, Whittaker, & Zaninetti, 1992, p. 34.

Test free, elongate, early portion a closely coiled planispire, later portion uniserial, rectilinear, round in transverse section. Aperture a large, terminal and



areal, almost rectangular slot, parallel to axis of early coiling. Wall agglutinated, Trochamminina-structure. Holocene; Fiji, mangrove swamps.

**Remarks.** Differs from *Ammobaculites* Cushman, 1910 by its large, terminal and areal, subrectangular aperture, positioned parallel to the axis of early enrolment. Subfamily: Ammomarginulininae.



**Figure 37.** Type specimens of *Ostiobaculites salsus* redrawn from Brönnimann *et al.* (1992).

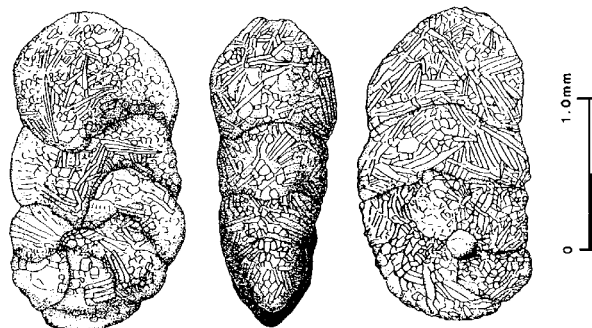
Brönnimann, P. Whittaker, J.E. & Zaninetti, L. 1992. Brackish water foraminifera from mangrove sediments of southwestern Viti Levu, Fiji Islands, southwest Pacific. *Revue de Paléobiologie*, **11**, 13-65.

#### PONCEAMMINA Seiglie, 1991

##### Figure 38

*Type species:* *Ponceamina vancouveringi* Seiglie, 1991, OD(M).

*Ponceamina* Seiglie, 1991, p. 96.



**Figure 38.** Holotype of *Ponceamina vancouveringi* Seiglie, 1991, from Seiglie *et al.* (1991).

Test free, large, elongate. Chambers arranged in an asymmetrical evolute planispire or very low trochospire, generally followed by one or more uncoiled

rectilinear chambers that are unequally inflated. Aperture slit-like, terminal and peripheral in spiral forms and terminal in uncoiled forms. Wall thick, composed of adventitious, mostly skeletal material, with calcareous cement. Lower Miocene; Puerto Rico.

**Remarks.** This genus is distinguished by its asymmetrical planispiral coiling and its calcareous cement. The type species possesses sutures that are strongly arched in the uniserial part, and remain sigmoidal (in the plane of coiling) in the uniserial part. The type species was described from deep-water limestones containing a mid-bathyal benthic foraminiferal assemblage. Family Ponceaminidae.

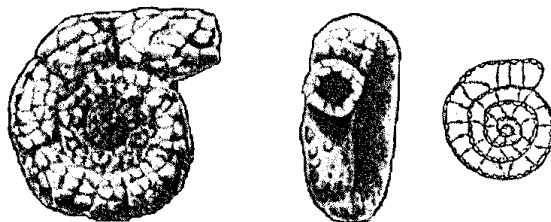
Seiglie, G.A., Baker, M.B., & Haman, D. 1991. *Ponceamina vancouveringi*, n.gen. n.sp., (Ponceaminidae, Foraminiferida) from the Early Miocene of Puerto Rico. *Tulane Studies in Geology and Paleontology*, **24**, 93-96.

#### STAROBOGATOVELLA Mikhalevich, 1994

##### Figure 39

*Type species:* *Starobogatovella hoeglundi* Mikhalevich, 1994, OD(M).

*Starobogatovella* Mikhalevich, 1994, p. 19.



**Figure 39.** Type specimens of *Starobogatovella hoeglundi* redrawn from Mikhalevich (1994).

Test free, planispirally coiled, evolute, flattened, round in outline, sometimes with the terminal part uncoiling slightly. The terminal part consists of one pseudochamber and is short and narrow (very small in comparison with the rest of the test), and is cylindrical in shape. The spiral part consists of 3-4 whorls, with as many as 16 pseudochambers in the last whorl. Pseudochambers are short, rectangular, rounded or oval in cross section. The spiral suture is narrow and deep, but sutures between pseudochambers are indistinct. Periphery is rounded. The external wall is coarsely agglutinated, with variable amounts of cement, and has an inner organic lining. Organic septae between pseudochambers are straight, with small oval **foramin.** The foramen has a weakly developed neck in the central part of the septa. Aperture simple, the open part of the tubular chamber, round, loop-shaped, or irregular. Holocene; Black Sea.

**Remarks.** Both generations are roughly the same size, but the microspheric form has a greater number of whorls. Differs from *Ammoscalaria* Höglund, 1947 in its almost completely planispiral coiling. The uncoiled part is short, consisting of one chamber, whereas *Ammoscalaria* has many flattened chambers

in its uncoiled part, which is 5-7 times longer than the spiral part. The two genera also differ in the shape of the aperture, which is slit-like in *Ammoscalaria*.  
Family: Ammoscalariidae.

Mikhalevich, V.I. 1994. Novyi rod i vid semeystva Ammoscalariidae (Foraminifera). *Zoologicheskii Zhurnal*, 73 (6), 18-21.

**FLATSCHKOFELIA** Rettori, Senowbari-Daryan & Zühlke, 1996

Figure 40

*Type species: Flatschkofelia anisica* Rettori, Senowbari-Daryan & Zühlke, 1996, OD(M).

*Flatschkofelia* Rettori, Senowbari-Daryan & Zühlke, 1996, p. 413.



**Figure 40.** Type specimens of *Flatschkofelia anisica* from Rettori *et al.* (1996). Left: holotype, middle and right: paratypes.

Test attached in the early stage, later free. Early stage biserial, later biserial to uniserial. Wall solid, agglutinated, simple in structure. Aperture simple, terminal in the initial biserial stage, moving to the margin in the uniserial stage. Middle Triassic; Mount Flatschkofel, Northern Dolomites, Italy.

**Remarks.** The genus is tentatively assigned to the Placopsilininae even though all the genera in this subfamily lack a biserial stage.

Rettori, R., Senowbari-Daryan, B., & Zühlke, R. 1996. *Flatschkofelia anisica* gen. et sp. nov. (Foraminifera) from the Middle Triassic (Anisian) of Northern Dolomites, Italy. *Revista Italiana di Paleontologia e Stratigrafia*, 102 (3), 413-416.

**LAPILLINCOLA** Wilson, 1986

Figure 41

*Type species: Lapillincola faringdonensis* Wilson, 1986  
*Lapillincola* Wilson, 1986, p. 3.

Test completely attached, consisting of a planispiral initial coil with shallow, nearly absent sutures, followed by a uniserial portion in which the chambers are rectangular to arcuate with generally parallel septa. Aperture a row of pores extending along the length of the apertural face. Wall agglutinated with

simple (not labyrinthic) internal structure. Aptian; Oxfordshire (England).



**Figure 41.** Holotype of *Lapillincola faringdonensis*, from Wilson (1986).

**Remarks.** *Lapillincola* is distinguished from *Rectocibicides* Cushman & Ponton, 1932 by the agglutinated wall structure; from *Acruliammina* by the absence of an erect distal portion or a cribrate aperture. Family: Placopsilinidae.

Wilson, M.A. 1986. New adherent foraminiferans from the Lower Cretaceous (Aptian) of south-central England. *Journal of Micropalaeontology*, 5 (2), 1-8.

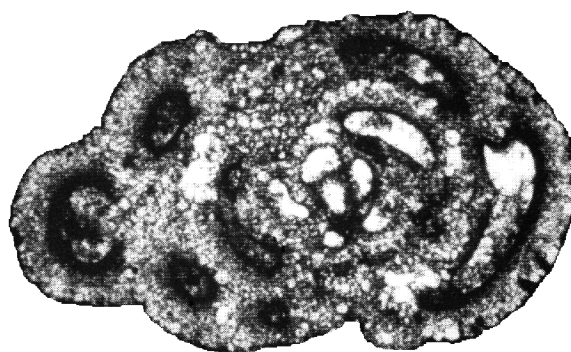
**HAPLOPHRAGMIACEA** Eimer & Fickert, 1899

**TEKKEINA** Farinacci & Yeniay, 1994

Figure 42

*Type species: Takkeina anatoliensis* Farinacci & Yeniay, 1994, OD(M).

*Takkeina* Farinacci & Yeniay, 1994, p. 49.



**Figure 42.** Type specimen of *Takkeina anatoliensis* modified from Farinacci & Yeniay (1994).

Test free, coiling evolute, initially streptospiral, later irregularly planispiral, whorls partially overlapping on the lateral sides. Wall of two layers, the outer layer is thick, made of coarse sparry agglutinated calcite grains, the inner one thin, of black material. Santonian; Anatolia.

**Remarks.** Differs from *Navarella* in its evolute, originally streptospiral coiling, lacking an uncoiled part, and it possessing septa that are rectilinear, rather than strongly arched. The wall of the type species *T. anatoliensis* is built of sparry carbonate grains, whereas the type species of *Navarella* (*N. joaquini*) possesses a wall built of quartz grains. Family: Ammobaculinidae.

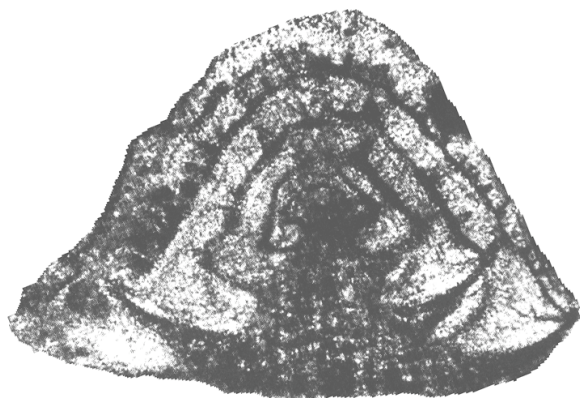
Farinacci, A. & Yeniay, G. 1994. *Tekkeina anatoliensis* n.gen. n.sp., a new foraminifer from Susuz Dag, Western Taurus, Turkey. *Palaeopelagos*, **4**, 47-59.

#### LUPERTOSINNIA Farinacci, 1996

Figure 43

*Type species: Lupertosinnia pallinii* Farinacci, 1996, OD(M).

*Lupertosinnia* Farinacci, 1996, p. 130.



**Figure 43.** Type specimen of *Lupertosinnia pallinii*, from Farinacci, 1996.

Test conical, trochospirally enrolled, dorsal side convex and involute, enlarging towards the base of the cone. Central portion of the test occupied by alveolar structure connected outside and with chambers, formed by a series of thin layers communicating among them by canals. Aperture with a tooth-plate. Thin porcellaneous wall. Campanian; southern Italy.

**Remarks.** Differs from *Praestorrsella* in having a porcellaneous rather than hyaline wall. Additionally, in *Lupertosinnia*, the inner alveolar structure is comprised of thin layers connected by perpendicular canals, whereas in *Praestorrsella* the inner structure is comprised mainly of pillars. Family: Nezzazatidae.

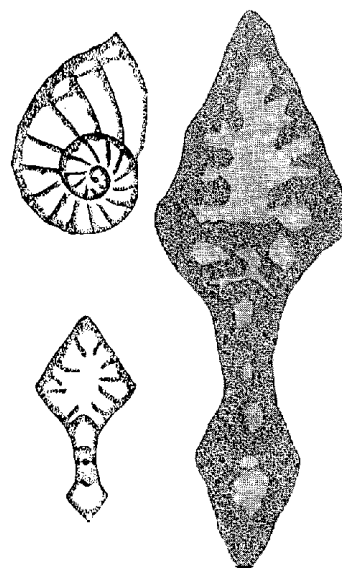
Farinacci, A. 1996. A new nezzazatid foraminifera in the Salento Upper Campanian limestones (southern Italy). *Palaeopelagos*, **5**, 129-137.

#### DEMIRINA Özcan, 1994

Figure 44

*Type species: Demirina meridionalis* Özcan, 1994, OD(M).

*Demirina* Özcan, 1994, p. 3.



**Figure 44.** Type specimens of *Demirina meridionalis* from Özcan (1994).

Test planispirally coiled, biumbilicate and semi-involute with an acute or sub-acutely angled periphery. Chambers relatively low, arched rectangular in the early stage, later increasing rapidly in length and width so that the septal face becomes broad and subcircular. Chambers, with the possible exception of the early ones, are subdivided by transverse partitions which project inward from the chamber wall almost vertically or in a slightly inclined manner, usually leaving an empty space in the median part of the chamber cavity. Partitions are attached to the consecutive septa along the margins of the chamber lumen. The aperture is interiomarginal in the early stage, later areal and then cribrate. Wall simple, finely agglutinated. Cenomanian; Turkey.

**Remarks.** *Demirina* differs from other internally subdivided agglutinated genera by its mode of partitions, type of coiling, and by its biumbilicate, peneropliform test with strongly thickened low and broad adult chambers. *Coxites* Smout, 1956 differs by its more complex inner structure with two sets of partitions and by its completely trochospiral biconvex test. *Rabanitina* Smout, 1956 differs by the presence of a more complex perforated plate and its globular test with an interiomarginal multiple aperture system. Subfamily: Coxitinae.

Özcan, E. 1994. *Demirina meridionalis* n.gen, n.sp., a new Cenomanian agglutinated foraminifer from south-eastern Turkey. *Revue de Paléobiologie*, **13** (1), 1-7.

