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ALBIAN FORAMINIFERA OF THE ROMANIAN PLAIN. PLANKTONIC FORAMINIFERA

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Abstract. This article represents a part of a projected monograph on the Albian foraminifera from the Romanian Plain, using the detailed stratigraphy of the Albian deposits from the Moesian Platform (Romanian Plain) established by R. Mutiu (2004) based on a rich ammonits fauna. The stratigraphic succesion start with the *Leymeriella tardefurcata* Zone of the lowermost Albian and continues until the uppermost Albian (Vraconian) zone with *Stoliczkaia dispar*. Using planktonic foraminifera, it was possible to recognise the folowing boizones: *Hedbergella planispira* p. r. zone, *Ticinella primula* p. r. zone for the *Leymeriella tardefurcata* Zone (Lower Albian), *Hedbergella richi – Ticinella primula* p. r. zone, *Hedbergella trochoidea* p. r. zone for the *Hoplites dentatus – Euhoplites loricatus* Zones (Middle Albian); *Biticinella breggiensis* t. r. zone for the Hysteroceratian Zone (lower part of the Upper Albian); *Planomalina buxtorfi* t. r. zone and *Rotalipora appenninica* p. r. zone for the *Stoliczkaia dispar* Zone (upper part of the Vraconian up to the boundary with the lowermost Cenomanian with *Rotalipora brotzeni.* In the paleontological part together with all the genera and species studied, the new taxon *Rugohedbergella mutziui* is described.

Keywords: Albian, planktonic foraminifera, biostratigraphy, taxonomy.

PLANKTONIC FORAMINIFERA AND MICROBIOSTRATIGRAPHY

Evolution and microbiostratigraphy – General considerations

The Lower Cretaceous foraminiferal faunas are rather rare and monotonous, when compared with those of the Upper Cretaceous.

For the Lower Cretaceous, the Albian is an interesting case regarding the planktonic faunas from the level of *Leymeriella tardefurcata* biozone and toward the final part of *Stoliczkaia dispar* biozone. For this timespan we can document the essential moments leading to the explosive development of those faunas concomitent with the end of *S. dispar* biozone and the base of *Mortoniceras inflatum* biozone, considered to mark the stratigraphical boundary between the Lower and Upper Cretaceous.

In order to understand the evolution of this very important group (for microbiostratigraphy) of foraminifera that dominated the planktonic life in the Late Cretaceous seas, we need to follow very carefully their evolution during the Albian. The existence in sediments of a rich ammonite fauna with marker species was an advantage.

A remarkable fact is that starting from the level of the *Leymeriella tardefurcata* biozone of the lower Albian, the planktonic population is very rich and well preserved. It shoud be mentioned that the lower part of this biozone that outcrops in Southern Dobrogea (Ostrov area) and is also known from boreholes, comes from a coarse lithofacies (sands or glauconitic sandy mudstones) in which planktonic faunas were not reported. Unfortunately, the material from the boreholes of late Aptian age in a marine facies was not accessibile, and we couldn't follow a planktonic fauna, that could be used in correlation with the rich lower Albian faunas. The associations of planktonic foraminifera became richer concurrent with the appearance of a marly, oddly tough shaly – marly lithofacies, as they get higher on the stratigraphical scale.

For this study it was possible to follow the marker ammonite fauna in parallel with the evolution of the planktonic associations.

One of the first observations, concerning all foraminiferal associations is related with the test size. For lower to middle Albian (close to the boundary with *Hysteroceras orbygni* biozone) the test size is remarkably small (under 0.3 – 0.4mm). In the upper part of middle Albian – *Euhoplites latus* (*Oxytropidoceras*), there can be observed an increase in teste size, which can reach two or even three times larger (0.6 – 0.7mm). From this level up to *S. dispar* biozone, there is a constant increase in test size that reaches 0.7 – 0.9mm in diameter (*Ticinella preticinensis*). Toward the final part of this biozone, at the Albian/Cenomanian boundary, species of the genus *Rotalipora* (known since earlier) will experience a populationall explosion as well as "gigantic" size (more than 1.0 mm in diameter).

Also remarkable is the evolution of the genus *Ticinella*. From the material available, this genus first appears as *Ticinella primula* at the upper part of the *Leymeriella tardefurcata* biozone. The genus continues its evolution troughout the *Hoplites dentatus* biozone; at the upper part of middle Albian its limit with upper Albian the taxon frequency decreases.

In the upper Albian, at the level of *Hysteroceras orbigny* biozone, *Ticinella madecassina* is known together with *Biticinella breggiensis*.

Ticinella praeticinensis and *T. ticinensis* first appear in the lowermost part of *Stoliczkaia dispar* biozone and are known up to the level of the *Planomalina buxtorfi* association. This is the moment when first specimens of *Rotalipora* are

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known. Even from the beginning, the specimens of this genus can be classified into two distinct evolutionary lines, by the morphological features of the test:

- the *Rotalipora praeticinensis* – *ticinensis* line, characterized by a trochospiral test, sometimes with a conical aspect;
- the *Rotalipora praebalernaensis* – *balernaensis* line, with a pateliform, low trochospiral test, together with the first specimens of *R. appenninica*.

At this level, it is possible to indicate where the evolutionary radiation of *Rotalipora* started. The maximum of this evolutionary process takes place during the Cenomanian.

Toward the final part of the *Stoliczkaia dispar* biozone (in the sample from Balaria drilling), a remarkable evolutionary and paleoecological phenomenon, among the *Rotalipora* populations, can be observed, whose roots can be traced back to the lower part of the *Stoliczkaia dispar* biozone. This phenomenon regards an explosive development of the population as well as a speciation process of comparable intensity.

Rotalipora ticinensis has a medium size, the test is clearly conical-truncate (on the spiral side), with the umbilical side clearly deep (crateriform), and having the sutural apertures situated on the edge, like in *Rotalipora brotzeni*, where the chambers of the last whorl grow bigger. *R. brotzeni* becomes the marker for lower Cenomanian.

The second populational group, more numerous, is represented by *Rotalipora appenninica*, considered to be a marker for the final part of the upper Albian (top Vraconian).

Within these extremely rich populations, a few interesting evolutionary directions can be followed. According with this tendency, the species *Rotalipora appenninica* has a pateliform - enlarged aspect, and the chambers of the last whorl are getting progressively bigger; the umbilical area is widely enlarged and the umbilical surface of the chambers is smooth (without burelettes, tubercules or keels). The sutural apertures are widely eliptical. The spiral side has a widely evolute aspect with arcuated sutural keels and a low trochospiral aspect.

A variety of the classical species is *Rotalipora evoluta* with a slender test, typically elongated – pateliform. The last chamber (or the last two chambers) shows a distinct tendency of elongation, unlike the other chambers (which are loosely uncoiled).

Rotalipora gandolfi, although keeping the main features of the classical species, is clearly differentiated by its robust size. The chambers of the last whorl, on the umbilical side, have distinct ornamentations consisting of burelets, pustules and keels; those features are to be found in a totally different morphological context in *Rotalipora cushmani* (Upper Cenomanian).

The final group, represented by *Rotalipora moesiana* n. sp., is characterised by a robust test (huge) in relation to the other related species. Readily distinct for this taxon is the strong lobate aspect of the periphery in association with the high romboid aspect of the last chambers that show a smooth surface.

A constant presence throughout the Albian planktonic foraminiferal associations is represented by populations of the genus *Hedbergella*, a form that is known from even lower in the Cretaceous (possibly Valanginian). In the lower Albian – *Leymeriella tardefurcata* Zone – before the development of *Ticinella primula* populations, the abundant development of small *Hedbergella planspira*, with its near to planspiral coiling is remarkable. This species continue its slow rate of development throughout the middle Albian and the lower part of upper Albian, extending even into the lower Cenomanian. Starting from the level with *Planomalina buxtorfi* this species becomes more and more scarce.

In the upper part of the *Leymeriella tardefurcata* Zone, and throughout the middle Albian, *Hedbergella rischi* has a notable development. The difference between this species and *Hedbergella planspira* lie in a more globular aspect of chambers forming the last whorl, and frequently by a moderated trochospiral coiling.

Toward the upper part of middle Albian (*Euhoplites*, *Oxytropidoceras*), two new elements occur in the association. These are represented by the genus *Schackoina* with the species *S. primitiva* form which evolves toward the final part of upper Albian, *Schackoina cenomana* which will make its way into the Cenomanian. The genus will continue its evolution all the way to the Campanian.

Another notable event is offered by the sudden increase in size of *Hedbergella trochoidea* and *H. gautirensis*. Characteristic for the first one is a high trochospiral test and the hispid surface of the chambers. *H. gautirensis* has a smaller size and a lower trochospiral coiling, and the test has a truncated aspect on the spiral side.

At this moment the speciation process took place that led to the appearance of the *Ticinella praeticinensis* branch. If we consider the test morphology in these two groups (*H. trochoidea* – *T. praeticinensis*), the only noticeble difference is made by the presence or absence of umbilical apertures.

At the level of the upper Albian, toward the upper part of the *H. orbignyi* biozone, close to the boundary with *S. dispar*, *Biticinella breggiensis* appears (which is probably an inadaptative radiation of the *Ticinella* group) with a rather short existence – an occasional mutant? This taxon vanishes before the lower limit of the *S. dispar* biozone, when there was another short lived inadaptive radiation, the species *Planomalina buxtorfi* appeared, which leaves room for the powerful adaptive development of the rotaliporids (the *Rotalipora appenninica* group, which crosses the Vraconian/lower Cenomanian boundary). It is to be mentioned that *Biticinella breggiensis* is in

association with a rich population of *Ticinella raynauldi*, and *T. madecassiana*.

Another inadaptative mutation among populations of the genus *Hedbergella*, is the new genus *Rugohedbergella mutziui*, encountered also at the *Planomalina buxtorfi* level. The main differences between this new genus and the original one – *Hedbergella* – can be observed in the ornamentations of the globular surface of the chambers – radial costae that are convergent toward the external area of the chambers. This peculiar ornamentation resembles the upper Senonian genera *Rugoglobigerina* (a striking example of morphologic homeomorphism).

Concerning the microbiostratigraphy, the three main subdivisions of the Albian, can be readily separated with ammonite fauna and also with planktonic foraminiferal associatons.

Since 1977 J. Sigal separated the first microbiozones based on planktonic foraminifera as follows:

Lower Albian – *Leymeriella tardefurcata* zone has at its base the *Ticinella bejaouensis* biozone that lasts to the basal part of middle Albian.

Middle Albian – *Hoplites dentatus* – *H. niobe* macrozones are characterized by *Ticinella primula* and *Hedbergella rischi*.

Upper Albian – *Mortoniceras inflatum* macrozone with the following microbiozones:

- The *Ticinella bregiensis* microbiozone, that has at its base the *Ticinella praeticinensis* biozone that continues all the way to the *S. dispar* biozone with *Ticinella ticinensis*.
- The Vraconian (*S. dispar* biozone) has at its base the *Planomalina buxtorfi* microbiozone, and in its upper part the *Rotalipora appeninica* microbiozone.

