ON THE NEW UNDERSTANDING OF THE ORDER LITUOLIDA LANKESTER, 1885
(FORAMINIFERA)

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Abstract. The composition order Lituolida Lankester, 1885 and the diagnosis of the 4 superfamilies, 16 families, 10 subfamilies and 80 genera entering this order sensu strictae are given below. All the diagnoses of the represented taxa (from the order up to the generic level) are emended. Three subfamilies (Comaliamminae, Acruilamininae and Popoviniinae) are new.

Keywords: Agglutinated foraminifera, Systematica, New taxa.

INTRODUCTION

Order Lituolida was first described by Lankester in 1885 and later in 1903 years. Lankester separated Lituolids among 10 orders of the class Foraminifera including in its composition families Lituolidae, Trochamminidae, Endothyridae and Loftusiidae. Reophax was included into the family Lituolidae. The diagnosis of the order was as follows: "Test arenaceous, usually regular in contour, chambers of the polythalamous forms frequently labyrinthic. Comprises sandy isomorphs of the simple porcellaneous and hyaline types..." With the exception of Endothyrids, this composition leaves till recent days (of course widened on the account of the new genera and families). Loeblich & Tappan (1992) elaborating further their previous classification (Loeblich & Tappan, 1987) included into this taxon above the Lituolacea (= order Lituolida of Lankester) - 13 superfamilies, and among them Ammodiscacea, Rzehakinacea, Hormosinacea. Thus nearly all known types of the foraminifer shells (pseudotwochambered and multichambered, uniserial and coiled of plano-, strepto- or trochospiral coiling, with different position and character of the aperture and different character of chambers) were united in one taxon. The only common feature for all of them was the agglutinated noncanaliculate wall of the shell (though some forms with canaliculi (Melatrokerion, Coscinophragma) and pseudopore openings (Lituolipora) were also present). This classification based more on the shell wall composition and structure is considered to have very important but subordinate meaning. Thus only part of the representatives of the superfamilies Lituolacea in the understanding of Loeblich & Tappan, 1992 are entering here the order Lituolida sensu strictae: Mayncinidae, Lituolidae (part): Lituolinae, Ammomarginulininae (part), Placopsilinidae; from the Haplophragmiacea: Barkerinidae, from the Biokovinacea: Charentiidae, Lituoliporidae, Biokovinidae, from the Loftusiacea: Mesoendothyridae (part): Planisepitinae, Labyrinthinidae; Hottingeritidae, Cyclamminidae (part): Buccicrenatinae, Choffatellinae, Pseudochoffatellinae; Spirocyclinidae (some of them also without some genera – see below). Some minor changes within the previous lituolids in the narrow sense are also made. The full revision of the lituolids is not finished yet as the structure of many genera, especially of their initial stages needs to be restudied and specified. The composition and the diagnosis of the 4 superfamilies, 16 families, 10 subfamilies and 80 genera entering the order Lituolida sensu strictae are given below. All the diagnoses of the represented taxa (from the order up to the generic level) are emended.

SYSTEMATIC DESCRIPTIONS

Phylum FORAMINIFERA d'Orbigny, 1826
Subclass MILIAMMINANA Mikhalevich, 1980
Order LITUOLIDA Lankester, 1885

Test multichambered, planispiral, at least initially, later may be uncoiled, coiled part involute (more often) or evolute, chambers from isomorphic nearly subtriangular in outline to broad and low (like in Peneroplis), with straight or arcuate sutures, wall agglutinated or microgranular-agglutinated, aperture terminal (areal to final), without a tooth, single or multiple.

Remarks. Lituolids included here are to a strong degree isomorphic to some higher Miliolata (for instance Charentia to Derventina; Stomatostoecha, Choffatella, Torinosuella and many others – to different Peneroplids). In the composition of the order Lituolida (Loeblich & Tappan, 1994 and in some following classifications) genera having both agglutinated and microgranular-agglutinated, aperture terminal (areal to final), without a tooth, single or multiple.

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cases. More often it is easier to distinguish the taxa based on shell form and the position and the character of the aperture. Position of the initial aperture is in many genera unclear and needs more detailed investigations. But in some cases the terminal character of the initial aperture is seen in thick sections in spite that in their diagnosis it is marked like interiomarginal. As it is no sharp boundary between agglutinated and microgranular agglutinated wall the special details in the diagnoses of the genera concerning their wall structure are given only in the cases when these details have diagnostic significance. Forms with the basal aperture, at least at the early stages are excluded from lituolids and transferred to the class Rotaliata, subclass Textulariana (order Nautiloculinida Mikhailевич, 2003) (Nautiloculina, Haplophragmoïdes and some others). The uniserial forms as well as ammomarginulinids with the terminal aperture displaced to the peripheral angle and some other ones bearing the nodosariata’s features - to the orders Hormosinida Mikhailевич, 1980, Ammomarginulinida Mikhailевич, 2002 and some others of the subclass Hormosiniana. Haurania-like forms with trochoid initial part transferred to Textularioida, trochospiral nezzazatids also are not included here. Pseudotwochambered forms with long tubular second chamber are placed in class Spirillinata (subclass Ammodiscana Mikhailевич, 1980, order Ammodiscida Mikhailевич, 1980). Litotubida was also separated from lituolids (Mikhailевич, 1992, 2000, 2003 in press). Some forms took their place within the same subclass but in the other orders: tubular multichambered forms (Rzhekinina-like) - in the order Schlumbergerinida Mikhailевич, 1980 (Ruzhekinida Saidova, 1981 is its junior synonym), forms streptospirally coiled – in the order Haplophragmoïida Mikhailевич, 1992, some forms with stable cyclic and annular chambers in both generations – in the order Cyclolinida Mikhailевич, 1992.

Superfamily Lituloidea de Blainville, 1827
Test free or attached, coiled part involute, wall simple.

Litulidae de Blainville, 1827
Test free, planispiral and mostly involute, consisting of early planispirally coiled and later uncoiled rectilinear part usually well developed, chambers of the coiled part usually broad and high (subtriangular) and more often rather inflated, as a rule gradually enlarging in size and not multiple in a whorl, with more or less straight sutures, chambers of the later part usually rounded in section with horizontal sutures, aperture single or multiple.

Ammobaculitinae Alekseychik-Mitskevich, in Subbotina et al., 1981
Test with a single aperture.

Remarks. Subfamily reinstated here from the synonymy of Ammomarginulininae in Loeblich & Tappan, 1987. It differs from the latter in having nonflattened test, horizontal sutures and central position of the aperture, but may be it also belongs wholly or partially to the order Ammomarginulida, the additional study is necessary. Genera with secreted wall and similar character of chambers occur both among higher nodosariats and higher miliolats and it is sometimes difficult to distinguish such forms among their agglutinated ancestors.

Ammobaculites Cushman, 1910 (Pl. I, fig. 1)
Type species: Spirolina agglutinans d’Orbigny, 1846
Test with closely coiled early portion and rounded in the section terminal part, aperture rounded, at the center of the coarse apertural surface. C (Miss) – Hol.

Ammobacularia Kristan-Tollmann, 1964 (Pl. I, fig. 2)
Type species: Ammobacularia trioba Kristan-Tollmann, 1964
Test with closely coiled early portion and rounded in the section terminal part, aperture triangular, nearly triradiate in appearance, situated on the fine-grained and slightly produced area. U. Tr.

Sculptobaculites Loeblich & Tappan, 1984 (Pl. I, fig. 3)
Type species: Ammobaculites goodlandensis Cushman & Alexander, 1930
Test with the planispiral part slightly evolute, terminal aperture rounded, wall extremely coarse (of oolites, calcite prisms of Inoceramus shells, shell fragments, foraminifers), Jr – Cr.