#### BIOKOVINACEA Gusic, 1977

##### TROCHAMIJIELLA

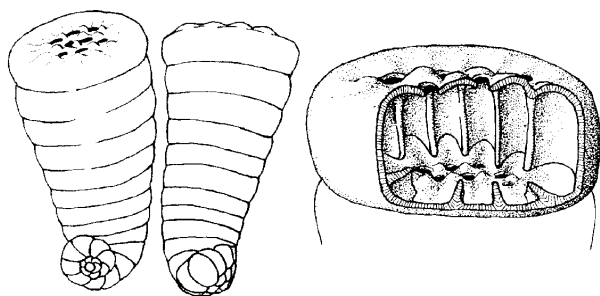
Athersuch, Banner & Simmons, 1992

Figure 45

*Type species: Trochamijiella gollesstanehi* Athersuch, Banner & Simmons, 1992, OD(M).

*Trochamijiella* Athersuch, Banner & Simmons, 1992, p. 7





**Figure 45.** Type specimens of *Trochamijiella gollesstanehi* from Athersuch *et al.* (1992).

Test calcareous-agglutinated, septate, uniserial, initially trochospiral, later uncoiling and becoming rectilinear, with chambers approximately circular in section perpendicular to the long axis. In the coiled part the aperture is initially interiomarginal and single, later it becomes areal, multiple and cribrate. In the uncoiled rectilinear part the multiple pore-like apertures are confined to the central, median part of each septum. The rectilinear chambers marginally possess vertical partitions which are arranged radially and extend inwards from the lateral chamber walls for about one-quarter to one-half the chamber diameter (the apertural area of each septum overlaps with the innermost extent of many of these radial partitions). The radial, vertical partitions are usually simple and rarely bifurcate. Wall is solid, noncanaliculate. Bathonian; Iran, U.A.E., Oman.

**Remarks.** Differs from both *Haurania* Henson, 1948 and *Amijiella* Loeblich & Tappan, 1985 by its early trochospiral coil. Family: Biokoviniidae.

Athersuch, J., Banner, F.T., & Simmons, M.D. 1992. On *Trochamijiella gollesstanehi* gen.nov et sp.nov. (Foraminiferida, Loftusiacea), an index for the Middle Eastern marine late Bathonian. *Journal of Micropalaeontology*, **11**, 7-12.

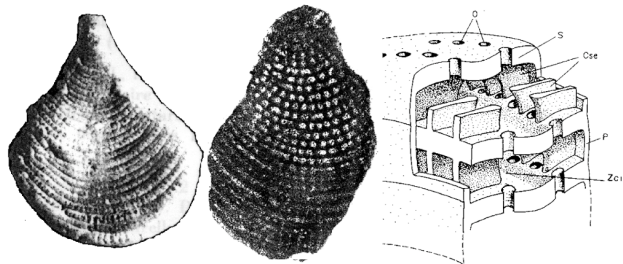
#### CYCLOLINACEA Loeblich & Tappan, 1964

##### SYRIANA Fourcade & Mouty, 1995

###### Figure 46

Type species: *Syriana khouryi* Fourcade & Mouty, 1995, OD(M).

*Syriana* Fourcade & Mouty, 1995, p. 220.



**Figure 46.** Type specimens of *Syriana khouryi* from Fourcade & Mouty (1995); O- aperture, S- septum, Cse- subepidermal partition, P- wall, Zci- undivided central zone.

Test free, wall simple, comprised of imperforate microgranular calcite, with numerous chambers. Test compressed and fan-shaped, with an initial conical stage that is probably trochospiral, followed by an uncoiled uniserial part. Apertures multiple, round, arranged in one, two, or three rows. Apertures are arranged along the prolongation of the subdivisions of the previous chamber, facing each other in two rows on the apertural face. The interior of the chambers is subdivided by many vertical radial subepidermal partitions perpendicular to the septa, and rarely by subepidermal partitions that parallel the septa. The central or median zone of the chambers is not subdivided. Callovian; Syria.

**Remarks.** Differs from *Eclusia* in the absence of pillaroid structures in the central zone of the chambers. Family: Cyclolinidae.

Fourcade, E., & Mouty, M., 1995. Discovery of a new larger foraminifer from the Jurassic of the south Tethyan margin: *Syriana khouryi* n.gen. n.sp. *Revue de Micropaléontologie*, **38**, 3, 217-227.

#### LOFTUSIACEA Brady, 1884

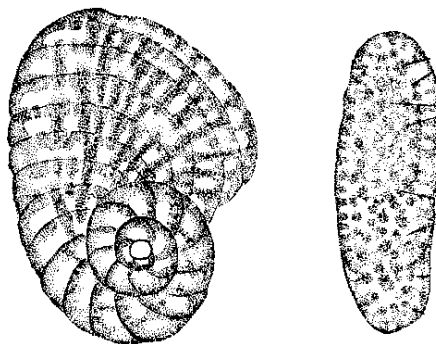
##### PLANISEPTA Septfontaine n.gen.

###### Figure 47

Type species: *Lituola compressa* Hottinger, 1967, OD.

*Planisepta* Septfontaine, 1988, p. 242 (name not available, ICZN Art. 13 (a) (i), no description).

*Planisepta* Septfontaine in: Kaminski, 2000, this study.



**Figure 47.** Specimen of *Planisepta compressa*, from Septfontaine (1988).

[Description provided by M. Septfontaine]: Test free, planispirally coiled and laterally flattened. Wall microgranular to slightly agglutinated. Chambers low with endoskeletal pillars. Stolon system radial. Marginal zone of chambers free. Aperture as multiple pores, cribrate. U. Carixian to L. Domerian; Morocco.

**Remarks.** Septfontaine (1988) did not provide a description of *Planisepta*, but simply remarked "See complete description and figures in Hottinger, 1967 and Septfontaine, 1984." The genus is now validated herein. *Planisepta* differs from *Paleomayncina* Septfontaine, 1988 by the presence of vertical radial partitions and pillars. Transitional morphotypes can occur between the two genera. Differs from *Lituosepta*

by the lateral compression of the test. Subfamily: Planiseptinae Septfontaine, 1988; Family: Mesoendothyridae.

Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic litiolids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume, 2*, 229-256.

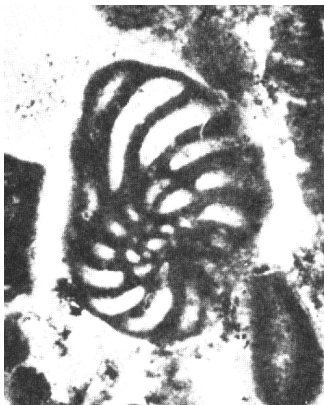
#### PALEOMAYNCINA Septfontaine n.gen.

Figure 48

*Type species: Mayncina termieri* Hottinger, 1967, OD.

*Paleomayncina* Septfontaine, 1988, p. 242. (name not available, ICZN Art. 13 (a) (i), no description)

*Paleomayncina* Septfontaine, in: Kaminski, 2000, this study.



**Figure 48.** Specimen of *Paleomayncina termieri*, from Septfontaine (1988).

[Description provided by M. Septfontaine]: Test free, planispirally coiled, laterally flattened. Wall microgranular with rare agglutinated particles. Chambers low without any internal microstructures. Aperture multiple, probably arranged in a single row. U. Sinemurian to Carixian (L. Domerian?); Morocco.

**Remarks.** Septfontaine (1988) did not provide a description of *Paleomayncina*, and only remarked "See complete description and figures in Hottinger, 1967 and Septfontaine, 1984." The genus is now validated herein. Subfamily: Planiseptinae Septfontaine, 1988.

Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic litiolids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume, 2*, 229-256.

#### PLATYHAURANIA Bassoullet & Boutakiout, 1996

Figure 49

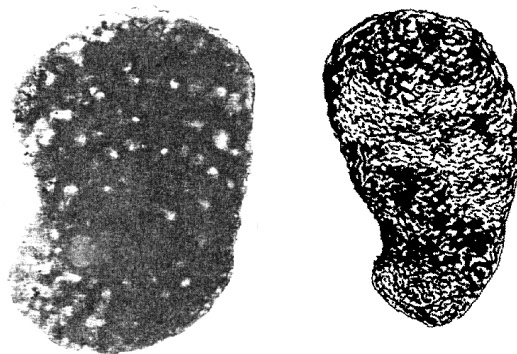
*Type species: Haurania (Platyhaurania) subcompressa* Bassoullet & Boutakiout, 1996 OD(M).

*Haurania (Platyhaurania)* Bassoullet & Boutakiout, 1996, p. 32

"A representative of the genus *Haurania* with the uncoiled part comprised in the majority of individuals of broad, flattened chambers; often falciform; fan-shaped in the largest forms." L. Toarcian; Morocco.

**Remarks.** *Haurania* differs in possessing cylindrical chambers in its uncoiled part. It represents an intermediate form in the phylogenetic evolution of the

Subfamily: Hauraniinae Septfontaine, 1988; Family: Hauraniidae Septfontaine, 1988.



**Figure 49.** Type specimens of *Haurania (Platyhaurania) subcompressa* from Bassoullet & Boutakiout (1996).

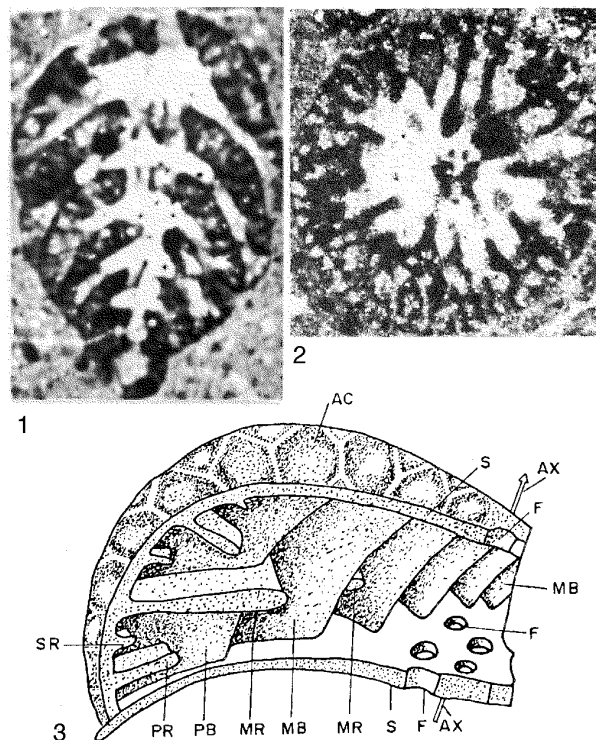
Bassoullet, J.-P. & Boutakiout, M. 1996. *Haurania (Platyhaurania) subcompressa* nov.subgen., nov.sp., grand foraminifère imperforé nouveau (Hauraniidae) de Toarcien inférieur du Maroc septentrional (Rides Sud-Rifaines). *Revue de Micropaléontologie*, **39**, 27-40.

#### KASTAMONINA Sirel, 1993

Figure 50

*Type species: Kastamonina abanica* Sirel, 1993 OD(M).

*Kastamonina* Sirel, 1993, p. 2.



**Figure 50.** 1. Holotype of *Kastamonina abanica*, axial section showing cribrate aperture; 2. horizontal section showing beams; 3. Structural model of chamber: MB-main beam, PB-primary beam, PR- primary rafter, SR- secondary rafter, S-septum, F- foramina, AC- alveolar compartment, AX- test axis; after Sirel (1993).



Test elongated to high conical in the microsphaeric form, high conical with a tapered base in the megalosphaeric form. The large megalosphaere is sometimes followed by a few chambers arranged in an arcuate series, followed by a uniserial part with broad, low, and strongly overlapping adult chambers. The marginal zone of each chamber is subdivided by an intricate subepidermal network consisting of two generations of vertical partitions (beams) and horizontal partitions (rafters), forming numerous irregular alveolar compartments. Pillars are absent in the central zone of the test. Wall calcareous-agglutinated, imperforate. Aperture cribrate, consisting of irregularly distributed multiple openings. Kimmeridgian-Portlandian; Turkey.

**Remarks.** This genus is morphologically similar to *Amijiella* and may be derived from this genus. It differs in its much reduced initial coiled portion and more complex internal structure, forming an irregular polygonal network below the epidermis. It differs from *Haurania* in the absence of a planispiral part and in lacking endoskeletal pillars in the central portion of the test. *Rectocyclammina* differs in its higher chambers and single terminal aperture. Subfamily Amijellinae Septfontaine, 1988.

Sirel, E. 1993. *Kastamonina abanica* n.gen.n.sp., a complex lituolid (Foraminiferida) from the Upper Jurassic Limestone of the Kastamonu Area (North Turkey). *Geologica Croatica*, **46** (1), 1-7.

#### REDMONDELLINA Banner & Whittaker, 1991

Figure 51

Type species: *Pseudocyclammina powersi* Redmond, 1964, OD.

*Alveosepta* (Redmondellina) Banner & Whittaker, 1991, p. 42.



**Figure 51.** Specimen of *Pseudocyclammina powersi* from Banner & Whittaker (1991).

"*Alveosepta* in which the median (equatorial) parts of the hypodermis of the septa project posteriorly to form pillars connecting the septal hypodermis with the preceding septal epidermis". Family Hottingeritidae.

Banner, F.T. & Whittaker, J.E. 1991. Redmond's "new lituolid foraminifera" from the Mesozoic of Saudi Arabia. *Micropaleontology*, **37**, 41-59.

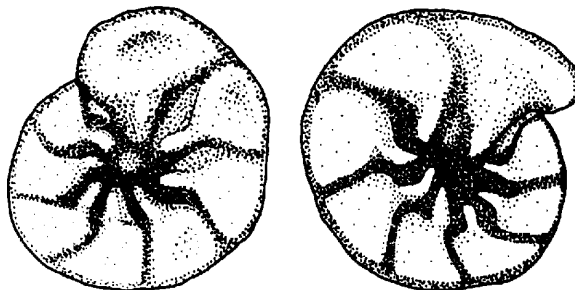
#### RETICULOPHRAGMOIDES

Gradstein & Kaminski, 1989

Figure 52

Type species: *Nonion jarvisi* Thalmann, 1932, (nom. subst. pro *Nonion cretacea* Cushman & Jarvis, 1932), OD.