In 1995, Robaszynski and M. Caron published new interpretations to Sigal's biozonation. They were able to separate totally a *Ticinella bejaouensis* range zone that lasts from the upper Aptian probably until the *H. dentatus* zone (although the authors were not sure about that):

- *Hedbergella planspira* interval and partial range zone; althrough confusing and not certain at all for the lower Albian;
- *Ticinella primula* interval zone, starting from the lower Albian and lasting until the base of Vraconian;
- *Ticinella praeticinensis* zone, from the base of *M. inflatum* to the base of *cristatum* zone;
- *Rotalipora subticinensis* zone in the upper Albian (its basal part);
- *Rotalipora ticinensis* zone, that follows (inflatus zone);
- *Rotalipora appenninica* interval zone, at the base of *S. dispar* zone to the first appearence of *Rotalipora brotzeni* (syn. *R. globotruncanoides*);
- *Biticinella breggiensis* total range zone (at the base of *cristatum* zone);
- *Planomalina buxtorfi* range zone, at the base of *S. dispar* zone (Vraconian).

Using the material from the Moesian Platform boreholes, considering the macropaleontological biozonation based on ammonites carried out by R. Muntiu (2004) we established the following chronostratigraphical distribution of the planktonic foraminiferal associations (text-fig. 1.):

- The *Hedbergella planspira* (partial range zone) – is situated at the basal part of lower Albian (*Leymeriella tardefurcata* zone), followed by *Hedbergella rischi* in association with the first appearence of *Ticinella primula*. This whole association constitues a significant marker at the upper part of the lower Albian.

The Middle Albian – *Hoplites dentatus* Zone, is clearly characterised by a significant development of *Hedbergella rischi* populations followed by *Ticinella primula* (with a moderate frequency), on a background of *Hedbergella planispira* with a high frequency.

- The *Hedbergella trochoidea* – *Globigerinelloides bentonensis* partial concurrent range zone. This association is located in the upper and final part of the middle Albian and in the basal part of the *Hysteroceras orbignyi* zone. At this moment is to be observe an important increase in test size at *H. trochoidea* that becomes heteromorph, as *Ticinella* is missing the sutural-ombilical apertures. Also at this moment *Globigerinelloides bentoniensis* appears, but with a slightly smaller size, and also *Hedbergella gautriensis*.

In the lower part of *Hysteroceras orbignyi* Zone t. r. zone with *B. breggiensis*, the *Ticinella madecassina* biozone can be separated, in association and followed by the first populations of *Ticinella raynaudi* and *Biticinella breggiensis* with a moderate frequency.

After that follows the first associations with *Ticinella praeticinensis* – *Ticinella ticinensis* in the basal part of the t. r. zone with *Planomalina buxtorfi* showing a powerfull evolution in a short timespan.

In this succession, are observed the first populations (with a low frequency) of *Rotalipora* with it's two directions of morphological evolution:

- the trochospiral – truncate test line, formed by *R. praeticinensis* – *R. ticinensis* – *R. praebrotzeni* that will continue into the Cenomanian evolutionary lineage *R. brotzeni* – *R. globotruncanoideas* – *R. micheli* – *R. recheli* up to the level of middle Cenomanian (when its evolution stops);
- the pateliform – low trochospiral test line, formed by *R. praebalernaensis* – *R. balernaensis* – *R. appenninica, R. evoluta* – *R. gandolfi* – *R. moesiana*, that will lead to *R. montsalvensis* and *R. cushmani* in the late Cenomanian, and after that will disappear.

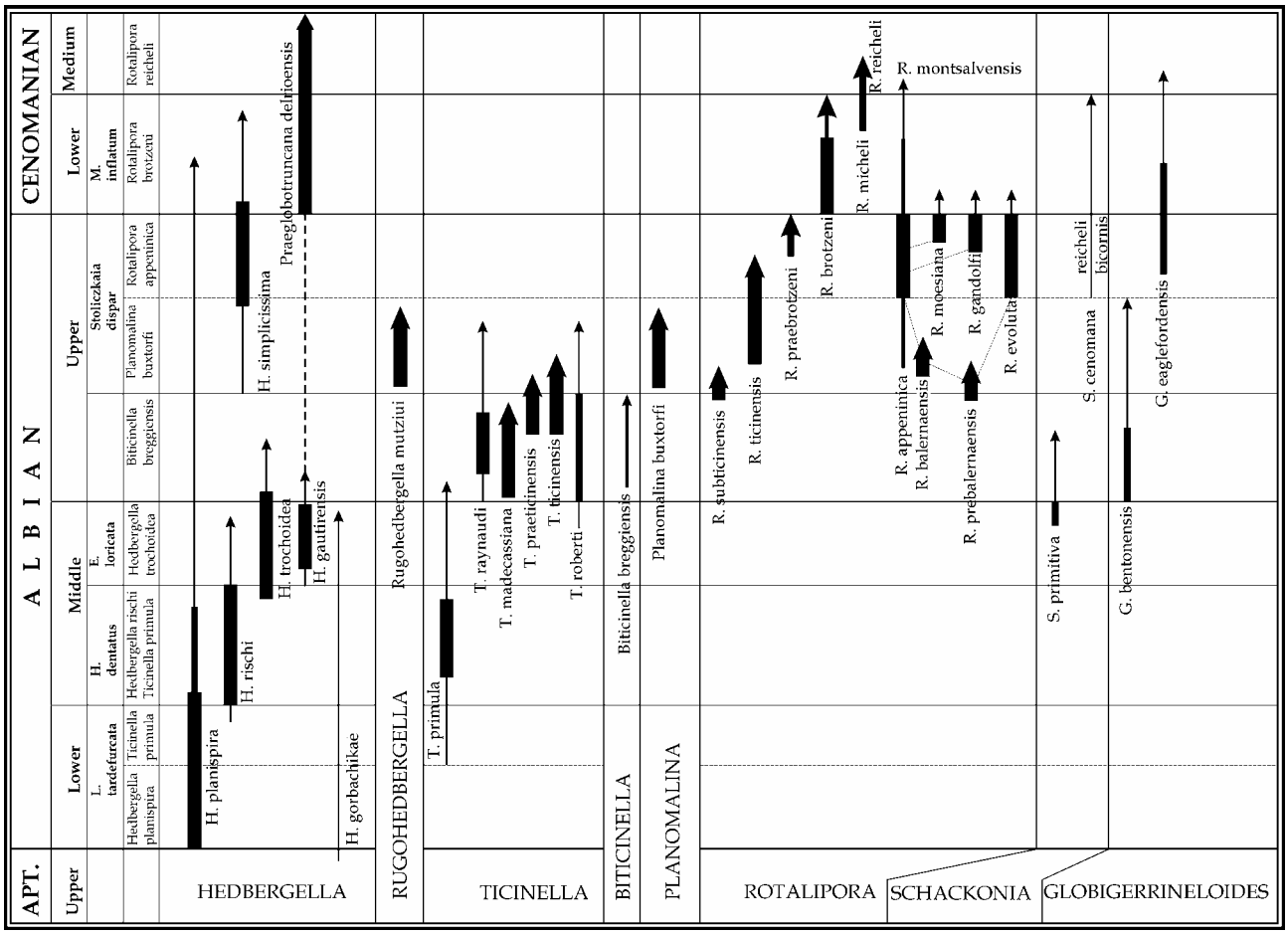

Fig. 1. Albian biozonation attempt using planktonic foraminifera.

From the evolutionary – phylogenetic point of view, it is possible to make the following observations about the planktonic populations from the Albian of the Moesian Platform:

- The genus *Hedbergella* continues its evolution, which began in the early Hauterivian with scarce and monotonous populations and with test sizes remarkably small. The same low evolutionary rate lasts through Barremian. During the Aptian, as Longoria (1973) pointed out, the genus shows a slow process of speciation that leads to the appearance of a remarkable number of species. At this moment, the first populations of the genus *Globigerinelloides* (in the lower part of the upper Aptian), followed by the genus *Ticinella* close to the Aptian/Albian boundary by *T. bejaouensis* – upon which a biozone will be separated – in the lower part of the basal Albian. In the samples from the Moesian Platform this species has not yet been found.
- The genus *Ticinella* will have a slow evolution during the middle Albian, as shown by *Ticinella primula*. In the upper part of middle Albian and the basal part of upper Albian, this genus will suffer an evolutionary process that will be reflected in its test morphology. The first populations, with a smooth test, without ornamentations and weakly trochospiral can be grouped in the line *T. primula – T. madecassina – T. raynaudi*, and a second line with a strongly trochospiral test, with a distinct ornamentation, and with an evident tendency toward forming a periferally keeled edge. From this line, trough *Ticinella praeticinensis – Ticinella ticinensis* the new genus *Rotalipora* will appear with a brotzeni type shape. The second morphological line of *Rotalipora appeninica* might have its origin the in *Ticinella raynaudi – T. aperta – R. praebalernaensis – R. balernaensis – R. appenninica* lineage.

From the *Ticinella* line, *Biticinella breggiensis* departed as an inadaptive radiation, although it is a minute mutant without evolutionary potential.

It is difficult to trace the phylogenetical origin of the second inadaptive radiation represented by *Planomalina buxtorfi* which follows stratigraphically *Biticinella bregiensis*. It has a unique morphology and a rapid evolution (it vanishes before the boundary with the lower Cenomanian) – this taxon appears strangely as a sudden and cryptic mutation.

Also in the upper Albian, the evolution of the genus *Globigerinelloides* continues. This genus appeared possibly since the Aptian. The absence of this taxon from the lower and middle Albian of

the Romanian Plain is indeed difficult to explain. However, in the *Hedbergella trochoidea* biozone the genus has a good frequency and is represented by *Globigerinelloides bentonensis*. This species will continue its evolution into the upper Albian (Vraconian) by *G. eaglefordensis* which will pass over the Vraconian/Cenomanian boundary, and will continue its evolution probably until the Senonian.

The first specimens of *Praeglobotruncana* first appear in the *S. dispar* zone, and this genus displays a rapid evolution during the latest Vraconian in the form of *P. delrioensis* which will reach its evolutionary climax in latest Cenomanian – earliest Turonian interval. The quest for its phylogenetical origin should take place in the lower part of the Vraconian or even within the *Hysteroceras varicosum* Zone, among the populations of *Hedbergella trochoidea* from which it enherited its trochospiral coiling and primitive carena (without the moniliform aspect as in *Rotalipora*) and missing umbilical burelets. Considering the overall morphology of *Hedbergella gautriensis*, this woud be a confirmation for this opinion.

The genera *Schackoina* was observed even since the asociation with *Hedbergella trochoidea*, although with a low frequency, represented by *S. primitiva*. The frequency of this genus increases during the late Vraconian (*R. appenninica* level) with *S. cenomana*. The evolution of this genus will continue during the Cenomanian and then will persist even until the Senonian. Noteworthy is the fact that all the planktonic genera grow remarkably larger in the Vraconian – Cenomanian interval. The test size for these genera remains constant (extremely small) although the morphology changes significantly.

This whole speciation process takes place during late Albian, with its climax at the level of the *S. dispar* Zone. At least one of the reasons that determined this phenomenon should be related with the increase in sea surface temperatures during the latest Albian. In 1967, Bandy published a curve with the sea surface paleotemperatures for the Cretaceous of Western Europe (text-fig. 2.), calculated on the basis of oxygen isotopes from belemnoid rostrae. The graphic shows water temperatures close to 25 degrees Celsius for the late Albian. After this period a sudden decrease is observed to temperatures around 16 degrees Celsius for the middle Cenomanian (*R. reichelli* zone). After this, the temperature starts to rise again until the level of the Coniacian but without reaching again the high temperatures observed from upper Albian (Vraconian).