Remarks. Aperture reported as “arch at the base” but is unclear and needs to be restudied, other features of the genus fit to this subfamily.

Simobaculites Loeblich & Tappan, 1984 (Pl. I, fig. 4)
Type species: Ammobaculites cuyléri Tappan, 1940
Test with nearly flat sides, flattened to slightly lenticular in section, initial part evolute, aperture terminal, slitlike to fusiform, symmetrically located at the midpoint of the apertural surface. U. Pennsylv. to L., Perm., Cr, Paleoc., Eoc., L. Mioc.

Ostiobaculites Bronnimann, Whittaker, Zaninetti, 1992 (Pl. I, fig. 5)
Type species: Ostiobaculites salsus Bronnimann, Whittaker & Zaninetti, 1992
Test with closely coiled early portion and rounded in the section terminal part, aperture large, almost rectangular slot, parallel to axis of early coiling. Hol.

Litulinae de Blainville, 1827
As Ammobaculitinae, but with the multiple aperture.
**Lituola** Lamarc, 1804 (Pl. I, fig. 6 – 8)
Type species: *Lituolites nautiloidea* Lamarc, 1804
Test with the initial part close coiled, with three or more volutions and numerous chambers, increasing gradually in size as added, rectilinear part well developed, aperture multiple in the uncoiled part and obviously even in the coiled part. U.Tr. – Hol.

**Atactolutuola** Loeblich & Tappan, 1984 (Pl. I, fig. 9, 10)
Type species: *Reophax subgoodlandensis* Vanderpool, 1933
Test with the initial part weakly coiled, the only whorl consisting of two or three chambers arranged in arcuate to semicoiled planispiral, rectilinear part well developed, may be slightly curved, with the chambers enlarging in size rather rapidly, aperture at the later stage cibrate, at the earlier stage – not described. L. Cr.

**Bulbobuccicrenata** Kerdany & Eissa, 1973 (Pl. I, fig. 11)
Type species: *Bulbobuccicrenata aegyptica* Kerdany & Eissa, 1973
Test with the planispiral initial part well developed, with few globular chambers in a whorl, enlarging so rapidly as added that the last chamber comprises more then one half of the test, rectilinear part weakly developed (only the tendency to uncoil), aperture – scattered rounded or oval openings at the face of the final chamber, obviously the same in the earlier chambers. U. Cr.

**Kolchidina** Morozova, 1967 (Pl. I, fig. 12)
Type species: *Ammobaculites manyschensis* N.K. Bykova, 1953 (= A. paleocenicus Cushman, 1947, nom. subst.pro A. midwayensis Cushman, 1940)
Test with well expressed both the planispiral and uncoiled part, with numerous chambers gradually increasing in size as added, wall may be considerably thickened resulting in reduced chamber lumen, aperture areal and arcuate to semilunate in the early coil, parallel with the axis of coiling, in the uncoiled stage - multiple, in a depression covering most of the upper portion, comprised by irregular, rounded and elongated openings. L. Paleoc.

**Carasuella** Neagu, 2000 (Pl. I, fig. 13)
Type species: *Carasuella cylindrica* Neagu, 2000
Test with well expressed both planispiral and uncoiled part and gradually increasing chambers, aperture cribrate, comprising many circular pores situated at the convex apertural surface in the uncoiled part, in the earlier coiled part not described, obviously the same. Cr.

**Buzasinidae** Mikhailovich, 2003
Test free, planispirally coiled, entirely, involute, compressed to different degree, with somewhat flattened chambers, aperture areal, single, looking as a transverse slit or circular, usually boarded by a narrow lip.

**Buzasina** Loeblich & Tappan, 1985 (Pl. I, fig. 14, 15)
Type species: *Trochammina ringens* Brady, 1879
Test somewhat compressed, involute, with 3-4 chambers per whorl, rapidly enlarging as added, the last one occupying nearly half of the test, wall very finely agglutinated, smooth, with considerable cement, brown, aperture areal, slitlike, equatorial, completely bordered by a narrow lip. U. Cr. Hol.

**Apostrophoides** McNeil, 1997 (Pl. I, fig. 17)
Type species: *Apostrophoides silus* McNeil, 1997
Test laterally compressed, involute to slightly evolute, biumbilicate, with numerous chambers enlarging gradually in size, wall finally agglutinated, aperture areal, rounded, apertural face projects forward above the aperture, but curved back below it thus forming a sub-apertural notch between the aperture and the preceding whorl. Maastr.

**Mayncinidae** Loeblich & Tappan, 1985
Test free, entirely planispirally coiled or with weak tendency to uncoil, lenticular to flattened, mostly involute, usually with numerous more or less broad and low flattened chambers per whorl in a rapidly enlarging coil, with septa gently arced, often curving back to the peripheral angle, chambers of the weakly uncoiled part (if present) oval to flattened, often in the depression of the apertural character.

**Mayncininae** Loeblich & Tappan, 1985
Test with the multiple aperture.

**Mayncina** Neumann, 1965 (Pl. I, fig. 18, 19)
Type species: *Daxia orbignyi* Cuvillier & Szakall, 1949
Test oval in outline, discoidal to lenticular, in operculinoid spire, chambers arced toward the apertural face, apertural face vertical, subtriangular, truncated to slightly excavated, aperture cribrate, areal, representing pores scattered up the apertural face and seen in thin section as a multiple passages through the septa. U. Cr.
**Flabellocyclolina** Gendrot, 1964 (Pl. I, fig. 20, 21)
Type species: *Flabellocyclolina laevigata* Gendrot, 1964
Test large, flattened and very thin, fanshape in outline, early stage evolute, with numerous chambers extremely broad and low, later stage peneropliform with flaring and strongly arced chambers, wall calcareous, microgranular, smooth, apertural face horizontal, very thin, aperture multiple, represented by a single row of rounded openings along the apertural face in the median plan of the test. U. Jr., U. Cr.

**Gendrotella** Maync, 1972 (Pl. I, fig. 22, 23)
Type species: *Choffatella rugoretis* Gendrot, 1968
Test flat, oval in outline, chambers broad and low, arced in the middle, apertural face high and very thin, apertural face vertical, thin, aperture multiple, areal, a series of pores aligned vertically up the apertural face, seen as passages through the septa in thin sections. U. Cr.

**Stomatostoecha** Applin, Loeblich & Tappan, 1950 (Pl. I, fig. 24, 25)
Type species: *Stomatostoecha plummerae* Applin, Loeblich & Tappan, 1950
Test discoidal to lenticular, oval in outline, with slight tendency to uncoil, incompletely involute, with depressed umbilicus, chambers somewhat more broad and arced than in *Phenacophragma*, apertural face vertical, very high, truncate or depressed centrally, aperture – a vertical row of rounded openings along the apertural face.

**Remarks.** Loeblich & Tappan, 1987 described in the diagnosis the aperture of the late stage as a single slit, but in their figure of the holotype of the type species *S. plummerae* it is distinctly multiple – a vertical row of the rounded openings.

Comaliamminae subfam. nov.
Test with the single aperture representing a slit along the apertural face.

**Daxia** Cuvillier & Szakall, 1949 (Pl. I, fig. 26, 27)
Type species: *Daxia cenomana* Cuvillier & Szakall, 1949
Test nearly circular in outline, lenticular to flattened, depressed at the umbilical region on the both sides, with numerous broad chambers, nearly crescentiform, arced centrally and curving back to the peripheral angle, apertural face vertical, short-triangular, truncated to slightly excavated, aperture areal, small, hardly seen externally, better in thin section. Cr.

**Remarks.** Loeblich & Tappan (1987) marked that the multiple aperture of *Daxia* is probably due to a misidentification.