*Reticulophragmoides* Gradstein & Kaminski, 1989, p. 79.



**Figure 52.** Specimens of *Reticulophragmoides jarvisi* (Thalmann), from the Palaeocene of Trinidad, from Gradstein & Kaminski (1989).

Test free, multilocular, planispirally coiled, with limbate sutures and umbilical boss. A blind tubular extension of the chamber lumina protrudes into the umbilical region. Chambers may develop simple alveolar structure in later chambers. Aperture simple, interiomarginal. Wall finely agglutinated, noncanaliculate, with siliceous cement. Palaeocene to Eocene; North Sea, Trinidad, Tunisia, Angola.

**Remarks.** *Reticulophragmoides* is transitional in morphology between *Haplophragmoides* and *Reticulophragmium* Maync, 1955. Its distinguishing features are its limbate sutures and the blind umbilical tube. The type species *R. jarvisi* (Thalmann) apparently evolved from a *Haplophragmoides* ancestor during the mid-Palaeocene. Subfamily: Alveolophragmiinae.

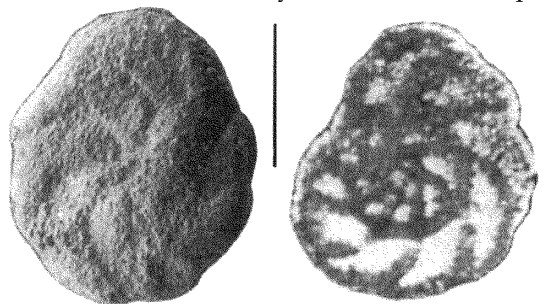
Gradstein, F.M. & Kaminski, M.A. 1989. Taxonomy and biostratigraphy of new and emended species of Cenozoic deep-water agglutinated foraminifera from the Labrador and North Seas. *Micropaleontology*, **35**, 72-92.

#### ABUHAMMADINA Abd-Elsahfy & Ibrahim, 1990

Figure 53

Type species: *Abuhammadina saidi* Abd-Elsahfy & Ibrahim, 1990, OD(M).

*Abuhammadina* Abd-Elsahfy and Ibrahim, 1990, p. 23.



**Figure 53.** Type specimens of *Abuhammadina saidi* from Abd-Elsahfy & Ibrahim (1990).



Test free, of medium size, concavo-convex, with dorsal side evolute. Coiling trochospiral, with about two whorls. Chambers triangular, with strongly arched sutures. Wall agglutinated, with an outer imperforate layer and a thick, coarse epidermal layer. Aperture cribrate, umbilical-extraumbilical. Upper Jurassic (Kimmeridgian); Egypt.

**Remarks.** Differs from *Pseudocyclammina* and *Everticyclammina* in the trochospiral coiling and umbilical-extraumbilical aperture. Subfamily: Choffatellinae.

Abd-Elshahfy, E. & Ibrahim, N. 1990. New Jurassic foraminifera from Egypt. *Acta Paleontologica Polonica*, **35**, 15-29.

#### SPIROPLECTAMMINACEA Cushman, 1927

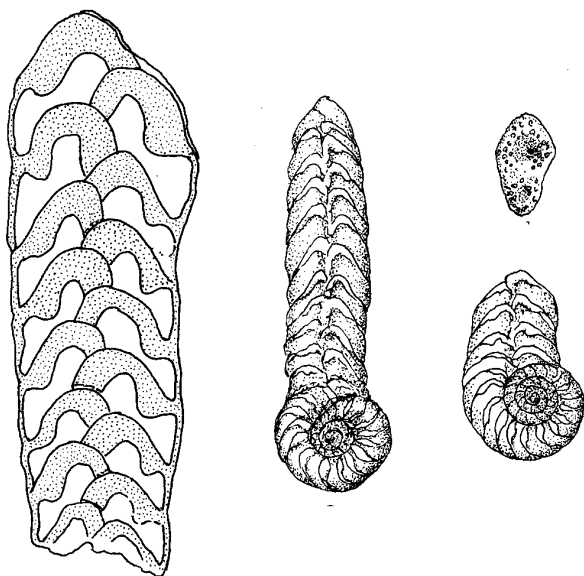
##### DUQUEPSAMMINA Sieglie & Baker, 1987

Figure 54

*Type species: Spiroplectoides cubensis* Cushman & Bermudez, 1937, OD

*Duquepsammina* Sieglie & Baker, 1987, p. 263.

Test about 1 mm in length, laterally compressed and elongate. Chambers planispirally arranged in the early stage, followed by rectilinear biserially arranged chambers. Planispire of megalosphaeric form with 1 or 2 whorls and 6 to 14 chambers in last whorl; planispire of microsphaeric form mostly involute with 3 to 4 1/2 whorls and 12 to 14 chambers in last whorl. Biserial chambers partially subdivided by constriction formed by thickened septal wall in the middle part of the chambers. Wall agglutinated, also thickened along the axis, remaining wall thin. Surface and walls composed of fine siliceous grains. Aperture a slit at the base of the last chamber, an oval terminal orifice in specimens with one or more uniserial chambers. Late Eocene - late Miocene; Caribbean and Pacific.



**Figure 54.** Specimens of *Duquepsammina cubensis*, from Sieglie & Baker (1987).

**Remarks.** Differs from *Spiroplectammina* Cushman, 1927 by the incipient subdivisions of the biserial chambers, the thickening of the wall in the central part of the chambers, and by the larger number of chambers and whorls in the spiral portion of the microsphaeric form. Differs from the genera of the family Discoamminidae by the biserial portion of the test. Family: Duquepsamminiidae Sieglie & Baker, 1987.

Sieglie, G.A. & Baker, M.B., 1987. Duquepsammiidae, a new family, and *Duquepsammia*, a new genus of agglutinated foraminifera. *Micropaleontology*, **33**, 263-266.

#### TRUNCULOCAVUS Brönnimann & Whittaker, 1993

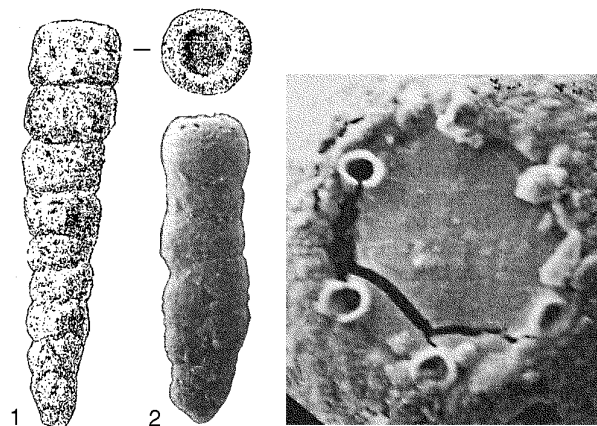
Figure 55

*Type species: Trunculocavus durrandi* Brönnimann & Whittaker, 1993, OD(M).

*Trunculocavus* Brönnimann & Whittaker, 1993, p. 122.

Test free, initially biserial then abruptly uniserial. Biserial chambers subglobular, uniserial chambers with circular transverse section. Wall agglutinated, Trochamminina-type. Aperture single, terminal, circular and large, devoid of everted border. Holocene; shallow water (Mangroves), Malay Archipelago.

**Remarks.** Differs from *Bigenerina* in its organically cemented wall and its large aperture without any border.



**Figure 55.** 1. Drawing of "*Bigenerina digitata* var." of Millett (1900), 2. holotype of *T. durrandi*, modified after Brönnimann & Whittaker (1993).

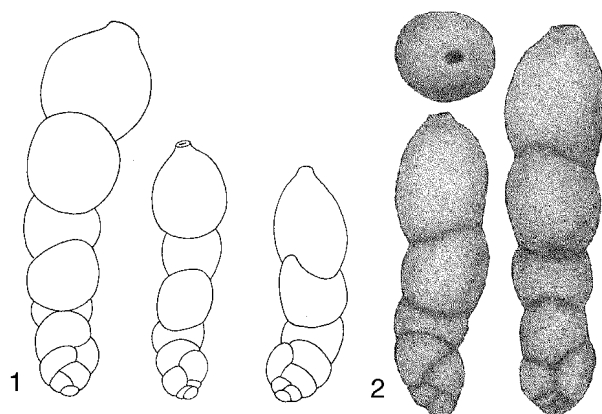
Brönnimann, P. & Whittaker, J.E. 1993. Taxonomic revision of some Recent agglutinated foraminifera from the Malay Archipelago in the Millett Collection, the Natural History Museum, London. *Bulletins of the Natural History Museum (Zoology)*, London, **59** (2), 107-124.

#### HAGHIMASHELLA Neagu & Neagu, 1995

Figure 56

*Type species: Haghimashella arcuata* (Haeusler, 1890), =*Bigenerina arcuata* Haeusler, 1890, OD.

*Haghimashella* Neagu & Neagu, 1995, p. 216.



**Figure 56.** Paralectotype specimens of *Bigenerina arcuata* Haeusler emend. Oesterle, 1968 from Oesterle (1968). 2- specimens of *Haghimashella arcuata* from Neagu & Neagu (1995).

Test free, finely agglutinated, smooth with siliceous cement (insoluble in acid). A short biserial early stage followed by a lax-uniserial adult stage, with 1-7 glandular-globulose chambers, and deep oblique sutures. Aperture terminal, circular or elliptical, supported by a short neck. Wall compact, noncanaliculate. Upper Jurassic; Romania.

**Remarks.** The chambers in the adult portion of the test are not wholly uniserial, but are loosely uniserial or sprawling (lax-uniserial) as in the calcareous genus *Pleurostomella*. Because of this, the sutures in the adult part are not perpendicular to the axis of growth. This genus differs from *Bigenerina* d'Orbigny, 1826 by its compact noncanaliculate wall structure; from *Aptotoichus* Loeblich & Tappan, 1982 by its smooth wall and the aspect of the adult uniserial chambers; and from *Pseudobolivina* Wiesner, 1931 in its terminal aperture. Family: Textulariopsidae.

Neagu, T. & Neagu, M. 1995. Smaller agglutinated foraminifera from the *acanthicum* Limestone (Upper Jurassic), Eastern Carpathians, Romania. In: Kaminski, M.A., Geroch, S., & Gasinski, M.A. (eds) 1995. Proceedings of the Fourth International Workshop on Agglutinated Foraminifera, Kraków Poland, September 12-19, 1993. *Grzybowski Foundation Special Publication* no. 3, 211-225.

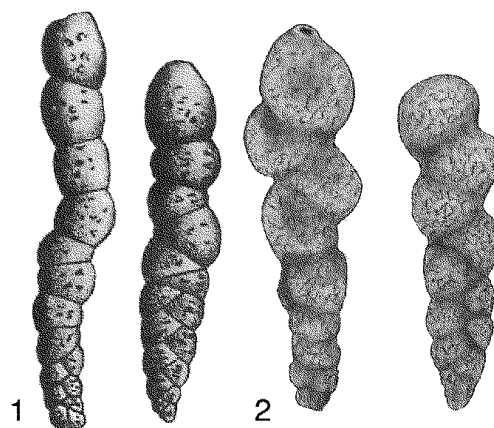
#### BICAZAMMINA Neagu & Neagu, 1995

Figure 57

*Type species:* *Bicazammina jurassica* (Haeusler, 1890) = *Pleurostomella jurassica* Haeusler, 1890, OD.

*Bicazammina* Neagu & Neagu, 1995, p. 216.

Test free, moderate to roughly agglutinated, biserial in the early stage, becoming lax-uniserial to nearly uniserial. Chambers globular with depressed sutures. Aperture areal with an elliptical or circular outline, Wall siliceous, compact, noncanaliculate. Upper Jurassic; Romania.



**Figure 57.** 1- Specimens of "*Pleurostomella jurassica*" from Haeusler (1890); 2- specimens from Neagu & Neagu (1995).

**Remarks.** This genus is strongly homeomorphic with *Bigenerina*, but differs from the latter in its noncanaliculate wall structure. Family: Textulariopsidae.

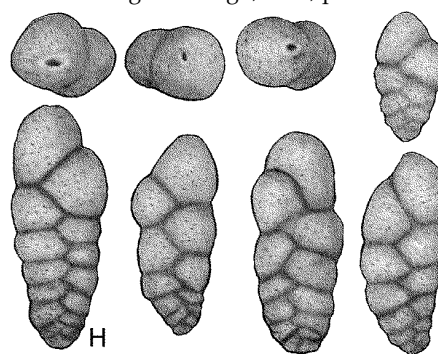
Neagu, T. & Neagu, M. 1995. Smaller agglutinated foraminifera from the *acanthicum* Limestone (Upper Jurassic), Eastern Carpathians, Romania. In: Kaminski, M.A., Geroch, S., & Gasinski, M.A. (eds) 1995. Proceedings of the Fourth International Workshop on Agglutinated Foraminifera, Kraków Poland, September 12-19, 1993. *Grzybowski Foundation Special Publication* no. 3, 211-225.

#### RASHNOVAMMINA Neagu & Neagu, 1995

Figure 58

*Type species:* *Rashnovammina carpathica* Neagu & Neagu, 1995, OD(M).

*Rashnovammina* Neagu & Neagu, 1995, p. 216.



**Figure 58.** H. Holotype of *Rashnovammina carpathica* Neagu & Neagu, other specimens paratypes; from Neagu & Neagu (1995).

Test free, fine to moderate agglutinated with siliceous cement (insoluble in acid), textulariiform, biserial with a tendency to become lax-uniserial in the last third part of the test, slightly globulose chambers with straight and depressed sutures. Aperture areal to terminal, elliptical or circular in outline, supported by a short neck. Wall compact, noncanaliculate. Kimmeridgian; Romania.