A remarkable fact is that those two intervals of maximum temperatures correspond to the two principal times of evolutionary radiations among the planktonic populations of foraminifera. In the late Albian the group of rotaliporids appeared and they experienced have an exlosive evolution until the boundary with the Turonian, when they

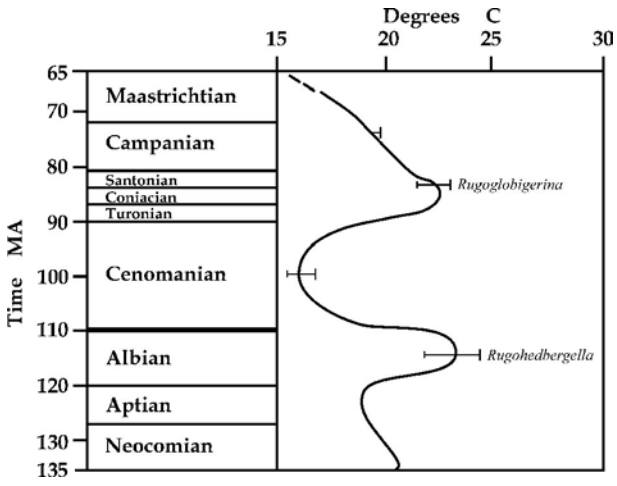

Fig. 2. Paleotemperature curve for the Cretaceous (adapted from Bandy, 1967).

disappeared. During the Coniacian, the second interval of maximum temperatures, another significant process of evolutive radiation takes place, when the group of marginotruncanids departs from the typical genera of globotruncanides together with the rugoglobigerinids from the Campanian – Maastrichtian interval.

It is worth mentioning that this phenomenon is superposed on the time of the big Cenomanian transgression. This event can be considered as one of the main causes that started the process of the first significant evolutionary radiation of planktonic foraminifera at the upper Albian/lower Cenomanian boundary. At that time the main branch of planktonic foraminifera was that of the rotaliporas, followed by hedbergellids among whom, for the first time, we can see the ornamentation of radial costellae of the chambers. The same phenomenon can be seen also in the second evolutionary radiation, from the Senonian in the case of rugoglobigerinids. The similarity of those two evolutionary events, observed among the planktonic foraminifera lead us to the conclusion that the sea surface temperature is the main factor controlling the evolution. This is also confirmation for the opinion that states that the same causes lead to the same results during the evolution of a certain group. Therefore we can conclude that owing to similar environmental changes, but never identical, the organisms react also alike. In the first case we see Rotalipora – Rugohedbergella, and in the second, Globotruncanidae – Rugoglobigerina.

SYSTEMATIC PALEONTOLOGY

Class FORAMINIFERA d'Orbigny 1826
Ord. GLOBIGERINIDA, Carpenter, Parker, Jones 1862
Superfamily PLANOMALINACEA Bolli, Loeblich, Tappan 1957
Family GLOBIGERINELLOIDAE Longoria 1974

Genus ***GLOBIGERINELLOIDES*** Cushman & ten Dam 1948

Globigerinelloides bentonensis (MORROW, 1934)
Plate 2, fig. 22-24., Plate 4., fig. 28-29.

Anomalina bentonensis MORROW.– CUSHMAN 1946, p. 154, pl. 63, fig. 7
Globigerinelloides bentonensis (MORROW).– LOEBLICH & TAPPAN 1961, p. 267, pl. 2, fig. 8-10.– TODD, 1964, p. 400, pl. 1, fig. 3-4.– CARON 1985, p. 47, pl. 29, fig. 8-9

Dimensions: (figured specimens) small diameter 0,17 mm – 0,21 mm; larger diameter 0,19 mm – 0,26 mm.

Remarks: Specimens from the biozone with *H. trochoidea* and Upper Albian have a smallest size and a more globulous aspect of the test in comparation with those from the *Planomalina buxtorfi* biozone.

Type specimens: L.P.B.IV11679, 11680.

Occurence: Putineiu –Vedea Valley, Buzescu – 511 borehole, -504m -508m, -564m.

Stratigraphic distribution: upper part of the Middle Albian and lower part of the Upper Albian.

Globigerinelloides eaglefordensis (MOREMANN, 1927)
Plate 1., fig. 22-24.

Planomalina caseyi BOLLI, LOEBLICH, TAPPAN 1957, p. 24, pl. l, fig. 4-5
Globigerinelloidea eaglefordensis (MOREMANN).– LOEBLICH & TAPPAN 1961, 268, pl. 2, fig. 3-7.

Dimensions: (figured specimens) small diameter 0,21 mm - 0,24 mm, larger diameter 0,24 mm - 0,31 mm.

Remarks: This species differs from *G. bentonensis* by its evident more evolute aspect of the coiling low trochospiral close to planispiral.

Type specimens: L.P.B.IV11681.

Occurence: Balaria 44 boehole, -625m -627m.

Stratigraphic distribution: Upper Albian (Vraconian).

Family PLANOMALINIDAE Bolli, Loeblich & Tappan 1957

Genus ***PLANOMALINA*** Loeblich & Tappan, 1946

Planomalina buxtorfi (GANDOLFI, 1942)
Plate 2., fig. 22-23., Plate 7., fig. 12-19.

Planulina buxtorfi (GANDOLFI).– SIGAL 1952, p. 23, fig. 22
Planomalina buxtorfi (GANDOLFI).– LOEBLICH & TAPPAN 1961, p. 269, pl. 2, fig. 1-2; CARON 1985, p. 65, pl. 29, fig. 1-2

Dimensions: small diameter 0,26 mm - 0,39 mm, larger diameter 0,31 mm - 0,50 mm.

Type specimens: L.P.B.IV.11682, 11683.

Occurrence: Glogoveanu borehole -1700m - 1705m, Dumbravitza borehole -2050m.

Stratigraphic distribution: Upper Vraconian - S. dispar- t. r. z with Pl. buxtorfi.

Family SCHACKOINIDAE Pokorny 1958

Genus ***SCHACKOINA*** Thalmann, 1932

Schackoina primitiva TAPPAN, 1940
Plate 1., fig. 31.

Schakoina primitiva TAPPAN 1940, p.123, pl.18, fig.14.– LOEBLICH & TAPPAN 1961 p. 272, pl.1, fig.1
Schackoina sp. NEAGU 1965, p. 36, pl. 10, fig. 5

Dimensions: small diameter 0,24 mm. larger diameter 0,34 mm.

Type specimens: L.P.B.IV 11685.

Occurence: Putineiu, Vedea Valley.

Stratigraphic distribution: Uppermost part of the Middle Albian (p. r. zone with *H. trochoidea*) and the basal part of the Upper Albian.

Superfamily ROTALIPOREACEA Sigal, 1958
Family HEDBERGELLIDAE Loeblich & Tappan, 1961
Subfamily Hedbergellinae Loeblich & Tappan, 1961

Genus ***HEDBERGELLA*** Bronnimann & Brown, 1952

Hedbergella rischi MOULLADE, 1974
Plate 1., fig.1-12

Hedbergella (H) sp. aff. infracretacea (GLAESSNER).– MOULLADE 1966 p. 89, pl. 8, fig. 6-9
Hedbergella rischi MOULLADE 1974, p. 1816

Dimensions: small diameter 0,12 mm - 0,19 mm; larger diameter 0,17 mm - 0,19 mm.

Remarks: By the reduced number of chambers in the last whorl and the globulous aspect of those, this species has obvious differences from *H. planispira* with which it is associated. Its size evidently grows within the *H. dentatus* Zone in the Middle Albian.

Type species: L.P.B.IV. 11637-11639.

Occurence: ISPH drilling Balla III (Oltina) right bank of the Danube River, drillings Chiciu, Calarasi, Giurgiu, Zimnicea (left bank of the Danube River) and Putineiu –Vedea Valley.

Stratigraphic distribution: Uppermost part of the Lower Albian and Middle Albian.

Hedbergella planispira (TAPPAN, 1940)
Plate 1, fig. 13-21

Globigerina planispira TAPPAN 1940, p. 122, pl. 19, fig. 12, 1943 p. 513, pl. 83, fig. 3
Hedbergella planispira (TAPPAN).– LOEBLICH & TAPPAN 1961, p. 276, pl. 5 fig 4-11.– NEAGU 1965 p. 36, pl. 10, fig. 1, not fig. 2-4.– CARON 1985 p. 59, pl. 25, fig. 23-24.

Dimensions: small diameter 0,12 mm - 0,19 mm; larger diameter 0,14 mm - 0,24 mm.

Remarks: This species is very well delimited by its small size of the test with 7-9 chambers in the last whorl and the evident planispiral aspect of the coiling this.

Type specimens: L.P.B.IV 11640-11643.

Occurence: ISPH Bala III borehole (Oltina) (right bank of the Danube River), Chiciu, Calaras, Giurgiu-Pod boreholes (left bank of the Danube River), Putineiu –Vedea Vally and Balaria – 44 borehole -625m—627m.

Stratigraphic distribution: Lower Albian-Vraconian- Lowermost Cenomanian (basal part of the t. r. zone with R. brotzeni).

Hedbergella trochoidea (Gandolfi,1942)
Plate 2, fig. 7-11

Anomalina lorneiana var. trochoidea GANDOLFI 1942 p. 99, pl. 2 fig. 1
Hedbergella trochoidea (GABDOLFI).– LOEBLICH & TAPPAN 1961, p. 277, pl. 5, fig. 1-2.– TODD & LOW 1964 p. 403, pl. 2, fig. 1-2.– CARON 1985, p. 60, pl. 25, fig. 17-18
Hedbergella planispira NEAGU 1965 not TAPPAN 1940, pl. 10, fig. 2-4

Dimensions: small diameter 0,19 mm – 0,31 mm; larger diameter 0,21 mm - 0,36 mm.

Remarks: The hispid aspect of the chambers, the clear trochospiral coilong and the umbilical large aperture are distinctive characters of this species.

Type specimens: L.P.B.IV 11644-11645.

Occurence: Putineiu (Vedea Vally), Zimnicea and Buzescu 11 boreholes.

Stratigraphic distribution: Uppermost part of the Middle Albian and basal part of the *Hysteroceras orbygni* Zone of the Upper Albian.

Hedbergella gautirensis (Bronnimann,1952)
Plate 2., fig. 1-6.

Globigerina gautirensis BRONNIMANN 1952, p. 11, pl. 1, fig. 1-3. text-fig. 2 a-m
Praeglobotruncana gautirensis (BRONNIMANN).– BOLLI 1959, p. 265, pl. 21, fig. 3-6

Dimensions: small diameter 0,17 mm - 0,19 mm; larger diameter 0,21 mm - 0,24 mm.

Remarks: By the trochospiral-flat aspect of the spiral side this species differs from *H. trocholidea* to which it is very close.

Type specimens: L.P.B.IV. 11646-11648.

Occurence: drillings Putineiu-(Vedea Valley), and Zimicea.

Stratigraphic distribution: Uppermost part of the Middle Albian - basal part of the *Hysteroceras orbygni* Zone of the Upper Albian.

Hedbergella simplicissima MAGNE & SIGAL, 1954
Plate 2., fig. 24.

Hastigerinella simplicissima MAGNE & SIGAL 1954, p. 487, pl.14, fig. 11
Hedbergella simplicissima (MAGNE & SIGAL).– CARON 1971, p. 147, text-fig. 3

Dimensions: small diameter 0,17 mm - 0,24 mm, larger diameter 0,31 mm - 0,39 mm

Remarks: Together with Longoria (1974) we consider *H. simplicissima* a good taxon because of its clearly defined characters.