**Biconcava** Hamaoui, 1965 (Pl. I, fig. 28, 29)
Type species: *Biconcava bentori* Hamaoui, 1965
Test broadly oval in outline, with slightly flattened sides, partially evolute, biumbilicate, chambers broad but not very low, with the elevated sutures which are straight to slightly arced, wall microgranular, apertural face vertical, broadly-triangular, depressed in the center, aperture in the earlier chambers – transverse arc above the base, later – long vertical areal slit in a vertical groove, going parallel to the lateral sides.

**Comaliamma** Loeblich & Tappan, 1985 (Pl. I, fig. 30, 31)
Type species: *Comaliamma charentiformis* Loeblich & Tappan, 1985
Test somewhat elongated, early part lenticular, one or two last chambers may be uncoiled, flat or oval in section and becoming arced, chambers of the early part less broad (only little broader then high), apertural face vertical, oval, slightly excavated, aperture areal in the early coiled stage (piercing the septa in thin section), in the last chambers tending to uncoil - a short terminal slit in a slight depression. L. Cr.

**Freixialina** Ramalho, 1969 (Pl. I, fig. 32, 33)
Type species: *Freixialina planispiralis* Ramalho, 1969
Test discoidal, oval in outline, partly evolute, with slightly depressed umbilicus on both sides, chambers moderately broad and low, with sutures straight to slightly arced and oblique, apertural face vertical, slightly elongated and slightly convex, aperture - single areal slit. U. Jr.

**Hinogammina** Neagu, 2000 (Pl. I, fig. 34)
Type species: *Hinogammina danubiana* Neagu, 2000
Test rather thick with flattened sides, broadly oval in outline, involute to evolute, chambers broad but not very low, slightly inflated in the center, latterly flattened, sutures straight to slightly arcuate in the adult, apertural face vertical, slightly elongated and convex, aperture – a long median vertical slit parallel to the lateral sides of the test along the whole height of the apertural face. Cr.

**Phenacophragma** Applin, Loeblich & Tappan, 1950 (Pl. I, fig. 35, 36)
Type species: *Phenacophragma assurgens* Applin, Loeblich & Tappan, 1950
Test discoidal to auriculate, oval in outline, compressed, partially to significantly evolute, tending to uncoil in the later stage, early chambers moderately broad with straight sutures, later ones broader, with slightly arced sutures, apertural face high, convex, suboval, aperture areal in the coiled stage, as seen in thin sections, terminal slit parallel to the periphery at the apex of the apertural face in later chambers, inner ends of these slits looks at sections as short peripheral curved hemisepta as a matter of fact representing the inner sides of the apertural slit. L. Cr.

**Placopilinidae** Rhumbler, 1913
Test attached completely or partially, with initial attached planispiral more or less regular and distinct to irregular part and in majority of the genera with the
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uncoiled part, which may be attached or free, wall usually thin and translucent on the attached side, more thick on the free side, aperture single or multiple, rounded or slitlike.

Remarks. Two of the genera of the family (Adhaerentia and Flatschkofelia) are described as having initial biserial part. As the biseriality of these forms may be due to the irregularity of the attached forms, they are kept here within Placopilinids (one of them - Flatschkofelia transferred here to Adherentiniae.

Two genera (Ammocibicoides and Ammocibicoides) are not included here as having trochoid test.

Placopilininae Rhumbler, 1913
Test with initial planispiral coil and single aperture.

Placopilina d Orbigny, 1850 (Pl. I, fig. 37, 38)
Type species: Placopilina cenomana D’Orbigny, 1850
Test attached throughout, with earlier planispiral part well developed and usually wider then later uncoiling part, peripheral margin rounded, rather regular, lobulated, aperture – terminal, rounded, may have a slight lip. M. Jr. – Hol.

Subbdelloidina Frentzen, 1944 (Pl. I, fig. 39, 40)
Type species: Subbdelloidina haeusleri Frentzen, 1944
Test completely attached, initial planispiral coil irregular and weakly developed, may be absent, chambers of uncoiled part wider then coiled part, gradually increasing in size, peripheral margin widely rounded, lobulated, aperture terminal, single. L. to U. Jr.

Acruliammininae subfam. Nov
Test with initial planispiral coil and multiple aperture at the adult stage.

Acrulimmina Loeblich & Tappan,1946 (Pl. I, fig. 41)
Type species: Placopilina longa Tappan, 1940
Test with the early planispiral part well expressed, later part uncoiling and may become free from the attachment, peripheral margin rounded, lobulate, aperture in the earlier stage – a low slit against the attachment, later terminal and as two slits, finally may become cribrate. L. CR. – U. Cr.

Lapillincola Wilson,1986 (Pl.I, fig. 42)
Type species: Lapillincola faringdonensis Wilson, 1986
Test attached completely, with a small planispiral coil, flattened and with unclear sutures and significantly wider uncoiled part which is also flattened with chambers rectangular to arcuate and parallel septa, peripheral margin narrow, aperture – a row of small openings along the apertural face. Aptian.

Adhaerentiinae Loeblich & Tappan, 1986
Test biserial part, planispiral coil not observed, aperture single or multiple.

Remarks. Belonging to the lituolids is doubtful because of the biserial (or pseudobiserial) character of the later part.

Adhaerentia Plummer, 1938 (Pl. I, fig. 43, 44)
Type species: Adhaerentia midwayensis Plummer, 1938
Test biserially arranged initially, then loosely biserial, becoming uniserial finally, proloculus attached, later part may be free and nearly cylindrical, with chambers gradually increasing in size, aperture terminal, single and rounded at the early stage, later irregular in outline and finally multiple consisting of two or more openings. L. Paleoc.

Remarks. Test usually attached to Lenticulina or other foraminifera, wall from foraminiferal tests and fish bone fragments, thick, especially near aperture and at the floor of chambers against the previous septum, with restricted chamber lumen.

Flatschkofelia Rettori, Senowbardi-Daryan & Zuhlke, 1996 (Pl. I, fig. 45)
Type species: Flatschofelia anisica Rettori, Senowbardi-Daryan & Zuhlke, 1996
Test with initial attached biserial part, later free, may be biserial to uniserial, aperture of the biserial early part terminal, single, moving to the margin in the uniserial stage. M. Tr.

Superfamily Barkerinoidea Smout, 1956
Test with chambers, internally subdivided, wall microgranular or microgranular-agglutinated. L. Cr.

Biplanatidae Mikhalevich, 1992
Test planispirally coiled, evolute to semievolute, chambers subdivided by a "plate" associated with the aperture or other type of partitions; aperture in the adult terminal, single or multiple.

Remarks. Family separated from the Nezzazatidae, differs from the latter in planispiral rather than trochoid test and in character and position of the aperture, though aperture of the earliest part is not known, but in adult stage it is terminal (areal) – represented by multiple openings or one opening (in Nezzazata aperture is basal). The “plate” of the representatives of this family also differs from that one in Nezzazata – its digitations in the lower part transfer into pillars which may attach the preceding chamber.

Biplanata Hamaoui & Saint-Marc, 1970 (Pl. II, fig. 3 - 5)
Type species: Biplanata peneropliformis Hamaoui & Saint-Marc,1970
Test planispiral throughout, evolute to semiinvolute, flattened, may be somewhat flaring at the end, with numerous (up to thirty in the final whorl) broad, very low and slightly curved chambers, subdivided internally by median basally digitate
“plate”, its separate portions attaching as pillars between the multiple openings of the preceding chamber, aperture – a row of openings at the apertural face. U. Cr.