**Remarks.** This genus differs from *Plectinella* Marie, 1956 to which it is homeomorphic externally, by its circular or elliptic aperture which is areal in position, supported by a short neck rather than an elliptical slit as in *Plectinella*. It differs from *Bimonilina* Eicher, 1960 (another homeomorph) by its areal circular or elliptical aperture supported by a neck rather than having a slit-like aperture. Family: Textulariopsidae.

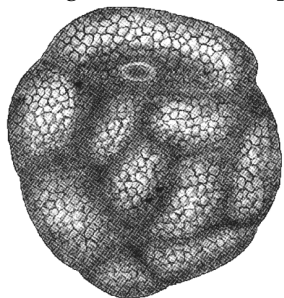
Neagu, T. & Neagu, M. 1995. Smaller agglutinated foraminifera from the *acanthicum* Limestone (Upper Jurassic), Eastern Carpathians, Romania. In: Kaminski, M.A., Geroch, S., & Gasinski, M.A. (eds) 1995. Proceedings of the Fourth International Workshop on Agglutinated Foraminifera, Kraków Poland, September 12-19, 1993. *Grzybowski Foundation Special Publication* no. 3, 211-225.

#### POKORNYAMMINA Neagu & Platon, 1994

Figure 59

*Type species: Pokornyammina clara* Neagu & Platon, 1994, OD(M).

*Pokornyammina* Neagu & Platon, 1994, p. 27.



**Figure 59.** Holotype of *Pokornyammina clara* from Neagu & Platon (1994).

Test globular, subsphaerical, with alternate chambers, streptospirally enrolled, resulting an outer-umbilical side on which there are the chambers of the last formed whorl, obviously oblique - alternate, and with an inner spiral side in which the streptospiral chambers of the previous whorl are obvious. Chambers rectangular or trapezoidal, equatorially extended, high, up to 1/2 of the width. Sutures smooth or very slightly depressed. Wall finely agglutinated, made of quartz grains in a siliceous cement, lacking internal structure. Aperture oval, or a slightly extended oval areal opening, slightly excentric, with a weak lip. Turonian-Maastrichtian; Carpathians.

**Remarks.** Differs from *Recurvoides* Earland, 1934 in its streptospiral coiling and in the biserial arrangement of the chambers. Family: Plectorecurvoididae (if the definition of the family is emended to include streptospiral forms).

Neagu, T., & Platon, E. 1994. Genera *Haplophragmoides* Cushman, 1910; *Recurvoides* Earland, 1934; *Thalmanammina* Pokorny, 1951; *Plectorecurvoides* Noth, 1952; and *Pokornyammina* n.gen. from Upper Cretaceous flysch facies, Eastern Carpathians, Romania. *Revista Española de Micropaleontología*, 26, 5-30.

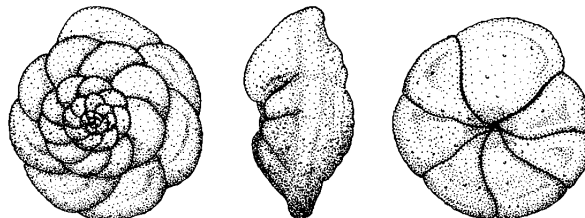
#### TROCHAMMINACEA Schwager, 1877

##### AMMOANITA Seiglie & Baker, 1987

Figure 60

*Type species: Ammoanita rosea* Seiglie & Baker, 1987, p. 491, OD.

*Ammoanita* Seiglie & Baker, 1987, p. 490.



**Figure 60.** Holotype of *Ammoanita rosea* from Seiglie & Baker (1987).

Test biconvex and trochospiral, with 7-10 chambers in the last whorl; periphery acute and may be keeled; surface finely agglutinated. Aperture interiomarginal, umbilical to extraumbilical. Campanian; Oman.

**Remarks.** Differs from *Trochammina* Parker & Jones, 1859 in its more restricted umbilical area, larger, more convex test, and more acute periphery. It is distinguished from Cretaceous species of *Trochammina* by the greater number of chambers and in its more acute periphery. Subfamily: Trochammininae.

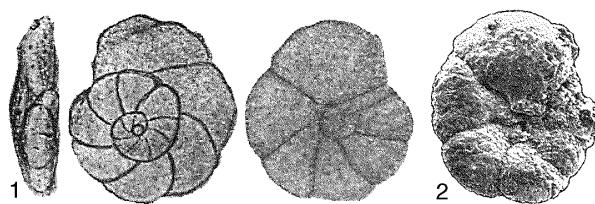
Seiglie, G.A. & Baker, M.B. 1987. *Ammoanita rosea*, new genus and new species of deep water Trochamminidae, Foraminiferida. *Proceedings of the Biological Society of Washington, D.C.* 100, (3), 490-492.

##### LINGULOTROCHAMMINA Hercogová, 1987

Figure 61

*Type species: Trochammina callima* Loeblich & Tappan, 1950 emend. Hercogová, 1987.

*Lingulotrochammina* Hercogová, 1987, p. 201, OD.



**Figure 61.** 1. Holotype of *Trochammina callima*, from Loeblich & Tappan (1950); 2. Specimen of *Lingulotrochammina callima*, emend. Hercogová, redrawn from Hercogová (1987).

Test free, trochospiral, chambers increasing gradually in size. Wall agglutinated, with simple interior. Aperture interiomarginal on the umbilical side reaching into the umbilicus, covered by lingual flaps projecting out of the periumbilical apices of the triangular umbilical side of the chambers. The flaps (at least in early chambers) may be arranged in a star-like

pattern. Albian-Cenomanian; Kansas USA, Czech Republic.

**Remarks.** Differs from *Trochammina* in possessing star-like apertural flaps, rather than a simple interiomarginal arch bordered by a lip. The star-like pattern on the umbilical side recalls the calcareous genus *Lingulogavelinella*.

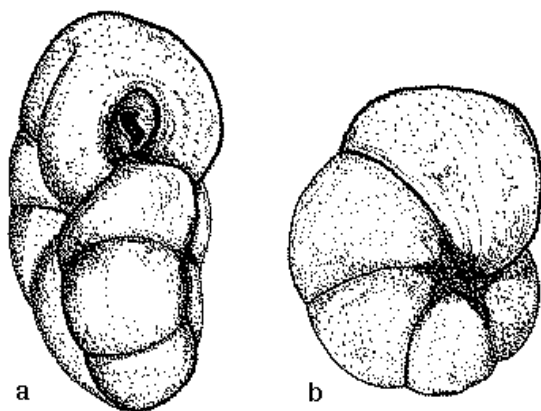
Hercogová, J. 1987. New findings of arenaceous foraminifera in the Cenomanian of the Bohemian Massif. *Sborník Geologických Ved, Paleontologie*, **28**, 179-227.

#### CAMURAMMINA Brönnimann & Keij, 1986

Figure 62

*Type species: Camurammina cifellii* Brönnimann & Keij, 1986, OD(M).

*Camurammina* Brönnimann & Keij, 1986, p. 20.



**Figure 62.** Type specimens of *Camurammina cifellii* redrawn from Brönnimann & Keij (1986, pl. 7). a. edge view of holotype; b. lateral view of hypotype.

Test free, trochospiral. Wall agglutinated, imperforate. Aperture single, interiomarginal, inside of scaphoid apertural face, with inward turned border. Holocene; Borneo, Vietnam, mangrove swamps.

**Remarks.** Differs from *Trochammina* by the scaphoid apertural face and the inward turned apertural border of the interiomarginal aperture which goes from an outer, spiral to an inner, umbilical position. Subfamily: Trochammininae.

Brönnimann, P. & Keij, A.J. 1986. Agglutinated foraminifera (Lituolacea and Trochamminacea) from brackish waters of the state of Brunei and of Sabah, Malaysia, northwest Borneo. *Revue de Paléobiologie*, **5**, 11-31.

#### LEPIDOPARATROCHAMMINA

Brönnimann & Whittaker, 1986

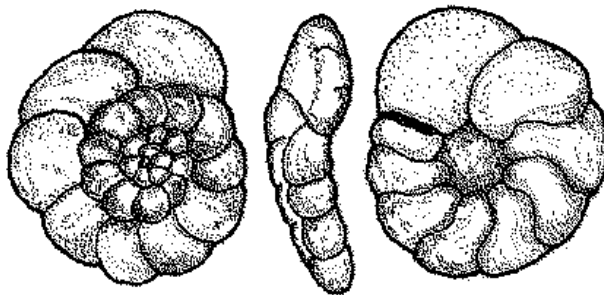
Figure 63

*Type species: Paratrochammina (Lepidoparatrochammina) lepida* Brönnimann & Whittaker, 1986, OD.

*Paratrochammina (Lepidoparatrochammina)* Brönnimann & Whittaker, 1986, p. 118.

Test free, trochospiral, watchglass- or scale-like tests, chambers strongly compressed in the axial plane. Wall agglutinated, single layered, imperforate.

Aperture single, interiomarginal, with or without umbilical flap, resting with its border on umbilical wall of first chamber of last whorl and that of penultimate chamber, asymmetric in respect to coiling axis. Holocene; Bellingshausen Sea, South Atlantic, 18-391 m.



**Figure 63.** Type specimen of *Paratrochammina (Lepidoparatrochammina) lepida* redrawn from Brönnimann & Whittaker (1986; pl. 21).

**Remarks.** Differs from *Paratrochammina* Brönnimann, 1979 by the strongly compressed adult chambers and the watchglass- or scale-like test. Subfamily: Trochammininae.

Brönnimann, P., & Whittaker, J.E. 1986. On the morphology of *Paratrochammina (Lepidoparatrochammina) haynesi* (Atkinson) from South Cardigan Bay, Wales, and validation of *Paratrochammina (Lepidoparatrochammina)* Brönnimann & Whittaker. *Revue de Paléobiologie*, **5**, 117-125.

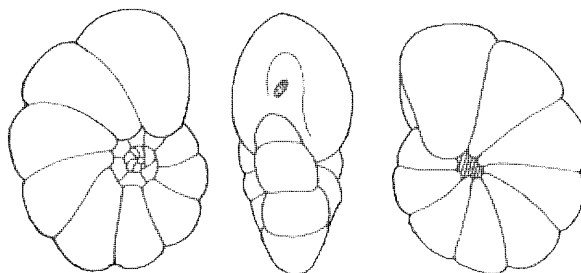
#### POLSKIAMMINA

Brönnimann, Zaninetti & Whittaker, 1987

Figure 64

*Type species: Arenoparrella mexicana* (Kornfeld) var. *asiatica* Polski, 1959, OD.

*Polskiammina* Brönnimann, Zaninetti & Whittaker, 1987, p. 106.



**Figure 64.** Holotype of *Polskiammina asiatica* (Polski), redrawn from Brönnimann *et al.* (1987).

Test free, very low trochospire, oval in outline, with rounded periphery. Adult chambers overlapping on previous ones on the spiral side, with tendency to planispiral enrolment. Septal face excavated perpendicular to the direction of enrolment. Wall agglutinated, imperforate. Aperture single or double, areal and terminal opening(s) near base of septum in excavated portion, surrounded by a thin border of agglu-

minated grains. Holocene; Pacific (north Asiatic shelf); brackish waters off Brunei.

**Remarks.** Differs from *Sepetibaella* and *Bykoviella* in the lack of a tendency to uniserial growth in the adult. Subfamily: Vialoviinae.

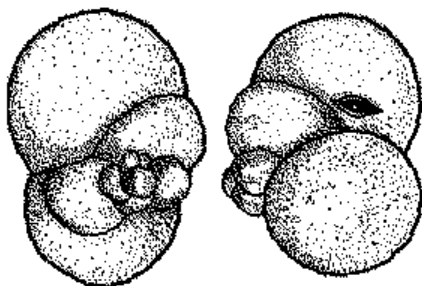
Brönnimann, P., Zaninetti, L., & Whittaker, J.E. 1987. *Polskiammina*, a new trochamminid genus from shallow waters of the North Asiatic Shelf (Protista: Foraminiferida). *Revue de Micropaléontologie*, 6, 105-109.

#### ALTERAMMINA Brönnimann & Whittaker, 1988

##### Figure 65

*Type species: Trochammina alternans* Earland, 1934, OD(M).

*Alterammina* Brönnimann & Whittaker, 1988, p. 123.



**Figure 65.** Specimen of *Alterammina alternans*, redrawn from Brönnimann & Whittaker (1988, pl. 45).

Test free, trochospiral in the early stage, adult stage biserial. Wall agglutinated, imperforate, single-layered. Aperture single, areal, near and parallel to the base of the ultimate chamber, on the umbilical side. Holocene; Southern Ocean, 580-3264 m.

**Remarks.** Both *Alterammina* and its close relative *Pseudotrochammina* Frerichs, 1969 have a single areal aperture situated near to, and parallel to, the base of the septal face of the last chamber. However, *Alterammina* differs from all other trochamminid genera in possessing a biserial adult stage. Subfamily: Trochamminellinae.

Brönnimann, P., & Whittaker, J.E. 1988. *The Trochamminacea of the Discovery Reports*. British Museum (Natural History). 152 pp.

#### EARLANDAMMINA Brönnimann & Whittaker, 1988

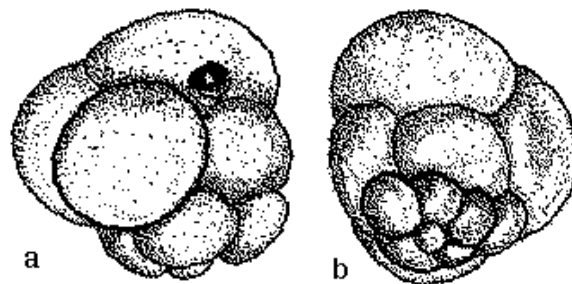
##### Figure 66

*Type species: Trochammina inconspicua* Earland, 1934, OD.

*Earlandammina* Brönnimann & Whittaker, 1988, p. 126.