Type specimens: L. P. B. IV

Occurrence: drillings 44 Balaria (625m -627m) 1795 Glogoveanu (-1700m -1705m)

Stratigraphic distribution: Upper Albian (Vraconian)

Genus ***RUGOHEDBERGELLA*** Neagu n. gen.

Type species: Rugohedbergella mutziui n. sp.

Derivation of name: from the type-ornamentation of the chambers and the hedbergelid aspect of the test.

Type level: Upper Albian (*Stoliczkaia dispar* Zone) total range zone with *Planomalina buxtorfi*.

Type locality: drilling Glogoveanu –Romanian Plain

Description: Test free, trochospiral "hedbergelliforme" with 5-7 globular chambers in the last whorl; a large umbilical area completely devoid of any secondary structures; surface of the chambers ornamented by pustules and costellae in a meridional pattern (homeomorphy with Rugoglobigerina from the Senonian) with the possible exception of the last one or two chambers which are smooth. Aperture umbibical with a narrow lip.

Remarks: The chamber ornamentation is similar to that of the genus *Rugoglobigerina* from the Senonian, but the number of chambers in the last whorl (typical for hedbergellidae) and the total lack of the umbilical secondary elements are the distinctive characters of this new genus.

Rugohedbergella mutziui NEAGU n. gen. n. sp
Plate 3., figs. 1-33.

Derivation of name: this species is dedicated to my good friend Dr. geologist Radu Mutziu in honour of his major contribution to the paleontology of the Albian fauna from the Moesian Platform.

Type level: Upper Albian-Vraconian- with *S. dispar* - total range zone with *Planulina buxtorfi*.

Type locality: drilling Glogoveanu (-1996m - 2000m).

Type specimens: L.P.B.IV. holotype: 11649; paratypes 11650.

Description: The same as for the genus.

Dimensions: holotype small diameter 0,31 mm. larger diameter 0,36 mm; paratypes small diameter 0,24 mm - 0,34 mm, larger diameter 0,24 mm - 0,39 mm.

Stratigraphic distribution: Upper Albian (Vraconian), total range zone with *Planomalina buxtorfi*.

Family ROTALIPORIDAE Sigal, 1958
Subfamily Ticinellinae Longoria, 1974

Genus ***TICINELLA*** Reichel, 1950

Ticinella primula LUTERBACHER, 1964
Plate 2, fig, 12-17

Ticinella primula LUTERBACHER 1964 in: O. RENZ et al. p. 1085, fig. 4 a-c.– SIGAL 1966, p. 198, pl. 3, fig. 11-14, pl. 4, fig. 1-9.– CARON 1985 p. 79, pl. 37, fig. 6-7.

Dimensions: Bala borehole: small diameter 0,21 mm, larger diameter 0,26 mm; Calaras borehole small diameter 0,14 mm - 0,19 mm larger diameter 0,21 mm - 0,24 mm, Craiova drilling small diameter 0,21 mm, larger diameter 0,21 mm.

Remarks: The globulous aspect of the chambers and the nearly planispiral coiling with a weak towards uncoiling tendency of the last chambers are the distinctive characters of this species.

Type specimens: L.P.B.IV.11652-11654.

Occurence: ISPH Balla III borehole (Oltina right bank of the Danube River), Chiciu and Calaras (left bank of the Danube River).

Stratigraphic distribution: Lower Albian (*L. tardefurcata* Zone) to Middle Albian (*H. dentatus* Zone).

Ticinella raynaudi SIGAL, 1966
Plate 1, fig. 25-27

Ticinella raynaudi SIGAL 1966, p. 200, pl. 5, fig. 10, pl. 6 fig. 1-13

Dimensions: small diameter 0,24 mm, larger diameter 0,29 mm - 0,31 mm.

Type specimens: L.P.B.IV.11655-11658.

Occurence: Buzescu 11 borehole (-570m); 2251 Dumbravita (-2253m).

Stratigraphic distribution: Upper Albian (*Hysteroceras orbygni* Zone- t. r. zone with *Biticinella breggiensis*).

Ticinella raynaudi digitalis SIGAL, 1966
Plate 1., fig. 28-30

Ticinella raynaudi digitalis SIGAL 1966, p. 202, pl. 6, fig. 6-8

Dimensions: small diameter 0,24 mm - 0,29 mm; larger diameter 0,29 mm - 0,34 mm.

Remarks: This subspecies differs from the typical one by its moderately elongated last 2-3 chambers.

Type specimens: L.P.B.IV.11656-11657.

Occurence: Glogoveanu borehole (marls with Aucellina -1695m -1700m), Copaceni borehole (marls with Aucellina -480m -485m).

Stratigraphic distribution: Upper Albian (Vraconian with *S. dispar*) *Planomalina buxtorfi* t. r. zone.

Ticinella madecassiana SIGAL, 1966

Ticinella madecassiana SIGAL 1966, p. 197, pl. 3, fig. 7-10.– CARON 1985 p. 76, pl. 36, fig. 4-5.– SHUALMIT et al, 2000, p. 12, pl. 1, fig. 6-8

Dimensions: small diameter 0,24 mm; larger diameter 0,26 mm - 0,36 mm.

Type specimens: L.P.B.IV11661.

Occurence: Harlesti borehole.

Stratigraphis distribution: Upper Albian (Vraconian *Hysteroceras orbygni* Zone).

Ticinella praeticinensis SIGAL, 1966
Plate 3, fig. 1-3, Plate 7, fig. 1-8.

Ticinella praeticinensis SIGAL 1966, p. 195, pl. 2, fig. 3, pl.3, fig.1-6.– CARON 1985, p. 78, pl. 36, fig. 8-9.– LIPSON-BENTAR et al 2000, p. 14, pl. 2, fig. 1-3

Dimensions: small diameter 0,26 mm - 0,39 mm; larger diameter 0,29 mm - 0,48 mm (figured specimens).

Type specimens: L.P.B.IV. 11661.

Occurence: Glogoveanu borehole (-1695m - 1700m).

Stratigraphic distribution: Upper Albian (Vraconian, Planomalina buxtorfi t. r. zone).

Genus ***BITICINELLA*** Sigal, 1956

Biticinella breggiensis (GANDOLFI, 1942)
Plate 4., fig. 25-27.

Anomalina breggiensis GANDOLFI 1942, p. 102, pl. 3, fig. 6
Ticinella (Biticinella) breggiensis (GANDOLFI).– SIGAL 1966 p. 192, pl. 1, fig. 1-10, pl. 2, fig. 2
Biticinella breggiensis (GANDOLFI).– SIGAL 1956, p. 35, text-fig.– LUTERBACHER & PREMOLI – SILVA 1962, 272, pl. 23, fig. 2-4; CARON 1985, p. 43, pl. 36, fig, 16-17

Dimensions: small diameter 0,24 mm; larger diameter 0,44 mm.

Type specimens: L.P.B.IV.11684.

Occurence: Buzescu 511 borehole (-570m).

Stratigraphic distribution: Upper Albian (Vraconian- *Hysteroceras orbygni* Zone- *B. breggiensis* t. r. zone.

Subfamily Rotaliporinae SIGAL, 1956

Genus ***ROTALIPORA*** Brotzen, 1942

Rotalipora subticinensis GANDOLFI, 1957
Plate 3., fig. 4-6., Plate 6., fig. 1-11.

Globotruncana (Thalmanninella) ticinensis subticinensis GANDOLFI 1957 p. 59, pl. 8, fig. 1.– KLAUS 1959 p. 803, pl. 1, fig. 4
Rotalipora subticinensis GANDOLFI.– CARON 1985, p. 72, pl. 33, fig. 1-2.– LIPSON et al 2000 p. 32, pl. 9, fig. 1-3

Dimensions: small diameter 0,29 mm - 0,34 mm; larger diameter 0,34 mm - 0,36 mm. (figured specimens).

Remarks: The primitive aspect of this species is evidenced by the hispid aspect of the peripheral area of the chambers, which foreshadows a primitive keel. This aspect is reminesscent of *Ticinela subticinensis* either this area is largely vague definite.

Type specimens: L.P.B.IV.11670.

Occurence: Glogoveanu borehole (-1695m—1700m).

Stratigraphic distribution: Upper Albian – Vraconian – *S. dispar* zone, *Planomalina buxtorfi* t. r. zone).

Rotalipora ticinensis GANDOLFI, 1942
Plate 4, fig. 7-9

Globotruncana ticinensis GANDOLFI 1942, pl. 2, fig. 3
Rotalipora (Thalmanninella) ticinensis ticinensis (GANDOLFI).– KLAUS 1959, p. 808, pl. 2, fig.1
Rotalipora ticinensis (GANDOLFI) CARON 1985 p. 72, pl. 33, fig. 3-5.– LIPSON-BENITAH et al 2000, p. 32, pl. 9, fig. 4-6

Dimensions: small diameter 0,29 mm - 0,40 mm; larger diameter 0,34 mm - 0,48 mm.

Remarks: The characteristic aspect of the test generated by the moderate to high trochospiral coiling and the truncated aspect of the umbilicus, the apertural aparatus on the umbilical sholder of the chamber, together with the total absence of any umbilical keels or pustules, characterize this species very well. In the basal part of the *Planomalina buxtorfi* t. r. zone the size of the test is small and grows gradually until medium dimensions in the *Rotalipora appenninica* p. r. zone (terminal part of the Vraconian).

Type species: L.P.B.IV 11671-11674.

Occurence: Glogoveanu borehole (-1995m-1700m) and Balaria 44 borehole (-625m-627m).

Stratigraphic distribution: Upper Albian (Vraconian S. dispar zone *Planomalina buxtorfi* – t. r. zone – *Rotalipora appenninica* p. r. zone).

Rotalipora praebalernaensis SIGAL, 1969
Plate 5., fig. 1-2

Rotalipora praebalernaensis SIGAL 1969, p. 635, pl. 1, fig. 1-12, pl. 2 fig. 1-3.– LIPSON-BENITAH et al 2000, p. 30, pl. 8, fig. 4-6

Dimensions: small diameter 0,24 mm – 0,36 mm; larger diameter 0,31 mm - 0,43 mm.

Remarks: The presence of an incomplete peripheral keel represented by fused rugosities, a moderate trochospiral coiling, and an open umbilical area are the distinctive characters of this species. The umbilical and spiral aspect of the chambers are similar to that of *R. appenninica*, confirming Sigal's opinion who considered it as the ancestor of the *R. appenninica* lineage. In the Moesian Platform this species is present only in the basal part of the t. r. zone with *P. buxtorfi* together with *R. praeticinensis* – *R. ticinensis* from which it differs very clearly by its low trochospiral coiling.

Type species: L.P.B.IV.11687.

Occurence: Glogoveanu borehole (-1699m - 1700m).

Stratigraphic distribution: Upper Albian (Vraconian *S. dispar* zone, *P. buxtorfi* t. r. zone).

Rotalipora balernaensis GANDOLFI, 1957
Plate 5., figs. 3-4, 16-19.

Rotalipora balernaensis GANDOLFI.– LOEBLICH & TAPPAN 1961, p. 297, pl. 8, fig. 11.– SIGAL 1969, pl. 2, fig. 2-8.– LIPSON-BENITAH et al 2000, p. 30, pl. 8, fig. 1-3
Rotalipora (Thalmanninella) appenninica balernaensis (GANDOLFI).– KLAUSS, 1960, p. 808, pl. 3, fig. 2

Dimensions: small diameter 0,34 mm - 0,40 mm; larger diameter 0,39 mm - 0,43 mm.