**Merlingina** Hamaoui, 1965 (Pl. II, fig. 6 – 8)

Type species: *Merligina cretacea* Hamaoui, 1965

Test almost planispiral but asymmetrical, semi-evolute and planoconvex at the early stage, later more nearly bilaterally symmetrical, flattened, with angled periphery and deepened umbilical area, tending to become uncoil and flaring finally, chambers broad and low, rapidly increasing in thickness, as a result the apertural surface becomes broad, nearly subcircular, sutures somewhat sinuous, chambers subdivided by slightly undulated toothplate going inward (= that curves inward) from the lateral borders of the apertural face, having two or three basal digitations attaching the septum of the preceding chamber, aperture reported as round at early stage, U- or V-shaped at later stage, associated with a toothplate.

**Remarks.** Aperture is difficult to observe externally.

**Demirina** Ozcan, 1994 (Pl. II, fig. 9, 10)

Type species: *Demirina meridionalis* Ozcan, 1994

Test planispiral, biumbilicate, semi-involute, with angled periphery, chambers broad and low, in the early stage arced rectangular, rapidly increasing in size as a result the apertural surface becomes broad, subcircular, adult chambers (the early ones possibly not subdivided) subdivided by transverse partitions which project inward from the chamber wall almost vertically or are slightly inclined, attaching the consecutive septa along the margins of the chamber lumen, usually leaving an empty space in the median part of the chamber cavity, aperture interiomarginal (?) in early stage, later areal, finally cribrate. Cenomanian.

**Remarks.** In the original description the comparison with *Merlingina* is not given.

The disposition of the inner partitions differ from that one of *Merlingina*. The interiomarginal character of the initial aperture is doubtful.

**Barkerinidae** Smout, 1956

Test planispirally coiled, involute, chambers internally subdivided by transverse interseptal partitions, aperture multiple.

**Barkerina** Frizzell & Schwartz, 1950 (Pl. II, fig. 1, 2)

Type species: *Barkerina barkerensis* Frizzell & Schwartz, 1950

Test subglobular, chambers numerous, transverse partitions are visible in sections, wall agglutinated, microgranular, aperture multiple – a row of small openings along the base of the apertural face. U. Cr.

**Remarks.** Character of the aperture is similar to that one in *Crenatella* Luczkowska, 1972 (Quinqueloculinidae, subfamily Scutulorinae Mikhalevich, 1987) – a low slit subdivided by a distinctly crenulate upper margin.

**Superfamily Biokovinoidea** Guszczic, 1977

Test free, entirely planispirally coiled or with later uncoiled part which may be straight or peneropliform and reniform, the planispiral part involute (sometimes semi-involute) or evolute, the proportions of the development of planispiral and uncoiled parts vary in different families, with agglutinated, microgranular thickened complicated wall, imperforate or perforated, may be with canaliculi and keriotheca-like and phrenotheca-like layers and additional endoskeletal elements (pillars, partitions, chomatalike structures), may be alveolar (Buccicrenatidae, Choffatellidae, Spirocyclinidae); aperture terminal, single or multiple.

**Charentiidae** Loeblich & Tappan, 1985

Test with early planispiral coil, involute to semi-involute, later may uncoil, planispiral part developed more then uncoiled or planispiral throughout, wall agglutinated, with imperforate outer epidermis and inner pseudoalveolar keriotheca-like layer (with cylindrical pseudoalveoles) not reaching either the inner or outer surface (with the exception of *Melathrokerion* having very thin canaliculi), septa homogenous and solid, no additional endoskeletal structures except chomatalike, aperture single or multiple.

**Remarks.** In many genera the early part may be with slight streptospiral oscillations, especially in microsphaeric generation.

**Charentia** Neumann, 1965 (Pl. II, fig. 11, 12)

Type species: *Charentia cuvillieri* Neumann, 1965

Test early planispiral coil, involute, biumbonate, lenticular to subglobular, later uncoiled part with one, two, rarely up to four chambers, rectilinear, compressed, with subacute to rounded periphery, wall imperforate, pierced by cylindrical canaliculi not reaching either inner or outer wall surface but looking as keriotheca or pseudoalveolar structure, wall of the early chambers and apertural surface solid, noncanaliculate, the portion of the apertural surface beneath the aperture distinctly thickened to form chomatalike triangular projection, aperture areal, an arc near the base of the apertural chamber in the early stage, later becoming triangular, the upper angle of the triangle gradually lengthening to become a narrow slit of the uncoiled chambers. Cr.

**Remarks.** Triangular projections on the spiral septum “superficially resembling fusulinacean chomata” (Loeblich & Tappan, 1987). They also resemble miliolidean tooth. I don’t consider this similarity as occasional or convergent but as showing the close relations of these groups (Mikhalevich, 2003).

**Ismailia** El-Dakkak, 1974 (Pl. II, fig. 13, 14)
Type species: *Ismailia neumannae* El-Dakkak, 1974

Test planispirally coiled throughout, semiinvolute, leaving open umbilicus, periphery subacute, wall microstructure not described, aperture – a vertical slit in the apertural face, may bifurcate basally. U. Cr.

**Remarks.** Loeblich & Tappan, 1987 supposed it to be congeneric with *Charentia*, but hesitated to unite them as the detailed sections of it absent.

*Karaisella* Kurbatov, 1971 (Pl. II, fig. 15, 16)

Type species: *Karaisella usbekistanica* Kurbatov, 1971

Test planispiral, involute, biumbilicate, periphery subacute to subcarinate, wall with imperforate epidermal layer, chomatalike structures on the spiral septum as in *Charentia*, aperture small, rounded, near the midpoint of the apertural face. U. Jr.

**Remarks.** Planispiral coils in the very early stage may oscillate, may be slightly streptospiral. The ultrastructure of the wall similar to that of *Charentia* was not observed in *Karaisella*, but as the thin section of the type species represents only the early stage and missed the adult one – it’s possible to wait the the similar wall ultrastructure like in adult *Charentia*. The rest significant features are found in the both genera. (Loeblich & Tappan, 1987).

*Melathrokerion* Bronnimann & Conrad, 1967 (Pl. II, fig. 18, 19)

Type species: *Melathrokerion valserinensis* Bronnimann & Conrad, 1967

Test planispirally coiled, with broad and rounded peripheral margin, wall of the early chambers and apertural face simple, of the later chambers becoming thick, pseudoalveolar (keriothecalike?), with very narrow cylindrical canaliculi piercing the wall “but not becoming true alveoles”*Loeblich & Tappan, 1987*, giving in section radially striate appearance to the wall, chomatalike structures on the spiral suture present (as in *Charentia*), aperture arial, a wide transverse crescentic slit looking as terminal opening. L. Cr.

**Remarks.** It is not clear from the diagnosis whether canaliculi rich the outer surface and open on it, in thin section given by Loeblich & Tappan, 1987, pl. 79, fig. 11 part of the terminal part of the last whorl looks surrounded by the thin imperforate (may be organic) layer, the earlier part of this whorl lacks such layer and canaliculi looks opening outside. The whole character of the test and its wall is close to that one of *Charentia*, so the position of the genus is preserved within this family.

*Moncharmontia* De Castro, 1967 (Pl. II, fig. 20, 21)

Type species: *Neoendothyra apenninica* De Castro, 1966

Test planispiral throughout, involute, biumbilicate, periphery broadly rounded, wall with imperforate outer layer over a canaliculate inner layer, septa and apertural face thin and simple, aperture areal and multiple: a single arced row boarded by short necks in the early stage, later more numerous openings irregularly distributed near the base of a narrow arced apertural face. U. Cr.

**Remarks.** The character of the wall is not clearly seen from the sections reported in Loeblich & Tappan, 1987.

*Paleomayncina* Sepfontaine in Kaminski, 2000 (Pl. II, fig. 17)

Type species: *Mayncina termieri* Hottinger, 1967

Diagnosis not given, the figure represents only thin section of the shell, but the aperture probably multiple as in *Mayncina*. Sepfontaine (1988) marked the keriothekal character of its wall. Carixian.