Test free, adult stage trochospiral, pluriserial, subglobular with subglobular appressed chambers. Axial depression closed. Wall agglutinated, imperforate, single-layered. Aperture simple, slit-like to oval, areal, in lower part of the apertural face parallel to

the base of the last chamber. Holocene; Southern Ocean, 1080-4517 m.



**Figure 66.** Specimen of *Earlandammina inconspicua*, redrawn from Brönnimann & Whittaker (1988; pl. 47).

**Remarks.** The pluriserial *Earlandammina* differs from its closest relative, the planoconvex *Pseudotrochammina* Frerichs, 1969, by the compact subglobular adult test and the more open slit-like to oval single aperture. It differs from *Ammoglobigerinoides* Frerichs, 1969 by the single, rather than double, areal aperture; and from *Resupinammina* Brönnimann & Whittaker, 1988 by the umbilical, rather than spiral position of the aperture. The closed axial depression and subglobular chambers indicate that *Earlandammina* is a free-living member of the Trochamminellinae.

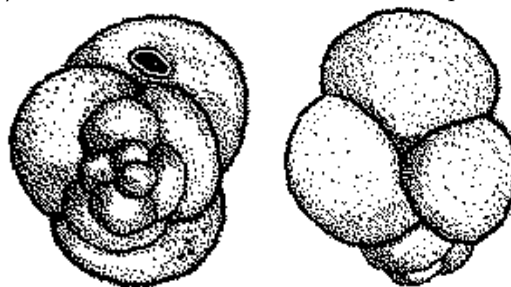
Brönnimann, P., & Whittaker, J.E., 1988. *The Trochamminacea of the Discovery Reports*. British Museum (Natural History). 152 pp.

#### RESUPINAMMINA Brönnimann & Whittaker, 1988

##### Figure 67

*Type species: Resupinammina scotiaensis* Brönnimann & Whittaker, 1988, OD.

*Resupinammina* Brönnimann & Whittaker, 1988, p. 139.



**Figure 67.** Holotype of *Resupinammina scotiaensis* redrawn from Brönnimann & Whittaker (1988, pl. 46).

Test free, trochospiral, adult stage pluriserial. Wall agglutinated, imperforate, single-layered. Aperture single, areal, on the spiral side of the test. Holocene; Southern Ocean, 572-4344 m.

**Remarks.** Differs from *Pseudotrochammina* by the spiral position of the aperture. It differs from *Ammoglobigerinoides* by possessing a single aperture on the spiral side, rather than a double aperture (one spiral, one umbilical). Subfamily: Trochamminellinae.

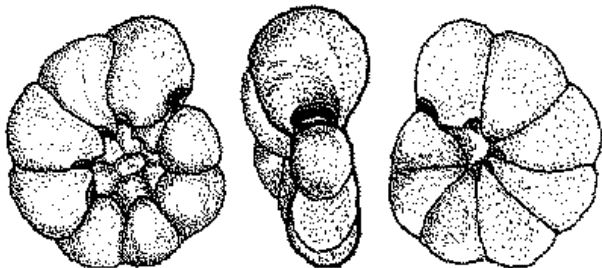
Brönnimann, P., & Whittaker, J.E., 1988. *The Trochamminacea of the Discovery Reports*. British Museum (Natural History). 152 pp.

#### ZAVODOVSKINA Brönnimann & Whittaker, 1988

Figure 68

*Type species: Zavodovskina careyi* Brönnimann & Whittaker, 1988, OD(M).

*Zavodovskina* Brönnimann & Whittaker, 1988, p. 142



**Figure 68.** Holotype of *Zavodovskina careyi* redrawn from Brönnimann & Whittaker (1988; pl. 51).

Test free, low trochospiral, with tendency to planispiral coiling in the adult. Chambers numerous, with depressed radial sutures. Wall agglutinated, imperforate, single-layered. Aperture triple; primary opening an interiomarginal subperipheral slit, secondary or supplementary openings at umbilical and spiral tips of the chamber, in axial-sutural position, posteriorly directed. Holocene; Zavodovski Island (South Sandwich Islands), 278-329 m.

**Remarks.** Differs from its closest relative *Deuterammina* Brönnimann, 1976 by the presence of additional supplementary apertures at the spiral tips of the chambers. In the type species, the supplementary apertures on both sides of the test remained open and probably functional throughout ontogeny. Those of the spiral side occur in all of the chambers of the final whorl and in part of the preceding whorl. Subfamily: *Zavodovskinae* Brönnimann & Whittaker, 1988

Brönnimann, P., & Whittaker, J.E. 1988. *The Trochamminacea of the Discovery Reports*. British Museum (Natural History). 152 pp.

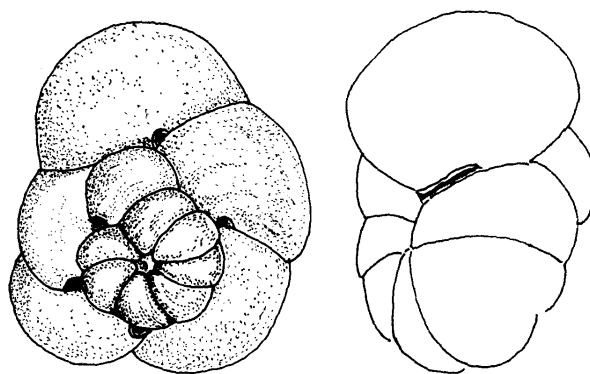
#### TORETAMMINA Brönnimann, 1986

Figure 69

*Type species: Toretammina whittakeri* Brönnimann, 1986, OD(M).

*Toretammina* Brönnimann, 1986, p. 95.

Test free, trochospiral. Wall agglutinated, imperforate. Aperture multiple; single primary opening in the form of an areal slit parallel and close to the base of the apertural face, umbilical in position; and secondary pore-like openings on the spiral side, in pit-like depressions at the intersections of spiral and intercameral sutures. Holocene; Indian Ocean, 2380 m.



**Figure 69.** Holotype of *Toretammina whittakeri* redrawn from Brönnimann (1986).

**Remarks.** *Toretammina* is characterised by the multiple supplementary apertures on its spiral side. The type species *T. whittakeri* possesses axially elongated chambers, and a small, deep axial depression. The primary areal aperture is surrounded by a fine lip; supplementary apertures are 20 µm in diameter and set in semicircular depressions. Subfamily: *Toretammininae* Brönnimann, 1986.

Brönnimann, P. 1986. *Toretammina whittakeri* gen.nov. sp.nov. from deep waters of the Indian Ocean. *Revue de Paléobiologie*, 5, 95-97.

#### BALTICAMMINA

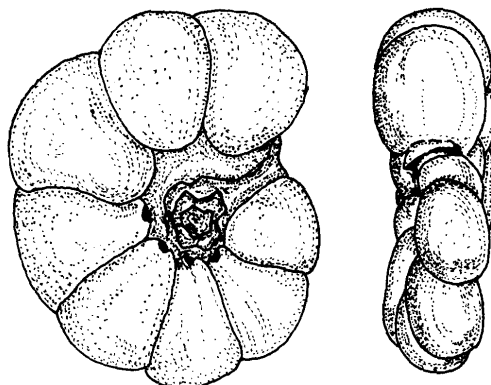
Brönnimann, Lutze, & Whittaker, 1989

Figure 70

*Type species: Balticammina pseudomacrescens* Brönnimann, Lutze, & Whittaker, 1989, OD.

*Balticammina* Brönnimann, Lutze, & Whittaker, 1989, p. 168.

Test free, a low trochospire. Wall with inner and outer organic sheets enclosing agglutinate bound by organic substance. Primary aperture a single interiomarginal slit (not equatorial), secondary aperture a single arch-like opening directed into axial depression (umbilicus). Holocene; Baltic Sea.



**Figure 70.** Holotype of *Balticammina pseudomacrescens* redrawn from Brönnimann *et al.* (1989).

**Remarks.** Differs from *Trochammina* by its primary interiomarginal aperture which extends slightly onto the spiral side and the occurrence of a small arch-like



secondary opening just posterior of the primary aperture, leading into the umbilicus. It differs from *Jadammina* Bartenstein and Brand, 1938 in the absence of areal pores and by having a primary aperture which, although running from the umbilical to the spiral side, is not equatorial. It also has a single secondary aperture per chamber. Subfamily: Trochammininae.

Brönnimann, P., Lutze, G., & Whittaker, J.E. 1989. *Balticammina pseudomacrescens*, a new brackish water trochamminid from the western Baltic Sea, with remarks on the wall structure. *Meyniana*, **41**, 167-177.

#### ABYSSOTHERMA Brönnimann, Van Dover & Whittaker, 1989

Figure 71

Type species: *Abyssotherma pacifica* Brönnimann, Van Dover & Whittaker, 1989 OD(M).

*Abyssotherma* Brönnimann, Van Dover & Whittaker, 1989, p. 143.

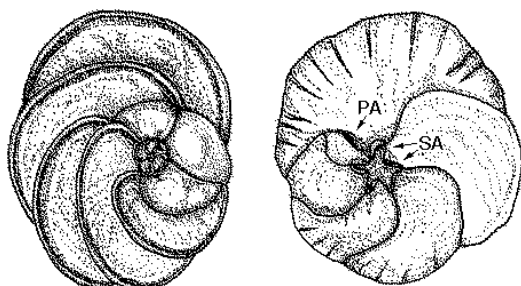


Figure 71. Holotype of *Abyssotherma pacifica* redrawn from Brönnimann *et al.* (1989). PA = primary aperture; SA = secondary apertures.

Test free, a low watchglass-shaped trochospire. Adult chambers spirally elongate, umbilically asymmetric and mushroom-shaped; interior subdivided by secondary septa formed by infolding of inner organic sheet. Aperture double: primary opening interior-marginal, in strongly incurved anterior flank of septum, anteriorly directed; secondary opening in axial-sutural position at tip of posterior flank of septum, posteriorly directed, also interior-marginal. Wall imperforate, consisting of agglutinated layer between outer and inner organic sheets. Holocene; East Pacific Rise.

**Remarks:** Differs from *Bruneica* Brönnimann, Keij, & Zaninetti, 1983 described from brackish mangrove swamps in Brunei in having two interior-marginal apertural openings per chamber. *Bruneica* has only one axial and anteriorly-directed aperture of the *Paratrochammina*-type. The type species *Abyssotherma pacifica* was collected from a deep-sea hydrothermal vent community at 2,600 m on the East Pacific Rise. It inhabits hard substrates near black smokers. Subfamily: Zaninettiinae; Family: Remaneicidae.

Brönnimann, P., Van Dover, C.L., & Whittaker, J.E., 1989. *Abyssotherma pacifica* n.gen. n.sp., a Recent remaneicid (Foraminiferida, Remaneicacea) from the East Pacific Rise. *Micropaleontology*, **35**, 142-149.

#### VERNEUILINACEA Cushman, 1911

##### GEROCHAMMINA Neagu, 1990

Figure 72

Type species: *Gerochammina stanislawi* Neagu, 1990, OD.

*Gerochammina* Neagu, 1990, p. 252.

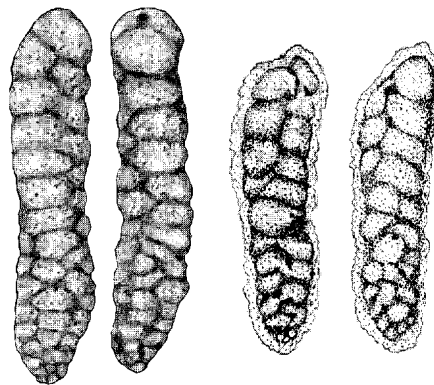


Figure 72. Specimens of *Gerochammina stanislawi* from Neagu (1990).

Test cylindroconical with the early stage acute to rounded conical, chambers initially trochospiral, later high trochospiral with number of chambers per whorl decreasing until the final biserial stage. Occasionally the biserial adult stage is slightly twisted and may be two to three times longer than the initial trochospiral stage. In some specimens the biserial stage is poorly developed giving the test a tapered shape. Wall medium to finely agglutinated, noncanaliculate, with a large quantity of siliceous cement, transparent in immersion, with simple chamber interiors. Aperture circular, subterminal, on the inner side of the apertural face of the last chamber, with a short collar, extending to the interior as a slightly arcuate apertural tube which forms the inner connections of the chambers. In immersion these tubes display the high trochospiral chamber arrangement in the early whorls. Upper Cretaceous; Romania, Poland.

**Remarks.** Differs from *Karrerulina* Finlay, 1940 in the high trochospiral arrangement of the initial chambers and in the absence of a triserial part. It is possible that *Gerochammina* is ancestral to *Karrerulina*. Subfamily: Prolixoplectidae.

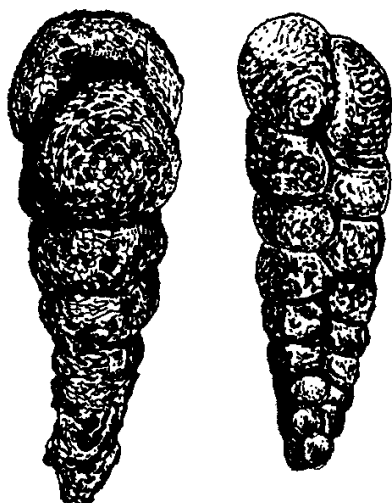
Neagu, T. 1990. *Gerochammina* n.g. and related genera from the Upper Cretaceous flysch-type benthic foraminiferal fauna, Eastern Carpathians - Romania. In: Hemleben, C., *et al.* (eds). *Paleoecology, Biostratigraphy, Paleoceanography and Taxonomy of Agglutinated Foraminifera*. NATO ASI Series C-327, Kluwer Academic Publishers, 245-265.

##### CARONIA

Brönnimann, Whittaker, & Zaninetti, 1992

Figure 73

Type species: *Gaudryina exilis* Cushman & Brönnimann, 1948, OD(M).



**Figure 73.** Specimen of *Caronia exilis*, redrawn from Brönnimann *et al.* (1992).

*Caronia* Brönnimann, Whittaker, & Zaninetti, 1992, p. 28.