Remarks: This species differs from *R. praebalernaensis* by the development of a clear peripheral keel and a tendency to develop a weak ornamentation on the umbilical side of the chambers.

Type species: L.P.B.IV.11662-11663.

Occurence: Glogoveanu (-1695m-1700m) and Dumbravita 2251 (-2050m) boreholes.

Stratigraphic distribution: Upper Albian (Vraconian *S. dispar* zone, *Planomalina buxtorfi* t. r. zone).

Rotalipora evoluta SIGAL, 1948
Plate 5., fig. 20-25

Rotalipora evoluta SIGAL 1948, p.100, pl. 1, fig. 3, pl. 2, fig. 2.– CARBONIER 1952 p. 118, pl. 7, fig. 2.– LOEBLICH & TAPPAN 1961, p. 298, pl. 7, fig. 1-4
Rotalipora appenninica evoluta SIGAL.– LUTERBACHER & PREMOLI - SILVA 1962 pl. 20, fig. 8

Dimensions: small diameter 0,36 mm, larger diameter 0,46 mm - 0,48 mm.

Type specimens: L.P.B.IV.11664-11665.

Occurence: Balaria 44 borehole (-625,-627m), Stefan cel Mare borehole (-215m).

Stratigraphical distribution: Upper Albian (upper Vraconian *R. appenninica* p. r. zone).

Rotalipora appenninica (RENZ, 1936)
Plate 5., fig 5-10., Plate 6., fig. 21-28

Globotruncana appenninica RENZ 1936, p. 20, pl. 6, fig. 1-11, pl. 7, fig. 1, pl. 8, fig. 4
Globotruncana (Rotalipora) appenninica (RENZ).– MORNOD 1950 p. 578, text-fig. 3-4, pl. 15, fig. 1
Rotalipora appenninica (RENZ).– SIGAL 1952, p. 24, text-fig. 23.– SUBBOTINA 1953 p. 159, pl. 1, fig. 5-6 (not fig.7-8), pl. 2, fig. 1-2
Rotalipora appenninica appenninica (RENZ).– LUTERBACHER & PREMOLI - SILVA 1962, p. 266, pl. 19, fig. 1-2, pl. 20, fig 1-4, pl. 21 fig. 1-4
Rotalipora (Thalmanninella) appenninica appenninica RENZ 1960 p. 808, pl. 3, fig. 3

Dimensions: small diameter 0,34 mm - 0,46 mm; larger diameter 0,40 mm - 0,60 mm.

Type specimens: L.P.B.IV.11666.

Occurence: Balaria 44 borehole (-625m-627m).

Stratigraphic distribution: Upper Albian (*S. dispar*. Uppermost Vraconian p. r. zone with *R. appenninica*).

Rotalipora gandolfi LUTERBACHER & PREMOLI - SILVA 1962
Plate 5., fig.14-15

Rotalipora appenninica gandolfi LUTERBACHER & PREMOLI - SILVA 1962, pl. 19, fig. 3
Rotalipora gandolfi LUTERBACHER & PREMOLI - SILVA.– CARON 1985 p. 69, pl. 35, fig. 5-7

Dimensions: small diameter 0,53 mm - 0,60 mm, larger diameter 0,65 mm - 0,67 mm.

Remarks: This species differs from *R. appenninica* by the high angular rhomboid aspect of the chambers.

Type specimens: L.P.B.IV.11667.

Occurence: Balaria 44 borehole (-625m-627m).

Stratigraphic distribution: Upper Albian (*S. dispar* Zone uppermost Vraconian p. r. zone with *R. appenninica*).

Rotalipora moesiana NEAGU n. sp.
Plate 5., fig. 11-13.

Derivation of name: from the Moesian Platform. The geologic-structural name of the Romanian Platform.

Type level: Upper Albian (*S. dispar* zone – *Rotalipora appenninica* p. r. zone, uppermost Vraconian).

Type locality: Balaria 44 borehole – Moesian Platform.

Type species: L.P.B.IV. holotype 11668, paratypes 11669.

Description: Test robust with 7-9 chambers in the last whorl; chambers with an evident high angular rhomboid aspect, deep and arched sutures; last 2-4 chambers very robust, smooth and high, the others are not as high and show reduced or absent ornamentation on the periumbilical area; peripheral keel is simple (not with a moniliform aspect) becoming slender; sutural apertures are periumbilical in position and large; umbilicus is widely open; the spiral side is more or less flat, and the early stage has a largely conical aspect; sutural keels on the spiral side are arched.

Dimensions: holotype: small diameter 0,62 mm, larger diameter 0,74 mm; paratypes small diameter 0,48 mm - 0,55 mm, larger diameter 0,60 mm - 0,74 mm.

Remarks: By the robust aspect of the test and the dimensions of the last chamber. This species differs from R. appenninica. From *R. gandolfi* it differs also by the high rhomboid aspect of the chambers of the last whorl and by the absence of ornamentation in the periumbilical area.

Stratigraphic distribution: Upper Albian (*S. dispar* Zone uppermost Vraconian p. r. zone with *R. appenninica*).

Rotalipora praebrotzeni NEAGU, n. sp,
Plate 4., fig. 10-15, 22-24., Plate 8., fig. 13-22

Derivation of name: latin prae = before and brotzeni = name of the marker species for the Lower Cenomanian, because of its intermediary characters it lies between *R. ticinensis* and *R. brotzeni*.

Type level: Upper Albian (uppermost Vraconian – p. r. zone with R. *appenninica*).

Type locality: Balaria 44 borehole (-625m - 627m) Moesian Platform.

Type specimens: L.P.B.IV. holotype 11677, paratypes 11676.

Description: Test with a medium size, moderately conical trochospiral side; chambers of the last whorl with a high rhomboidal aspect; straight and deep sutures; a small and deep umbilicus with a crateriform aspect; sutural apertures raised on the umbilicus brim; surface of the chambers are periumbilical ornamented; spiral side with a typical conical aspect; spiral sutures marked by arcuate and with a pearly aspect; apertural side of the last chamber with a high aspect having a large primary aperture.

Dimensions: holotype small diameter 0,48 mm; larger diameter 0,60 mm; paratypes small diameter 0,39 mm - 0,48 mm; larger diameter 0,39 mm - 0,58 mm.

Remarks: From *R. brotzeni* with which this species presents visible affinities. *R. praebrotzeni* differs by its moderate size and by the absence of periumbilical keels on the last chambers. This species has an intermediary position between the small but high trochospiral coiled species such as *R. ticinensis* and those robust species with high periumbilical chambers and with periumbilical keels such as *R. brotzeni*.

Stratigraphic distribution: Upper Albian (uppermost Vraconian p. r. zone with *R. appenninica*).

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EXPLANATION OF THE PLATES

PLATE 1

Figs. 1-12 – *Hedbergella rischi* MOULLADE 1974
Figs.1-3, 10-12 – Middle Albian (H. dentaus), Giurgiu hypotypes L.P.B/IV.11639
Figs. 3-9 – Lower Albian (L. tardefurcata) ISPH drilling Bala III-Oltina right bank of the Danube River. hypotype L.P.B.IV.11638
Figs. 13-21 – *Hedbergella planispira* (TAPPAN, 1940) Middle Albian (H. dentatus) Giurgiu hypotypes L.P.B.IV.11641
Figs. 22-24 – *Globigerinelloides eaglefordensis* (MOREMANN, 1927) Upper Albian (Vraconian) Balaria 44 borehole (-625m-627m) hypotypes L.P.B.IV.11681
Figs. 25-27 – T*icinella raynaudi* SIGAL 1966 Upper Albian (Vraconian) Buzescu 11 borehole (-570m), hypotypes L.P.B.IV.11656
Figs. 28-30 – *Ticinella raynaudi digitata* SIGAL 1966 Upper Albian (Vraconian) Copaceni borehole (-481m -485m) hypotypes L.P.B.IV.11656
Fig. 31 – *Schackoina primitiva* TAPPAN 1940 Middle Albian Putinei - V. Vedea borehole, hypotypes L.P.B.IV.11685

PLATE 2

Figs. 1-6 – *Hedbergella gautirensis* (BOLLI, 1959), Middle Albian figs. 1-3 Zimnicea boreholes, hypotypes L.P.B.IV.11647, figs. 4-6 Putineiu borehole hypotypres L.P.B.IV.11646
Figs. 7-11 – *Hedbergella trochoidea* (GANDOLFI, 1942) Middle Albian Putineiu borehole hypotypes L.P.B.IV.11644
Figs. 12-17 – *Ticinella primula* Luterbacher 1964, Lower Albian, (tardefurcata) figs.12-13 Craiova borehole hypotypes L.P.B/IV.11654, figs. 14-17 Bala – Oltina borehole hypotypes L.P.B.IV.11652
Figs. 18-21 – *Globigerinelloides bentonensis* (MORROW, 1934) Upper Albian (Vraconian) Dumitritza borehole, hypotypes L.P.B.IV.11688
Figs. 22-23 – *Planomalina buxtorfi* (GANDOLFI, 1942) upper Albian (Vraconian) Dumbravitza borehole hypotypes L.P.B.IV.11683
Fig. 24 – *Hedbergella simplicissima* MAGNE & SIGAL 1954 upper Albian (Vraconian) Balaria 44 borehole (-625m -627m) hypotypes L.P.B.IV.11648

PLATE 3

Figs. 1-33 – *Rugohedbergella mutziui* NEAGU n. g. n. sp. Upper Albian (Vraconian Planomalina buxtorfi t. r. zone). Glogoveanu borehole (marls with Aucellina -1695m-1700m), figs.1-3 holotype L.P.B.IV.11649, figs 4-33 paratypes L.P.B.IV.11650

PLATE 4

*(Genus Rotalipora evolution and possible phylogenetic connections **ticinensis branch**)*

Figs. 1-3 – *Ticinella praeticinensis* SIGAL 1966 Upper Albian (Vraconian, basal part) Glogoveanu borehole L.P.B.IV.11665
Figs. 4-6 – *Rotalipora subticinensis* (GANDOLFI, 1957) Upper Albian (Vraconian-basal part), Glogoveanu borehole L.P.B.IV.11670
Figs. 7-9 – *Rotalipora ticinensis* (GANDOLFI, 1942), Upper Albian, R. appenninica p. r. zone, Balaria 44 borehole (-625m-627m) L.P.B.IV.11671
Figs. 10-15, 22-24 – *Rotalipora praebrotzeni* NEAGU n.sp. Upper Albian (Vraconian R. appenninica p. r. zone) Balaria 44 borehole (-625m-627m) L.P.B.IV hollotype 11675 (fig.13-15, 11676 paratypes fig. 10-12)
Figs. 16-18 – *Ritalipora brotzeni SIGAL,* Lower Cenomanian, Pestera Valley (Souther Dobrogea)
Figs. 19-21 – *Rotalipora micheli* (SACAL & DEBOURLE) upper part of the Lower Cenomanian, Sipote (Souther Dobrogea)
Figs. 25-27 – *Biticinella breggiensis* (GANDOLFI, 1942) Upper Albian (Vraconian, P. buxtorfi t. r. zone), Buzescu 11 borehole L.P.B.IV.11684
Figs. 28-29 – *Globigerinelloides bentonensis* (Morrow) Upper Albian (Vraconian) Dumbravitza borehole, L.P.B.IV.11688
Figs. 30-33 – *Ticinella raynaudi SIGAL* 1966, Upper Albian (Vraconian B. breggiensis t. r. zone) Dumbravitza borehole, L.P.B.IV.11655