*Prekaraisella* Kurbatov, 1972 (Pl. II, fig. 22)

Type species: *Prekaraisella vandobensis* Kurbatov, 1972

Test compressed, planispiral and semiinvolute initially (with slight tendency to be streptospiral), biumbilicate, later chambers with tendency to uncoil into one-two rectilinear chambers, periphery subacute, wall of the earlier chambers simple, in the later chambers “fibrous”, small chomatalike septal bases present against the earlier whorl, aperture areal in coiled part, in the uncoiled chambers - terminal rounded opening. U. Jr.

*Praepeneroplis* Hofker, 1952 (Pl. II, fig. 23)

Type species: *Peneroplis senoniensis* Hofker, 1949

Test planispiral throughout, closely-coiled and involute in the early stage, later slightly evolve and biumbilicate, chambers numerous, cuneate, ultrastructure of the wall not described, chomatalike structures present, aperture areal, ovate to triangular. U. Cr.

*Bosniella* Gusic, 1977 (Pl. II, fig. 24)

Type species: *Bosniella oenensis* Gusic, 1977

Test with early planispiral part and later uncoiled, in microsphaeriform earlier part coiled somewhat irregularly, megalosphaeriform one has bilocular embryonal stage, wall thick, homogenous, “perforations separated by narrow microgranular lamellae resulting in a keriothecal structure, septa thick, no endoskeletal structures but chomatalike present, aperture single in the early stage, later becoming cribrate. L. Jr. – as reported in Loeblich & Tappan, 1987.

**Remarks.** The genus moved from Biokovinidae as lacking endoskeletal structures (pillars).

*Lituoliporidae* Gusic & Velic, 1978

Test planispirally coiled, at least initially, later can change the direction of coiling or become uncoiled, uncoiled part not more developed then the planispiral one, wall agglutinated, homogenous, microgranular, with large pores opening both on outer and inner surfaces, no additional endoskeletal structures present, aperture multiple.

**Remarks.** Test possibly involute (figures given
**Remarks.** Genus very close to Buccicrenata, differs from the latter in having less compressed test, in form of the chambers, simple slitlike aperture and more massive chomatalike structures.

**Feurtillia** Maync, 1958 (Pl. II, fig. 31)

Type species: *Feurtillia frequens* Maync, 1958

Test planispiral, compressed, involute in early stage, later uncoiling, at least in the microsphaeric form, wall “with distinct subepidermal network of shallow alveoles that appear polygonal in tangential section, septa thick, recurved” (Loeblich & Tappan, 1987), aperture terminal, single, elongated, parallel with the axis of coiling, occupying over the half of the apertural face in adult. U. Jr. to L. Cr.

**Remarks.** Chomatalike structures are hardly seen in thin section. Though Sepfontaine (1988) considered this genus to be a junior synonym of *Evertycyclammina*, it is kept here as a separate one as it differs from *Evertycyclammina* in the form of the test and the chambers which are more low, broad and arcuate.

**Choffateilla** Maync, 1958

Test planispirally coiled initially, involute to seminovolute, strongly compressed – often with short axis of coiling, later uncoiled stage reniform or peneropliform, more rarely rectilinear, planispiral part developed more then uncoiled one, wall with solid outer epidermis and continuous inner alveolar hypodermis, no additional endoskeletal elements developed, aperture multiple.

**Remarks.** Family transferred from the former Loftusiacea, where it had subfamily rank. Differs from loftusiids firstly in quite another structure of the test and also in the absence of the endoskeletal structures (the absence of pillars is underlined in the descriptions of all the included genera). Genera *Amisijella*, *Bramkampella* and *Rectocyclammina* transferred to Ammomarginulinida Mikhalevich, 2002, to superfamily Flabellamminopoidoidea Mikhalevich, 2002 on the basis of their test morphology.

**Choffateilla** Schlumberger, 1905 (Pl. II, fig. 32, 33)

Type species: *Choffateilla decipiens* Schlumberger, 1905

Test planispirally coiled, strongly compressed, partially evolute, with only slight tendency to uncoil, wall with well developed subepidermal network, septa thick, massive, pierced by the large apertures in the median plane of the test, aperture – a single areal row extending up the apertural face in the plane of coiling, those of successive chambers form the radial series as could be seen in axial section, the series of such apertures of the new volutions are intercalated between previous ones. U. Jr. to U. Cr.

**Remarks.** Test similar in form to *Stomatostoecha*, differing from it in the wall character.

**Alveosepta** Hottinger, 1967 (Pl. II, fig. 34)

Type species: *Cyclammina jaccardi* Schrodt,
Test planispirally coiled, involute, moderately compressed (megalospheeric forms more so), with only slight tendency to uncoil, wall with well developed subepidermal layer both on the septa, apertural face and outer chamber wall, aperture in the early stage probably areal, in adult is represented by the large openings (cribrate), “supplementary areal foramina may be produced by resorption of the epidermal layer of the septum” (Loeblich & Tappan, 1987). U. Jr.

**Remarks.** The genus was previously described as having streptospiral coiling of the initial part in microspheeric test but Banner & Whittaker, 1991 showed that “some (but far from all) specimens of microspharic test but Banner & Whittaker, 1991 as having streptospiral coiling of the initial part in a perfect plane, which are sometimes added obliquely”. They also underline that *Alveospera* is morphologically close to *Choffatella*. All this gives the reason to put it here (with some hesitation) among the other choffatelids. The alveolar subepidermal layer of *Alveospera* has a distinct gap in the distal part of the septal hypodermis (between the epidermis and hypodermis of the septa) (Banner, Whittaker, 1991). Such feature was not mentioned for the other choffatellid genera. Alveolar of the hypodermal layer may bifurcate or trifurcate distally (Banner & Whittaker, 1991). Though the initial aperture is areal position as in the similar litoulid forms but is difficult to observe.

**Torinosuella** Maync, 1959 (Pl. II, fig. 35, 36)

*Type species:* *Choffatella peneropliformis* Yabe & Hanzawa, 1926

Test flattened, very thin, with early planispiral coil and more developed flaring to peneropliform uncoiled part, chambers broad and low, increasing rapidly in breadth as added, wall finely agglutinated, with imperforate epidermis and inner alveolar subepidermal meshwork, septa with numerous perforations of the multiple apertural openings, aperture terminal, cribrate. U. Jr.

**Ijdranella** Bassoullet, Boutakiout & Echarfaoui, 1999 (Pl. II, fig. 37, 38)

*Type species:* *Ijdranella atlasica* Bassoullet, Boutakiout & Echarfaoui, 1999

Test flattened, with early planispiral involute to evolute coil and peneropliform uncoiled stage, chambers broad and low, increasing rapidly in size, wall with long radial blades united superficially by a coarse network, aperture terminal, possibly multiple. Pliensbachian.

**Remarks.** Aperture of the genus not described. Judging from the thin sections, it is areal, single in the early stage, in one later septa seen as double, possibly multiple in adult. Also judging from the figures of sections it differs from *Torinosuella* in less compressed shell and less low and broad chambers.
**Pseudocyclammina**. Pillars are not the constant feature of this genus and appear occasionally in adult specimens. The genus becomes in this feature transitional between choffatellids and spirocyclinids. The additional study is necessary.

**Hottingeritidae** Loeblich & Tappan, 1985
Test planispiral at least initially, evolute, with isomorphic chambers only little higher than broad and straight radial sutures, periphery broadly rounded, wall agglutinated, alveolar, aperture single, areal or representing wide open end of the last chamber as in tubular forms.

**Popoviinae** subfam. nov.
Test planispiral initially and with well developed uncoiled part, rather thick, uncoiled portion rectilinear, broadly oval in section, wall agglutinated, may be with larger grains, alveolar in structure, septa thin, solid, aperture single areal in the early stage, terminal in uncoiled chambers.