Test free, early stage triserial, short, followed by a longer biserial stage. Aperture interiomarginal arch in equatorial position. Wall agglutinated, thin, of the Trochamminina-type. Holocene; Fiji, mangrove swamps.

**Remarks.** Differs from *Gaudryina* by its thin agglutinated wall and organic cement. Subfamily: Caroniidae Brönnimann, Whittaker, & Zaninetti, 1992.

Brönnimann, P. Whittaker, J.E. & Zaninetti, L. 1992. Brackish water foraminifera from mangrove sediments of southwestern Viti Levu, Fiji Islands, southwest Pacific. *Revue de Paléobiologie*, **11**, 13-65.

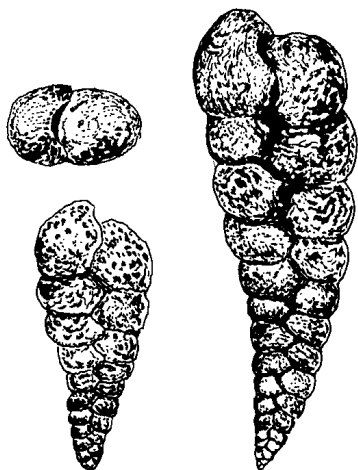
#### PALUSTRELLA

Brönnimann, Whittaker, & Zaninetti, 1992

Figure 74

Type species: *Textularia palustris* Warren, 1957, OD.

*Palustrella* Brönnimann, Whittaker, & Zaninetti, 1992, p. 36.



**Figure 74.** Specimens of *Textularia palustris* (Warren), redrawn from Brönnimann *et al.* (1992).

Test free, biserial throughout in the megalosphaeric generation. Initially planispiral, then biserial in the microsphaeric generation. Aperture an interiomarginal elongate arch-like opening, equatorial in position. Wall thin, agglutinated, of Trochamminina-type. Holocene; Fiji, mangrove swamps.

**Remarks.** The type species, *T. palustris* has a slender, elongate shape and a smooth surface. It displays, when viewed in immersion, either a large proloculus followed by a biserial series of chambers, or a smaller one surrounded by 6-7 equally small planispiral chambers coiled in the plane of the biserial enrolment. Bender (1989) used the name "*Textularia*" *palustris* in quotation marks, because of its organically-cemented, imperforate wall structure. Subfamily: Palustrellinae Brönnimann, Whittaker, & Zaninetti, 1992.

Brönnimann, P. Whittaker, J.E. & Zaninetti, L. 1992.

Brackish water foraminifera from mangrove sediments of southwestern Viti Levu, Fiji Islands, southwest Pacific. *Revue de Paléobiologie*, **11**, 13-65.

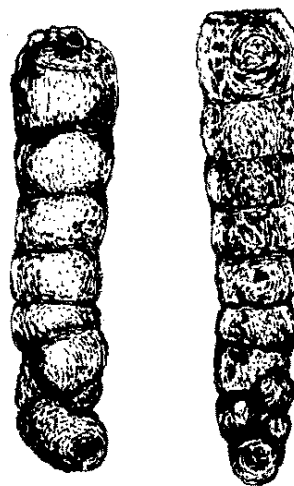
#### MONOTALEA

Brönnimann, Whittaker, & Zaninetti, 1992

Figure 75

Type species: *Monotalea salsa* Brönnimann, Whittaker, & Zaninetti, 1992, OD(M).

*Monotalea* Brönnimann, Whittaker, & Zaninetti, 1992, p. 32,



**Figure 75.** Type specimens of *Monotalea salsa* redrawn from Brönnimann *et al.* (1992).

Test free, polythalamous, early stage biserial, later uniserial and rectilinear. Uniserial cylindrical chambers radially-symmetrical in cross section. Aperture terminal, rounded. Wall agglutinated, thin, Trochamminina-type. Holocene; Fiji.

**Remarks.** The chambers of the type species *M. salsa* are globular. Microsphaeric individuals have two or three pairs of truly biserial chambers followed abruptly by a uniserial stage of 4-6 chambers with depressed, horizontal sutures. Megalosphaeric indi-

viduals have a large (40  $\mu\text{m}$ ) bulbous proloculus followed by a short (3-4 chambers) stage that is actually lax-uniserial, then wholly uniserial. The wall is thin (4  $\mu\text{m}$ ), with inner and outer organic linings, and abundant organic cement in the form of strands. The aperture is a large circular opening devoid of any neck or lip. Subfamily: Monotaleinae Brönnimann, Whittaker, & Zaninetti, 1992.

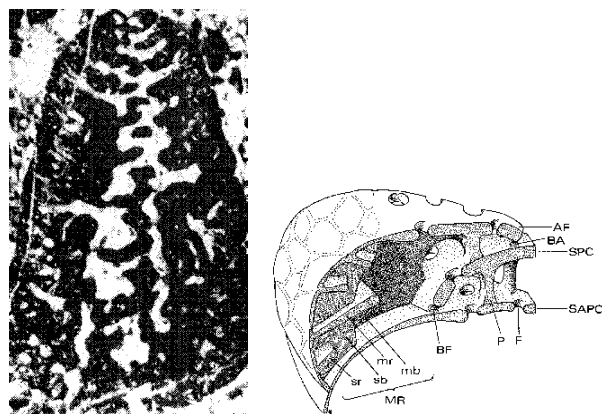
Brönnimann, P. Whittaker, J.E. & Zaninetti, L. 1992. Brackish water foraminifera from mangrove sediments of southwestern Viti Levu, Fiji Islands, southwest Pacific. *Revue de Paléobiologie*, **11**, 13-65.

#### ATAXOPHRAGMIACEA Schwager, 1877

##### ANATOLIELLA Sirel, 1988

Figure 76

*Type species: Anatoliella ozalpiensis* Sirel, 1988, OD(M).  
*Anatoliella* Sirel, 1988, p. 478.



**Figure 76.** Holotype and reconstructed chamber morphology of *Anatoliella ozalpiensis* Sirel, 1988. For explanation see Sirel (1988).

Test free, initially low conical, becoming high conical in late ontogeny, with three chambers in each whorl. Early growth stage consisting of a large protoconch followed by a second chamber positioned at the apex of the test. These are followed by a short series of low trochospiral chambers. Adult chambers are successively more inflated. The marginal chamber lumen is subdivided by a subepidermal network consisting of several generations of vertical radial beams (main, primary, secondary, and shorter beams) and horizontal partitions (main, primary, secondary, and shorter rafters), forming numerous irregular alveolar compartments in each chamber. Septal wall partially covers the apertural face of the two previous chambers, with a single row of basal apertures and irregularly distributed supplementary areal apertures. The central chamber lumen located in the axial zone of the test may be partially subdivided by a few thick pillars supporting the septal wall between the areal and marginal apertures. The pillars may fuse with the main radial chamber partitions by means of a distal connection below the chamber roof, thereby

avoiding the foramina. Wall imperforate, agglutinated. Thanetian limestones; Turkey.

**Remarks.** Differs from the Maastrichtian *Gyroconulina* Schroeder & Darmonoian, 1977 in its wholly triserial coiling, high chambers, and in the more complex inner structure. *Anatoliella* has several generations of vertical and horizontal partitions, forming numerous alveolar compartments, whereas *Gyroconulina* has only beams, occasional vertical partitions, and only a single generation of rafters, forming only four rows of hexagonal compartments in the marginal zone. *Anatoliella* differs from all orbitolinid genera with a single series of shallow cup-like chambers in its triserial chamber arrangement. Only a megalosphaeric generation of *Anatoliella* has been observed by Sirel (1988). Subfamily: Ataxophragmiinae.

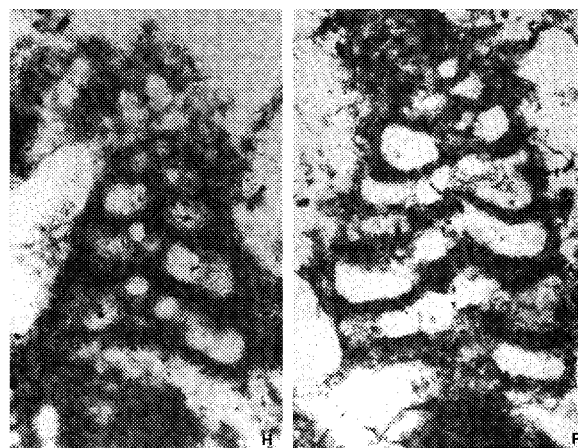
Sirel, E. 1988. *Anatoliella*, a new foraminiferal genus and a new species of *Dictyokathina* from the Paleocene of the Van area (East Turkey). *Revue de Paléobiologie*, **7**(2), 447-493.

##### MONTSALEVIA Zaninetti, Salvini-Bonnard, Charollais, & Decrouez, 1987

Figure 77

*Type species: Montsalevia elevata* Zaninetti, Salvini-Bonnard, Charollais, and Decrouez, 1987, OD.

*Montsalevia* Zaninetti, Salvini-Bonnard, Charollais, and Decrouez, 1987, p. 168.



**Figure 77.** Holotype and paratype of *Montsalevia elevata* from Zaninetti *et al.* (1987).

Test small, conical, with a reduced ?trochospiral initial portion, followed by a biserial portion comprised of 5 to 8 sets of chambers that are wider than high. Periphery subangular to rounded, with radially arranged internal vertical secondary septa, but lacking any horizontal secondary septa. Wall calcareous microgranular, simple, imperforate. Aperture unknown, probably interiomarginal. Berrasian-Valanginian; Northern French Alps.

**Remarks.** Zaninetti *et al.* considered this genus to be ancestral to *Sabaudia*. Family: Montsaleviidae Zaninetti *et al.* (1987).

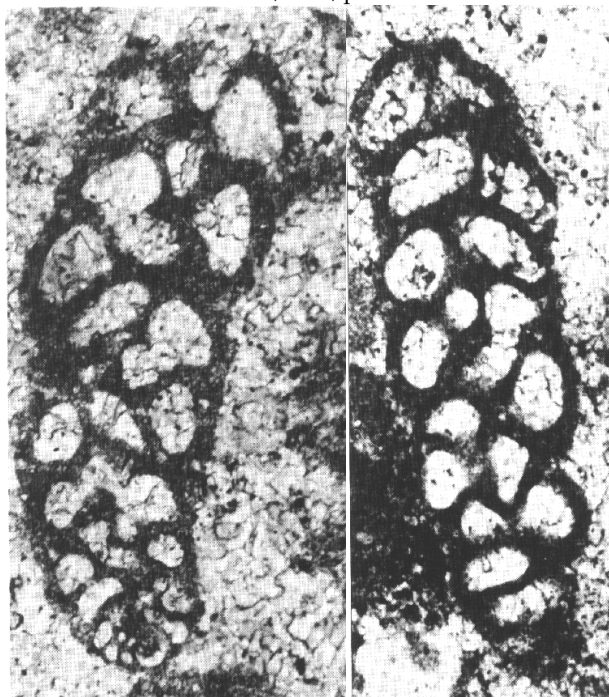
Zaninetti, L. Salvini-Bonnard, G. Charollais, J. and Decrouez, D. 1987. *Montsalevia* n.gen. (Montsaleviidae, n.fam., foraminifère) dans le Cretacé Inferieur (Berriasien moyen - Valanginien) du Mont Salève et du Jura Méridional (Haute Savoie, France); Note Préliminaire. *Revue de Paleobiologie*, 6(1), 165-168.

#### PIALLINA Rettori & Zaninetti, 1993

Figure 78

Type species: *Piallina tethydis* Rettori & Zaninetti, 1993, OD(M)

*Piallina* Rettori & Zaninetti, 1993, p. 171.



**Figure 78.** Type specimens of *Piallina tethydis* from Rettori & Zaninetti (1993).

Test free, elongate, rounded in section. Consisting of a short early stage in the form of a low trochoid (or streptospiral?) coil; second stage triserial, short, followed by a trochospiral stage, slightly contorted, with an indefinite number of chambers per whorl (probably not more than five) which reduces to three, possibly two, chambers per whorl in the final stage. Undivided chambers subangular in shape with distinct rounded angles and indistinct sutures. Wall agglutinated, simple, noncanaliculate, with a smooth surface. Aperture rounded, interiormarginal, characterised by an extension of wall within the chamber lumen in direction of preceding chamber. Upper Triassic (Carnian); Turkey, Hungary, China. Family: Piallinidae Rettori & Zaninetti, 1993.

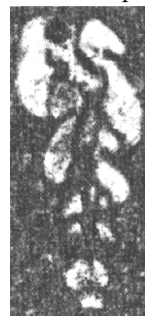
Rettori, R., Zaninetti, L., Martini, R., & Vachard, D., 1993. *Piallina tethydis* gen. et sp.nov. (Foraminiferida) from the Triassic (Carnian) of the Kocaeli Peninsula, Turkey. *Journal of Micropalaeontology*, 12, 170-174.

#### SIPHOVALVULINA Septfontaine, 1988

Figure 79

Type species: *Siphovalvulina variabilis* Septfontaine, 1988, OD(M).

*Siphovalvulina* Septfontaine, 1988, p. 245.



**Figure 79** Type specimen of *Siphovalvulina variabilis* Septfontaine, 1988.

Test trochospirally coiled, high or low. In general three chambers per whorl. Wall may show a keriothecal structure, rarely visible. Interior of chambers free. Twisted siphonal canal connecting successive apertures. Aperture unique, basal, may become cribrate in last chambers of advanced forms. Hettangian to Lower Cretaceous; Pre-Alps, Switzerland.

**Remarks.** The aperture in the type species varies from single to multiple (porous), suggesting a close relationship of the genus with the pfenderinids. This common form has been variously placed in *Belorussiella*, *Trochammina*, or *Gaudryina*, but these genera do not possess a central siphon. Subfamily: Pseudopfenderininae Septfontaine, 1988; Family: Pfenderinidae

Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic lutilids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume*, 2, 229-256.