PLATE 5

Rotalipora evolution and possible phylogenetic connections – ***appenninica branch***)

Figs. 1-2 – *Rotalipora praebalernaensis SIGAL 1967* Upper Albian (Vraconian P. buxtorfi t. r. zone) Dumbravitza borehole, L.P.B.IV.11687
Figs. 3-4 – *Rotalipora balernaensis GANDOLFI 1957* Upper Albian (Vraconian P. buxtorfi t. r. zone) Dumbravitza borehole. L.P.B.IV.11663
Figs. 5-10 – *Rotalipora appenninica* (GANDOLFI, 1942) Upper Albian (Upper Vraconian p. r. zone with R. appenninica) Balaria 44 borehole (-625m-627m) L.P.B.IV.11666
Figs. 11-13 – *Rotalipora moesiana NEAGU n. sp.* Upper Albian (upper Vraconian, R. appenninica p. r. zone) Balaria 44 borehole (-625m- 627m), hollotype L.P.B.IV.11668
Figs. 14-15 – *Rotalipora gandolfi LUTERBACHER - PREMOLI SILVA 1962* Upper Albian (uppermost Vraconian, R. appenninica p. r. zone) Balaria 44 borehole (-625m-627m), L.P.B.IV.11667
Figs. 16-17, 18-19 – *Rotalipora balernaensis GANDOLFI 1957* Upper Albian (Vraconian P. buxtorfi t. r. zone), Dumbravitza borehole, L.P.B.IV.11663
Figs. 20-25 – *Rotalipora evoluta SIGAL 1948,* Upper Albian (Vraconian R. appenninica p. r. zone) Balaria borehole (-625m-627m), L.P.B.IV.11665

PLATE 6

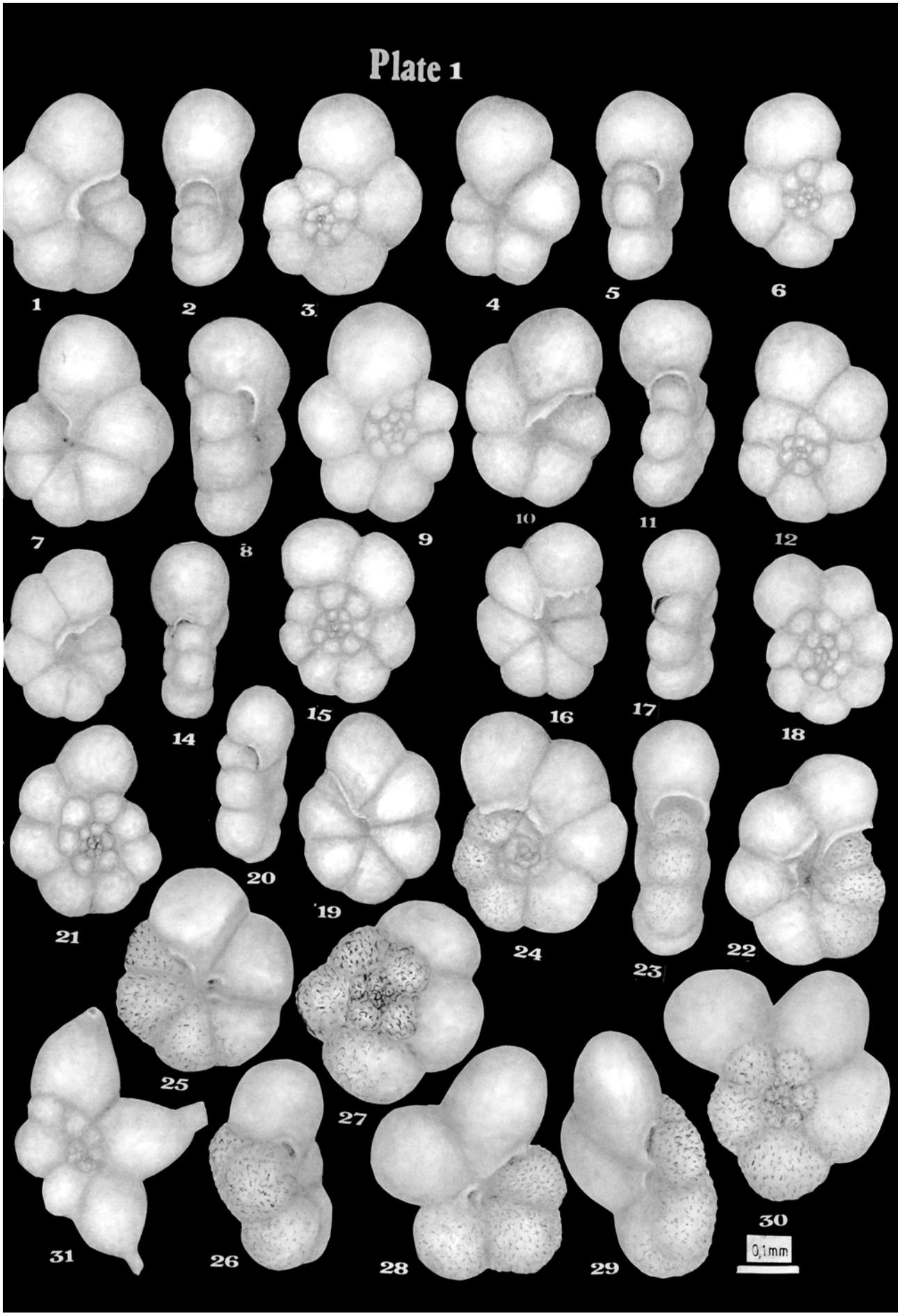
Figs. 1-11 – *Ticinella praeticinensis SIGAL 1966* Upper Albian (Vraconian) Glogoveanu borehole (-1695m-1700m Aucellina marls) L.P.B.IV 11661
Figs. 12-20 – *Rotalipora balernaensis* GANDOLFI 1957, Upper Albian (Vraconian) figs. 12-18 Glogoveanu borehole (-1695m-1700m) L.P.B.IV.11662, figs. 19-20 Stefan cel Mare borehole
Figs. 21-28 – *Rotalipora appenninica* (RENZ, 1936) Upper Albian (uppermost Vraconian), Balaria 44 borehole (-625m,-627m), L.P.B.IV.11666

PLATE 7

Figs. 1-8 – *Ticinella praeticinensis* SIGAL 1966 Upper Albian (Vraconian P. buxtorfi t. r. zone) Glogoveanu borehole, L.P.B.IV11661
Figs. 9-11 – *Hedbergella sp. cf. gorbachichae KONGORIA* Middle Albian (H. trochoidea p. r. zone) Putineiu borehole
Figs. 12-19 – *Planomalina buxtorfi* (GANDOLFI, 1942) Upper Albian (Vraconian) Glogoveanu borehole, marls with Aucellina (-1695,-1700m) L.P.B.IV.11682