**Remarks.** Subfamily differs from the subfamily Hottingeritininae in having rectilinear uncoiled part, less number of chambers per whorl and areal aperture of the coiled planispiral part. *Popovia* is transferred from the Alveolophragma minae on the basis of its terminal (even at the early stage) rather than basal aperture.

**Popovia** Suleymanov, 1965 (Pl. II, fig. 45, 46)
Type species: *Alveolophragmium planum* N.K. Bykova, 1939
Test with early planispiral evolute coil with one- two volutions, radial sutures, later part uncoiled, rectilinear, broadly oval in section, chambers five to seven in a whorl, gradually increasing in size as added, sutures radial in the early part, horizontal in rectilinear one, wall agglutinated, with alveolar suepidermal layer, septa thin, simple, aperture terminal, single, nearly at the middle of the apertural face in the coiled part (judging from the sections), at the adult possibly with a short neck.

**Remarks.** Though the aperture of this form at the earlier part was described as interiomarginal it is nevertheless areal even in the earliest stage - see Loeblich & Tappan, 1987, pl. 97, fig. 9. The genus is transferred from Alveolophragma minae, genus *Sabellovoluta* Loeblich & Tappan, 1985 from the same subfamily is more possibly belonging to Ammomarginulinoidea group.

**Pseudochoffatellidae** Loeblich & Tappan, 1946
Test large, with later uncoiled part developed more then the initial planispiral evolute part, especially in megalosphaeric form, where this initial part can be reduced to protoconch and deuteroconch, wall with imperforate epidermis and subepidermal network, no additional endoskeletal elements, aperture terminal, multiple.

**Remarks.** Family transferred from the former Loftusiacea where it was placed as subfamily. It differs from loftusiids firstly in quite another structure of the test and also in the absence of the endoskeletal structures. Genera *Balkhana* and *Montsechiania*, are transferred to order Cyclolinida Mikhailievich, 1992 (superfamily Vaniinoidea Mikhailievich, 2003) on the basis of the character of their tests with cyclic and annular chambers.

**Pseudochoffatella** Deloffre, 1961 (Pl. III, fig. 1)
Type species: *Pseudochoffatella cvillieri* Deloffre, 1961
Test large, discoidal, tests of different generations differ in form and dimentions micro-sphaeric one with nearly parallel sides, planispiral part about two volutions, then going pen-eropliform and afterwards cyclic or annular parts with numerous extremely broad and low chambers, those of peneropline part significant-ly arcuate, later ones less so, the whole diameter achieving 12 mm, maximum thickness 1.2 mm; megalosphaeric test with reduced initial coil which is represented by large initial chamber constricted in two unequal parts followed by peneropline and then flabelliform stage never attaining reniform or cyclic stage and not more then approximately 6 mm in diameter; wall with thin epi-
imperforate epidermal layer and subepidermal polygonal meshwork (of beams, rafters and joists or second order beams, aperture multiple: a series of irregularly arranged openings over apertural face. L. Cr.

**Alzonella** Bernier & Neumann, 1970 (Pl. III, fig. 2)

Type species: *Alzonella cuvillieri* Bernier & Neumann, 1970

Tests of different generations though both having initial planispiral coil differ in form: the microsphaeric one with initial evolute planispiral coil, later usually flabelliform or may be reniform or irregular discoidal, megalosphaeric one after the planispiral coil becomes narrow and rectilinear or subtriangular; wall with imperforate epidermal layer covering reticular subepidermal network comprising short partitions going parallel to and perpendicular to the septa, not deep into the chamber lumen, aperture terminal, multiple – a row of pores on the apertural face. M. Jr.

**Broeckinella** Henson, 1948 (Pl. III, fig. 3)

Type species: *Broeckinella arabica* Henson, 1948

Test large (up to 3.1 mm in diameter), flabelliform, chambers following planispiral evolute stage become arcuate but not completely cyclical, which results in complanate and finally reniform appearance, wall with imperforate outer layer and subepidermal layer which consists of vertical and two sets of transverse partitions aligned from chamber to chamber, outermost part of marginal zone represents polygonal meshwork (subdivided by very short secondary partitions), aperture in the median plane, multiple, opening into the empty part of the chamber situated between the vertical partitions. U. Cr. to M. Paleocene.

Remarks. Loeblich & Tappan (1987) doubt if the Cretaceous examples belong to this genus.

The difference between microspheric and megalosphaeric tests are not studied.

**Dhrumella** Redmond, 1965 (Pl. III, fig. 4)

Type species: *Dhrumella evoluta* Redmond, 1965

Test large, flattened, planispiral evolute part is followed by uncoiled rectilinear one with broad low chambers, which are slightly arced centrally, subepidermal layer is of short vertical beams not aligned from chamber to chamber and of a few horizontal rafters, probably only one horizontal level per chamber, thus the lower part of the chamber is open, large globular particles are incorporated in septa, aperture obviously multiple, possibly a row of small pores. M. Jr.

Remarks. The difference between microspheric and megalosphaeric tests not studied, but the figures given (Loeblich & Tappan, 1987) show, that the rectilinear part can be more straight and narrowing to the end (holotype) or finally widening. The subepidermal network is similar to that one of Alzonella, but is simpler and beams of successive chambers not align. Nothing is said concerning the presence or absence of the imperforate epidermis.

**Torremiroella** Brun & Canerot, 1979 (Pl. III, fig. 5–7)

Type species: *Torremiroella hispanica* Brun & Canerot, 1979

Test elongated, with early planispiral part followed by uncoiled rectilinear one, wall with imperforate epidermis and very coarse, large irregular projections from the septa can partially fill the chamber and questionably could be considered as endoskeletal structures, aperture terminal, irregularly cribrate in the uncoiled part, unclear in the earlier planispiral one. L. Cr.

Remarks. The presence of strange endoskeleton (nither pillar nor other structural elements) possibly makes this genus the intermediate between Pseudochoffatellidae and Spirocyclinidae. The coarse wall obviously obscure the position of initially areal aperture of the planispiral stage if it is disposed close to the base.

**Biokovinidae** Gusic, 1977

Test with earlier planispirally coiled and later uncoiled part, developed less then the planispiral one, wall honeycomblike in transverse section, with keriothecalike and phrenothekalike structures and additional endoskeleton elements (pillars), aperture multiple.

Remarks. Test possibly involute (figures given only in sections).

*Chablasia* is transferred to pfenderinids. *Bosniella* which was previously included in this family, is similar to *Biokovina* in test arrangement and in the presence of keriothecalike layer and thin perforations, but differ in the absence of endoskeletal structures thus representing an intermediate form between Charentiididae and Biokovinidae.

**Biokovina** Gusic, 1977 (Pl. II, fig. 47)

Type species: *Biokovina gradacensis* Gusic, 1977

Test with planispiral early stage, later uncoiled and rectilinear, wall with tubules perpendicular to the surface separated by thin microgranular lamellae, resulting in a keriothecalike structure, septa homogenous and massive, endoskeletal interseptal pillars in the middle region of the chambers may fuse together to form partitions and are surrounded by a pillar-free marginal zone, very thin dark lines crossing the chambers approximately perpendicular to the septa appear to be phrenotheke structures, commonly microgranular, aperture of the early stage – a single areal opening, later – cribrate. L. Jr.

Remarks. The genus was described previously as having pores but the pore outer surface was a result of corrosion of the upper epidermal layer (Banner, Whittaker, 1991).

**Labyrinthinidae** Sepfontaine, 1988

Test planispirally coiled, involute, then uncoiled, with uncoiled part not more developed than the
planispiral one, wall agglutinated, microgranular, imperforate, with complex additional endoskeleton of exoskeletal beams and endoskeletal pillars, both these elements may be continuous from chamber to chamber (in Labyrinthina) or other kinds of complex endoskeleton in other genera, aperture multiple.