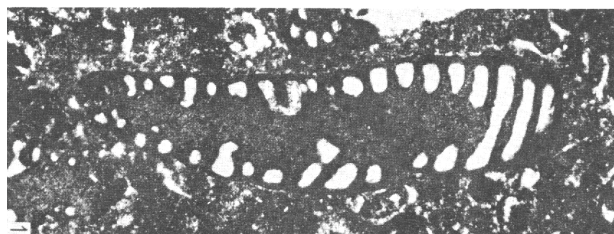
#### PALEOPFENDERINA Septfontaine, n.gen.

Figure 80

Type species: *Pfenderina salernitana* Sartoni & Crescenti, 1962, OD.

*Paleopfenderina* Septfontaine, 1988, p. 245 (name not available, ICZN Art. 13 (b), type species not designated, no description given).

*Paleopfenderina* Septfontaine in: Kaminski, 2000, this study.



**Figure 80.** Holotype of *Pfenderina salernitana* from Sartoni & Crescenti (1962; pl. 50, fig. 1).

[Description provided by M. Septfontaine]: Test free, trochospirally coiled with 3-4 whorls. Test elongate or rather low. Wall microgranular to slightly agglutinated, sometimes showing a keriothecal microstruc-



ture. Chambers low and broad. Septa slightly oblique to the spiral axis. A central microgranular columella twisted along the coiling direction is present. Some pillars are sometimes visible in the columella of the last chambers. Presence of a subcameral tunnel or groove in the massive columella. Aperture multiple, cribrate, as a porous plate. Bathonian to Callovian; Apennines, Italy.

**Remarks.** Description not originally given. Septfontaine (1988) did not designate a type species and only remarked "See original description of *P. salernitana* in Sartoni & Crescenti (1962) and *P. trochoidea* in Smout & Sugden (1961)." *Paleopfenderina* differs from *Pfenderina* Henson, 1948 by the superficial position of the tunnel, as a groove at the surface of the columella. The inter-pillar spaces are filled with calcitic material in *Paleopfenderina*, whereas in *Pfenderina* the filling is less important and the pillars are clearly visible. Subfamily: *Paleopfenderininae* Septfontaine, 1988; Family *Pfenderinidae*.

Sartoni, S. & Crescenti, U. 1962. Ricerche biostratigrafiche nel Mesozoico dell'Appennino meridionale. *Giornale di Geologia*, ser. 2, **29** (1960-1961),

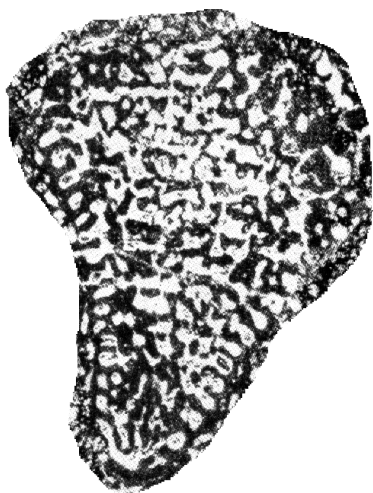
Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic litooids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume*, **2**, 229-256.

#### CONICOPFENDERINA Septfontaine, n.gen.

Figure 81

*Type species:* *Lituonella mesojurassica* Maync, 1972, OD. *Conicopfenderina* Septfontaine, 1988, p. 246 (name not available, ICZN Art. 13 (a) (i), no description).

*Conicopfenderina* Septfontaine in: Kaminski, 2000, this study.



**Figure 81.** *Lituonella mesojurassica* Maync, 1972.

[Description provided by M. Septfontaine]: Test conical, with variable shape from high conical to almost cylindrical. Coiling initially trochospiral, with adult chambers uniserial, saucer shaped. Wall microgranular to slightly agglutinated, sometimes showing a keriothecal microstructure. Presence of irregular interseptal pillars in the centres of the chambers.

Stolon system radial. The marginal zone of the chambers is not subdivided. Aperture multiple, as a porous plate. U. Bathonian; Switzerland.

**Remarks.** Septfontaine (1988) did not provide a description of the genus, but only remarked "See original description of Maync (1972)". The genus is validated herein. According to Septfontaine (1988), the name *Lituonella* (an Eocene form) should not be used for Middle Jurassic orbitoliniform foraminifera, as it has a different phylogenetic history. *Conicopfenderina* differs from *Parurgonina* Cuvillier, Foury, & Pignatti Morano, 1968 by the uniserial arrangement of its chambers, which in the latter is trochospiral. Subfamily: *Paleopfenderininae* Septfontaine, 1988.

Maync, W. 1972. *Lituonella mesojurassica* n.sp. from the Mytilus Dogger of the Swiss Prealps. *Revista Española de Micropaleontología*, **4**, 251-266.

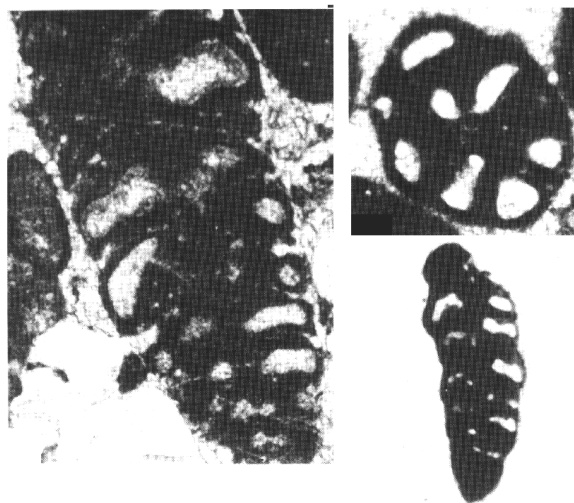
Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic litooids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume*, **2**, 229-256.

#### PSEUDOEGGERELLA Septfontaine, 1988

Figure 82

*Type species:* *Pseudoeggerella elongata* Septfontaine, 1988, OD(M).

*Pseudoeggerella* Septfontaine, 1988, p. 246.



**Figure 82.** *Pseudoeggerella elongata* from Septfontaine (1988).

Test trochospiral throughout, with five chambers per whorl in the adult stage, probably more in the younger stage. Wall microgranular, agglutinated, sometimes with two layers; an inner microgranular one and an outer (clear) agglutinated one. The floor and roof of the chambers are thickened by calcitic deposits which form a small protuberance in the middle part of the chambers. Presence of a narrow columella in the axis of the test. The stalagmitic protuberance is deeply incised against the columella. No aperture visible. Bathonian; Pre-Alps, Switzerland.

**Remarks.** *Pseudoeggerella* is related to *Paleopfenderina*, but lacks a subcameral tunnel. It is homeomorphic to

*Pseudopfenderina* Hottinger, 1967 but differs in possessing calcitic protuberances in the chambers. Subfamily: Paleopfenderininae.

Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic litoiids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume, 2*, 229-256.

#### CONICOKURNUBIA Septfontaine, 1988

Figure 83

Type species: *Conicokurnubia orbitoliniformis* Septfontaine, 1988, OD(M).

*Conicokurnubia* Septfontaine, 1988, p. 247.

Test conical, chambers cup-like in the adult stage, uniserial; early stage and embryonic chambers not known. Wall microgranular, with a complicated hypodermic network; vertical (first order) partitions join the centre of the chambers and coalesce with the pillars; vertical (second order) partitions are only restricted to the marginal zone. Cylindrical interseptal pillars, in the central part of the chambers, may be associated with an apertural plate. Aperture multiple, cribrate. Stolons radial. Oxfordian to Kimmeridgian.



Figure 83. *Conicokurnubia orbitoliniformis* from Septfontaine (1988).

**Remarks.** Differs from *Dictyoconus* Blanckenhorn, 1900 in the less complicated marginal zone of the chambers. Subfamily: Kurnubiinae.

Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic litoiids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume, 2*, 229-256.

#### PRAEDICTYORBITOLINA Schroeder, 1990

Figure 84

Type species: *Praedictyorbitolina carthusiana* Schroeder, 1990 OD(M).

*Praedictyorbitolina* Schroeder in Schroeder et al. 1990, p. 196.

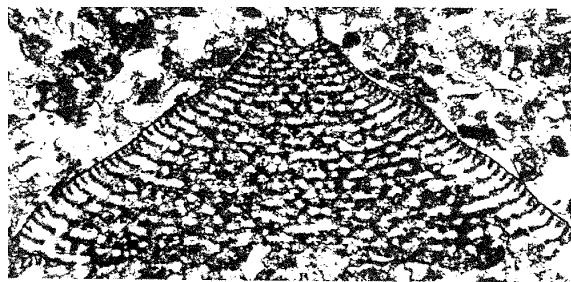


Figure 84. Holotype of *Praedictyorbitolina carthusiana*, modified from Schroeder et al. (1990).

An orbitolinid genus characterised by a simple embryonal apparatus in an excentric position, by first order chamberlets in the marginal zone that are vertically aligned, and by a central zone with pillars that alternate in position from one chamber to the next. Early Barremian; Western Alps, France.

**Remarks.** Differs from *Dictyorbitolina* in its excentric embryonal apparatus and distinct deuteroconch. However, the structure of the chambers in the two genera are identical. *Paracoskinolina* differs mainly in the position of the pillars in the central zone, which do not alternate in position from chamber to chamber. In all the remaining orbitolinid genera, the first order chamberlets in the marginal zone and the structural elements subdividing the central zone alternate in position from one chamber to the next. Subfamily Praedictyorbitolininae Schroeder, 1990.

Schroeder, R., Clavel, M.B., Charollais, J. 1990. *Praedictyorbitolina carthusiana* n.gen. n.sp., Orbitolinidé (Foraminiferida) de la limite Hauterivien-Barrémien des Alpes occidentales. *Paläontologische Zeitschrift*, **64** (3-4), 193-202.

#### TEXTULARIACEA Ehrenberg, 1838

##### PRAEDOROTHIA Desai & Banner, 1987

Figure 85

Type species: *Dorothia praeauteriviana* Dieni & Massari, 1966, OD.

*Praedorothia* Desai & Banner, 1987, p. 18.

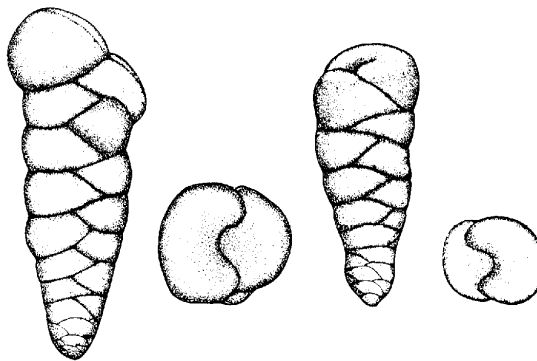


Figure 85. Type figures of *Praedorothia praeauteriviana* (Dieni & Massari) from Dieni & Massari (1966).

Test chamber arrangement, septal form, and aperture as in *Dorothia* Plummer, 1931, but the wall is solid,



not canaliculate. Valanginian–Barremian; Sardinia, northwest Europe, DSDP sites.

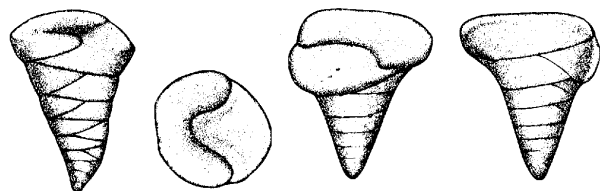
**Remarks.** Desai & Banner (1987) demonstrated that many of the Lower Cretaceous species previously assigned to *Dorothia* (i.e., *D. praeauteriviana* Dieni & Massari, 1966, *D. praeoxycona* Moullade, 1966; *D. zedleri* Moullade, 1966) can be transferred to this genus on the basis of their noncanaliculate wall structure. Subfamily: Dorothiinae.

Desai, D., & Banner, F.T., 1987. The evolution of Early Cretaceous Dorothiinae (Foraminiferida). *Journal of Micropaleontology*, 6(2), 13-27.

#### PROTOMARSSONELLA Desai & Banner, 1987

Figure 86

Type species: *Dorothia hechti* Dieni & Massari, 1966, OD  
*Protomarssonella* Desai & Banner, 1987, p. 24.



**Figure 86.** Type figures of *Protomarssonella hechti* (Dieni & Massari), from Dieni & Massari (1966).

Test coiling, septa, and apertures as in *Marssonella*, but the agglutinated wall is solid, not canaliculate. U. Jurassic - L. Cretaceous; Sardinia, northwest Europe, DSDP sites.

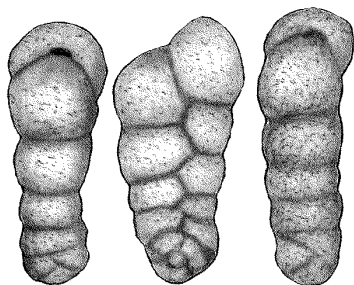
**Remarks.** This genus differs from *Marssonella* Cushman, 1933 just as *Praedorothia* differs from *Dorothia*. *Protomarssonella* may occur in strata as old as Late Jurassic, e.g., "*Marssonella*" *donesiana* Dain, as figured by Luterbacher (1972). Subfamily: Dorothiinae.

Desai, D., & Banner, F.T., 1987. The evolution of Early Cretaceous Dorothiinae (Foraminiferida). *Journal of Micropaleontology*, 6(2), 13-27.

#### PSEUDOMORULAEPLECTA Neagu & Neagu, 1995

Figure 87

Type species: *Pseudomorulaepecta franconica* (Gümbel, 1862) = *Textilaria franconica* Gümbel, 1862, OD.  
*Pseudomorulaepecta* Neagu & Neagu, 1995, p. 218.