PLATE 8

Figs. 1-12 – *Praeglobotruncana delrioensis* PLUMMER 1931 Upper Albian (Vraconian R. appenninica p. r. zone) Balaria 44 borehole (-625m-627m) L.P.B.IV.11678
Figs. 13-32 – *Rotalipora praebrotzeni* NEAGU n. sp. paratype upper Albian (Vraconian. Figs. 13-20 *P. buxtorfi* t. r. zone, Glogoveanu borehole L.P.B.IV 11677. figs 21-33 *R. appenninica* p. r. zone Balaria 44 borehole (-625m-627m) L.P.B.IV.11676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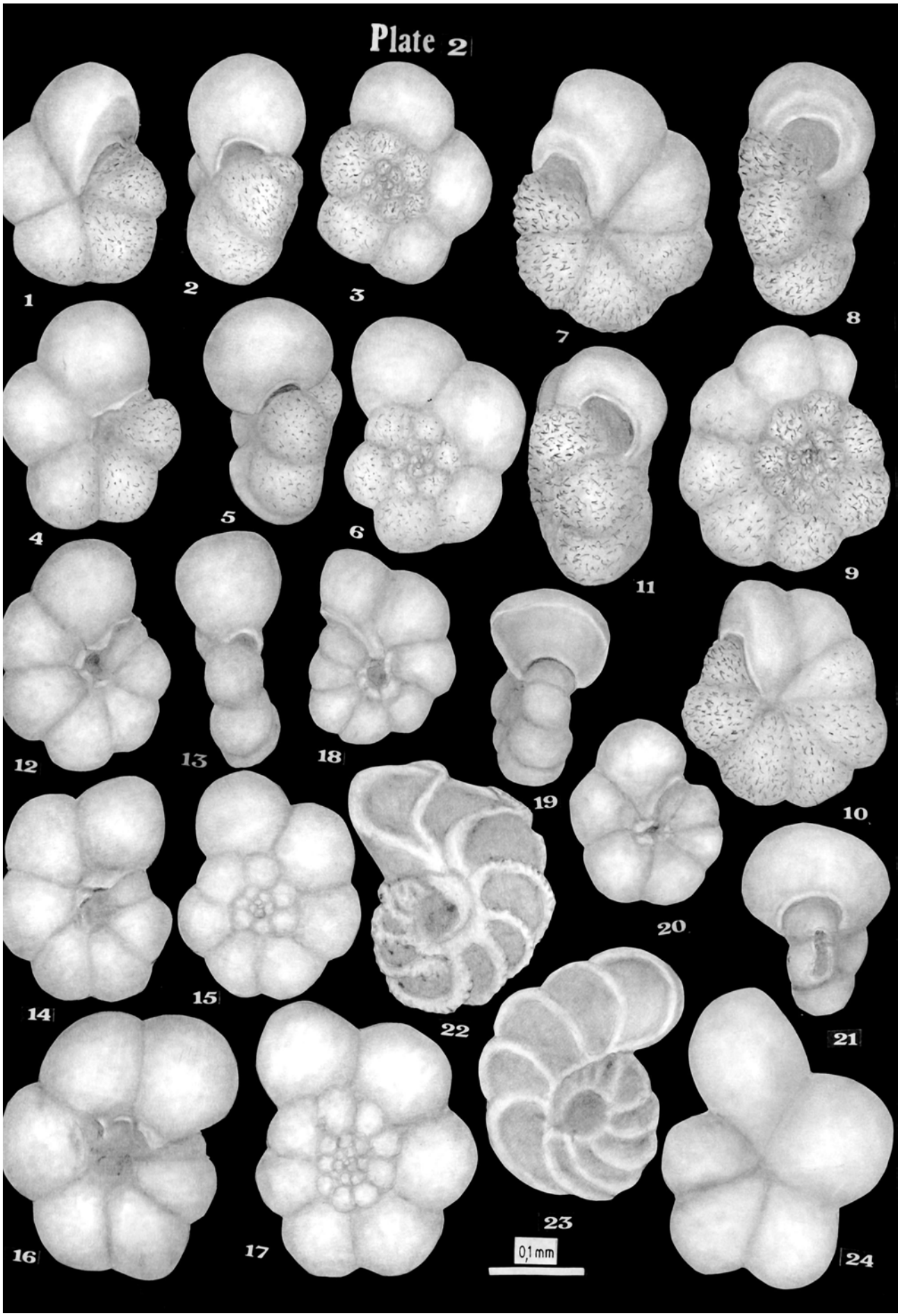
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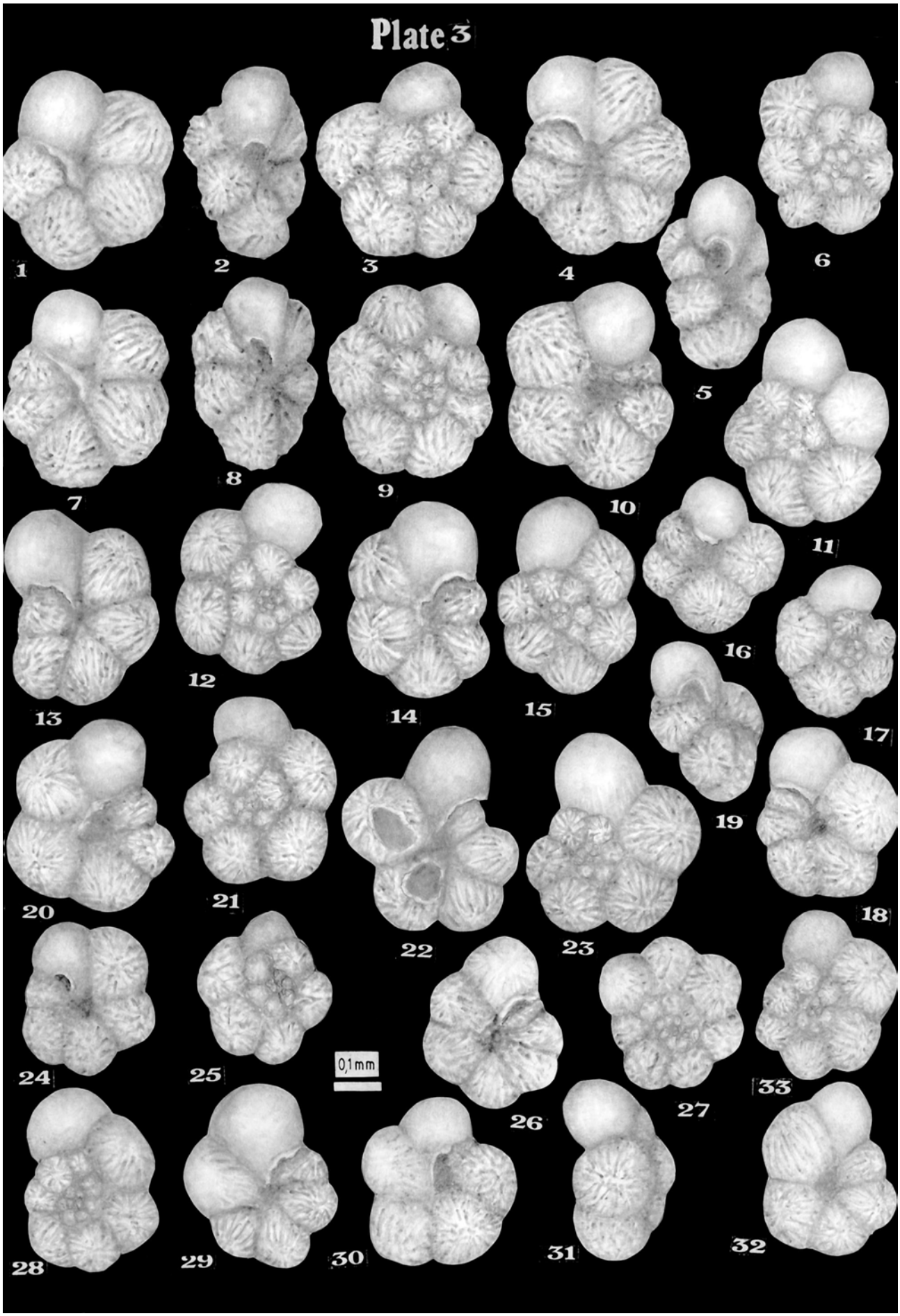