**Labyrinthininae Sepfontaine, 1988**

Test thick, with initial involute planispiral coil and rectilinear uncoiled part which is usually more narrow then the coiled part and rounded or oval in section, with though rather broad chambers, but not very low and with straight sutures, tendency to peneropliform very weak, chamber lumen with complex endoskeleton.

*Labyrinthina* Weynschenk, 1951 (Pl. II, fig. 48, 49)

Type species: *Labyrinthina mirabilis* Weynschenk, 1951

Test with early stage planispirally coiled, involute, later uncoiling and rectilinear to slightly compressed to peneropliform, wall agglutinated, microgranular, simple, imperforate, chamber interior with a row of exoskeletal beams extending from septum to septum and of endoskeletal pillars extending from chamber floor to roof and also may be continuous from chamber to chamber, aperture single areal opening in the early enrolled stage, areal and multiple over the central part of the apertural face in the adult. L. to U. Jr.

**Remarks.** Though in the diagnosis of this genus the aperture at the initial stage is reported as “interiomarginal” as a matter of fact it is areal even in the chambers of the coiled part as it could be clearly thin from the thin sections.

**Planisepitae** Sepfontaine, 1988, nom. nudum

Test thin, compressed, peneropliform, with initial planispiral coil and later flaring uncoiled part with very low and broad chambers and arcuate sutures, endoskeleton structures present, character of the wall (perforate or imperforate) unknown.

**Planisepita** Sepfontaine in Kaminski, 2000 (Pl. II, fig. 50)

Type species: *Litula compressa* Hottinger, 1967

Test like in *Paleomayncina* in form but with a complex inner endoskeleton.


**? Levrantinellae** Fourcade, Mouty & Teherani, 1997

Test compressed, with internal structure of “zigzag pillars” not reaching the lateral wall which is imperforate.

**Remarks.** It is difficult to give the clear diagnosis of the subfamily as the structure of the test of the type genus is somewhat unclear.

*Levrantinella* Fourcade, Mouty et Teherani, 1997 (Pl. II, fig. 51)

Type species: *Mangashtia? egyptiensis* Fourcade, Arafa & Sigal, 1984

Test compressed, planispirally enrolled in the early stage, later uniserial, chambers has internal structures in the form of “pillars” in the shape of zigzag blade situated in the median plane of the chamber, in the marginal zone of the chamber this pilaroid structure forms intercalating digitations between two apertures of the same row, but it never reaches the lateral wall, subepidermal partitions absent, wall imperforate, aperture multiple, openings aligned in rows alternating from one side of the equatorial plane to the other Oxfordian to Kimmeredgian.

**Remarks.** The genus described only from sections, full picture and many essential characters are unclear. It is compared with *Mangashtia*, whose structure is also unclear.

**Spirocyclinidae** Munier-Chalmas, 1887

Test strongly compressed, initial planispiral part usually not strongly developed, may be irregularly planispiral, the uncoiled part well developed, usually more then initial coiled part, peneropliform to cyclic, chamber interior with complex additional endoskeleton (horizontal and vertical septulae (“beams and rafters" in Loeblich & Tappan, 1987, “partitions” in Banner & Whittaker) and pillars), wall with imperforate epidermal layer and subepidermal network, aperture cribleate.

**Remarks.** Form of the uncoiled part strongly varies within each genus and even within one species Family transferred from the former Loftusiacea (without Quataria, Saudia, Thomasella Sirel, 1998, *Timidonella*, *Vania* having cyclical or annular chambers, and without conical and initially trochospirally coiled forms (*Haurania*, *Spiroloconulus*)), it differs from the families Choffatellidae and Pseudochoffatellidae mainly in its developed endoskeleton.

**Spirocyclina** Munier-Chalmas, 1887 (Pl. III, fig. 8, 9)

Type species: *Spirocyclina choffati* Munier-Chalmas, 1887

Test large (up to 10 mm in diameter), flattened, planispirally enrolled, slightly asymmetrical, largely involute and peneropline (rarely uncoiled rectilinear tests are met, possibly another generation), chambers numerous (up to 25 in the final whorl), extremely broad and low, arcuate, rapidly increasing giving the test peneropliform appearance, periphery subacute, wall with imperforate epidermal layer and coarse subepidermal network, interseptal beams and rafters or septula subdivide chamber lumen into rectangular chamberlets, near the center of the test the beams may be reduced to pillars or to mere protuberances from the septa intercalated between the apertural pores, but a single elongated one going in the plane of coiling between the apertural pores of successive chambers may subdivide the test, septa compact, of slightly less thickness than the chamber.
lumen, aperture terminal, multiple, two rows of pores parallel to plane of coiling in the central elongated depression of the apertural face. U. Cr.

**Anchispirocyclina** Jordan & Applin, 1952 (Pl. III, fig. 12)

Type species: *Anchispirocyclina henbesti* Jordan & Applin, 1952

Test planispiral to slightly asymmetrical with periphery rounded to subacute, often containing occasional large sand grains or foraminiferal tests, tests of the two generations differ: microsphaeric one large, discoid, flattened and with the undulating edges, later part spreading through peneropline and reniform to nearly circular, with broad and very low arced chambers which may become cyclic finally, megaloapertural form (judging from the section) less flaring, with less broad and low chambers, wall with imperforate outer layer underlined by a reticulate choffatelloid network of beams and rafters, the narrow chambers are not subdivided inward from reticulate zone leaving empty chamber spaces (called “canal” but not true canal) into which the septal apertures are opened, near the median plane chambers are filled by “irregular labyrinthic structure produced by radial pillars or batresses arising between adjacent apertural passages and extending from septum to septum, batresses of successive chambers radially aligned” (Loeblich & Tappan, 1987), aperture cribrate, openings scattered over apertural face. U. Jr.

**Martiguesia** Maync, 1959 (Pl. III, fig. 14, 15)

Type species: *Martiguesia cyclamminiformis* Maync, 1959

Test relatively thick, early planispiral coil well developed, with relatively not broad chambers rather slowly increasing in size as added, with oblique or only gently curved towards the periphery sutures, the uncoiled part nearly rectilinear, more narrow than the initial one, with rather high and not broad chambers divided by nearly straight and horizontal sutures, periphery rounded, wall with imperforate epidermis and coarse subpeneropline alveolar network, endoskeletal of irregular radial pillars that subdivide and nearly completely fill the chamber lumen, aperture areal, cribrate. U. Cr.

**Remarks.** The genus strongly resembles the genus *Pseudocyclammina* from Choffatellinae differing from the latter practically only in the strongly developed pillars which in *Pseudocyclammina* are only slightly represented in the median plane of the shell, possibly the Martiguesia Maync, 1959 is only the junior synonym of *Pseudocyclammina* Yabe & Hanzawa, 1926. Martiguesia differs from other spirillinds in its narrow uncoiled part.

**Pseudospirocyclina** Hottinger, 1967 (Pl. III, fig. 16 – 18)

Type species: *Pseudospirocyclina maynci* Hottinger, 1967

Test large, compressed, with broad and low chambers, tests of the two generations differ: the microsphaeric form is larger, involute planispiral coil containing more volutions, chambers low, strongly arced, rapidly increasing in width giving the test widely flaring, peneroplistiform appearance, in megaloapertural form chambers of both parts less broad, those of the uncoiled part slowly increasing with growth, more slightly arced, the adult test with nearly parallel sides, periphery rounded, wall with imperforate outer layer and underlying finely reticular subpeneropline network, endoskeletal septa perforated by irregularly arranged apertures aligned from chamber to chamber, postjuvenile chambers with pillars flanking the openings of the septa and aligned with the apertural axes, the empty undivided chamber space between the endoskeletal together with exoskeletal elements and the lateral wall forms passage called “canal”, areal, cribrate – numerous small openings scattered over apertural face. U. Jr.