**Figure 87.** Specimens of *Pseudomorulaepecta franconica*, from Neagu & Neagu (1995).

Test biserial textularoid in the adult stage, a short low trochospirally coiled early stage with a bulbaceous aspect. Aperture interiomarginal, textularoid the basal part of the last formed chamber. Wall canaliculate, fine to moderately agglutinated wall with siliceous cement. Upper Jurassic; Romania.

**Remarks.** This genus differs from *Textularia* DeFrance, 1826 (with which it is homeomorphic) by its early low trochospirally coiled stage. It differs from *Morulaepecta* Höglund, 1947 by its canaliculate wall structure. Subfamily: Textulariinae.

Neagu, T. & Neagu, M. 1995. Smaller agglutinated foraminifera from the *acanthicum* Limestone (Upper Jurassic), Eastern Carpathians, Romania. In: Kaminski, M.A., Geroch, S., & Gasinski, M.A. (eds) 1995. Proceedings of the Fourth International Workshop on Agglutinated Foraminifera, Kraków Poland, September 12-19, 1993. *Grzybowski Foundation Special Publication* no. 3, 211-225.

#### HEMLEBENIA Loeblich & Tappan, 1989

Figure 88

Type species: *Hemlebenia aptiensis* Loeblich & Tappan, 1989, OD(M).

*Hemlebenia* Loeblich & Tappan, 1989, p. 776.



**Figure 88.** Holotype specimen of *Hemlebenia aptiensis* redrawn from Loeblich & Tappan (1989).

Test tiny, pyramidal in form, triangular in section, with slightly concave sides and rounded angles. Chambers triserially arranged throughout. Wall finely agglutinated, canaliculate, with considerable cement, surface rather smoothly finished. Aperture a small arch at the base of the apertural face. Aptian; DSDP Site 398, northeastern Atlantic.

**Remarks.** Although the type species of *Hemlebenia* was referred to *Verneuilina* d'Orbigny, 1839 by Desai & Banner (1987), it differs in having a canaliculate wall (Upper Cretaceous *Verneuilina* have a solid wall). The gap in stratigraphic occurrence suggests that a relationship between *Hemlebenia* and true solid-walled *Verneuilina* is unlikely, and there is no evidence of repeated divergence of advanced canaliculate species from *Verneuilina*. Subfamily: Pseudogaudryinae.

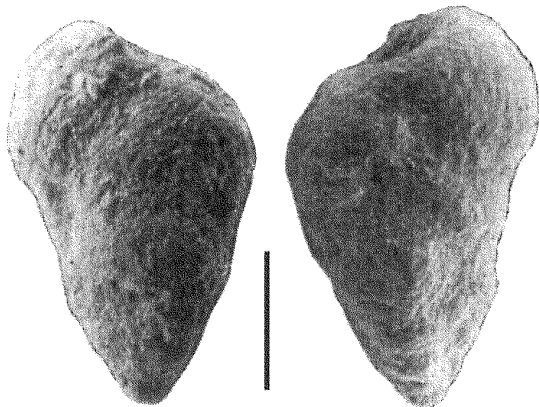
Loeblich, A.R. & Tappan, H. 1989. Implications of wall composition and structure in agglutinated foraminifers. *Journal of Paleontology*, **63**, 769-777.

**PARAMIGROS** Adb-Elsahfy & Ibrahim, 1990

Figure 89

*Type species: Paramigros hammadensis* Adb-Elsahfy & Ibrahim, 1990

*Paramigros* Adb-Elsahfy & Ibrahim, 1990, p. 24.



**Figure 89.** Holotype of *Paramigros hammadensis*, modified from Adb-Elsahfy & Ibrahim (1990). Scale = 50  $\mu$ m.

Test free, elongate, initially triserial, then becoming biserial. Wall arenaceous. Aperture semicircular, occupying the lower half of the exposed part of the last chamber. Bathonian-Kimmeridgian; Egypt.

**Remarks:** Differs from *Gaudryina* and *Migros* in possessing a semicircular aperture extending from the base to the center of the last chamber.

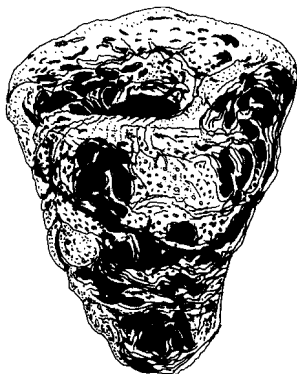
Abd-Elsahfy, E. & Ibrahim, N., 1990. New Jurassic foraminifera from Egypt. *Acta Paleontologica Polonica*, **35**, 15-29.

**CONNEMARELLA** Loeblich & Tappan, 1989

Figure 90

*Type species: Gaudryina rudis* J. Wright, 1900, OD.

*Connemarella* Loeblich & Tappan, 1989, p. 774.



**Figure 90.** Specimen of *Connemarella rudis*, redrawn from Loeblich & Tappan (1989).

Test conical, with early triserial arrangement followed by broad and low biserial chambers that increase steadily in breadth and height, apertural face flattened; sutures horizontal and constricted. Wall coarsely agglutinated with calcareous cement; outer chamber wall distinctly canaliculate, but apertural face and septa not canaliculate. Aperture a broad low arch, in a reentrant at the base of the apertural face. Holocene; Ireland. Subfamily: Pseudogaudryinae.

Loeblich, A.R., & Tappan, H., 1989. Implications of wall composition and structure in agglutinated foraminifers. *Journal of Paleontology*, **63**, 769-777.

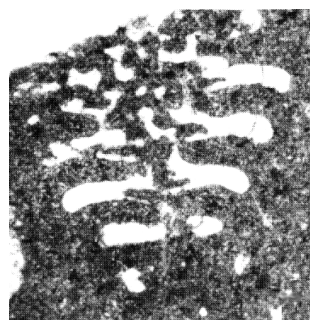
**PARAVALVULINA** Septfontaine, 1988

Figure 91

*Type species: Paravalvulina complicata* Septfontaine, 1988, OD(M).

*Paravalvulina* Septfontaine, 1988, p. 248.

Test trochospiral throughout, three chambers per whorl. Wall microgranular, agglutinated, with a keriotheca. Interior of chambers simple, but disrupted organic layer often visible. Main aperture transformed in multiple aperture on successive tooth plates. Pillars subconical, associated with a crosswise-oblique stolon system. U. Bajocian to Bathonian; Sardinia.



**Figure 91.** *Paravalvulina complicata* from Septfontaine (1988).

**Remarks.** Differs from *Parurgonina* in having fewer chambers per whorl in the adult stage and in having a central zone that is less developed in terms of volume. *Paravalvulina* is the possible ancestor of *Kilianina*, Pfender, 1933 which has a more complicated inner structure and a greater number of chambers per whorl. Subfamily: Paravalvulininae Banner, Simmons & Whittaker, 1991; Family Chrysalidinidae.

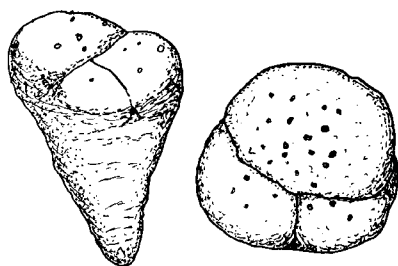
Septfontaine, M. 1988. Towards an evolutionary classification of Jurassic luluolids (Foraminifera) in carbonate platform environment. *Revue de Paléobiologie Special Volume*, **2**, 229-256.

**INDOMARSSONELLA** Mandwal & Singh, 1993

Figure 92

*Type species: Indomarssonella eucona*, Mandwal & Singh, 1993, OD.

*Indomarssonella* Mandwal & Singh, 1993, p. 64.



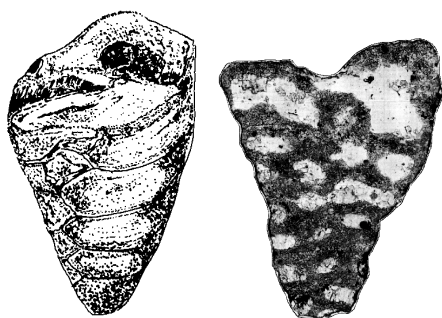
**Figure 92.** Holotype of *Indomarssonella eucona*, redrawn from Mandwal & Singh (1993).

Test conical, initially trochoid, rounded in cross section with four to five chambers to a whorl; later portion rounded to subtriangular in cross section with three to five chambers to a whorl. Chambers increase in size gradually and display two growth stages. Chamber surface generally smooth, flat to slightly inflated, with chambers of the last whorl much inflated, sometimes globular. Peripheral margin rounded to bluntly angled. Sutures straight to arched, flush to depressed. Wall noncanaliculate, finely agglutinated with a calcareous matrix. An elongate groove is present at the base of the last chamber, extending across the basal surface and filled with an irregular calcareous groundmass. Aperture cribrate, apertural pores scattered on the chambers of the last whorl. Bathonian; Kachchh, India.

**Remarks.** Dissection of specimens by Mandwal & Singh failed to reveal any basal aperture as in *Marssonella*, and no apertural flap was observed in any thin sections. Differs from *Pseudomarssonella* in the cribrate aperture, which is scattered over the entire surface of the chambers of the last whorl. Subfamily: Paravalvulininae Banner, Simmons & Whittaker.

Mandwal, N. & Singh, S.K. 1993. *Indomarssonella*, a new genus from the Jurassic rocks of Jhurio Hill, Kachchh, India. *Journal of the Palaeontological Society of India*, **38**, 63-72.

**REDMONDOIDES** Banner, Simmons & Whittaker, 1991  
Figure 93



**Figure 93.** *Pseudomarssonella media*, redrawn from Banner et al. (1991).

*Type species: Pseudomarssonella media* Redmond, 1965, OD.

*Redmondoides* Banner, Simmons & Whittaker, 1991, p. 117.

Test high trochospiral, quinqueseiral or quadriserial initially, becoming quadriserial in the adult. Adult primary aperture interiomarginal, umbilical, with an apertural flap or lip (not penetrated by areal accessory apertures) projecting from the lowest part of the apertural face above the aperture. No internal, umbilical pillars. Terminal faces and septa are flattened or weakly convex, and make distinct angles with the uninflated chamber walls. Wall calcareous agglutinated, microgranular. Bajocian-Kimmeridgian; Middle East.

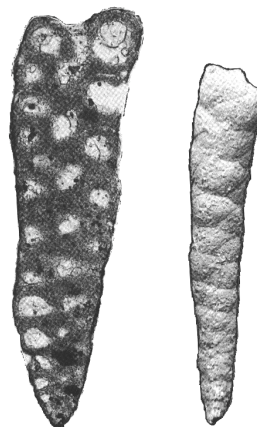
**Remarks.** *Pseudomarssonella* Redmond, 1965 differs from *Redmondoides* by possessing broad umbilical flaps (penetrated by areal cribrate accessory apertures) that fuse to the opposite chambers of the same whorl. In *Redmondoides* the umbilical flaps (or lips) are much narrower and the interiomarginal aperture remains open. Subfamily Paravalvulinidae Banner, Simmons & Whittaker.

Banner, F.T., Simmons, M.D. & Whittaker, J.E. 1991. The Mesozoic Chrysalidinidae (Foraminifera, Textulariacea) of the Middle East: the Redmond (Aramco) taxa and their relatives. *Bulletin of the British Museum of Natural History (Geology)*, **47**, 101-152.

**RIYADHOIDES** Banner, Simmons & Whittaker, 1991  
Figure 94

*Type species: Pseudomarssonella mcclurei* Redmond, 1965, OD.

*Riyadhoides* Banner, Simmons & Whittaker, 1991, p. 126.



**Figure 94.** *Pseudomarssonella mcclurei*, from Banner et al. (1991).

Test high trochospiral, initially quadriserial reducing to adult triseriality. Terminal face and septa flattened. Adult primary aperture interiomarginal, central in position, no apertural flap, no umbilicus or internal umbilical pillars, no areal accessory apertures. Wall calcareous agglutinated, microgranular. Bajocian; Middle East.

**Remarks.** *Redmondoides*, the presumed ancestor of *Riyadhoides*, differs in its quinqueseptal-quadriseptal coiling and in possessing an umbilicus over which apertural flaps may develop. *Riyadhoides* differs from *Protomarssonella* Desai & Banner, 1987 in lacking terminal biseriality. Reduction in the number of chambers per whorl may be so great that the test approaches biseriality. The adult test of the type species becomes almost parallel-sided as in some Lower Cretaceous species of *Protomarssonella* however true biseriality is never achieved. As in *Riyadhella* Redmond, 1965 the triserial terminal whorls of *Riyadhoides* consist of chambers so closely appressed that no umbilical space can exist between them. It may be distinguished from *Riyadhella* by its flattened terminal faces which form distinct angles with the uninflated chamber walls. Subfamily Paravalvulinidae Banner, Simmons & Whittaker.

Banner, F.T., Simmons, M.D. & Whittaker, J.E. 1991. The Mesozoic Chrysalidinidae (Foraminifera, Textulariacea) of the Middle East: the Redmond (Aramco) taxa and their relatives. *Bulletin of the British Museum of Natural History (Geology)*, **47**, (2), 101-152.

## Part 2: New Genera regarded as invalid:

### SIPHOEGGERELLA Hermelin, 1989

*Type species: Gaudryina siphonella* Reuss, 1851

*Siphoeggerella* Hermelin, 1989, p. 33.

"Test trochospiral with three chambers to whorl in adult, basal part rounded. Wall agglutinated. Aperture round, in terminal face of ultimate chamber, on a short neck."

**Remarks.** This name is considered invalid because *Gaudryina siphonella* Reuss is the type species of *Karrierella* Cushman, 1933.

Hermelin, O.R. 1989. Pliocene benthic foraminifera from the Ontong-Java Plateau (western equatorial Pacific Ocean): Faunal response to changing paleoenvironment. *Cushman Foundation for Foraminiferal Research Special Publication*, **26**, 143 pp.

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