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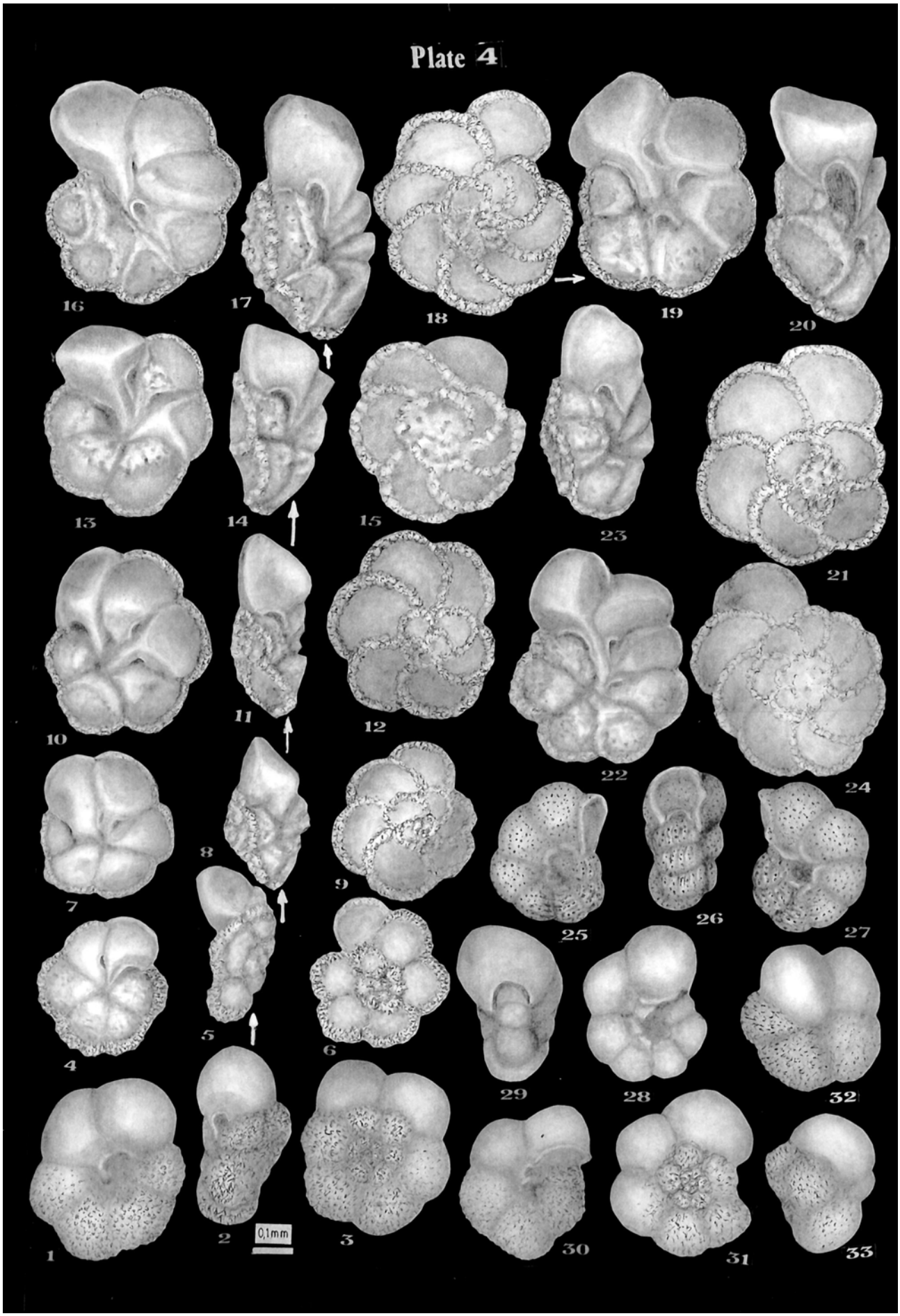
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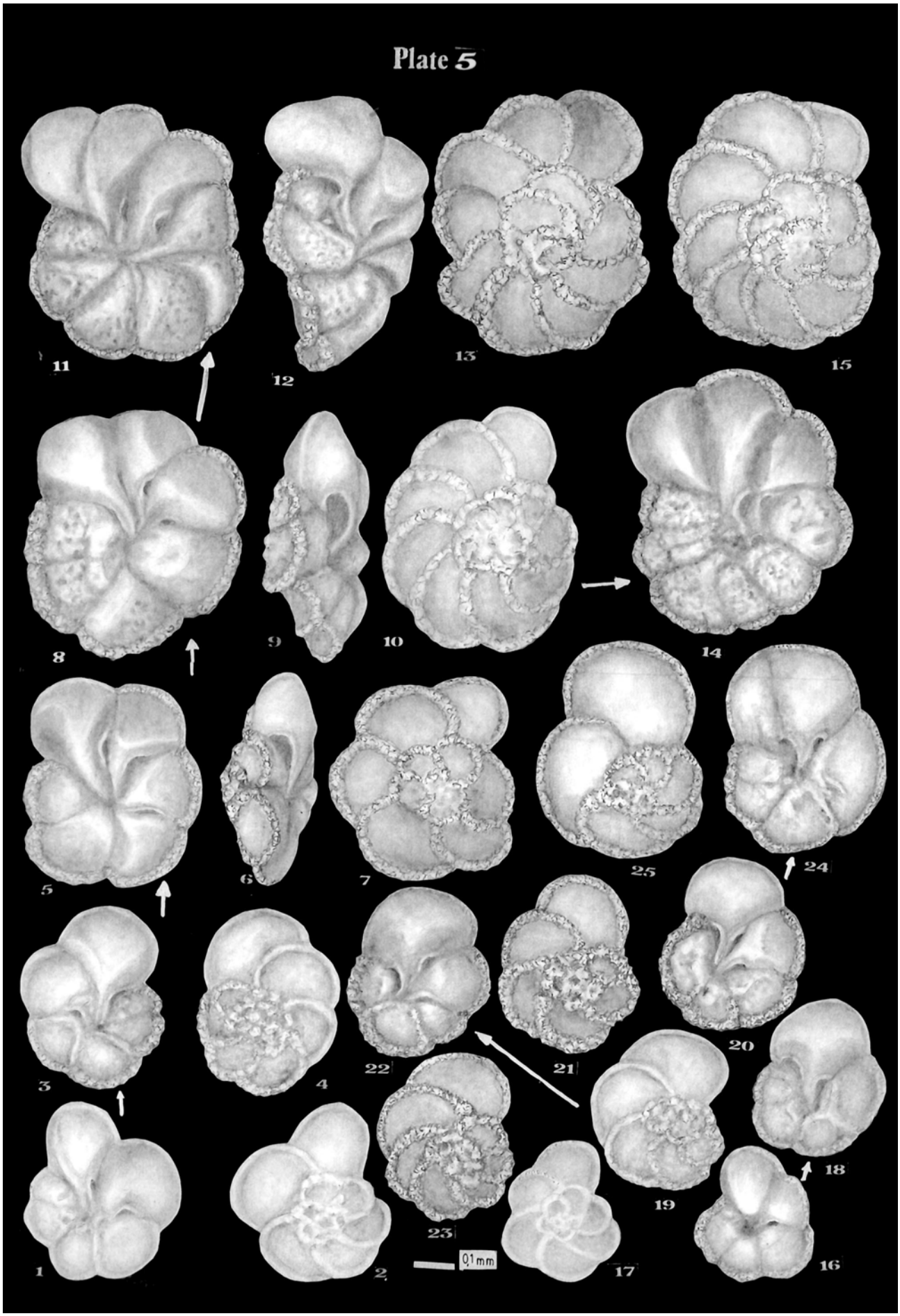
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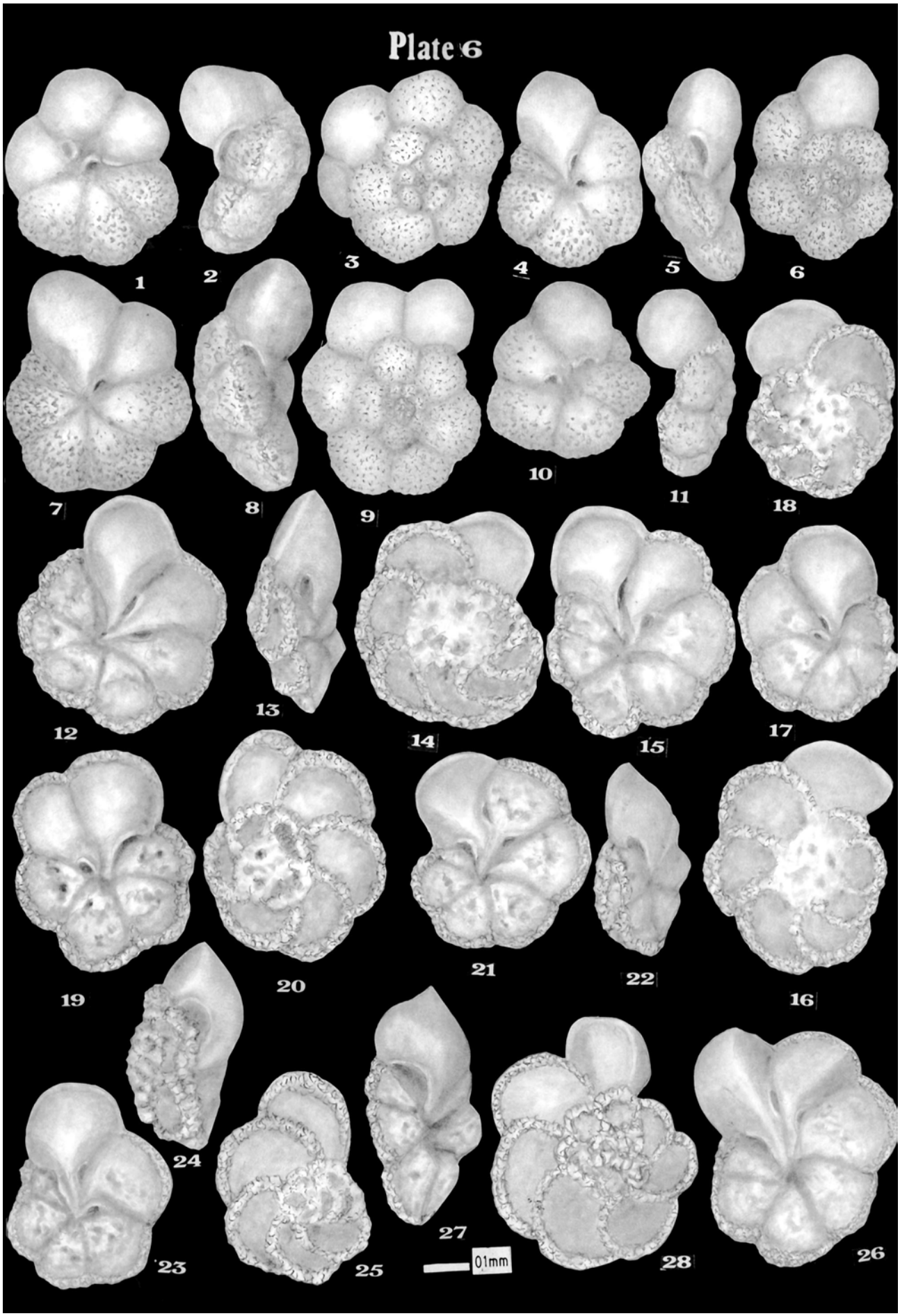
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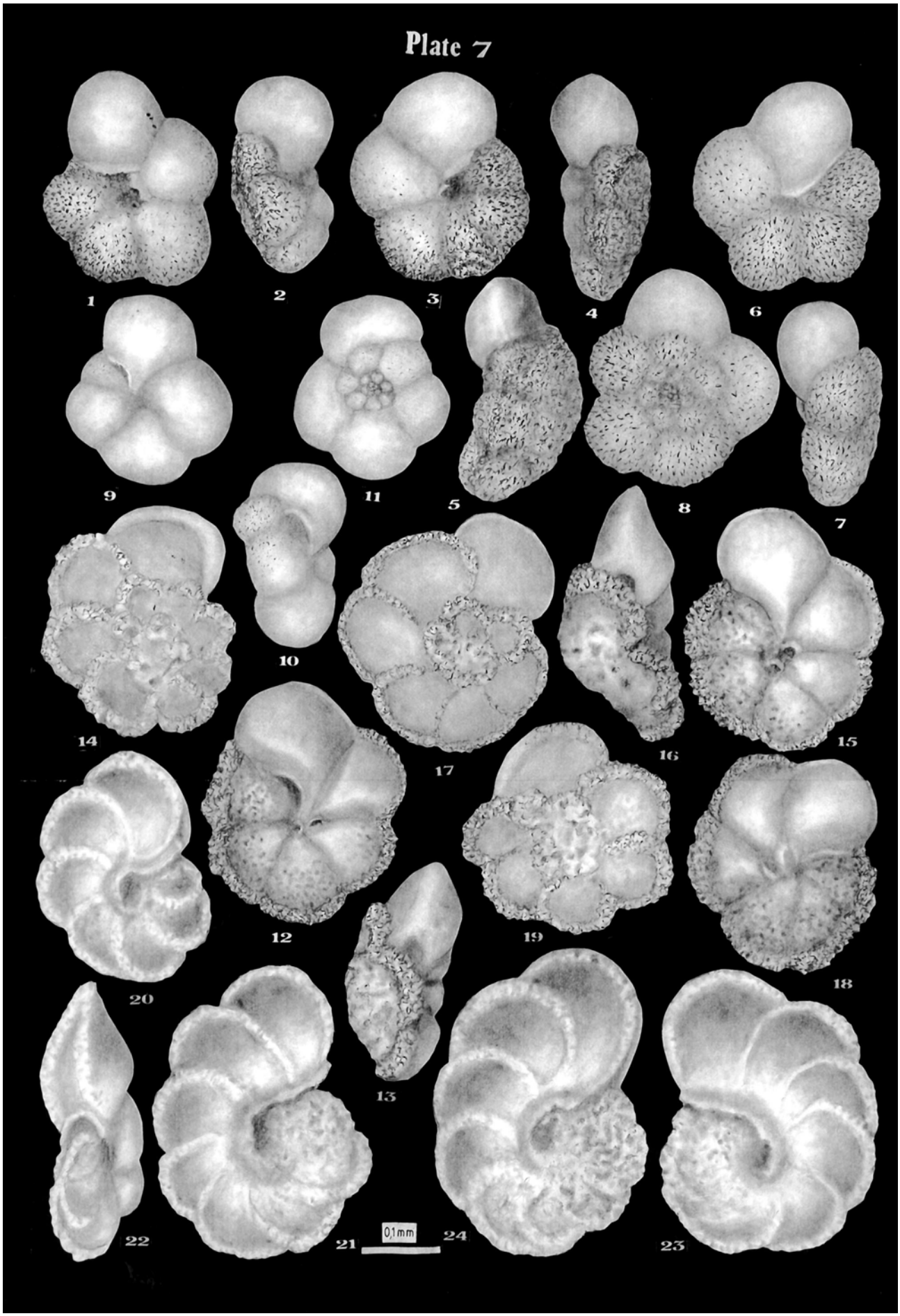
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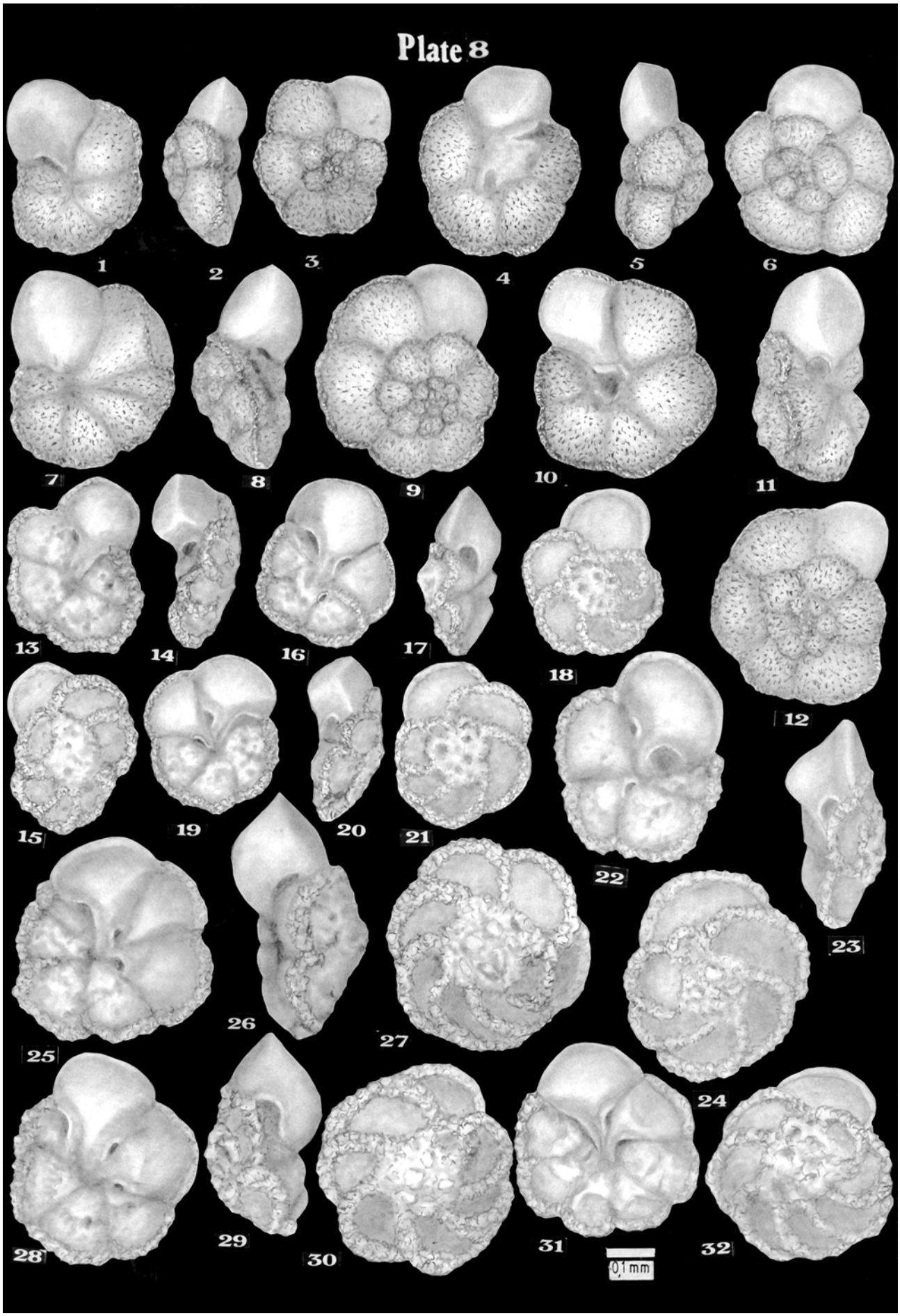
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