**Redmondellina** Banner & Whittaker, 1991 (Pl. III, fig. 10, 11)

Type species: *Pseudocyclammina powersi* Redmond, 1964 (= *Alveosepta* (Redmondellina) Banner & Whittaker, 1991)

Test compressed (to different degree in different generations), with earlier coiled and later uncoiled part, chambers broad and low, arcuate, more so in the microsphaeric form, uncoiled part slightly peneroplistiform, wall with thin outer epidermal and subpeneropline (alveolar) layers, endoskeleton formed by the hydropodium in the median (equatorial) part of the hydropodium of the septa projecting posteriorly to form pillars, pillars connect the septal hypodermis with the preceding septal epidermis. Mesozoic.

**Remarks.** The genus differs from *Alveosepta* in the presence of endoskeleton (pillars). It is very close to *Alveosepta* and nearly isomorphic with it, and having the same character of the gap between epidermis and hypodermis in distal part of the septa and bifurcating and trifurcating alveolae, described originally as its subgenus. The authors of the genus having restudying Redmond’s material described the forms of the three generations: megaloapertural A1 being more strongly compressed than megaloapertural A2 and microsphaeric B-generation.

**Reissella** Hamaoui, 1963 (Pl. III, fig. 19)

Type species: *Reissella ramonensis* Hamaoui, 1963

Test in the early stage planispirally enrolled, involute, later tending to uncoil and flare, chambers broad and low, rapidly increasing in size, sutures radial in early part, later weakly arced, wall imperforate, with “subpeneropline mesh formed by elongate primary and short secondary exoskeletal beams vertical to the septa and aligned from chamber to chamber, adjacent beams connected by numerous short horizontal rafters that do not extend.
inward beyond the ends of the secondary beams", "primary aperture elliptical to siltlike, areal, slightly produced on a necklike elevation, near the base of apertural face in the early stage, becoming central in later chambers, numerous scattered apertural pores scattered over the apertural face except for a marginal zone near the chamber periphery." "(Loeblich & Tappan, 1987) U. Cr.

**Remarks.** Pillars absent.

**Sornayina** Marie, 1960 (Pl. III, fig. 20, 21)

Type species: **Sornayina foissacensis** Marie, 1960

Test compressed, oval in outline, planispiral at the early stage, slightly asymmetrical, only rarely uncoiled, chambers broad and low but less broad than in **Spirocyclina** and more slowly enlarging, periphery subangular and slightly lobulate, forms of the two generations differ: microsphaeric one up to 3 mm, more flaring, megasphaeric – smaller and more nautoidal, "wall with imperforate subepidermal layer and subepidermic reticular meshwork as in Choffattelinae, chamber lumen subdivided into chamberlets by somewhat irregular or even bifurcating transverse septula perpendicular to the septa (less evenly spaced than in Spirocyclina), septula progressively reduced inward to form discontinuous pillars and finally only small projections, leaving the chambers open in the subcentral zone, but with a more or less continuous median partition resulting from a single elongate median septum present in successive chambers that divides the test axially into two equal parts" (Loeblich & Tappan, 1987), aperture terminal, cribrate, openings irregularly scattered over the elongated central part of the apertural face which is depressed between thickened margins. U. Cr.

**Streptocyclammina** Hottinger, 1967 (Pl. III, fig. 13)

Type species: Pseudocyclammina parvula Hottinger, 1967

Test compressed, broadly oval to circular in outline, with broadly rounded periphery, planispirally coiled, (though oscillating or slightly streptospiral in the very beginning), chambers broad and low, slightly peneropilform, wall with imperforate epidermal layer and very fine subepidermal network, septa massive, leaving rather big volumn of chamber cavity empty, with numerous perforations, pillars few, weakly developed only in adult chambers, aperture terminal, multiple, openings scattered in adult chambers all over the apertural face L. to U. Jr. I

**Remarks.** The genus differs from **Spirocyclina** in the less thickness and less peneropilform appearance as well as in the weaker development of endoskeleton and more delicate subepidermal network, from Pseudocyclammina in its test form and more developed pillars. The streptospiral coiling reported for **Spirocyclina** is not well expressed and more probably is a result of somewhat irregular planispiral oscillating like in **Hottingerita** and **Alveosepta**.

**Superfamily Coscinophragmatoidae** Thalmann, 1951

Test attached, initial part may be coiled, later uncoiled, in curving irregular rows of chambers, or branching, chambers irregular in size and shape, wall complicated - canaliculate, may be alveolar, aperture terminal, single or multiple.

**Haddoniidae** Saidova, 1981

Test with early stage coiled, later uncoiled, irregular, wall canaliculate, aperture terminal – irregular slit with irregular inner projections.

**Haddonia** Chapman, 1898 (Pl. III, fig. 22)

Type species: **Haddonia torresiensis** Chapman, 1898

Test with coiled early stage, later uncoiled, uniserial, may be rectilinear or irregular, branching, chambers broad and low, rather irregular in form, gradually increasing in size, wall coarsely agglutinated externally, internally smoothly finished, canaliculate, aperture of the final part terminal, an irregular slit with one or two inner projections resembling teeth. Hol.

**Stylolina** Karrer, 1877 (Pl. III, fig. 23)

Type species: **Stylolina lapugyensis** Karrer, 1877

Test like in **Litula**, but inner structure complicated with pillars.

**Remarks.** Reinstated by Popescu et al., 1998 from the synonymy of **Litula**.

**Coscinophragmatidae** Thalmann, 1951

Test with early stage coiled which may be reduced in some cases, later stage uncoiled, irregular, wall alveolar, perforated, aperture terminal, single or multiple.

**Remarks.** Genus **Ammotrochoides** is not included here as having trochoid test.

**Coscinophragma** Thalmann, 1951 (Pl. III, fig. 26)

Type species: **Lichenopora cribrosa** Reuss, 1846

Test large (up to 34 mm in length), tests of the two generations differ: microsphaeric form with initial coiled part and later uncoiled, rectilinear and may be branching, in megasphaeric one only the uncoiled part developed, chambers of the both parts very slowly increasing in size, wall three layered: outer coarsely agglutinated layer cemented by the small quantity of matter insoluble in acid, median canalicate layer with canalici going perpendicular to the surface and smaller second order canalici going from the first ones outward, inner smooth homogenous calcareous layer covering the inner surface like lamella, aperture at the uncoiled stage terminal, cribrate. L. Cretaceous.

**Remarks.** The trochospiral character of the coiled part and its interiomarginal aperture is doubtful.
Alpinophragmium Flugel, 1967 (Pl. III, fig. 24)
Type species: **Alpinophragmium perforatum** Flugel, 1967

- Test irregular, cylindrical, subconical or spreading, coiled part not observed, chambers rapidly increasing in size becoming broad and low, wall microgranular, calcareous, probably agglutinated, with large pores (alveolar?), aperture terminal, crirbrate. U. Tr.

**Bdelloolina** Carter, 1877 (Pl. III, fig. 25)
Type species: **Bdelloolina aggregata** Carter, 1877

- Test spreading over the substrate, consists of numerous very broad and low uniserial chambers gradually increasing in size, wall with perforate alveolar structure as in *Coscinophragma*, aperture terminal, multiple – single or double row of openings. Paleocene, Holocene.

**Remarks.** Genus very similar to *Coscinophragma*, the difference in flat attached chambers rather than cylindrical chambers growing erect in *Coscinophragma* could be the result of the variability in the mode of growth.

**REFERENCES**


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

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